

# Recreational Scuba Diving In Caribbean Marine Protected Areas: Do The Users Pay?

There are more than 200 marine protected areas (MPAs) in the Caribbean and Central America that contain coral reefs and are therefore theoretically attractive to scuba divers. One fifth of dive operators in 30 countries were surveyed for their use of MPAs: the majority are located within 20 km of at least one MPA and 46% conduct at least 80% of their diving within a MPA. An estimated 15 million dives take place outside of Florida each year, half of these occurring inside MPAs. Only 25% of MPAs containing coral reefs charge divers an entry or user fee, which is most usually USD 2–3 levied per dive or per diver. The revenue generated by these fees is estimated at USD 1–2 million annually, but the potential for generating income has not been fully realized. A significant contribution to the cost of regional conservation could be achieved if higher fees were applied more widely than at present.

## INTRODUCTION

The benefits of establishing marine protected areas (1) are well known, particularly for coral reefs. A reduction in fishing pressure, ideally through the complete closure of selected areas to all types of fishing, typically maintains more numerous and diverse populations of previously targeted species (2–4), leads to the reappearance of species absent from fishing grounds (5), and substantially increases the biomass of large predatory species (6). There can also be positive effects on coral reef habitat with increased coral cover and structural complexity (7). All of these factors can combine to make marine protected areas (MPAs) attractive to scuba divers and commercial dive operators. Regardless of the effectiveness of any MPA in actually achieving and maintaining these ecological benefits there is often an assumption that MPAs will provide a high quality diving experience, an obvious marketing bonus for those selling it. Marine protected areas do come at a cost however; even small MPAs with few staff command budgets of several USD 100 000 per year (8). This has led to a realization that a MPA cannot be effectively managed without support from a suite of financing mechanisms that are sustainable over the long term (9, 10).

In the Wider Caribbean a variety of financing mechanisms have been used for MPAs including government subvention, international assistance, individual donations, commercial and bilateral debt swaps and trust funds (9, 10). However, none of these mechanisms implement the principle that the direct beneficiaries of protected areas should contribute to the recovery of operating costs. This is encapsulated in the levying of charges—most frequently referred to as ‘user fees’—on those who accrue benefits from the MPA. Equity is therefore a major attraction of user fees and the principle challenge is to devise a system which sets a fair value on uses and services, and generates ac-

ceptable net returns. Many organizations and protected areas have begun with a single type of user fee and gradually developed a more diverse fee structure to the point that a substantial income can be generated.

This is best illustrated in the Wider Caribbean region by 3 well



Divers visiting the Bonaire Marine Park pay a USD 10 user fee and wear this type of tag attached to their equipment. Photo: K. De Meyer.

**Table 1. Potential advantages and disadvantages of user fees.**

Advantages	Disadvantages
Generation of regular and predictable income which can constitute a substantial proportion of operational costs (8)	Cost of fee collection can exceed revenue raised, especially in little used sites (29)
Self-generated income facilitates raising of additional funds or the capital costs of other projects (10)	Effort assigned to fee collection can reduce capacity to protect resources (30)
Increased respect from visitors and professionalism amongst staff (10)	Danger of revenue generation becoming an overriding performance criterion for managers (31)
Fees can be related directly to management costs and adjusted accordingly (9)	

**Table 2. This questionnaire was used to gather data from dive operators throughout the Wider Caribbean and Pacific coast of Central America on their diving activity inside and outside marine protected areas. The questionnaires were distributed by post or used to frame a telephone interview. Data was collected by both methods in the most appropriate local language (English, Spanish or French).**

1. How many individual divers dive with your company per year?
2. What is the total number of dives which your company carries out per year?
3. What percentage of this total take place in Marine Protected Areas?

