

Venezuela: Los Roques Archipelago National Park

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Date of most recent on-site evaluation: May 2002

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Location: Federal Dependency, Venezuelan Caribbean Sea

Year Created: 1972

Area: 221,120 ha

Ecoregion: Coastal Venezuelan mangroves

Habitat: Coral reefs, seagrass (*Thalassia*) beds, coastal mangroves, littoral grassland



Summary

Description

Los Roques Archipelago National Park was created in 1972 to protect a marine ecosystem of exceptional beauty and ecological value dominated by coral reefs, mangroves, and seagrass beds. The park, located about 130 km from the Venezuela's mainland coast, covers 221,120 ha, making it the largest marine park in the Caribbean Sea. Long before it was declared a national park, an important fishing practice was establishing in the archipelago, one that developed into the small native town of Gran Roque Island, which produces 90% of the lobster for consumption in Venezuela. In 1996, Los Roques was declared a Ramsar site because of its importance as a reservoir of biodiversity and food resources. Over the past ten years, tourism has replaced fishing as the main economic activity. More than 50 thousand tourists, who stay in any of 60 available lodges, visit the park yearly. Today, the town has more than 1,200 residents and its tourism services are becoming insufficient.

Biodiversity

This national park protects one of the highest-quality coral reefs with respect to species diversity, area of live coverage, and low incidence of diseases in all the Caribbean. Los Roques harbors about 61 species of corals, 200 species of crustaceans, 140 species of mollusks, 45 species of echinoderms, 60 species of sponges, and 280 species of fish. In addition, 92 bird species, 50 of which are migratory, can be seen in the park. Four globally endangered sea turtle species nest regularly on the islands, including the most important nesting site for *Eretmochelys imbricata* in Venezuela.

Threats

Los Roques is one of the best parks in the country in terms of its conservation, and it boasts an important community of allies; hence, solving its threats is more feasible in comparison with other national parks. Current threats include the lack of adequate personnel and infrastructure, solid waste contamination, wastewater management, and illegal fishing. The growth, both of the tourist industry and the population of Gran Roque, could become a serious threat to the biological integrity of this park, which is why ParksWatch considers it [vulnerable](#). However, implementation of an ambitious insular development project proposed by the Ministry of the Environment could be the solution to these threats.

Description

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Physical description

Los Roques Archipelago National Park is found in the Caribbean Sea, 130 km north of the central coast of Venezuela's continental territory. The archipelago is an extensive coral atoll that spans 36 km east to west and 24.6 km north to south. The atoll is composed of 50 islands, about 292 keys, and extensive coral reefs covering an area of 221,120 ha. It is only 130 meters above sea level at its highest point, but it can reach depths of 1,700 m in its deepest portion, with average depths below 15 m in the north. The park is located between 11° 58' 36" and 11° 44' 26" N and 66° 57' 26" and 66° 36' 25" W, and it is part of the Federal Dependencies of Venezuela's insular territory.



Aerial view of the archipelago. Photo: Yann Arthus Bertrand

The climate in Los Roques is warm and dry. Average annual temperature is 28 °C with an average annual rainfall of 250 mm (maximum of 480 mm). The warmest months are September and October. Under these conditions vegetation is mostly xerophytic, dominated by halophilic grasslands and bushes common to the Venezuelan coast. There are also large extensions of mangrove forests and immense shallow water seagrass beds. Inland lagoons are common in the many keys that form part of the archipelago. Many of these lagoons were created when two or more keys intertwined, and also when the growing tendency of mangrove forests and coral reefs enclosed the lagoons (originally connected to the open sea). One of the major attractions is the coral atoll that forms the archipelago. Experts consider it to be one of the largest and best-preserved atolls in the Caribbean Sea.

The geologic origin of these reefs is very recent -about 10,000 to 15,000 years ago. However, the rock foundations that sustain the reefs originated about 40 million years ago during the Upper Cretaceous (Méndez 1978). These igneous and metamorphic rock foundations constitute the hills in Gran Roque. Calcareous sediments from reef crumbling, shells, and the residues of other marine organism, accumulated on these rock foundations. After the last ice age, between 15 and 19 thousand years ago, sea levels rose considerably due to the melting of polar ice. This caused the growth of the north and south barriers, which enabled the formation of keys because they offered a natural protection of the inner area (Méndez 1978, AUA 2002). Los Roques is a unique archipelago because it is a coral-shaped atoll that formed without the intervention of volcanic processes (Méndez 1978).

In 1996, Los Roques was declared as a Ramsar site because of its importance as a biodiversity and food-resource reservoir.

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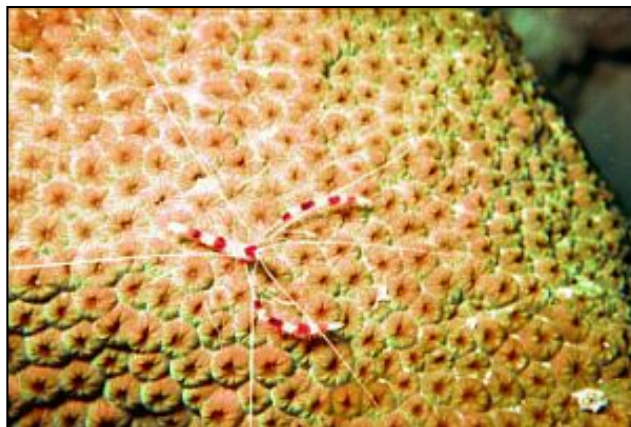
Biodiversity

Due to its privileged geographic location in the Caribbean Sea and the convergence of three highly diverse ecosystems (coral reefs, seagrass beds, and mangrove communities), Los Roques Archipelago is considered a coastal marine paradise.

