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The Use of Scuba Diving Tourism for Marine Protected Area Management

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***Abstract*—**Marine Protected Areas can benefit from nature based tourism, monitoring environmental impacts and also become target for human presence. From more than 3 million tourists visiting Cozumel Island every year, an average of 2,8 million arrive by cruise ship, and 41% are estimated to have motivation for water activities. The destination is relying so much on the tourism activity, that scuba diving and snorkeling in the National Park Reef of Cozumel sustain the major economic activity. In order to achieve the sustainable development indicator designed for regional environmental development, the PNAC offers a training course to tourism providers to access the protected area. This way, the update of the last 5 years of such training is directed to diving staff, boat crew and professionals, making them able to assist in managing the natural resource. Moreover, the case study is an example to be used for raising awareness among tourists visiting protected areas.

***Keywords*—**Education, Marine Protected Area, scuba diving, sustainability, tourism.

I. Introduction

SINCE 1990, protected areas have been considered for protection and conservation of natural habitat, doubling terrestrial protection in 59 of the 228 listed countries and dependencies on database. Marine protection represents higher numbers, with 86 registered areas in 172 countries. The numbers of Marine Protected Areas (MPA) have risen in importance up to 12 miles offshore where the line for international waters it set. Reference [1, p. 49] states the increment "from 3.1% in 1980 to 7.2% in 2010... it is known that protected areas are strongly related with reducing declines of species, although half of the world's most important terrestrial sites for species conservation remain unprotected" The number of important protected sites has increased since 1950, but the total protected area for biodiversity sites has declined overall.

The objective of this paper is to report the importance given to scuba diving as nature-based tourism activity to protect the MPA settle on the reef of Cozumel, in Mexico. This natural resource is fundamental for sustaining tourism, the only economic activity on the island. Therefore, special attention has determined the environmental education training course, mandatory for professionals in the need to operate inside the boundaries of the MPA, an agreement for better management of the resource. Hence, is also illustrated the roll of professions that have attended to the training to operate in the MPA.

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II. Literature Review

Nature-based tourism attempts to function in balance with the natural environment, taking into account both positive and negative impacts. There is something of a mutual dependence: tourism activity requires natural resources for development of the activity and in some way nature "requires human pressure" for conservation and sustainability of the species. That is to say a symbiotic relationship can be developed that prolongs the existence of certain species, and through the use of sustainable strategies the tourism industry can also positively affect the natural environment [2].

Reference [3] has predicted that nature-based tourism will double in the next 20 years as long as it is managed well. Among several authors, examples include MPAs, underwater sanctuaries such as shipwrecks for scuba diving, which boost local economies and become a shelter for some marine species, which allows them to be observed more easily; or manmade structures used for coral reef restoration where divers can be educated about reef ecology, and alternative strategies for coral reef management.

Scuba diving became more popular and more widely available at the tourist destinations suitable for the activity. As per [4], in 2001 the World Tourism Organization (WTO) estimated there to be 6 million certified divers, of which around one third were originally from European countries, followed by the United States of America and Australia. In addition, in [5] was estimated there were 5 to 7 million active divers in the world, with 2.5 million in the U.S., approximately 100,000 in the U.K. contributes, and 34,600 in Australia. In a study conducted in South-East Asia and Francophone countries of the Indian and Pacific Oceans, [6] calculated annual totals of 107,320 and 69,150 divers, respectively.

Reference [7] has stated that in 1989, dive tourism in Australia was responsible for 239,000 international visitors and in 1996; approximately 100,000 Australians received their diving certification. Reference [5, p. 1] states that "Australian recreational diving market has been estimated to be worth $1 billion from international visitors and $547 million from Australian divers; around 5% of international visitors dive during their stay in Australia and about 0.5% of Australian domestic travelers dive while on holiday. The Great Barrier Reef situated offshore from Queensland is a stopover for 93% of international divers visiting Australia and around 40% of domestic diving holidays in Australia. The Great Barrier Reef

Marine Park, Queensland's most popular diving destination attracted over 1.8 million visitors in 2002 and generates approximately 1 billion Australian dollars from reef-based tourism each year".

