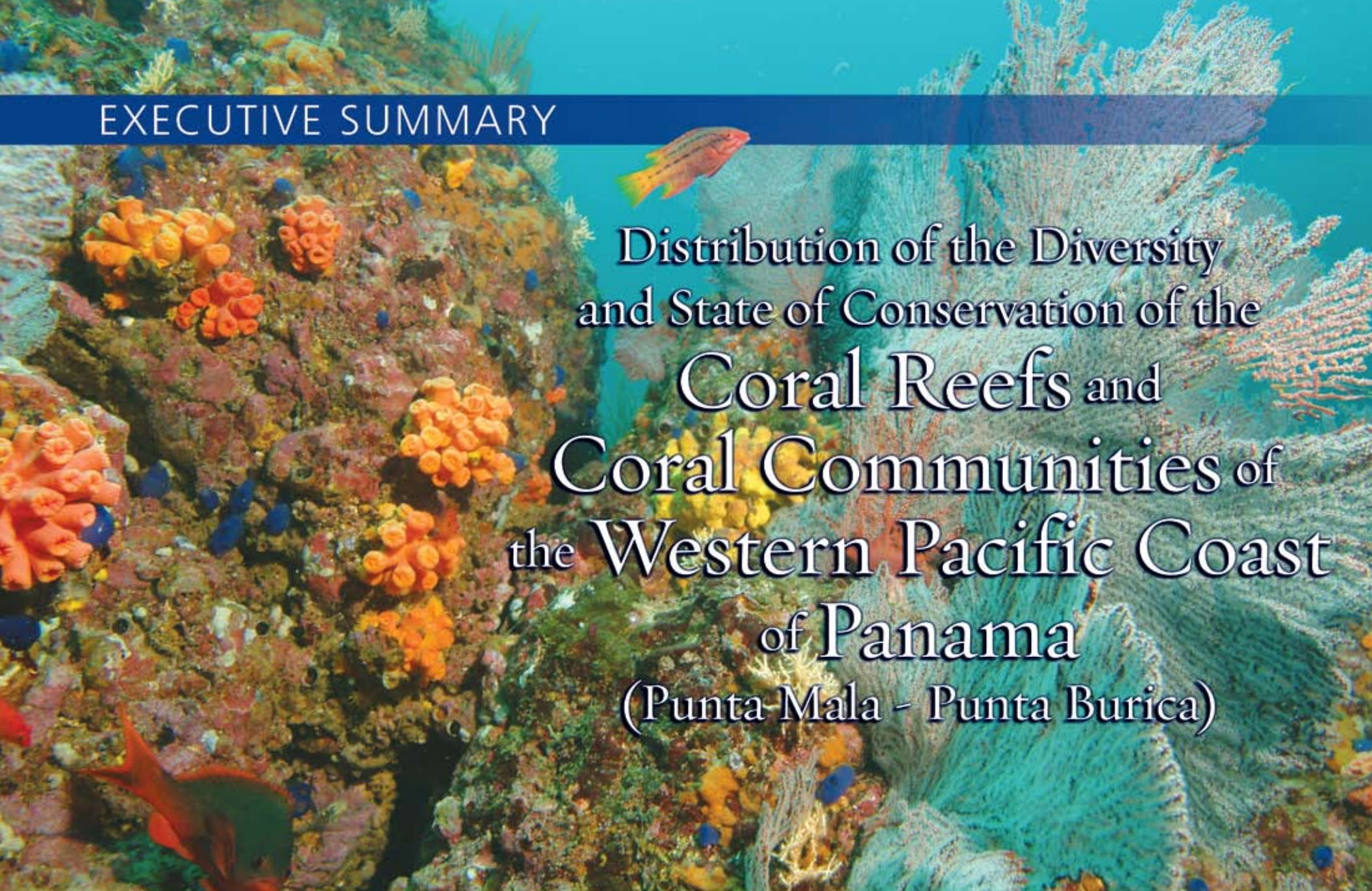


EXECUTIVE SUMMARY



Distribution of the Diversity
and State of Conservation of the
Coral Reefs and
Coral Communities of
the Western Pacific Coast
of Panama
(Punta Mala - Punta Burica)