Name of Protected Area	Fee charged for entry to the Protected Area				
	Currency	Per dive	Per diver*	Per day diver*	Per boat*
Comments:					
Definitions: Dive – the act whereby a single diver enters the water with scuba equipment. Diver – an individual person carrying out a dive. Therefore a boat of 10 divers who all do two dives in one day equals a total of 20 dives. Notes: * for a fixed period, e.g. per week or year. In all cases these fees were levied for a year long period.					

known examples. The Saba Marine Park was established in 1987 with government subventions and funding from conservation organizations on condition that it achieve financial independence within 5 years (11). Fees levied upon scuba divers were one component of a three-pronged fundraising strategy which achieved this goal on schedule: presently 70% of the total income is generated in this way (8). Since 1992, charter boat and scuba dive operators in the British Virgin Islands have collected fees from their customers in exchange for the use of a system of moorings. The revenue is passed on to the National Parks Trust, exceeding USD 110 000 in 1993 and covering the costs of 3 staff, the moorings and project boat (12). The Bonaire Marine Park was established in 1979 with funding from the World Wildlife Fund, The Netherlands, but once this initial grant had expired the park declined to a point where there was no formal management in the early 1990s. The Park was re-established in 1992 and revenues were generated by the introduction of annual diver's admission fees (13); currently 60% of the budget is raised through these fees (8).

The mooring system in the British Virgin Islands and the Marine Parks of Bonaire and Saba indicate that it is possible for a MPA in the Wider Caribbean to generate the majority of operational income from user fees targeted principally at foreign diving tourists. Yet how typical are these examples which are located in small island territories of developed nations (the UK and The Netherlands)? There are 484 MPAs in the Wider Caribbean region, and another 23 MPAs located along the Pacific coast of central America (14). User fee systems are not without potential problems (Table 1) and although the benefits are generally considered to outweigh the disadvantages (10) there can be political and commercial resistance to their introduction. It is not known how extensively the British Virgin Islands or Bonaire models have been adopted elsewhere in the region, or to what extent scuba divers contribute financially to regional marine conservation through payment of user fees.

This report presents an investigation into the use of MPAs by scuba diving operators in the Wider Caribbean and Pacific coast of central America. Data were collected on user fee systems in operation across this region and are analyzed here.

## MATERIALS AND METHODS

Although some contact information for the 507 MPAs in the Wider Caribbean and Pacific coast of central America is available, direct correspondence with the vast majority is difficult. By contrast dive operators have an obvious commercial incentive to advertise and maintain good communications, and correspondence is therefore relatively straightforward.

There are more than 900 dive operators in the Wider Caribbean region (15). A disproportionate number (250+) are located in the USA (Florida) and were excluded to avoid bias, and because marine conservation in Florida is managed at local, state, and federal government levels, a system which is not typical of the rest of the region. A questionnaire was distributed to the 655 dive operators outside of the continental USA to collect information from across the region on the number of dives being con-

**Table 3. More than one-fifth of all dive operators in the Wider Caribbean and Pacific coast of Central America were surveyed. Notable omissions are Cuba (with 16 dive operators), St. Martin (5), Guatemala (3), St. Kitts and Nevis (2) and El Salvador (1). The former is an increasingly important dive destination. N = number.**

Country	Dive operators (N)	Responses (N)	Proportion surveyed (%)
Anguilla	3	1	33
Antigua and Barbuda	5	1	20
Bahamas	36	10	28
Barbados	7	1	14
Belize	33	3	9
Bermuda	20	3	15
British Virgin Islands	10	2	20
Cayman Islands	66	13	20
Colombia	28	1	4
Costa Rica	11	1	9
Dominica	7	1	14
Dominican Republic	13	11	85
El Salvador	1	1	100
Grenada	8	4	50
Guadeloupe	5	2	40
Honduras	30	3	10
Jamaica	25	4	16
Martinique	4	1	25
Mexico	87	22	25
Montserrat	1	1	100
Netherlands Antilles	81	10	12
Panama	16	4	25
Puerto Rico	41	8	20
St. Barthelemy	2	2	100
St. Lucia	9	2	22
St. Vincent & the Grenadines	8	2	25
Trinidad and Tobago	4	3	75
Turks and Caicos	17	4	24
US Virgin Islands	34	7	21
Venezuela	17	11	65
Totals	628	138	22

ducted, the use of MPAs, and user fees levied on scuba divers (Table 2). Forty responses were received throughout the summer of 2000 and were followed by 98 additional telephone interviews during the autumn, targeted at countries from which few responses had been received by mail. In total, 22% of dive operators in 30 countries of the Wider Caribbean and Pacific coast of Central America were surveyed (Table 3).

The regional distribution of dive operations and marine protected areas was analyzed in a Geographical Information System (GIS) using buffering techniques. Diver, dive, and user fee data were analyzed to generate estimates of the volume of diving occurring in the Wider Caribbean and Pacific coast of Cen-

tral America, the proportion of dives which take place in MPAs, the range and nature of user fees in operation throughout this region and the revenue so generated for marine conservation.