Diving destinations such as Palau are very popular for scuba diving holidays, in particular for shark-diving activities in the MPA. The recent trend of shark tourism produced some studies into the species and the economic benefits for the local populations, which depend strongly on an active promotion of the tourism destination. According to [8], whale shark watching (*Rinchodon typus*) was estimated to have generated 47.5 million USD worldwide. The shark industry has grown much more; Topelko and Dearden, as cited in [9], reported that approximately 500,000 divers had participated in shark-diving activities.

Water-related activities are the ones moving more people around the world, but there is a lack of representative data to back up the numbers. It is known that snorkeling involves less equipment and is more affordable than scuba diving, although [10] observed connectivity between both activities, triggering participants to engage in scuba diving.

Divers were studied for their behaviors by [11] while attending a conservation education program to develop "ownership and stewardship" towards the marine protected area held at the Flower Garden Banks National Marine Sanctuary in the USA. Divers were aged 18 to 65 years old, of which 70% were male and 30% female. In [12], the most relevant age range and gender for divers visiting the Cozumel MPA was described to be 45% between 18 to 30 years old, and 23% with more than 50 years old, of which 61% were male.

Scuba diving is commonly associated with educational components in natural and protected areas, as a form of balanced interaction with distinctive species, culture and societies linked to the natural environment. In [13]-[19], such association has become popular through wildlife interaction in places considered for low-impact tourism where adventure tourism and ecotourism take place, and visitors can learn from their experiences.

References [20], [21] have studied certain coastal areas, where the whole community is dependent on the water environment for living, so preserving coral reefs and the marine ecosystem are very important. Reference [22] approach refers scuba diving creating the opportunity to develop and change the environment, and at the same time promotes Marine Protected Areas and conservation of species. The revenue collected from diving-related activities can easily be used to sponsor management work and tools for "boosting" natural resources [23], becoming even more attractive to tourists in the process. For [24], local economies can benefit from diving tourism and "preserve the local environment".

Cozumel Island is located on the Mesoamerican Barrier Reef system, and is the largest island in the Mexican Caribbean. Fig. 1 illustrates the two Marine Protected Areas, however the most popular area for scuba diving is located on the southwest part of the island, which was declared the Cozumel Reef Marine Park (PNAC in Spanish) in July 1996, and in 2002 it achieved the status of National Park. The park lies east off the mainland at 20° 29' 02. 93" and 20° 14' 27.02" N; 86° 53' 11.54" and 87° 03' 32.07" W, covering 11 987 ha from the high tide shoreline to 2.5 nautical miles offshore. Within 120 Km^2 of total area, 50Km^2 were declared no take area [25].

Refereeing the report issued in 2012 by [26], the Island can be accessed by car/passenger ferry boat with a 16.5 km journey from Punta Venado near Playa del Carmen. Cozumel International Airport can support up to 9 flights an hour and the smaller Capitan Eduardo Toledo airfield caters for small and private aircrafts. Cozumel has three international piers for international cruise liners and receives around 2.5 million passengers per year.

According to the Secretary of Tourism for the State of Quinta Roo, visitors filled 51% of hotel occupancy among the 45 hotels on the island; 4,098 rooms accommodated 403,793 tourists. The average stay on Cozumel, in the same year was 3.3 days and tourists spent an average of 538.00 USD during their visit. In 2012 according to the Port Authority of the state of Quintana Roo [27], 2,744,952 passengers visited the island by cruise ship and spent an average of 89.00 USD during their 7–11-hour stay. Connections to the mainland carried 1,343,718 passengers by ferry boat and 457,269 by plane [28]. Cozumel Island is populated by 79,535 habitants [29] who rely heavily on the tourism industry.

A profile study conducted by [31], found that 41% of the people visiting Cozumel were interested in water activities, of which 75% went on scuba diving or snorkeling excursions. Following this trend, [17] confirmed the strong dependence on water activities by the island, finding more than 23 diving spots (see Fig. 1 for diving area), and [12] registered 50% preference for scuba diving as the most popular activity on the island and main reason to visit the island.