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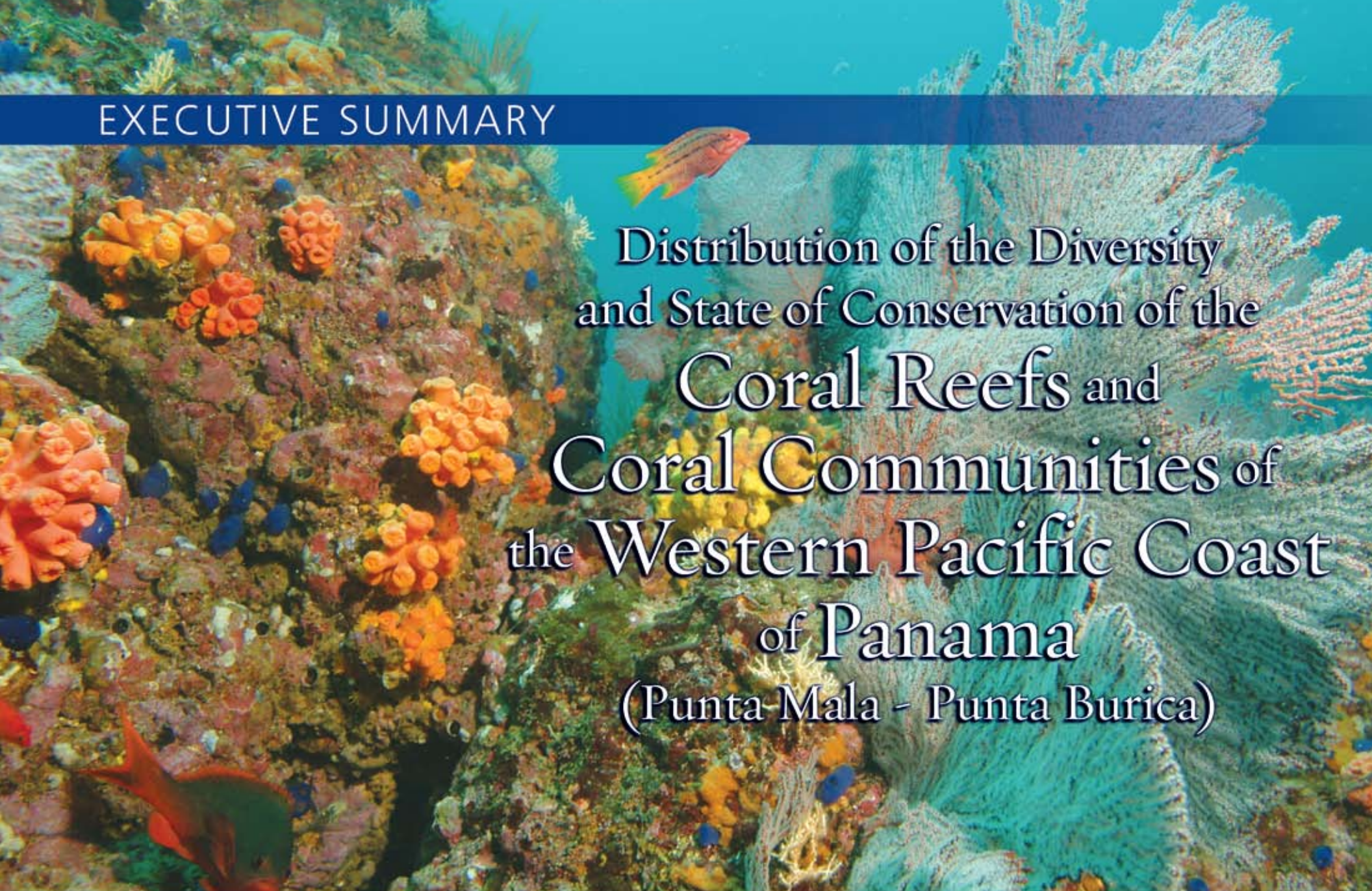


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EXECUTIVE SUMMARY



Distribution of the Diversity
and State of Conservation of the
**Coral Reefs and
Coral Communities of
the Western Pacific Coast
of Panama**
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The information presented in this report is based on the results of a scientific study carried out by Héctor M. Guzmán and Odalisca Breedy, published in the report “Distribution of the Diversity and State of Conservation of the Coral Reefs and Communities of the Panamanian Western Pacific” (TNC, 2008).