Los Roques Archipelago National Park is the most important reef formation in Venezuela and in the south Caribbean Sea (Ramirez 2001). About 56 species of scleractinian corals and three milleporids have been reported for Los Roques. This represents almost all the coral species reported for the country (66 scleractinian and three milleporid). Also, present in the park are nine of the 56 species of octocorals present in Venezuela. The low density of octocorals is apparently explained by the deeper average depth of reefs in Los Roques, which does not favor the establishment of species of this family (Ramirez 2001).

Carolina Bastidas, a Marine Biology Professor at Simón Bolívar University, told ParksWatch that this archipelago harbors one of the highest quality coral reefs with respect to species diversity, area of live coverage and low incidence of diseases in the Caribbean Sea. The park has a large coverage of corals from the Acroporidae family, which have been adversely affected in the rest of the Caribbean region.

The marine fauna in Los Roques -characteristic of coral reefs and seagrass beds- includes, among other taxonomic groups, about 200 crustacean species, 140 mollusk species, 45 echinoderm species and 60 sponge species (65% of the country's). Approximately 280 fish species, from 41 genera and 31 families, have been catalogued. This represents 35% of the species that exist in the country. These fish have an important economic and nutritional value. Snappers, including yellow tailed snappers (Lutjanidae), and groupers (Escombridae and Serranidae) are of high economic value (Gondelles 1997).



There is a great diversity of marine invertebrates in Los Roques. Photo: Carolina Bastidas

The lobster (*Panulirus argus*) and queen conch (*Strombus gigas*) are also examples of commercially valuable species found in Los Roques. The park contains the most important unexploited populations of these species in the entire Caribbean region (Fernández 2002). Another commercially important species is the queen conch, which is a very large gasteropod with a shell length of about 20 cm. Due to the alarming rates of overexploitation of its natural populations, in 1994 the gasteropod was included in the International Union for the Conservation of Nature (IUCN) list of "Commercially Threatened Species" and in The Red Book of Venezuelan Fauna (Rodríguez & Rojas-Suárez 1999, AMNH 1996). Human settlements in the Caribbean Sea use this species as a food resource and raw material for handicrafts.

Numerous migratory birds converge in Los Roques and it is a suitable area for the establishment of marine

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and pelagic bird colonies. About 92 bird species can be found in Los Roques, 50 of which are migratory and come from North America (Lentino, Luy & Bruni 1994). Among the most attractive birds that nest annually in Los Roques, are the brown pelican (*Pelecanus occidentalis*), two bobby species (*Sula sula* and *S. leucogaster*), the laughing gull (*Larus atricilla*), the common, least, and brindled tern (*Sterna hirundo*, *S. antillarum*, *S. anaethetus*), the brown noddy (*Anous stolidus*) and the lesser noddy (*Anous minutus*) (Bosque, Esclasans & Pizani 2002). Flamingos (*Phoenicopterus ruber*) are also present in the park. A black colored subspecies (*Coereba flaverola lowii*) of the common bananaquit is endemic to Los Roques. Also found in are the yellow warbler (*Dendroica petechia obscura*) and the common ground-dove (*Columbina passerina tortugensis*), which are subspecies endemic to Venezuelan Caribbean Islands (Lentino, Luy & Bruni 1994).



Chicks and juveniles of Sula leucogaster in a reproductive colony at upper Canqui island

Four species of sea turtles nest in Los Roques: the loggerhead turtle (*Caretta caretta*), the green turtle (*Chelonia mydas*), the leatherback turtle (*Dermochelys coriacea*), and the hawksbill turtle (*Eretmochelys imbricata*) (Guada & Vernet 1992, De los Llanos 2002). The first two are globally endangered (EN A1abd), and the last two are critically endangered (CR A1abd, CR A1abd+2bcd) according to the criteria used by the IUCN. The Red Book of Venezuelan Fauna categorizes the loggerhead as vulnerable and the other three species as endangered (Rodríguez & Rojas-Suaréz 1999). Los Roques is the most important nesting place for *Eretmochelys imbricata* in Venezuela (De los Llanos 2002). Other reptiles include the lizard *Gonatodes vitattus roquensis*, a subspecies endemic to the archipelago, and *Cnemidophorus lemmiscatus nigricolor*, a very abundant black lizard that was first described with a specimen from Los Roques (SCNLS 1956). *Gymnodactylus antillensis* is a species endemic to leeward Caribbean islands that has been reported only in Bonaire, Curacao, La Orchila, Las Aves, and Los Roques.

An interesting fact about the fauna from the archipelago is that, with the exception of the fishing bat (*Noctilio leporinus*), no native land mammals exist (Gondelles 1997). Hence, any biological invasion poses a serious threat to the biological integrity of the system. With respect to marine mammals, a recent investigation has included Los Roques as part of the potential distribution for six cetaceans: *Balaenoptera edeni*, *Megaptera novaeangliae*, *Delphinus* sp., *Stenella frontalis*, *Stenella longirostris*, and *Tursiops truncatus* (Acevedo 2001).