## RESULTS

The majority of dive operators in the Wider Caribbean are located within an easy boat journey from a marine protected area (Fig. 1); more than 60% (372 operators) would have to travel less than 20 km.

Our respondents reported an annual total of 750 000 divers doing an average of 4 dives per person per year. Given that one fifth of the dive operators outside of Florida were surveyed this would suggest that approximately 15 million dives take place in the region each year. Excluding 5 operators based in countries with no MPAs, such as El Salvador and Montserrat, analysis of the questionnaires revealed that 31 operators never use a marine protected area, but that 39 from 11 different countries carry out all their diving within at least one MPA. Broadly speaking there seem to be 2 groups of dive operators in the region (Fig. 2); those that operate primarily in MPAs and those that rarely, or never, do so. Overall 50% of dives throughout the Wider Caribbean and Pacific coast of Central America take place within a MPA, amounting to approximately 7.5 million dives annually. The implication is therefore that a large proportion and number of dives occur in a limited number of marine protected areas.

Our respondents also reported that they used 74 MPAs throughout the region. Of these 21 MPAs (30%) do not levy a user fee of any type whereas the others use different types of fee system with charges being levied per dive, per day, per boat, and per tank. In some cases charges are not levied on individual divers but on operators as an annual fee or percentage of income. Thirty-four (64%) of the MPAs charging scuba divers levy a fee on individual divers. This ranges between USD 1 and USD 50 although fees at the lower end of this scale are most usual (median per diver fee is USD 2.50). Information on 24 of the MPAs that charge scuba divers for access is available from the World

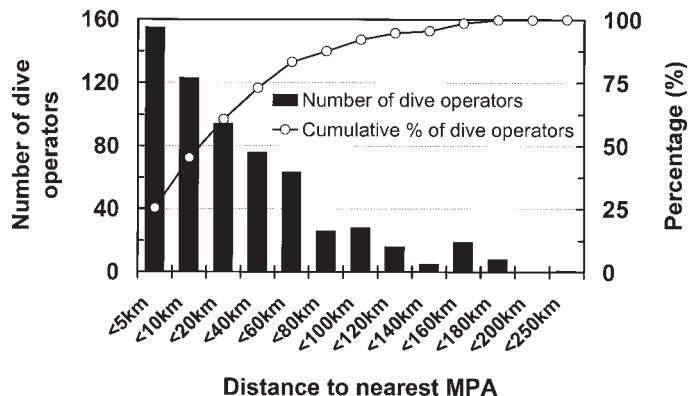


Figure 1. The spatial relationship between MPAs and dive operators across the Wider Caribbean and Pacific coast of Central America was investigated using buffering techniques within a GIS. More than 60% of dive operators are located less than 20 km from a MPA.

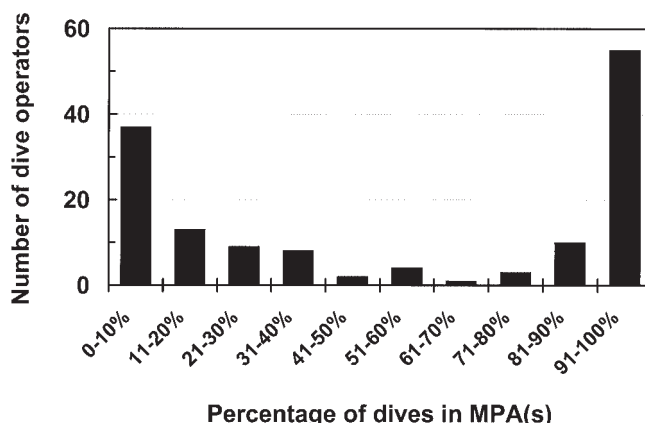


Figure 2. In terms of use of MPAs there are 2 groups of dive operators in the Wider Caribbean and Pacific coast of Central America, those that conduct few dives within an MPA, and those that carry out the vast majority of their diving within a protected area.