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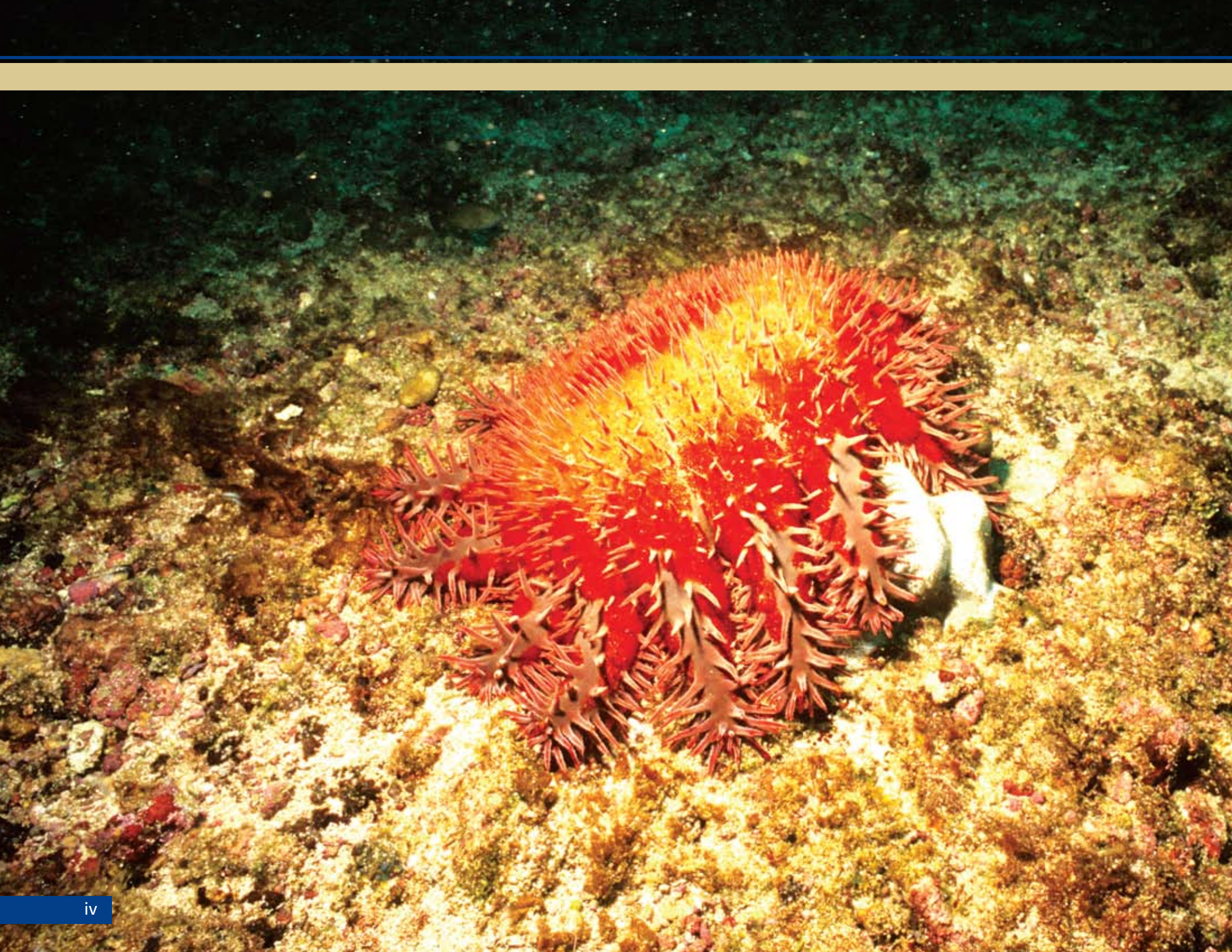




*“Diversity is the key to preserving
the world we know”*

E. O. Wilson, 1999

(Photo: Alex Schmid-Albatros Media)

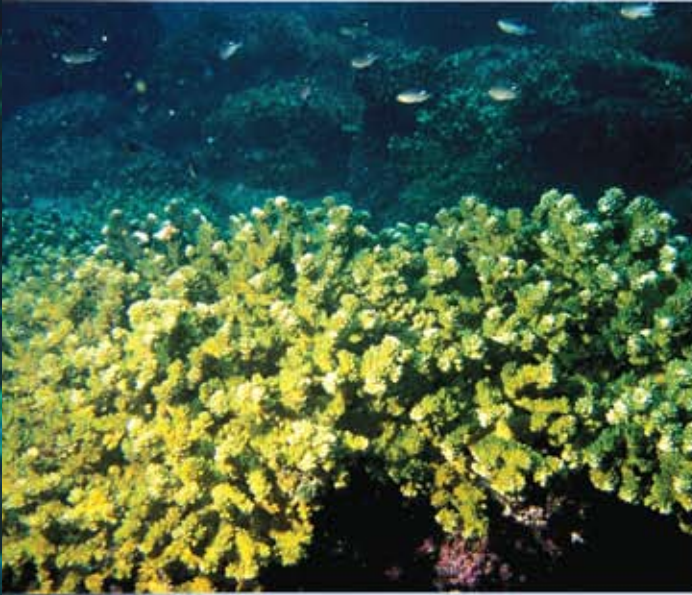


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(Photo: Héctor Guzmán)





Introduction

The Western Pacific Coast of Panama (POP for its name in Spanish) contains more than 455 islands and islets and more than 2300 km of coastline and is one of the key areas for marine biodiversity conservation in Mesoamerica (Marine Mesoamerican Ecoregional Assessment, 2008). Moreover, POP is located inside the Marine Conservation Corridor of the Eastern Tropical Pacific Seascape, which is considered to be one of the highest marine biodiversity regions in the world. The following is a summary of the exhaustive research, by Dr. Hector Guzman and Dr. Odalisca Breedy, on the diversity, status and distribution of coral reefs and coral communities in POP. Research began in 2004 and has been continually updated since then under the monitoring program run together by the Smithsonian Tropical Research Institute and the Nature Conservancy. The scale of this work has never been approached in the past for coral reefs or coral communities in POP.

