

# The Economic Impact of Shark Diving in Florida

Report prepared for:

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## INTRODUCTION

Many shark populations worldwide have faced severe population declines in recent years. Recent estimates by the International Union for the Conservation of Nature (IUCN) indicate that approximately 24 percent of all chondrichthyan species (sharks and their relatives) are threatened, with some at the risk of extinction (Dulvy et al. 2014).

The primary reason for these declines centers on overfishing, either through directed fisheries, bycatch, or the demand for fins (Worm et al. 2013, Stevens et al. 2005, Clarke 2007). Inconsistent catch reporting and under-reporting, the highly migratory nature of many shark species, and their wide distribution has further confounded management attempts to regulate shark fishing at sustainable levels (Clark et al. 2006).

A growing number of countries are beginning to recognize that sharks have value to their economies beyond commercial fishing. Sharks' value to the health of marine ecosystems is just beginning to be understood (Ferretti et al. 2010, Baum and Worm 2009). Further, several recent studies have documented the value of sharks to local marine tourism (Neff & Yang 2013; Friedrich et al. 2014). For example, Gallagher and Hammerschlag (2011) found that shark diving takes place in 29 different countries with nearly 400 operators. Several case studies have documented the economic impact of shark diving from small island nations in the South Pacific (Clua et al. 2011, Vianna et al. 2012) and South Africa (Dicken and Hosking 2009) to The Bahamas (Haas et al. 2017). The concern for declining shark populations coupled with the recognition of the ecological importance of shark species and the increasing role of sharks in marine shark tourism (Catlin et al. 2009, Gallagher and Hammerschlag 2011) has resulted in growing efforts for shark conservation (Friedrich et al. 2014) and the establishment of marine reserves for the protection of sharks (Brunnschweiler 2010).

The purpose of this report is to add further context to the economic value of sharks to the marine ecotourism industry. Shark diving is rapidly becoming a focal point for many operators in their business advertising and the offering of dive trips specifically targeting sharks. Within this report shark diving is defined as diving with SCUBA gear where sharks are commonly found and a high probability of encountering is present. Snorkeling where sharks are present was not considered within the scope of this study.

There have been few comprehensive diving studies conducted in Florida in the past two decades. The Diving Equipment and Marketing Association reported that between 2005 and 2012, 114,784 divers were certified in Florida (DEMA 2016). Further, the report estimated that 4.56 million Scuba diving and 4.24 snorkeling days occurred in Florida during 2012. The few more comprehensive diver studies that have been conducted have focused on specific regions of the state, such as the Florida Keys, Southeast Florida or Martin County (Hazen and Sawyer 2004); specific locations such as artificial reefs (Bell, et al. 1998); or on certain subsets of divers like charter divers (Johns et al. 2001). With the exception of the study by Johns et al. (2001), most diving economic studies have collected limited diver expenditure data. Further, most of the recent studies on divers have focused on the economic value of various marine

resources, such as coral reefs and aquatic habitat. As a result, it was challenging to find a method that would allow for the estimation of divers using both commercial charters, and private and rental boats, and their diving-related expenditures.

Most economic impact studies of shark diving have occurred in island nations in the South Pacific and elsewhere. A recent study by Haas et al. (2017) showed that direct expenditures by shark divers in The Bahamas contributed approximately \$48.8 million (USD) to the local economy by 44 operators during 2015. The growth in shark diving and the Bahamian diving industry, in general, are thought to be benefitting from the designation of all Bahamian marine waters as a shark conservation area (Hass et al. 2017). This effort started in the 1990s with a ban on long-lining and was heightened when the country declared all of its marine waters a shark sanctuary in 2011. The economic impact of shark diving, while gaining interest within the context of shark conservation and over-exploitation, has been confined to a relatively few studies in island nations, particularly in the South Pacific. No studies have been conducted on the economic impact of shark diving in Florida or the broader U.S.

This lack of information for U.S. shark diving activities, and growing concern for the shark populations and management in U.S., prompted the need to begin understanding the impacts of sharks on the economy of the U.S. beyond their commercial fisheries value.

Three objectives were identified for this project:

1. To estimate marine diving activity in Florida.
2. To estimate the extent of marine diving activity that directly involves sharks as a component of the diving experience, through trips specifically targeting sharks or to locations with high probabilities of shark encounters.
3. To estimate the direct expenditures and value added impacts of shark-related diving in Florida.