Approximately 38 plant species have been reported. Four mangrove species live in the park: red mangrove

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(*Rhizophora mangle*), black mangrove (*Avicennia nitida*), white mangrove (*Laguncularia racemosa*), and button-wood mangrove (*Conocarpus erectus*). Also present are various halophilic plants like the sea purslane (*Sesuvium portulacastrum* and *Sporobolus pyramidatus*), three cypress species (*Cyperus* sp.), and many shrubs that include the salt wort (*Batis maritima* and *Tournefortia gnaphalodes*). A specimen from Los Roques was used to describe the grass *Setaria submacrostachya* to science. The cacti *Stenocereus griseus*, *Melocactus caesius*, and *Opuntia wentiana* dominate areas that are high and exposed to winds. Shallow water zones with sandy bottoms are mostly dominated by *Thalassia testudinum* seagrass beds, a species widely distributed in the Caribbean Sea (SCNLS 1956, Gondelles 1997).



The red mangrove (Rhizophora mangle) the most common mangrove in Los Roques



Seagrass bed of Thalassia testudinum Photo: Carolina Bastidas

Management

Due to its geographic location and Federal Dependency status, many governmental organizations are present in Los Roques. In order to prevent the overlap of responsibilities, the Autoridad Única de Área (AUA) was created in 1991. The goal of this organization, which is ascribed to the Ministry of the Environment, is to coordinate the functions of all the institutions present in the park in order to follow the Management Plan for Los Roques Archipelago National Park.

Since 1991, Los Roques has a "management plan in which seven management zones are outlined:

- **Integral Protection Zone:** Made up of the islands Selesquí, Los Canquises, Isla Larga and the Esparquí-Sebastopol-Boca de Cote complex, and emergent zones around them like sand bars and reefs. Access is restricted and only monitoring and research activities supervised by INPARQUES are allowed.
- **Primitive Zone:** Includes the marine area that surrounds Selesquí Island coral reef, Cayo Carenero, and part of the area that surrounds Los Canquises (a distance of half a nautical mile [926 m]). Also included are Cayo Sal, Dos Mosquises Norte, Cayo de Agua, Bequevé, and the East Barrier, which contains the keys of Nordisquí, Cayo Vapor, Cayo Muerto, Botosquí, Saquisaqui, among others (see map).
- **Managed Natural Environment Zone:** Includes the keys Remanso Isla Felipe, Isla Fernando, Yonquí, Sarquí, Espenquí, Isla Agustín (Prestonquí), Turquí, Sandquí, Cayo Loco, and Rabusquí. All areas that are not included in any other category, as the waters that lie outside the archipelago but that remain inside park limits, fall under this category.
- **Recreation Zone:** Includes Gran Roque islands, and the keys and reefs of Francisquíes, Rasquí,

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Madrisquí, Cayo Pirata, Noronquises and Crasquí.

- **Zone of Historic, Cultural, Archaeologic and Paleontologic Interest:** Includes certain sectors of Bequevé, Cayo de Agua, Dos Mosquises, middle Noronquí, Cayo Sal, Los Canquises, Gran Roque, and Crasquí keys.
- **Service Zone:** Comprises areas of the park allotted for the installation of infrastructure for tourism, scientific research, and anchoring zones for boats.
- **Special Use Zone:** Includes all areas that have been affected or submitted to activities that go against park rules to which special management plans have been assigned. These are:
 - Navigation Channel, a 100m wide waterway that determines the entrance route to the park by sea.
 - Dos Mosquises Sur key, includes the surface of this key and all installations dedicated to scientific research.
 - Gran Roque Island, where the only permanent human settlement is found and the categories of Managed Natural Environment Zone, Service Zone, Recreation Zone, and Traditional Human Settlement Zone have been included on the island.

According to the AUA's creation decree (1,214 of Gaceta Oficial N° 4,250E, 01/18/1991), this organization is in charge of administering public services and urban regulations in Gran Roque Island, the fulfillment of the management plan for the town and tourist activity control. The desalination plant that produces water for human consumption, in addition to the electric plant and management of waste, are all controlled by the AUA. Their operating expenses come almost entirely from taxes paid by tourist operators in the park (restaurants and lodges) and a visitor entrance fee. The AUA has 50 employees in Los Roques and approximately 25 in Caracas.

In other respects, environmental regulation and administration of non-tourist zones in the park fall under the jurisdiction of the National Parks Institute (INPARQUES), the organization responsible for administration and management of national parks in Venezuela. Aside from these two institutions (AUA and INPARQUES), the Autonomous Fishery Service (SARPA), ascribed to the Ministry of the Environment; regulates fishing activities in the archipelago with the help of INPARQUES and the National Guard.

INPARQUES has seven park guards and one superintendent (Ing. Jesús Durán) that monitor and guard the park. Most of them are stationed at the Gran Roque guard post. The Dos Mosquises post has one guard, and there are no permanent personnel at the Crasquí post. The park has three boats with only one of them working properly. The latter is an 18-foot boat with two 175 HP motors that was donated by the Spanish Agency of International Cooperation (AECI). The AECI also donated computer equipment to the office of INPARQUES in Gran Roque. The headquarters in Gran Roque, Dos Mosquises guard post, and the boat donated by the AECI are all equipped with radios.