This research identifies the distribution of centers with the highest diversity of sessile organisms, finds at least 12 species that are new to science,

identifies those centers that contain rare or threatened species, goes in depth into the taxonomy of octocorals, and encourages us to pay more attention to coral communities than the traditional focus on coral reefs. It also reminds us of the importance of protected areas as the core for conservation. Specifically, the role that the Gulf of Chiriqui Marine National Park plays for gene flow between populations, and the importance of Coiba National Park, as it contains the highest coral diversity, highest abundance of rare species, and healthiest reefs in all of POP.

It is our hope that these recommendations will be used by decision makers, managers and resources users to improve the management and to implement better practices for the effective management of the coral reefs and coral communities in this beautiful region of the world.

Malena Sarlo
Conservation Planner
The Nature Conservancy - Panama

(Photos: Héctor Guzmán)

Coral Reefs and Coral Communities

Coral reefs are one of the most diverse ecosystems on the planet and comparable in biological richness to tropical forests. The main sessile, or non-mobile, groups that make up reefs are corals (both hard and soft), macroalgae and sponges. Coral communities are an assemblage of coral and other associated species that grow on a rocky substrate. They shelter a greater diversity of habitats than the actual coral reefs and generally contain a higher number of species (Glynn y Wellington 1983; Guzmán and Cortés 1993; Cortés 1997; Guzmán et al. 2004).

The health and state of conservation of coral reefs and coral communities have a direct impact on the well-being of human beings as these ecosystems are a valuable source of high protein foods as well as medicines to treat disease, contribute an important part of the economic incomes of coastal communities that depend on fishing and tourism, offer an unequalled environment for recreation and protect the coasts from the erosion produced by wave action.





The Western Pacific Coast of Panama

The Western Pacific Coast of Panama (POP according to the Spanish acronym), which spans the area between Punta Burica and Punta Mala, encompasses a number of protected areas, most notably Coiba National Park (CNP) and the Gulf of Chiriqui National Marine Park. The POP includes approximately 1527 km of continental coast and 767 km of insular coast and contains more than 455 islands and islets, most of which are contained in four archipelagos known as Islas Paridas, Islas Secas, Islas Contreras and Isla Coiba. The area of the insular system of the POP is approximately 657 km², with Coiba being the largest island with an extension of 493 km².

CNP contains the highest species richness of

the entire POP. The area of coral reefs in this park alone is 1,700 ha. These reefs are the oldest known reefs in Panama, believed to be approximately 5,600 years old (Glynn and MacIntyre 1977). They were formed by vertical structures up to 12 m thick, made up primarily of the coral species *Pocillopora damicornis*.

CNP is characterized by abundant rainfall of up to 3,500 mm per year, an average temperature of 25.9 °C and two well-defined seasons: a dry season (from mid- December to mid-April) and a rainy season (the rest of the year). The tropical humid monzonic climate provides the ideal conditions for the development of corals and coral communities.

(Photo: Héctor Guzmán)





Coiba and the International Marine Conservation Corridor

CNP, which was declared Natural Patrimony of Humanity by UNESCO, is part of a regional protection system known as the “Marine Conservation Corridor of the Eastern Tropical Pacific Seascape”. This international marine corridor covers 211 million hectares, encompasses five national parks and includes the Islas Malpelo and Gorgona (Colombia), The Galapagos Islands (Ecuador) and the Coco Islands (Costa Rica). The corridor represents a pioneering initiative for the conservation of biodiversity and the

promotion of the sustainable use of the marine resources of the Eastern Tropical Pacific (UNEP 2006) and is considered one of the highest areas of biodiversity of the world. The international marine conservation corridor, providing a connection between ecosystems, supports the migration of a significant variety of species from one habitat to another and provides protection for species such as marine birds, whales, turtles, sharks, tuna, and others.

(Photos: Héctor Guzmán)



What did the Study Reveal?

Traditionally, the coral reefs of the Eastern Pacific (Ecuador, Costa Rica and Panama) were characterized as small and low in diversity of species (Glynn and Wellington 1983; Guzmán and Cortés 1993; Cortés 1997). Recent studies in the entire Western Pacific Coast of Panama, carried out by scientists of the Smithsonian Tropical Research Institute, with the support of The Nature Conservancy and Fundación AVINA, have revealed an area and diversity of coral species previously unknown for this area. These findings demonstrate the existence of a natural laboratory with unique species, a fact that highlights the importance of studying and understanding its dynamics.