The water temperature on Cozumel Island ranges from 25 to 29°C, depending on the season and also on the current flowing on the channel. Cozumel is known as the capital of drift diving on the Caribbean Sea; the water flow is mainly conditioned by the North Equatorial Current, and an extension of South Equatorial Current, the Guyana Current. In the Antilles, the current splits into the Caribbean Current, and crosses the Yucatan Strait to form important gyres in the Gulf of Mexico.

Reference [25] estimates 1500 visitors among them divers and snorkelers visit the local reef areas daily and the same number is used as field capacity of Cozumel reef. The value is estimated from a function of seats per diving embarkation which have been registered with the Port Authority to operate in the marine park. The park controls the divers' entry through the wristbands purchased in the main office. In 2012 the National Commission for Protection of Natural Areas in Mexico (CONANP) issued a total number of 299,395 wristbands. Considering that not every boat went out at full capacity, for 2012 the average number of divers in the water was 818 per day.

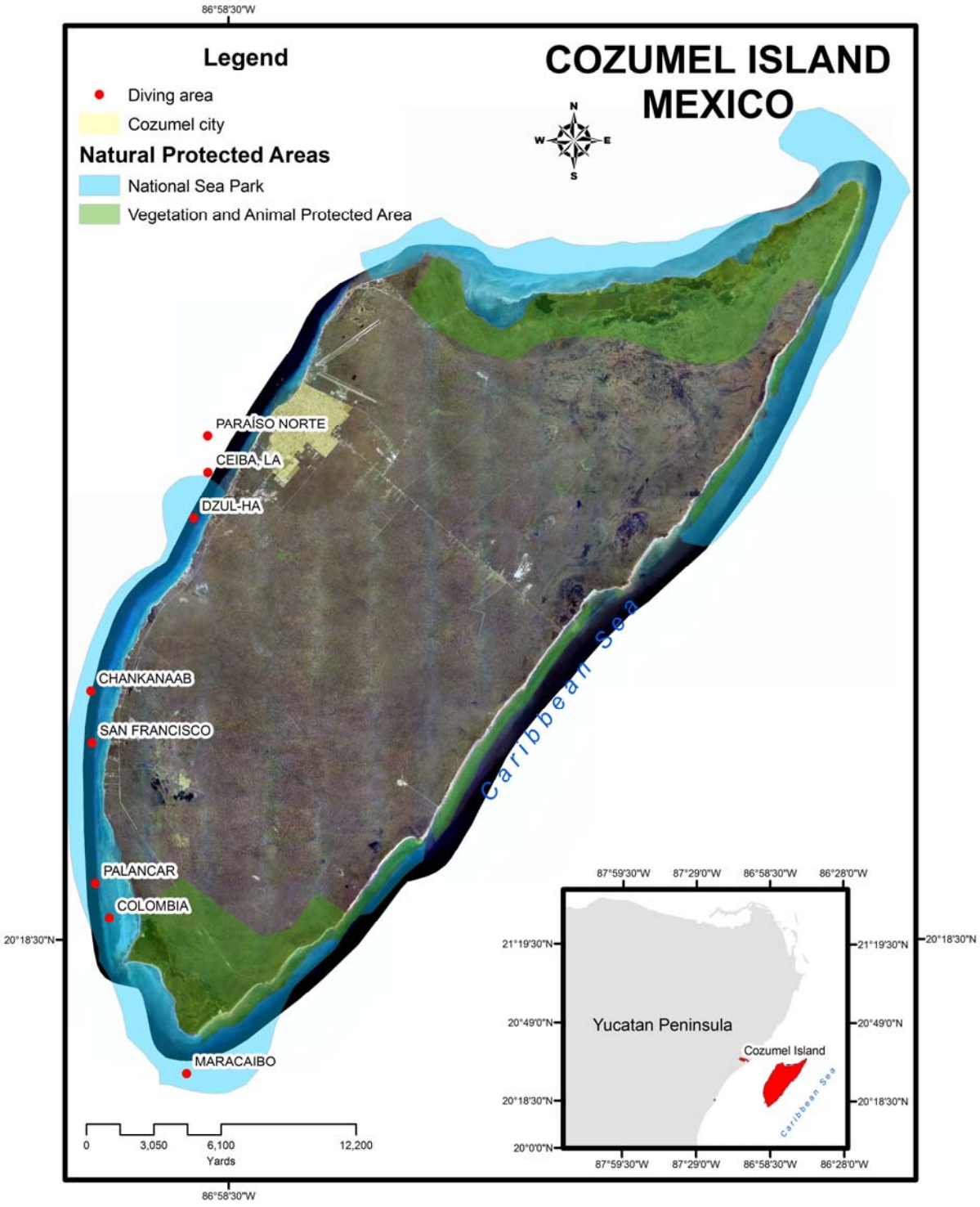

Fig. 1 The map of Cozumel and respective MPAs [30]

The dependency on tourism, and in particular scuba diving, has previously enforced good practices at least while offering water based activities. Taught since 1997, an environmental education course has been a blue print for qualifying diving instructors, diving and snorkeling guides, boat captains and their crew members to work inside the marine park. As mentors of the program [32], and mentioned on [33], page 56, were covered subjects like "Physical-geographical aspects, Terrestrial ecosystems, Coral reef ecosystem, Zoning, Natural enemies of coral, Man and the coral reef system, Cozumel coral reef, looking and touching, purposes and goals of the PNAC and laws governing the Natural Protected Area".