The park has three access routes by sea, all duly outlined in navigation charts and marked by beacons. There is one beacon on the northeastern limits in the Boca de Sebastopol (11° 46' N, 66° 35' W), another at the southwestern tip close to Dos Mosquises (11° 48' N, 66° 54' W), and the third located around the north access in Gran Roque Island. The islands visited by tourists are well marked. However, Integral Protection Zones and Managed Natural Environment Zones visited by ParksWatch-Venezuela lacked signs or the existing signs were not properly maintained.

The annual budget assigned to INPARQUES for managing Los Roques is of 30,000,000 bolívares (about US \$30,000). All of this money comes from the central administration. Other minor income comes from entrance fees (visiting boats) and from a few older lodges that do not pay the AUA. On the other hand, in the year 2000, the AUA received approximately 418,505,000 bolívares (about US \$418,505) from entrance fees alone (payment from lodges or other income are not included in this amount).

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Human influence

Park inhabitants

Humans have been present in the park since the first millennium of our era. Recent archaeological studies indicate that indigenous people frequently visited the archipelago. They navigated from the mainland to fish, capture turtles and queen conchs, and extract salt in Los Roques. These activities followed until the time of the Spanish occupation when fishers, pearl divers, and mangrove harvesters began to visit the archipelago, and pirates and smugglers used it as a base or hiding place. By the middle of the 18th century, Los Roques was a very important place for guano harvesting. In 1866, the Venezuelan government signed an agreement with a Dutch businessman for the extraction and commercialization of guano from Los Roques. Also during this period, fishers and salt harvesters from Curacao, Aruba and Bonaire visited the archipelago. The peculiar names of most of the keys in the archipelago we owe these visitors; names that end in "qui," which is a deviation from the English word "key" (Northeast Key: Nordisquí, Sails Key: Selesquí, St. Louis Key: Celusquí, to name a few).

It was not until the middle of the 20th century that Venezuelan fishers started to inhabit the archipelago permanently. They came from Margarita Island and progressively brought their families with them. By 1941, Los Roques had a population of 484 people spread amongst eight islands (Gran Roque, Crasquí, Carenero, Cayo Pirata, Domusquí, Esparquí, Isla Fernando and Prestonquí). The population had grown to 559 people by 1950. In 1956, there was a school running in Gran Roque, electricity was generated with fuel, and there were plans to build a desalination plant (SCNLS 1956). After the national park was created, population was limited to Gran Roque Island. In 1987, Los Roques Scientific Foundation performed a census and determined there were 847 inhabitants in Gran Roque. Only 663 of these were permanent residents and the rest were fishers that came from Margarita (Posada & Brunetti 1988). Presently, the island has 1,209 permanent residents, which include native settlers, tourist operators, and institutional personnel (AUA 2001).

Historically, fishing has been the major economic activity in the archipelago; however, since the early 1990s tourism has experienced an immense growth. Fishing has been strictly regulated since the creation of the national park and about 300 fishers take up temporary residence on the island during the fishing season.

Fishing

According to archaeological research done in the park, resource exploitation of fishing resources in the area dates back to pre-colonial times (Antczak & Antczak 1988). Nowadays, fishing is an important economic activity for the inhabitants of Gran Roque, and furthermore, Los Roques represents an important source of food for the rest of the country. Los Roques produces 94% of the lobster consumed in Venezuela and it also represents an important part of the high commercial value of fish species, especially the snappers and groupers (Gondelles 1997).

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Fishermen in Gran Roque

Since the management plan was created in 1991, fishing is strictly regulated by the Autonomous Fisheries Service (SARPA), a part of the Ministry of the Environment. This organization registers the size and weight of the 1,000,000 kg of fish and 120,000 kg of lobster that are extracted by Los Roques and Margarita fishers during the season. According to the superintendent, in 2000, lobster fishery revenues were in the order of 300 million bolívares (about US \$300,000). About 100 people are currently dedicated to this economic activity (AUA 2001), which is less than in 1987 when research reported 172 resident fishers from a total of 767 inhabitants in the archipelago (Posada & Brunetti 1988).

Tourism

In the last decade, tourism has become important in Los Roques. Locals were not involved in tourist activities until 1990. Before this, outsiders (wealthy Venezuelans from Caracas and foreigners), who could buy houses inside the park, managed the few existing lodges. Access was restricted to light aircraft or private boats. Aerotuy was the only commercial airline operating in Los Roques at the time.

There are 60 lodges, 50 travel agencies and six airlines currently operating in Los Roques. However, Aerotuy still dominates the tourist industry in the area. In 2000, 49% of the tourists that traveled by air did so through Aerotuy; 43% of foreign tourists and 27% of the Venezuelan tourists stayed at 10% of the lodges, all of which are owned by Aerotuy. Tourist packages for 33% of the Venezuelan tourists were bought in the Aerotuy travel agency (AUA 2000).