In this study, 75 species of coral were identified, including 23 species of hard or scleractinian corals and 52 species of soft coral or octocorals, in an area of 2,324 kms of insular and continental coast. One of the most important contributions of this study is the finding of at least 12 species completely new to science, over 40 species that

are new registries for Panama and three endemic or unique species for this region.

Amidst the diversity of hard corals, the hydrocoral *Distichopora robusta*, a species new to science, was identified (Lindner et al 2004) and the presence of *Pavona* cf. *duerdeni*, *P. xarifae* y *P. cf. minuta*, were confirmed, species that are widely distributed in the Western and Central Pacific. The diversity of soft coral is relatively high with 52 species identified for the area. In addition, various species of the hard coral *Pacifigorgia*, were identified, which were recently described as new to science (Breedy and Guzmán 2003a, 2003b, 2004). Perhaps one of the most novel and important contributions of the study was the enrichment of our understanding of the soft coral species in the area, a group that was ignored in the Western Pacific for almost a century, as were sponges (Glynn and Wellington 1983; Cortés 1997; Glynn and Maté 1997; Maté 2003). The study results confirmed previous findings of relatively low diversity among the sponges in this area.

The map of the distribution of coral species in the Western Pacific Coast of Panama reveals at least 15 areas with moderate or high diversity¹.

While CNP has the highest coral species richness of the region, including the majority of rare and endemic species and populations of species previously considered endangered (such as the hydrocoral, *Millepora intricata*), the distribution of these species is not homogeneous. The area south of Jicarita Island stands out as an important centre of diversity, with over two thirds of the rare species. Areas distant from the park also contain abundant richness, in particular the Islotes de Los Frailes to the South of the Azuero Peninsula, the Islas Ladrões and the Islas Secas.

While the Gulf of Chiriqui National Marine Park features lower coral species diversity, it contains a large number of reefs that play an important role in the maintenance of the genetic flux of species within the POP. Nevertheless, sites such as Islas Paridas in the Gulf of Chiriqui National Park are threatened by high levels of sedimentation associated with the unplanned carrying out of tourism and agriculture activities.

(Photo: Alex Schmid-Albatros Media)

¹ Areas with moderate or high diversity are those that contain over 50% of the total species identified for the Panamanian Pacific.

In general terms, the state of health of the coral and the live coral cover in the coral communities and reefs is average to high, with an average cover of 35% and a maximum cover of 84%. While the average cover for macroalgae and coral algae was 57% and 8% respectively, the other sessile groups studied (sponges and soft coral) had less than 0.2% cover. At the individual level, the highest live coral cover can be found in certain reefs of Islas Secas, reefs of Isla Uva and in the Northwestern part of Coiba Island. A reef in good condition was also found East of Isla Jicarita. In addition, the reefs of Ensenada de Achotines showed relatively high live coral cover for continental reefs.

In the coral communities of the Western Pacific Coast of Panama, coral cover is moderate for the greater part of the coastal zone. It is interesting to note that the cover of corals, macroalgae and coral algae in the coral communities is similar to that of the coral reefs. The areas with the highest live coral cover are found on the Islas Contreras, the Islas Jicarón and Jicarita in the South, and the Eastern part of the Islas Canal de Afuera. In the coral communities, the areas with greater coverage of live coral also contain higher diversity of hard corals.



An underwater photograph of a coral reef. The scene is filled with diverse marine life, including several species of fish swimming in the clear blue water. The coral structures are varied, with some appearing healthy and vibrant in color, while others show signs of bleaching, appearing white and skeletal. The lighting is bright, highlighting the textures of the coral and the movement of the fish.

Natural Threats in the Western Pacific Coast of Panama

In contrast to the Caribbean, the Pacific Ocean is plagued more regularly by increases in temperature associated with the natural phenomenon known as El Niño (every 2 to 7 years), leading to coral bleaching. The 1982/83 and 1997/98 El Niño events had a devastating impact on the coral reefs of the Western Pacific, causing unprecedented coral mortality in the region, the loss of 50-100% of live coral cover in some areas, reduction or loss of some coral species, reduction in fish captures and a deterioration in

fishing and recreational activities. While the effects of this natural phenomenon cannot be mitigated, there is increasing evidence that climate change, which is caused, among other factors, by an increase in greenhouse gas emissions from human activities, could worsen the effects of El Niño (Rasmussen 1997), though there is some circumstantial evidence that some coral species in the region have become more thermo-tolerant (Guzman and Cortes 2007).

(Photo: Héctor Guzmán)



Anthropogenic Threats in the Western Pacific Coast of Panama

The human impact has been significant as extensive exploitation of natural resources has occurred in the Panamanian Pacific coast since time immemorial. The four main threats that undermine the survival of the coral reefs and communities of the Western Pacific Coast of Panama are: overfishing, localized sedimentation, the extraction of corals and reef fishes and incompatible recreational activities (Maté 2003; Guzmán et al. 2004).