Table 4. These 24 MPAs levy a user fee on scuba divers. Divers are charged USD 1 each for entry to all 16 MPAs in the British Virgin Islands (total area 42 ha); these are not included here. Information has been extracted from the World Database of Protected Areas. Abbreviations used: IUCN Cat. = The World Conservation Union (IUCN) management category which gives an indication of the legal regime protecting the site. These are defined in detail at ([http://www.unep-wcmc.org/protected\\_areas/categories/index.html](http://www.unep-wcmc.org/protected_areas/categories/index.html)); Cor and Man = whether these sites are known to contain coral reefs and mangroves, respectively (Y = yes, N = no); Lat. = decimal degrees of latitude; Long. = decimal degrees of longitude (negative values indicate a position west of the Greenwich meridian). No data is indicated by a hyphen.

Country	MPA Name	Fee (USD)	Fee type	Designation	IUCN Cat	Size (ha)	Year
Anguilla	Little Bay	1	Other <sup>a</sup>	Fish Nursery Reserve	—	—	—
Bahamas	Exuma Land and Sea Park	25	Per day	National Park	II	45 584	1958
Belize	Half Moon Caye	5	Per day	National Monument	III	3 925	1982
Belize	Hol Chan	2	Per day	Marine Reserve	IV	411	1987
Colombia	Isla de Malpelo *	50	Per diver	Fauna and Flora Sanctuary	Ia	—	1995
Colombia	Corales del Rosario	2	Per diver	Natural National Park	II	120 000	1977
Colombia	Isla Gorgona *	10	Per diver	Natural National Park	II	49 200	1984
Dominican Republic	Litoral Sur (Santo Domingo)	2	Per dive	National Park	UA	1 075	1968
Dominican Republic	Del Este	2	Per diver	National Park	II	80 800	1975
Dominican Republic	Parque Submarino La Caleta	3	Per diver	National Park	II	1 010	1986
Mexico	Arrecifes de Cozumel	2	Per dive	National Park	II	11 988	1996
Mexico	Isla Mujeres, Punta Cancún y Punta Nizuc	1	Per diver	National Park	V	8 673	1996
Mexico	Laguna de Chankanaab	2	Per diver	Parque Natural	UA	—	1983
Mexico	Costa Occidental de Isla Mujeres	1	Per dive	Area de Protección de Flora y Fauna	IV	664	1973
Netherlands Antilles	Saba	3	Per dive	Marine Park	—	820	1987
Netherlands Antilles	Bonaire	10	Per diver	Marine Park	—	2 600	1979
Panama	Isla Bastimentos	10	Per day	National Park	II	13 226	1988
St. Lucia	Soufriere	4	Per diver	Marine Reserve	—	—	—
Turks & Caicos Islands	Fort George Land & Sea	250	Per boat	National Park	IV	494	1987
Turks & Caicos Islands	North West Point Marine	250	Per boat	National Park	II	1 026	1987
Turks & Caicos Islands	Princess Alexandra Land and Sea	250	Per boat	National Park	V	2 645	1992
Turks & Caicos Islands	West Caicos Marine	250	Per boat	National Park	IV	397	1992
US Virgin Islands	Buck Island Reef	2	Per dive	National Monument	III	3.56	1961
Venezuela	Mochima	300	Other <sup>b</sup>	National Park	II	94 935	1973

Notes:

\* indicates MPAs which are located on the Pacific coast of central America<sup>a</sup> - per scuba tank,

<sup>b</sup> - this is the annual fee which each dive operator pays for access to the park

**Table 5.** These 21 MPAs do not levy a user fee on scuba divers. Information has been extracted from the World Database of Protected Areas. Abbreviations used: IUCN Cat. = The World Conservation Union (IUCN) management category which gives an indication of the legal regime protecting the site. These are defined in detail at ([http://www.unep-wcmc.org/protected\\_areas/categories/index.html](http://www.unep-wcmc.org/protected_areas/categories/index.html)); Cor and Man = whether these sites are known to contain coral reefs and mangroves respectively (Y = yes, N = no); Lat. = decimal degrees of latitude; Long. = decimal degrees of longitude (negative values indicate a position west of the Greenwich meridian). No data is indicated by a hyphen.