More than 75,000 tourists visited Los Roques in 2001 (AUA 2002). At the beginning of the tourist boom, 60% of the visitors were foreigners, most of them from the United States, Italy, Spain, Germany, France and the United Kingdom. However, in the last three years, this tendency has reversed. International tourism in the country has decreased after the Vargas State landslides towards the end of 1999 (for more information see ParksWatch news). The consequent reduction of "sun and beach" destinations in the central Venezuelan littoral, and the increasing offer of affordable tour packages of one or two days to the park, has boosted local tourism. In 2001, 65% of the tourists that visited Los Roques were Venezuelan. That year, the highest tourist influx happened during school holidays from July to September, in December, Easter and at Carnival (AUA 2000).

Out of all the tourists that visit Los Roques, 95% of them arrive by plane while the rest travel by boat (AUA 2002). Airfare from Caracas is US \$130. Most of the 60 existing lodges belong to foreign businesspeople, though some of them are the property of families from Los Roques. Lodging includes breakfast and dinner and prices range from US \$50-200 per night per person. Some lodges also include transfers to islands, lunch,

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beach chairs, sunshade, and snorkeling equipment. Staying on a sailboat is another option for about US \$150 a day per person. The cheapest option is to camp in designated INPARQUES areas. Even though Los Roques has a variety of lodging options, 96% of the tourists stay in lodges, 3% in sailboats and less than 1% camp (AUA 2000).

Los Roques Archipelago attracts a number of visitors that come to do many different activities. The natural beauty of the beaches attracts most tourists (AUA 2000). Coral reefs are of special interest to professional and recreational scuba divers. Sport fishing and windsurfing are also practiced in Los Roques, and it is even possible to go for a ride in an ultralight. Among other tourist attractions are the Virgen del Valle celebrations in the second week of September, and the Lobster Festival at the beginning of the lobster-fishing season in November. Sailors and Pilots also consider Los Roques to be a very interesting place because it is an amazing archipelago due to its distance from the mainland.



The coral reefs are a popular attraction for scuba divers. Photo: Carolina Bastidas



Tourists during the low season on the island of Francisquí

Without a doubt, tourism is the most important economic activity in the park. In Gran Roque, it generates direct employment for almost 40% of the active population between 18 and 70 years of age (AUA 2001). From 1996 to 2001, the AUA received an average of 400 million bolívares per year (about US \$400,000) from tourist entrance fees paid by those who come to Los Roques by plane (AUA 2000 & ParksWatch interview).

Conservation and research

Long before it became a national park, Los Roques was the object of scientific research in many different disciplines including geology, anthropology, oceanography, ecology and marine biology. In 1937, Aguerrevere and López led one of the first expeditions to Los Roques during which they studied the system's geology and phosphate deposits. Other pioneer expeditions were that of William Phelps in the 1950s, who made notable contributions to the archipelago's bird fauna, and the expeditions in 1950 and 1954 by the La Salle Foundation who put together the most complete fauna and flora study of the time.

Many research projects have been carried out in Los Roques. Carlsen (1999) registered 78 research projects mainly in tourism, ecology and marine biology. Since 1963, Los Roques Scientific Foundation (FCLR), with a Marine Biology Station on Dos Mosquises Island, has worked as a private institution carrying out conservation and research in marine science and archeology. Until 1999, the FCLR had conducted about 42

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research projects in taxonomy and marine systematics, aquaculture, fishery biology, marine ecology, human ecology, sustainable development, and archaeology. These projects have produced 92 scientific papers, 17 technical reports, 33 theses and about 30 popular or educational publications. Marlena and Andrej Antczak have been conducting archaeological research in many of the archipelago's islands since 1982. The Biological Station at Dos Mosquises currently exhibits some of their findings.

Since 1987, Juan Posada has studied the fisheries of queen conch, lobster, and fish in general. As a marine biology teacher at Simón Bolívar University in the last few years Posada has advised a number of students studying many aspects of commercially valuable species (i.e. queen conch, lobster, and bone fish). Aside from this, students from the Science Faculty of the Central University of Venezuela have studied coral anomalies and its diseases, and the possible effects that tourism causes on coral reefs. In 1996, the Universidad Central de Venezuela diving club (BIOSUB) studied coral bleaching and evaluated the sea cucumber population with the purpose of regulating its commercial harvest (see López 1996).

Carlos Bosque, Ornithology teacher at Simón Bolívar University, determined the conservation status of the reproductive colonies of sea birds in Los Roques. The project was financed by the World Bank with the intermediacy of INPARQUES. According to this study, park zoning has been beneficial for the maintenance of reproductive colonies of many bird species that are considered rare or scarce in the Caribbean Sea.

The conservation status of sea turtles that nest in the park was recently evaluated by Verónica de Los Llanos and Hedelvy Guada. The Spanish Agency of International Cooperation (AECI) has developed the program "Araucaria Los Roques" in order to conserve biodiversity and promote sustainable development of the natural resources in Los Roques Archipelago National Park. This four-year program started in 2000, has a budget of 790,029 Euros. This comprehensive project involves the community at Los Roques, governmental organizations, and universities. Two institutes from the Simón Bolívar University are currently carrying out research that is included in the program. The Natural Resource Institute evaluates the conservation status of the park's natural resources and their management. The Regional and Urban Studies Institute is conducting a demographic study of the population that lives in Gran Roque.