Overfishing

Extensive commercial/ artisanal and industrial fishing takes place in the Gulf of Chiriqui. The lack of strict regulatory measures to monitor the sites, volumes and harvesting techniques of different species is contributing to the degradation of the coral reefs and threatening the future of the fishery. Industrial fishing is concentrated on shrimp, anchovies and herring, and is characterized by high levels of by-catch or incidental fishing; this results in millions of fish

(Photo: Héctor Guzmán)

and other species being trapped, the majority dying before being hurled back to the ocean. In addition, the fishery employs fishing techniques that are highly destructive of coral reefs, such as the trawling techniques used by shrimp fishers. Trawling is taking place illegally in the Gulf of Chiriqui National Marine Park with the associated destruction of the benthic ecosystems and reduction in their biodiversity. Fishing also harms the reefs through anchoring and the discarding and abandonment of nets in the ocean.

The artisanal fishery of the Panamanian Pacific is concentrated primarily on white shrimp and high commercial value fish such as snapper, grouper, tuna and mullet. The industry uses artisanal gillnets, driftnets, purse nets and longlines, despite the existing restrictions on the use of these types of equipment (Maté 2006). The fleet and number of fishers continue to grow and artisanal fishers have already seen drastic reductions in the capture of species in areas close to the coast (Maté 2006).

Although the fishery is regulated in some sectors

of CNP, fishing with nets, longlines and lobster divers persist. In the absence of strict controls, illegal fishing continues to be a recurrent practice within protected areas and continues to contribute to the deterioration and destruction of the coral reefs and coral communities. For example, a recent study in the CNP demonstrated the existence of shrimp boats working actively and illegally in the interior of the park (Moretti 2002). Many of these protected areas are not known by fishers or are not sufficiently protected by park rangers, mainly because of a lack of equipment, infrastructure and financial resources (Maté 2006). With the development of the Management Plan for CNP, the planning team recently carried out extensive awareness raising activities with artisanal and commercial fishers in order to promote the sustainable use of the marine resources.

Sedimentation

Cattle ranching, agriculture and tourism activities and the slashing and burning of forests in the coastal and insular areas lead to the deposit of tons of sediment into the ocean, which gradually

covers the coral and leads to their death. For example, in the Islas Contreras, Jicarón, Jicarita and Montuosa, coastal and nearby populations are exerting strong pressure on the logging of timber species in order to meet the timber needs of inhabitants. Protected areas such as Islas Paridas are not exempt from this reality. These practices have led to the loss of extensive areas of forest, significant erosion and as a result, excessive sedimentation in the estuarine areas (Ibáñez 2006). The sedimentation caused by deforestation, agricultural and cattle ranching practices is affecting the entire continental coast, the Islas Paridas and the drainage area North of Coiba. The development of tourism infrastructure within protected areas such as that which is being carried out in the Gulf of Chiriqui National Marine Park is also contributing to the sedimentation problem (Hall 2001).

Coral and Fish Extraction

The extraction of coral and reef fishes has led to biodiversity reduction and erosion in the reefs of the Western Pacific Coast of Panama (Guzmán, personal communication, 2008). Despite being prohibited in Panama, the pressure from aquarium suppliers continues to grow and is expanding throughout the country.

Incompatible Recreational Practices

Recreational practices, such as those associated with tourism, can also have a negative impact on the coral reefs and coral communities of the area, leading to pollution, and thus reducing the socio-economic and ecological value of the area (Hall 2001).