Country	MPA name	Designation	IUCN Cat.	Size (ha)	Year	Cor	Man	Lat.	Long.
Bahamas	Conception Island	National Park	II	809	1973	Y	Y	23.83	-75.12
Belize	Laughing Bird Caye	National Park	II	4 300	1991	-	-	16.44	-88.20
Bermuda	North Shore Coral Reef	Preserve	IV	13 050	1966	Y	-	32.42	-64.77
Bermuda	South Shore Coral Reef	Preserve	IV	450	-	Y	N	32.30	-64.72
Cayman Islands	Bloody Bay - Jackson Point	Marine Park	II	161	1986	Y	N	19.68	-80.08
Cayman Islands	North Sound	Replenishment Zone	IV	3 310	1986	Y	Y	19.33	-81.30
Colombia	Sierra Nevada de Santa Marta	Natural National Park	II	383 000	1959	Y	N	10.92	-73.59
Costa Rica	Santa Rosa *	National Park	II	37 217	1971	-	Y	10.86	-85.72
Jamaica	Negril	Marine Park	-	-	1998	Y	Y	18.32	-78.37
Mexico	Cabo Pulmo *	National Marine Park	II	7 111	1995	Y	-	23.17	-109.83
Mexico	Fondo Cabo San Lucas *	Area de Protección de Flora y Fauna	-	-	1973	Y	-	24.47	-110.50
Netherlands Antilles	St. Eustatius	Marine Park	-	-	1998	Y	-	17.47	-62.97
Puerto Rico	Cayos de la Cordillera	Nature Reserve	IV	88	1980	Y	Y	18.38	-65.58
Puerto Rico	Humacao	Wildlife Refuge	IV	1 026	1984	-	Y	18.15	-65.83
Puerto Rico	La Parguera	Nature Reserve	IV	4 973	1979	Y	Y	17.97	-67.07
Trinidad and Tobago	Buccoo Reef	Nature Reserve	la	650	1973	Y	Y	11.16	-60.83
US Virgin Islands	Culebra	National Wildlife Refuge	IV	633	1909	-	Y	18.32	-65.32
Venezuela	San Esteban	National Park	II	43 500	1987	Y	Y	10.41	-67.97
Venezuela	Archipiélago Los Roques	National Park	II	221 120	1972	Y	Y	11.87	-66.78
Venezuela	Henri Pittier	National Park	II	107 000	1937	-	Y	10.44	-67.62
Venezuela	Morrocoy	National Park	II	32 090	1974	Y	Y	10.82	-68.22

Notes: \* indicates MPAs which are located on the Pacific coast of central America.

Database of Protected Areas, and is summarized in Table 4. All but 2 of these MPAs are known to include coral reefs and 13 include mangroves. Divers are charged user fees either directly or indirectly, through fees levied on dive operators, in 12 countries. The revenue so raised presumably contributes to the conservation of more than 500 000 ha (Table 4), though the size of the marine component is unknown.

Diving also takes place in 21 MPAs without a user fee being levied (Table 5). A total terrestrial and marine area of at least 860 000 ha is covered by these MPAs. Comparison of Tables 4 and 5 appear to indicate that in many countries across the region the instigation of a user-fee system has been

on a case by case basis. For example some national parks in the Bahamas, The Netherlands Antilles, Mexico, Venezuela and Belize charge scuba divers while other national parks in the same country allow free access. The results of the survey suggest that only in the British Virgin Islands and the Turks and Caicos Islands are divers charged for access to all MPAs, directly in the former and indirectly in the latter through boat charges levied on dive operators (Table 4).

Less is known about 3 areas, which our respondents report as charging a user fee but which are not included in the World Database of Protected Areas. It was clear from some of the additional comments made by dive operators that they use protected areas which are not recognized by national legislation and which would therefore not be included in the World Database of Protected Areas. Some of these areas may have been established by local communities in an attempt to

protect marine resources, as has happened in the Bay Islands of Honduras (16). Elsewhere areas have apparently been deliberately renamed as 'reserves' or 'parks' in order to attract divers. However the ability to levy and collect a fee would seem to suggest that some administrative capacity does exist.

The data collected through the questionnaire permits a crude estimation to be made of the revenue generated for marine conservation by charging user fees per diver or per dive. The number of dives and divers recorded by dive operators, weighted for the proportion of dive operators surveyed in that country, was combined with the data on fees and the proportion of the operators' dives which take place in MPAs. This indicates that 17 MPAs in 8 countries across the Caribbean and Pacific coast of Central America (Bahamas, Belize, Colombia, Dominican Republic, Mexico, Netherlands Antilles, Panama, and St. Lucia, Table 4) generate in the region of USD 1-2 million annually through these types of user fee.