Threats

Current threats

INPARQUES' administrative weakness

In Los Roques Archipelago National Park, management has focused on urban planning and tourist activities, without giving much attention to areas that are not related to tourism. Because of the different aspects that require state control or supervision, a great number of government agencies exist in Los Roques. Even though the duty of the Autoridad Única de Área (AUA) is to coordinate the functions of other organizations, hierarchies and responsibilities are not clear. Many of these organizations are dependencies of the Ministry of the Environment. However, assigned budgets are noticeably different, which interferes with their capability to adequately accomplish their obligations.

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A sign on the island Francisquí, a Recreation Zone managed by AUA



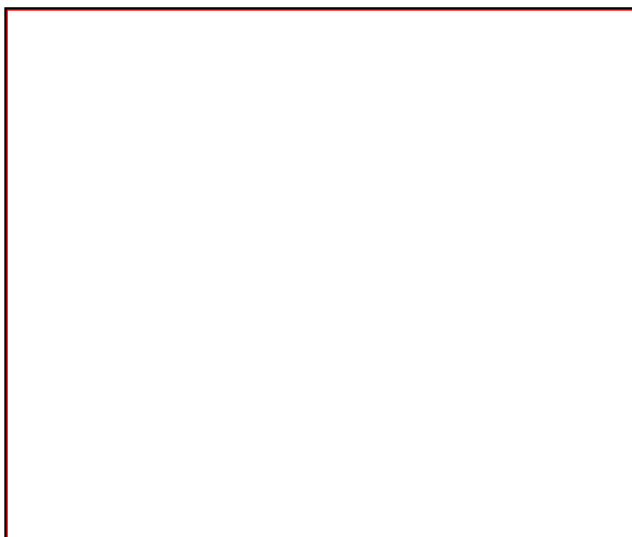
Signs on Isla Larga, an Integral Protection Zone managed by INPARQUES

The AUA serves as a local government in charge of providing public services to the people of Gran Roque. Although this is only a small part of park management, it is considered the most important, obvious by the size and budget of this institution. Most of AUA's income (400 million bolívares per year) comes from tourist entrance fees and taxes paid by lodges and other concessions. On the other hand, INPARQUES receives insufficient funds (30 million Bolívares per year) from the central administration and very little income, if any at all, from other sources. In Los Roques, the AUA has 50 employees that work in Gran Roque. INPARQUES, however, has only 10 employees that are in charge of educational activities and guarding the entire park. This difference in administrative capabilities affects how well they perform their duties; for example, when garbage accumulation in recreation zones is compared to that in higher protection zones (see solid waste contamination).

Lack of personnel and infrastructure

The park has seven active park guards. Most of them are from other non-marine parts of the country and there are some who do not have the skills needed (swimming and boat navigation) to do their job well. A noteworthy exception to this is park guard Toribio Mata. For over 26 years, he has worked for INPARQUES, and he is the park's most experienced guard. One out of seven park guards stays at the Dos Mosquises guard post station. The rest remain at the main guard post in Gran Roque, while the Crasquí post is unmanned.

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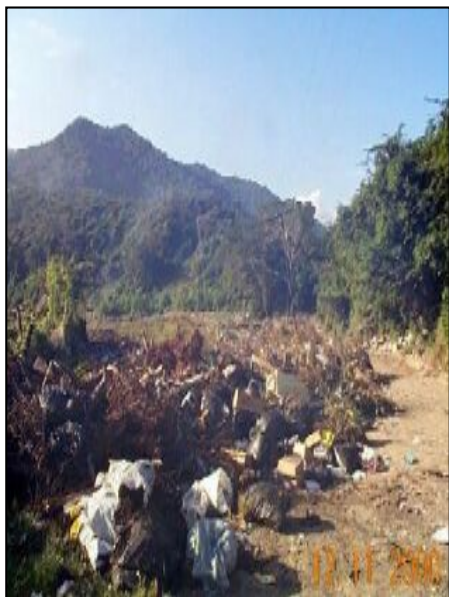


The guard post in Dos Mosquises Sur. Photo: Diana Esclasans

In addition, INPARQUES does not have enough boats for control and guard duties. Only one of three boats is in working order; the one recently donated by the AECI. The other two present have mechanical problems. The lack of boats, and the fact that not all park guards are capable of driving them, reduces the ability to guard the park and to detect environmental infractions.

Solid waste contamination

During our visit to the Integral Protection Zones of lower Canquí, upper Canquí, and Isla Larga, we noticed a large amount of garbage on the shore of these islands. However, on Sarquí Island, a Managed Natural Environment, we noticed that most of the garbage was inland. During the high tourist season, Sarquí Island is visited by a number of boats, even though it is not a recreational zone most air-travelers visit.



Garbage on the island of Sarquí, Managed Natural Environment Zone

The garbage was mostly plastic waste, and bottles, cans of fuel and oil for outboard motors. Most of the items found in the waste were brands that are not commercially distributed in Venezuela. We believe that

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they are tossed by foreign boats visiting the park, those of tourists in their yachts and/or from cargo boats that buy fish in Los Roques and sell it to other Caribbean islands. It is also possible that some of the waste comes from other Antillean countries through marine currents to the coasts of Los Roques. Waste accumulates in these "protected" zones because cleaning efforts are not as frequent as in recreational zones. INPARQUES, which has less budget and personnel than the AUA, is responsible for cleaning of non-recreational zones.