Recently, the environmental course has been used as part of a strategy to manage the MPA, and is delivered to achieve one sustainable development indicator designed for Cozumel – Environmental Education. This way, the local community is committed to achieve balance and guarantee sustainability for future generations. There is the need to educate people and raise awareness to respond to environmental issues. Since 2007, the PNAC has promoted the restructured training course, developed by the Coral Reef Alliance, which covers environmental issues. This falls in line with the priority to raise awareness and change attitudes towards the environment.

TABLE I
PROFESSIONALS' SOCIO-DEMOGRAPHIC PROFILE ACCEDING TO THE MPA ON COZUMEL ISLAND

Field		Missing	Valid	Min	Max	Mean	Mode	Percent	Std.
Age		173	914	16	73	36	32	81.07	10
Residence on Cozumel (years)		211	876	0.06	67	21.06	30	80.59	12.91
Gender	Male	-	1087			-		91.81	-
	Female					-		8.19	-
Nationality	Mexican	-	1087			-		87.49	-
	Foreign					-		12.51	-
Education	No school	108	979			-		0.31	-
	Primary					-		11.64	-
	Secondary					-		39.73	-
	Bachelors					-		27.28	-
	University					-		20.53	-

III. METHODOLOGY

The study has required references such as a transcript of an academic thesis, being a previous evaluation of the course provided by the PNAC, written by [34] since the creation of the Marine Park until the year 2003. Furthermore, the access to technical documents reporting the evolution of the PNAC, and bibliography exposing an important strategy for better management of MPAs, gave focus to the environmental education-training course "Environmental Education for Tourism Providers and Volunteers for the National Park Cozumel Reef".

In the year 2008, Coral Reef Alliance reviewed the course contents and layout for being delivered and introduced changes on the evaluation process, becoming more accessible to all tourism providers on the island. On a previous academic program from the University of Quintana Roo (UQRoo), on Cozumel, the course was registered on a database crowded with variables describing demographics (nationality, place of birth, age, gender, and time of residence on Cozumel) and socio-cultural profile (educational level, working position and work experience). Therefore, based on the last available registry, the period 2008-2011 was reviewed and updated up to the last course taught in 2012.

Moreover, informal interviews at the PNAC office were conducted for better understanding of the paper work review and variables reviewed for analysis of the last 5 years of the training course.