## DISCUSSION

The survey results suggest that the capacity to generate revenue for marine conservation from scuba divers through user fees has not been exploited fully in the Wider Caribbean region. Of the 507 MPAs in the Wider Caribbean and Pacific coast of Central America 220 are known to contain coral reefs and are therefore at least potentially interesting to divers. The majority of dive operators in the region use MPAs, and many millions of dives take place within protected areas, yet a minority of MPAs levy user fees. Why might this be so? Perhaps the direct and indirect costs of introducing a fee collection system (10) presents an obstacle in some locations, and in others socioeconomic conditions and political opinion may be set against user fees. Certainly it is not the present or future number of diving tourists which is limiting MPA income. The Wider Caribbean and Central America is the world's most tourism dependent area and premier diving destination, attracting 57% of all international scuba diving tourists (17). Overall tourist arrivals are predicted to increase by 4.6% per year up to 2010. With divers accounting for perhaps 20% of these tourists (18), and the rising popularity in scuba diving (19), the potential for raising revenue for MPA management from scuba activities can be expected to increase. Neither does the willingness of diving tourists to pay seem to

Cor	Man	Lat.	Long.
Y	-	-	-
Y	Y	24.52	-76.65
Y	Y	17.22	-87.52
Y	Y	17.87	-87.99
Y	-	3.98	-81.58
Y	Y	10.16	-75.74
Y	Y	2.97	-78.18
Y	N	18.43	-69.90
Y	Y	18.22	-68.70
Y	N	18.45	-69.90
Y	-	20.45	-86.90
Y	Y	21.25	-86.75
Y	-	20.43	-87.00
Y	Y	21.23	-86.73
Y	Y	17.65	-63.23
Y	Y	12.17	-68.25
Y	Y	9.30	-82.12
Y	-	13.85	-61.13
Y	N	21.90	-72.08
-	Y	21.85	-72.33
-	-	21.80	-72.20
Y	-	21.67	-72.48
Y	-	17.77	-64.77
Y	Y	10.31	-64.48

have been fully capitalized on by MPAs. Fees of USD 2–3 per diver are most common at present (Table 4) whereas surveys in Curacao and Jamaica (20), and Bonaire (13), indicate a willingness to pay of around USD 25 per person.

However, the continued expansion of diving-related tourism and its associated economic benefits cannot be indefinitely compatible with ecosystem protection. Already our results indicate that diving is concentrated in a small number of protected areas. Training programs (21) can mitigate the physical damage done by divers to corals (22, 23) to some extent but an inverse relationship between numbers of divers and reef ‘quality’—an indicator based on percentage cover and species diversity—has been predicted (24) and demonstrated (25, 26). The level of diving activity in Bonaire in 1992 (18 700 divers doing approximately 200 000 dives) was judged to be close, or slightly in excess, of the carrying capacity for the Marine Park (13).

These results do not indicate how many others of the 74 MPAs in our survey are close to reaching their carrying capacity, but

it does reveal that a negligible proportion of the revenue generated by divers is channelled towards the maintenance of the MPAs which attract so many to the Caribbean and Central America (27). Protected area agencies in the Caribbean are experiencing an average financial shortfall of USD 30 per ha (28). The total area (terrestrial and marine) of MPAs containing coral reefs in the Caribbean region, excluding Florida, is at least 4 million ha (16), which may be under-resourced by USD 120 million. Our survey suggests that 3.75 million divers visit the region annually. If there is indeed a willingness among this large group to pay user fees of around USD 25 per person (13, 20) then USD 93 million, or 78% of the shortfall, could theoretically be raised through user fees. Although this calculation is unavoidably oversimplistic it demonstrates that a wider application of user fees, set to a level which the market would bear, could make a major contribution to the cost of conservation in the Caribbean region.

## References and Notes

- The definition of a protected area used here is that adopted by the World Conservation Union (IUCN): an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means. MPAs referred to in this paper fall into one of six protected area management categories, I–VI, based on the primary management objective. Further details may be obtained at ([http://www.unep-wcmc.org/protected\\_areas/categories/index.html](http://www.unep-wcmc.org/protected_areas/categories/index.html)).
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- UNEP-WCMC maintains a global database of marine protected areas as a part of its World Database on Protected Areas in close collaboration with the IUCN World Commission on Protected Areas (WCPA). This is the only comprehensive global list of protected areas, and contains links to descriptive data describing important features, and GIS-data showing the distribution of sites, including mapped boundaries for a large number of locations.
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