We did not observe accumulated garbage either in the Francisquí Recreational Zone or in the Gran Roque Special Use Zone. This is due to the fact that concession owners are obligated to maintain clean islands, and also because tourist operators return the garbage generated by their tourists to Gran Roque. The AUA maintains a biweekly garbage collection program on the island and in other recreational zones. Garbage is sorted by its type (plastic, metal, paper) by the solid waste management program, and it is then either incinerated or shipped to the mainland depending on its type. In the past, garbage was sorted by collectors before it was taken to the incinerator, now, it is sorted onsite at the incinerator plant. We must take into consideration the fact that ParksWatch-Venezuela visited the park during the low-tourist season. The efficiency of solid waste management should also be verified during the high season.

Wastewater management

Gran Roque Island has inadequate wastewater management. Household septic tanks do not have adequate control and are not cleaned regularly. In 1999, an investigation done by the Environmental Quality Division of the Ministry of the Environment, determined that certain Gran Roque Island beaches presented bacteria, fungi, and fecal bacteria densities above legal permissible limits. During the rainy season, investigators that work in the park have reported foul odors. One of the park guards told us the foul odors spread because ill-maintained septic tanks filter out when the water table rises. It is necessary to evaluate if sewage management in Gran Roque could be affecting the park's marine ecosystem or the island inhabitants.

Illegal fishing

The over-fishing of certain highly sought after species has seriously affected these populations even before the archipelago was decreed a national park. The queen conch (*Strombus gigas*) and lobster (*Panulirus argus*) are the most affected species, producing over 90% of the nation's total production in 1987 (Posada & Álvarez 1988). Studies carried out by Los Roques Foundation determined that almost 70% of the extracted queen conchs were juveniles and the adult population had decreased by 17.6% (Posada & Álvarez 1988). As a result of these studies, the fishing season for the gasteropod has been closed indefinitely since 1991.

Regardless of the prohibition, queen conch fishing has continued illegally. This has caused animosity between INPARQUES and some fishers who on one occasion attacked the park guards and biological station personnel. The enormous mountains of shells on Isla Fernando, La Pelona, Cayo Sal, and Carenero, among others, are evidence of the scale of queen conch extraction. From April through November, when the lobster season is closed, queen conch poaching intensifies (Matos 2000). In two hours, up to 700 conchs can be captured (Posada & Álvarez 1988). Similarly, while lobster is protected during its reproductive season, fishing is still a common activity, including that of small fish, also prohibited by law (Yallonardo 2001).

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Illegal fishing: a pile of queen conch shells (Strombus gigas). Photo: Carolina Bastidas

Fishing in restricted zones is one of the most frequent violations in the park. Also, fishers usually do not report their entire catch to the fisheries authority (currently SARPA). In 1987, research determined that the harvest of fish for that season was 1,316,327 kg, and only 277,062 kg of these were reported (Posada & Brunetti 1988). Most of the illegal commerce of the fish catch occurs in Aruba, Curacao, and Bonaire where prices are better, which explains the reason why fishers do not report their total catch. There is also illegal harvesting of other species. In 1996, a ship bound for Japan with a 500 kg sea cucumber cargo valued at US \$150,000, was confiscated in Los Roques.

In regard to the sea turtles that live in the park, Guada & Vernet (1992) estimated that 500 sea turtles are poached annually. A recent study determined that humans poach 30% of the nests laid by the four species of sea turtles that nest in the park (De Los Llanos 2002).

Future threats

Population growth

The 2001 census performed by the AUA determined 1,209 people were living in Los Roques. Even though there are no other censuses of equal quality, it is possible to deduce a temporary growth out of the age structure of the population. Most of the population (54%) is under 28 years of age and almost 30% is under 16 (AUA 2001). An important part of the population is between 28 and 40 years of age (22%) who have lived in Los Roques less than 10-years (AUA 2001). Apparently, they were attracted by the availability of jobs promoted by the tourist industry since 1990.



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More than 1,000 people live on the island of Gran Roque which is also popular with tourists.

Due to the lack of space for urban growth and the imminent collapse of already deficient public services, population growth is in itself a threat. Crowding is common and about 40 families are homeless. Before the end of the year, 24 of these families will receive a home (AUA 2002). If migratory and reproductive tendencies continue, in the next five years the demand for space will increase dramatically.

Tourist industry growth

Because of the income generated by tourism in the last 10 years, INPARQUES and AUA have expressed a desire to develop tourist activities in Los Roques. Informal comments from both institutions express an interest to increase the number of lodges and to even allow access to currently restricted zones. Nevertheless, the ecological and economic effects of an increase in the number of lodges in the park have not been evaluated.



Tourist accommodations in Gran Roque

The tourist industry is practically monopolized by Aerotuy. Its airline is used by 49% of the tourists; 43% foreign tourists and 23% Venezuelan tourists stay in its lodges (10% of total), and 33% of the national tourists buy tour packages in Aerotuy's travel agency. The park's economy must be studied before the number of lodges is increased. In this way, predicting whether or not more lodges will benefit the park and/or the people of Gran Roque can be evaluated without risk. It is possible that many lodges already do not receive enough money throughout the year. If this were the case, the solution would be to evaluate the cause of unequal demand of lodges, not to build more.

