Recreational SCUBA Diving Activity in the U.S. Caribbean

GRACIELA GARCIA-MOLINER, WALTER R. KEITHLY, JR.
and IRIS N. OLIVERAS
Caribbean Fishery Management Council
268 Muñoz Rivera Avenue, Suite 1108
San Juan, Puerto Rico 00918-2577

ABSTRACT

SCUBA diving activity has been increasing in the U.S. Caribbean without any statistics on the number of people involved as users of the marine resources. SCUBA diving schools, stores and centers were identified from the telephone book, the tourism guides and diving magazines. A telephone survey, conducted by the Caribbean Fishery Management Council during 1998 - 1999, aimed at (1) identifying these centers to establish a database; (2) gathering information on the (a) number of divers using the resource; (b) areas visited; (c) number of visits per area; and (d) activities carried out by the divers at these sites.

Preliminary results indicate that there are over 100 diving operations in the area. Of these, most are involved in taking divers sightseeing. All levels of expertise are reported, but the beginner and intermediate divers predominate. Diving activities take place at depths between 10 and 20 meters (U.S.Virgin Islands) and 10 - 33 meters (Puerto Rico) over coral reef areas. The preliminary results of the survey show that on average, there are two dive trips per day, five days per week, which include nine divers per trip. As a first approximation, there could potentially be over 300,000 divers per year in the U.S. Caribbean. There were over 90 named diving locations which were reported as visited over 10 times per week. Further analyses of the data will include the number of areas frequented by divers (chartered activities) and the number of dives to each specific reef or wreck. This information, along with descriptions of changes in the species diversity and condition of the reef, could help in determining the effect of divers on reefs.

KEY WORDS: divers, recreational diving, SCUBA

INTRODUCTION

Management of marine resources is usually exercised over commercial fishing activities. This is so because most of the data available to determine the status of fish stocks and the impacts from fishing on these stocks are from the commercial fishing sector. Recreational activities which have direct and indirect impacts over marine resources include boating, cruising, anchoring of cruising and fishing vessels, fishing, snorkeling and SCUBA diving, among others. Most of the information available from the recreational fishing activities comes

from big game fishing (marlin) either from tournaments or special projects in both Puerto Rico and the U.S. Virgin Islands. The other source of information is the noncontinuous creel surveys targeting the shore fishing activities (e.g., Mateo 1998) or telephone surveys (e.g., Jennings 1992) which allow for a general estimate of the per cent of the population who fish.

Recreational SCUBA divers impact marine resources, directly by touching and removing coral (habitat) and indirectly by removing fish. No information is available documenting the changes in the SCUBA diving activity in the U.S. Caribbean. The 'sport' became popular in the 1970s and its popularity has continued to increase ever since. There is no documented history of the development of the recreational SCUBA diving industry in the U.S. Caribbean. An additional factor of importance is the increasing number of visitors to the U.S. Caribbean that has also resulted in an increasing number of people diving.

In order to establish a baseline database on the recreational diving activities, and lacking a comprehensive list of SCUBA divers, centers or operators, this study focused on a telephone survey of the diving operations in the U.S. Caribbean during 1998 - 1999. This survey besides identifying and documenting these operations aimed at:

i) estimating the number of divers using marine resources
ii) describing the activities carried out by these divers (e.g., spearfishing, photography)
iii) identifying the areas used, and
iv) estimating the number of visits to each area.

METHODS

SCUBA schools, dive centers or shops, and dive operations were identified from the local yellow pages for Puerto Rico and the U.S. Virgin Islands (St. Thomas, St. John, and St. Croix). Local tourist guides (e.g., Que Pasa (PUERTO RICO), May - June 1999; St. Thomas This Week, February 9-16 1998), newspapers and specialized magazines were searched for information on SCUBA operations. The owners/managers of the Centers also cooperated by providing us with the names and phone numbers of other operators. The local government offices were also contacted (e.g., P.R. Tourism Co., Puerto Rico Department of Natural and Environmental Resources, U. S. Virgin Islands Department of Planning and Natural Resources, etc.) for information on SCUBA diving activities.

The survey conducted included questions aimed at identifying the greatest number of diving operations in the area and the number of years in business, the port of origin of these operations, the sites (reefs) most visited and the frequency of dives on these reefs, the degree of expertise of the divers visiting the reefs and the depths of the dives, the activities allowed by the operators (e.g.,

photography, collection, harvest), the number of divers and number of dives per trip, as well as the number of trips per week. The answers of the respondents were taken at face value.