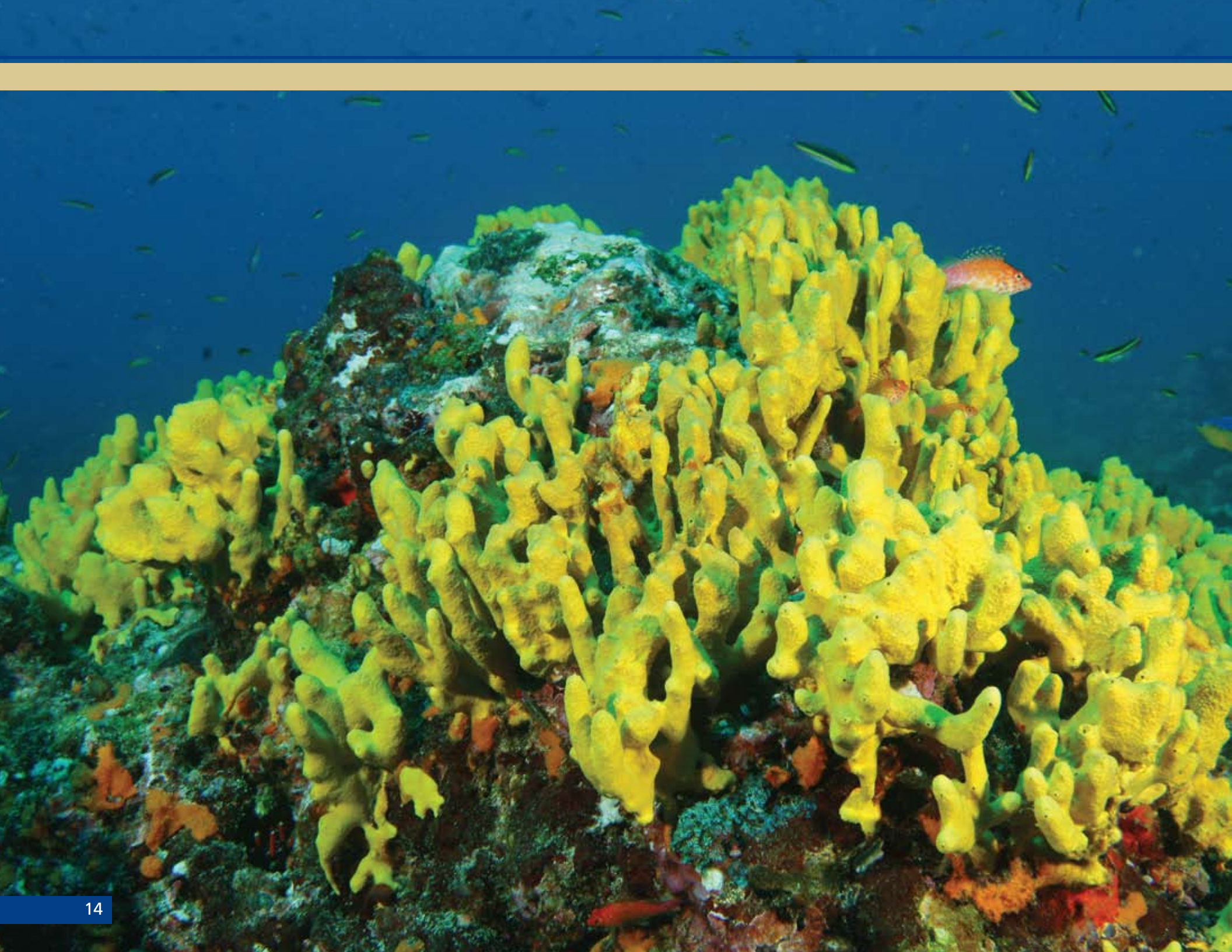


Where to Conserve and How to Manage Protected Areas

The studies on the distribution of diversity and live coral cover in the coral reefs and communities of the Western Pacific Coast of Panama reveal two main areas of high diversity and cover: the Northern area that incorporates Islas Ladrones, Islas Secas and Islas Contreras-Northern/Northeastern Coiba Island; and the Southern region that includes Southern Coiba island-Isla Jacarita. These regions contain relatively small populations of rare or threatened species. It is believed that these coral communities supply the larvae that are repopulating certain areas in which species had been devastated by the El Niño events, including the hard coral *Pocillopora spp.* and the hydrocoral *Millepora intricada* (Glynn et. al. 2001).

Coral conservation should not focus only on the conservation of coral reefs, but should pay as much or more attention to coral communities as these provide shelter for a greater number of species than the coral reefs themselves. Furthermore, because of the close interdependence between the terrestrial and marine environments, the successful design of management plans for the protected areas of the Western Pacific Coast of Panama should consider and integrate both. In addition, the creation of marine corridors especially designed to connect different protected areas in the Western Pacific Coast of Panama is critical, in order to facilitate the movement of species from one region to another and the habitual migration of other species such as whales and turtles.

(Photo: Héctor Guzmán)





Recommendations

It is recommended that three absolute protection areas be **created** in which high-impact human activities such as artisanal, sport and commercial fishing and, as well as sand and coral extraction would be prohibited and the ban on coral extraction would be strictly enforced. Regulated recreational tourism diving and snorkelling could be practiced. These zones include: Zone 1, which should be within CNP and should include the following zones: *Northern Zone*- Islas Contreras; *Northeastern Zone*- Canal de Afuera-Ranchería- Northern and Northeastern part of Coiba Island; and *Southern zone*- Isla Barca, Isla Jicarón and Isla Jicarita. **Zone 2** would include Islas Secas and **Zone III** would include Islas Ladrones. It has been shown that marine protected areas provide benefits to nearby fisheries (National Research Council 2001; Gell and Roberts 2003), such that their immediate conservation would contribute to the preservation of various marine species of high commercial value in surrounding areas.