IV. RESULTS

Despite numerous findings of lack of information registered in the enrolment forms, the results obtained are based on 1087 cases. In some cases, people employed by the Military Special Forces have got their information automatically classified; being just registered the course number and date of the environmental education training. Also, lacks of strictness lead to missing information on the student record file, as illustrated on Table I. The variables in study are presented on where the course is described on his first appearance with the new format provided by Coral Reef Alliance, and updated until 2012.

Data represented on this table is subjected to personal information provided by the participants, and professionals arriving from other parts of Mexico located on the Riviera Maya, and so not being registered as residents on Cozumel giving missing data on the database. Tourist destinations located on the mainland are often organizing diving excursions to Cozumel, and most of their professionals do not hold a permit to operate inside the MPA.

The variance of age ranges from 16 to 73 years old, indicating participation and interest of local population in learning about marine protection, receiving vital understanding of the whole ecosystem on Cozumel. The course, meant to be for tourism providers has become mandatory for any professional who wants to work within the National Park boundaries, being Mexican citizen or who is in procession of the Mexican work permit FM3. It is frequent to have individuals volunteering for the PNAC in order to help

any park ranger, protecting the island ecosystem, for academic internship, or when the nature of their professional activity requires acceding to the National Park area. For this group of people is given the opportunity to participate as a volunteer and together with tourism providers attending to the environmental education course.

Table I represents both genders on the training program with big majority of male and small percentage of female, showing likewise some heterogeneity of the groups attending to the course. The PNAC is not exclusive to Mexican citizens but as well educates any foreign professional, or volunteer, that pretends to work within the MPA boundaries. Credentials were issued to 87.49% Mexicans and 12.51% foreign citizens. The education level varies from a small number of people that did not attend to school to people holding university degrees. 0.31% individuals are leading the work force without having attended to school, 11.64% educated with Primary school, 39.73% with Secondary school, 27.28% with bachelors and 20.53% with university level.

V. Conclusion

Scuba diving is the nature based activity chosen to promote the local reef on Cozumel Island, one example to follow for management of MPAs. This way, it was found a compromise between the need to preserve the natural resource and the achievement of a sustainable indicator designed for Cozumel Island –Environmental Education. Delivered as a training course, is directed to all professionals required to work within the MPA boundaries, and has the particular mission of raising awareness among all professions directly related with scuba diving, and tourists. Thus, people involved locally make the difference by adopting good practices at work and providing detailed information to visitors about the reef ecosystem and environmental behaviors.

The database study refers to the period from 2008-2012, it has relevant missing information for good management of the course and for analysis of eventual professional evolution of the participants. There is enough data for conducting studies about frequency of the training course, but due to the lack of detailed information, in some cases, still insufficient data for analysis of tendency. The variables created for demographic description of the participants and their socio-cultural profiles are important to be registered, allowing having a better approach when developing materials for new training sessions. Moreover, studies can provide knowledge about migrations to Cozumel Island and characterize the importance of the Island for Sustainable Tourism Development planning.

Since the introduction of the training course, and as a way to settle the environmental education indicator, the program has always been focused on the natural ecosystem supporting nature as the main attraction on the island. Sustaining travel industry and tourism development on Cozumel, Coral Reef Alliance has updated the course contents for the environmental education training, and introduced changes on the evaluation procedure. Due to the fact that the course is taught in Spanish, and is very interactive, the updated materials give chance to foreign professionals to clearly understand the subjects approached and obtain their working credential without a written exam.

The course brings professional benefits to individuals looking up to ascend in their job career and working in any position inside the PNAC. Besides, is a successful alternative to be extended to other MPAs existent on the island. Scuba diving is the most representative tourist activity and takes place not only in the MPA described, but also North from it. Currently, tourism providers benefit from trained staff and delivery of better eco-service to their guests. The learning process is about good practices to be followed, which can be extended to the whole island, and to all activities.

Being educated, allows humans to perceive problems and define solutions, the Park is the whole island and the community living for it, our responsibility is to educate tourists about the importance of the natural resources.

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