The telephone interviews were conducted by the same person and each lasted about 20 minutes unless the respondent provided additional comments or requested information. Each individual store/center was tried at least five times but most interviews were done on the first try with only one refusal. Calls were made during the day only; between 7:00 and 8:00 a.m. and 5:00 and 7:00 p.m. because most diving trips take place between 9:00 a.m. and noon and 1:00 and 4:00 p.m. every day. Night diving was an on-request activity.

RESULTS

The number of diving operations identified in the U.S. Caribbean totaled 104, 26 in the U.S.V.I. and 78 in Puerto Rico, 13 of which have gone out of business (Table 1). The overall effective response rate based on 91 diving operations was 73%, much better than expected. The highest number of diving operations was found in San Juan, Puerto Rico (14) and St. Thomas (13), where most of the tourist populations are found.

Table 1. Number of dive operations identified in the U.S. Caribbean and effective response rate by areas.

	Coast / Island	Number of dive shops	Closed Operations	Answered	Effective Response (%)
Puerto Rico	North	37	6	20	0.65
	East	20	3	12	0.71
	South	10	1	6	0.67
	West	11	0	8	0.73
Total PR		78	10	46	0.68
USVI	St. Thomas	13	3	9	0.90
	St. John	5	0	3	0.60
	St. Croix	8	0	7	0.88
Total USVI		26	3	20	0.87
Total		104	13	66	0.73

Figure 1 shows the cumulative increase in the number of dive shops in the area since 1968 and the range in the number of years in business between two and 30. The activities allowed by the dive operators include sight-seeing, photography, videotaping, spear fishing, hand harvest (lobster), trolling, wreck exploration and some participate in scientific studies (e.g., fish census and measuring coral growth). In the U.S.V.I., 79% of the diving operations are exclusively of a passive nature, not allowing any removal of fish or coral. In Puerto Rico, 51% of the businesses do not allow fishing while 12% did not specify the activities allowed, and 37% allow harvesting. Among the species being harvested are spiny lobster, queen conch, hogfish and snappers.

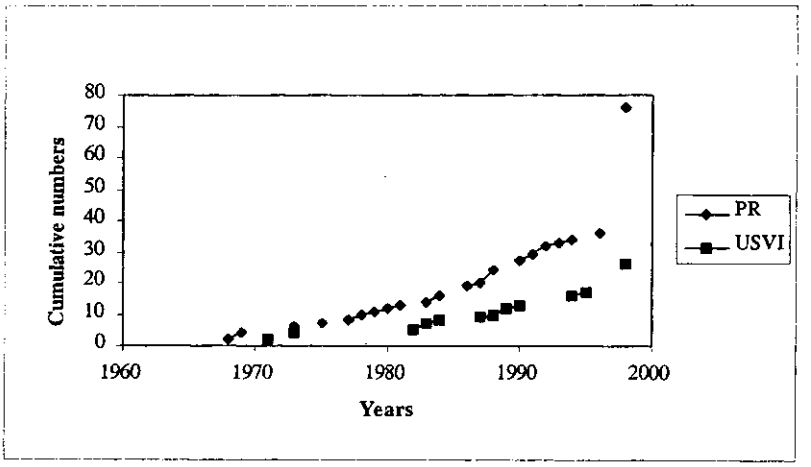

Figure 1. Cumulative increase in the number of dive operations in the U.S. Caribbean

Diving depths were reported to be shallower in the USVI (5- 27 m) than in Puerto Rico (10 - 33 m) with most diving taking place at an average depth of 16 and 20 m in the USVI and Puerto Rico, respectively. The expertise or

experience of the divers reflects the differences in depth with most divers in the USVI being beginners and intermediate divers being reported from Puerto Rico.

Most diving operations have one diving vessel, five businesses rent the diving platforms or have no need for one because most diving is done from shore, while six businesses own between two and four boats. Most dive shops are not restricted to their immediate sea area but are agile in moving boats to other coastal areas. In Puerto Rico for example, shops in the north coast concentrated their diving efforts on the east (Palominos and Palominitos) and west coasts (Mona and Desecheo Islands) where there is more coral reef development than in the narrow and high energy north coast.