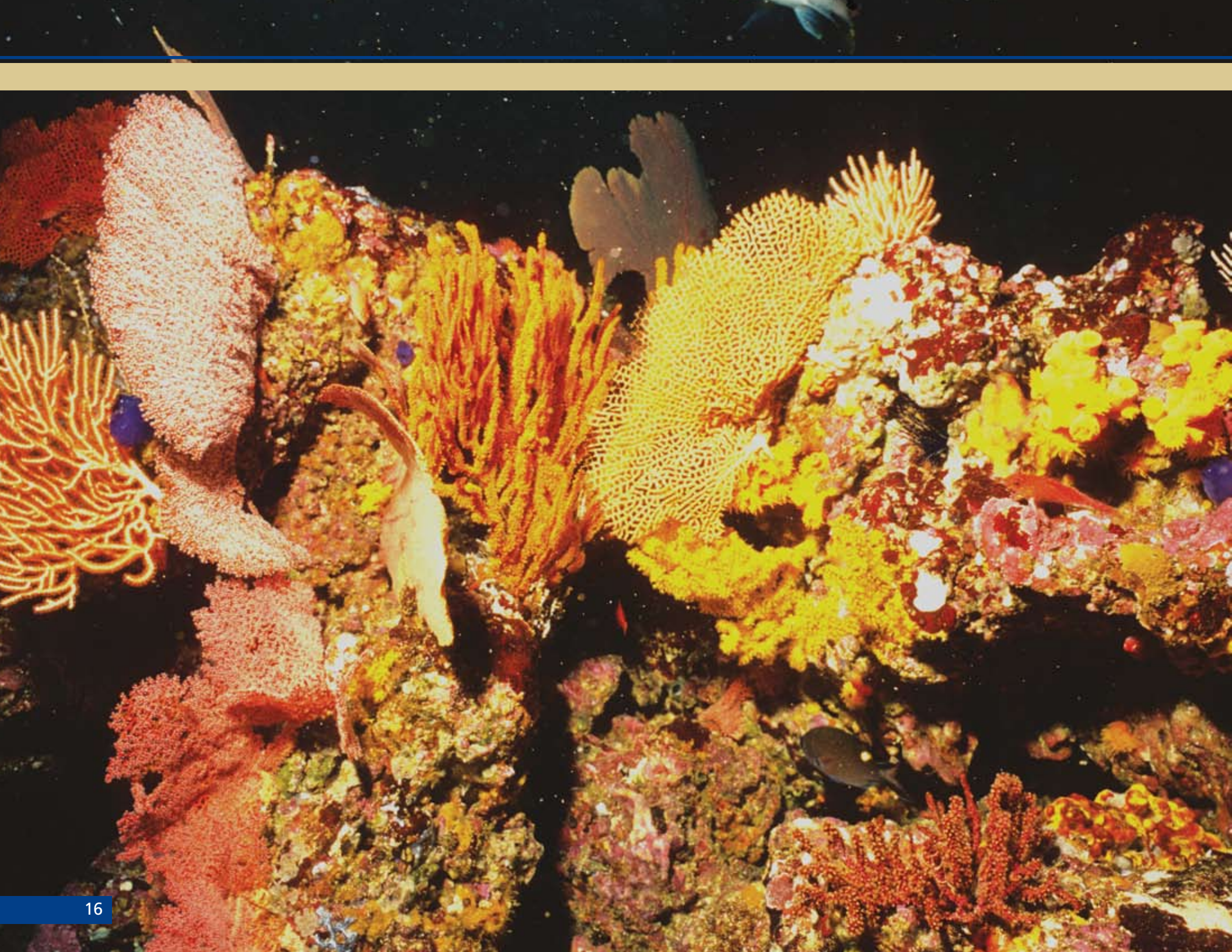
It is vital to continue to study the diversity and distribution of the coral reefs and communities

(Photos: Alex Schmid-Albatros Media)

in other sites of the Western Pacific in order to identify and understand their unequalled richness. In addition, it is recommended that threats to their diversity and abundance be **identified** at the local level, and that the impact of fisheries and other human activities in the region continue to be **studied** and **evaluated**. The distribution of protected areas should also take into consideration the risks associated with unmanageable pressures such as anomalous ocean temperatures (Done 2001).

Concurrently, efforts to **monitor** the biological diversity of species and water conditions should increase, in order to evaluate changes in marine communities and alert the authorities responsible for their management about natural changes or changes caused by humans.

Finally, it is critical that integrated and effective management plans be developed, in order to safeguard the resources of the area, including the coral reefs and communities, and regulate human activities, such as tourism. The implementation of these management plans, with the support of all relevant stakeholders would permit the conservation and sustainable use of marine and coastal resources for the social and economic benefit of the communities of the region.





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(Photos: Héctor Guzmán)

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