Recommended Solutions

Current threats

INPARQUES' administrative weakness and lack of personnel and infrastructure

Even though the tourist industry is important for the park, we must not forget that the main objective of a national park is to protect the ecosystem. Special efforts must be made by INPARQUES and AUA (both belonging to the Ministry of the Environment) to improve management of the park's non-tourist areas, which will make Los Roques an attractive destination for "ecotourists."

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A potential way to increase the number of park guards, taking into account INPARQUES' budget deficit, is to ask the AUA to pay for their salaries. However, INPARQUES must also assign permanent personnel to the guard posts outside of Gran Roque. INPARQUES has not benefited from the presence of so many groups that are interested in the park's well being such as, tourist operators, commercial airlines, and telecommunication and commercial bank companies. These groups could be important allies for INPARQUES, facilitating the acquisition and maintenance of equipment like boats, radios, and other guard posts to improve park vigilance.

Regarding Los Roques' personnel training, currently, park guards are taking a scuba diving course, training which would be beneficial to repeat in the future. Training locals to become park guards would be an ideal project. They have the skills and knowledge needed to successfully accomplish the job. The additional advantages to this idea would be helping the economies of local communities and forming allies with local leaders and the general public. In Los Roques, as well as in other national parks, there is ample evidence of how local park guards are respected by inhabitants.

Solid waste pollution

In the town of Gran Roque and the recreational zones of Los Roques, the AUA has the responsibility for solving this problem. They have carried out awareness campaigns and are planning to reactivate a program of sorting garbage in the town. The garbage will be sorted into containers before taken to the incinerator. A temporary concession was recently offered to take and commercialize solid waste on the mainland. The island's plastic cutting machine was recently fixed through an agreement with the AEI. Can-crushing equipment and an ecological incinerator system will soon be implemented.

Educational campaigns during the high tourist season could provide incentives --in the form of gifts-- to tourists who pick up their trash. A program like this was carried out in Mochima National Park with positive results. Gifts were provided and sponsored by companies interested in "green publicity."

INPARQUES has promoted guided visits to Integral Protection Zones for school children from Gran Roque. They have picked up garbage during many of these visits. Non-tourist zone cleaning campaigns can be organized for volunteer groups from local schools or from other parts of the country. Since Los Roques is so attractive and there are many groups with economic interests in this park, it should be easy to find volunteers for cleaning campaigns, while generating allies for the park at the same time.

Wastewater management

The Minister of the Environment, Ana Elisa Osorio, recently presented the aqueduct and integral drainage project for Gran Roque which proposes to develop a fresh-water distribution system involving the collection and treatment of domestic wastewater. Three thousand million dollars will be invested in this project (La Rotta 2001).

Future threats

Population growth and tourist industry

The Ministry of the Environment is developing a program to populate the islands of the Venezuelan Caribbean Sea. It is expected that in the long run a large part of the population of Los Roques will be relocated to islands outside the park. This will begin once the proper infrastructure, adequate for the region's harsh weather, is constructed (La Rotta 2001).

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Gabriel Cruz, of AUA's Urban Department Program, informed ParksWatch that "sun and beach" tourism and fishing would be the main economic activities in these new settlements. The knowledge that people from Los Roques have for managing limited resources (e.g. water) will be used to develop the economies of these new settlements, which hopes to divert these types of tourists to other islands and away from the park.

In addition, the development of the tourist industry in the park will be focused on promoting ecotourism. Specialized tourism with high quality services would attract visitors interested in scuba diving, sport fishing, birdwatching, and observing other animals, like turtles and cetaceans. Ecotourism is becoming more important in the worldwide tourism market. Tourism of this sort will maintain a high level of income without having to increase the number of visitors to the national park.

This program seems to be the solution to the threat of population growth and it should be implemented as soon as possible. This will depend on how efficiently economic resources are made available, and decisions are taken by the Ministry of the Environment.

Conclusions

Undoubtedly, from a biological standpoint, Los Roques Archipelago National Park is one of the best-conserved national parks in Venezuela. It is a refuge for many species of birds, reptiles, and sea mammals, and is therefore of high ecological value. Many of these species are regionally or globally endangered. In addition, Los Roques has the most important and best conserved coral formations in the Caribbean Sea. The park is also important to the national economy as a tourist destination and food source. There is a great number of direct and indirect beneficiaries of the park, a wide array of strategic allies, and plentiful economic resources for its management but to increase patrolling and improve overall park management outside the tourist zones, these strengths need to be taken advantage of. In the near future, the growth of Gran Roque's population and increased tourism may become a serious threat to the parks biological integrity. The program proposed by the Ministry of the Environment should be implemented in the short-term. This program considers the relocation of some inhabitants in Los Roques and the diversion of "sun and beach" tourism to other Venezuelan islands.

Links

Biodiversity

[The 2000 IUCN Red List of Threatened Species](#)

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Management

Autoridad Única de Área de Los Roques ([AUA](#))

Tourism

[Landslides in Venezuela: BBC news](#)

Research and Conservation

[Universidad Simón Bolívar](#)

[Facultad de Ciencias](#) , [Universidad Central de Venezuela](#)

[Agencia Española de Cooperación Internacional](#) , Proyecto Araucaria Los Roques

[Instituto de Recursos Naturales](#)

[Instituto de Estudios Regionales y Urbanos](#)

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