On average, the number of divers per trip in the USVI is nine while in Puerto Rico is thirteen; dive operators make three dives per day in the USVI while only two in Puerto Rico; and go out five days per week in the USVI and three days per week in Puerto Rico. However, the individual answers were used to estimate the maximum number of divers each center could potentially take out on an annual basis. This was calculated from the number of divers per trip, the number of dives and trips per day and the number of days per week when operators take divers out. It is the number of dives rather than the number of divers that is estimated because it is not known how many are repeat dives versus different divers. Assuming that there is no seasonality effect, meaning that the number of days per week when dive trips take place is the same throughout the year and, that they operate 52 weeks per year, the maximum number of potential dives is 169,156 dives per year in the USVI and 196,664 dives per year in Puerto Rico. The total number of potential dives, only from dive shop operations in the U.S. Caribbean is 365,820 dives per year.

Each respondent identified between one and 14 sites frequently visited, for diving or snorkeling, and in some cases specified the frequency of their visits to each site (e.g., number of visits per week). Based on this information, in the USVI, the diving areas around St. Thomas receive 80% of the total annual potential dives, while St. Croix receives only 13% and St. John 7%. The most visited reef areas around Puerto Rico are the Islands of Desecheo and Mona on the west coast, the Island of Culebra, the keys of La Cordillera such as Palominos and Palominitos and the Island of Vieques on the east coast. These sites receive visits from more than 25% of the dive operations established in Puerto Rico.

Table 2 shows a sample of the most visited areas in the U.S. Virgin Islands and the potential number of dives per year that each reef or site receives. Cow and Calf might be the most frequented site in the USVI.

Table 2: Potential number of divers visiting these sample reef sites in the U.S.V.I.

Island	Reef Area	Divers per year	Potential maximum number of divers per Island
St. Thomas	Buck Island	5,720	
	Cow and Calf	11,648	
	Congo Cay	2,080	
			134,316
St. John	Cow and Calf	832	
	Congo Cay	832	
			11,232
Total	Cow and Calf	12,480	
	Congo Cay	2,912	145,548
St. Croix	Wapa Gardens	884	
	Salt River National Park	936	
	Cane Bay	416	
	North shore	1,768	23,608
Total USVI			169,156

Dive operations allowing fishing account for 37% (Puerto Rico) and 21% (USVI) of the total number of respondents. The number of divers actually fishing could be estimated from the responses given, that is, the maximum number of potential divers harvesting fish if all divers in a party/trip were fishing. Table 3 shows the values estimated for the number of divers harvesting lobster and spearfishing. In the USVI 3%, and 30% in Pureto Rico of the total number of divers could be harvesting fish. If each potential diver is successful in harvesting one lobster or spearfishing one fish, recreational SCUBA divers could potentially be removing 63,440 fish per year. Anecdotal information indicates that one dive shop could sell 22,360 spear guns per year.

The last column in Table 3 is an attempt to estimate the potential impact of divers on corals. Impact being broadly defined as ranging from touching the coral with their hands to re-suspending sediment by flipping their fins. The estimate is obtained by multiplying the number of potential divers (365,820) by two hands and two feet. The potential impact is then 1,463,280 units of impact per year.

Table 3. Maximum number of potential divers fishing and impacting coral in the U.S. Caribbean.

	Divers	Lobster	Spear fishing	Total Fishing	Per Cent	Impacts on Corals
USVI	169,156	3,432	1,248	4,680	0.03	676,624
PR	196,664	3,640	55,120	58,760	0.30	786,656
TOTAL	365,820	7,072	56,368	63,440	0.17	1,463,280

DISCUSSION

Impacts from recreational activities are not well documented in the U.S. Caribbean. A detailed description of recreational fishing effort, harvest, species targeted and fishing practices is not available. The present trend of increasing recreational SCUBA diving activities, including harvesting of commercially important species, shows no indication of leveling off.

A database has been established for diving operations and other diving sectors have been identified (e.g., clubs, classes, certified instructors, private diving). A description of the activities carried out by divers was presented and an estimate of the potential impact calculated. Areas impacted by these activities have been identified but their condition needs to be assessed.

The number of visitors to Puerto Rico between July 1997 and June 1998 was recorded at 4,670,800 of which 3,396,115 spent at least one night on the Island (Puerto Rico Tourism Company, 1998). The Tourism Company estimated 20, 000 divers in 1997. This survey estimates 196,664 divers using marine resources annually, a number that could represent 4% of the total visitors reported to Puerto Rico and, ten times more divers than previously thought. The dive operators in the tourist guides account for only 30% of the operations on the Island.

In the U.S. Virgin Islands, the number of visitors totaled 2,138,900 in 1998 (B.M. Melendez, Government Development Bank, Bureau of Economic Research, United States Virgin Islands). The number of potential divers in the U.S.V.I. was estimated at 169,156 which could account for 8% of the total visitors. The U.S.V.I. dive operators might be targeting the tourist industry, most specifically, the cruise ship tourist. Therefore, the areas around St. Thomas could be receiving more of a direct impact from divers than St. John and St. Croix.

The survey does not include information on the more local diving industry, that is, it does not include the local divers who own boats (over 40,000 recreational vessels registered in the U.S. Caribbean) and equipment and who dive on weekends, on local dive clubs, and other such groups. It does not include information on the certification SCUBA classes offered on average three times a year (beginners, open water and advanced). These groups need to be incorporated into the data gathering process.

This survey does not include information on the costs of running diving operations, nor does it incorporate the economic benefits derived by the local governments from the lure of diving in the tropical coral reef areas. A cost-benefit analysis of the recreational SCUBA diving industry would be welcomed. As a first step it is worth mentioning that in Puerto Rico, the new Fishing Law requires that recreational fishers obtain a license for fishing. This license carries a fee and registration, information that could be helpful in obtaining information about how many divers are actually fishing in Puerto Rico.

Safety is always an issue to consider, and there is only one nonmilitary and operating Hyperbaric chamber in Puerto Rico, which began offering services in 1997. There were twenty four reported diving accidents between August 1997 and May 1998, three of which were recreational SCUBA divers (Holstein and Soto 1998). These divers, two who were certified, had been diving at depths between 27 and 38 meters and were divers not associated with the dive operations. Operational costs of the treatments were not available from the report. The report does not include information on diving accidents which resulted in death prior to arrival at the facilities.

A description of the activities carried out by 66 out of 91 identified dive shops operators in the U.S. Caribbean is finally available. The next step is to set up monitoring at the areas frequented by divers to determine direct and indirect impacts. Historical scientific data exist from some of these areas and before and after comparisons should be attempted. Some of the respondents are already cooperating with monitoring efforts through private non-profit organizations or universities.

The Magnuson-Stevens Act as amended, requires that essential fish habitat be defined and both fishing and non-fishing impacts on habitat be described. It also requires that fishing communities or communities affected by fishing activities be identified and described. Most of the information available is from the commercial fishing sector. Some information is available from the recreational fishing sector but mostly from shore fishing or boat fishing activities. At the time of the Council amending the fishery management plans, nothing was available on the recreational SCUBA diving sector. Questions regarding the number of recreational divers, their distribution and activity patterns, and their overall impact of fisheries and essential fish habitat are still

unanswered. The experience of the divers would greatly influence the impact they could have on the coral and surrounding areas. This basic information is also needed to determine what mitigating measures are necessary if there are adverse impacts from inexperience divers, for example. Among these mitigating measures are the placement of mooring buoys and the establishment of restricted fishing or diving areas, among others.

Finally, among the comments received from the respondents the most common ones were the requests for education and orientation, as well as more contact from government regulating agencies and the Council.

LITERATURE CITED

Holstein, D.J. and O. Soto. [1998]. Operational statistics. Medical Center, Hyperbaric Medicine. Administración de Servicios Médicos de Puerto Rico, Centro Médico de Puerto Rico. Unpubl. MS. 46 pp.

Jennings, C.A. 1992. Survey of non-charter boat recreational fishing in the U. S. Virgin Islands. *Bulletin of Marine Science* **50**(2):342-351.

Mateo, I. [1998]. Activity and harvest patterns in U.S. Virgin Islands recreational fisheries (Job 4). Annual Performance Report U.S. Fish and Wildlife Service Sport Fish Restoration Program, U.S. Virgin Islands. Unpubl. MS. 19 pp.

Puerto Rico Tourism Company. 1998. *Selected Statistics of the Tourism Industry in Puerto Rico*, 1997 - 1998 Edition. Office of Statistics. San Juan, Puerto Rico.