## **STUDY METHODS**

In order to understand the extent of marine diving, in general, and shark diving, specifically, in Florida it is necessary to identify the industry members that provide direct services to divers. This includes dive shops that schedule dive trips and provide limited retail space for equipment, full service diving centers that have an extensive retail business in addition to scheduling dive trips, and dive instruction and training businesses that schedule dive trips as part of their programs.

There is no single source of information for either identifying diving-related businesses or active divers in Florida. To address this absence of information, several approaches were used to identify diving businesses. First, we searched for diving-related business on the Internet. These included dive shops and centers, charter boat operators offering dive trips, and resorts that offered diving activities for their guests. We also searched for dive operator associations which were generally local or regional in nature. We contacted tourism agencies in larger cities to obtain lists of their diving-related members. Finally, when we interviewed dive operators by telephone, we asked them for the names of other operators in their local areas. This approach has proven effective in identifying a large majority of

businesses operators such as charter captains and fishing guides in previous studies (Hass et al. 2017, Fedler 2013, Fedler 2017).

To collect dive trip information from operators, two surveys were employed. All businesses identified in the Internet search had email and/or telephone contact information recorded from their website. Businesses with email addresses were sent an email (Appendix A) briefly identifying the survey sponsor, the purpose of the project, the type of data that was being asked for in the survey, and a survey link that took the recipient to the online survey.

Businesses that did not provide an email contact on their website received a telephone call informing them about the purpose of the project and asking them to respond to the same series of questions about their diving business that were used in the online survey. Additionally, respondents were asked for the names of other diving businesses in their regions. Contact information on these referral businesses was sought through an Internet website, and if none were found, directory assistance was consulted.

These procedures resulted in the identification of 402 marine diving businesses in Florida. Follow-up with each business through email or telephone call resulted in 37 businesses with disconnected telephone numbers or non-functional email addresses. When an email bounced back as undeliverable, a telephone call was made to the business. Details of the business contacts and survey responses are provided in the results section.

### ***Dive Operator Survey***

Previous experience surveying diving, charter boat, and fishing guide business owners and managers has shown them to be very reluctant to divulge details of their business operation. This includes the number of dive trips they made during the year and the number of customers they average on each trip. As a result, the survey needed to focus on a specific issue which most dive operators would relate to and would be willing to provide the needed data. Shark conservation is a cause most dive operators support and it was used as the centerpiece of the discussion when contacting operators and asking for their cooperation in completing the brief survey. Both online and telephone surveys consisted of the following four questions.

1. How many total diving trips did your business make during the past 12 months?
2. What percentage of these trips were shark-related diving trips? A shark-related diving trip is defined as a trip where divers have expressed a desire for shark encounters and that the dive site chosen had a high probability that sharks would be present.
3. What percentage of your dive trips were specifically marketed as a shark dive? That is, divers expected, and were specifically told, that shark encounters were the primary objective of the trip.
4. What is the average number of divers taken on each dive trip?

The small number of questions was used to facilitate operator responses. Our past experience with surveys of this nature has shown that asking more than four or five questions significantly reduces

survey completion. Online and telephone surveys were conducted during November and December 2016.

### ***Estimating Private Boat Diving***

An important aspect of this study was to represent private boat and rental boat divers. There is scarce information on the total number of divers in Florida and less known about their characteristics, expenditures and diving preferences. With the growth of shark diving being relatively recent, few studies considered asking questions about diving with sharks. Because of the limitations of the study, surveying individual divers in Florida was not feasible. Thus, it was necessary to draw from one of the few comprehensive studies of Florida divers to construct an estimate of all diving in Florida and to estimate the amount of shark diving that is occurring.

The only study of divers in Florida that involved both divers using charter boats and private boats was conducted by Johns et al. in 2001. Charter boats are licensed for-hire boats that take divers to dive sites. A group of divers either pays for exclusive use of the boat or divers pay an individual dive fee to join other divers on a boat. This study focused on diving at natural and artificial reefs in four southeast Florida counties. As a result, we were able to use data from this study to estimate the number of private boat divers in our study, based on their proportion to charter boat divers. The assumption here is that the relationship between the number of charter boat divers and private boat divers is essentially the same in 2016 as it was in 2001. While this assumption may be reasonable, changes in the economy, demographics, recreational activity preferences, environmental factors, and other reasons may have changed the nature of this relationship. The growth of shark tourism and increasing public concern for the marine environment may also have influenced the relationship between charter and private boat divers and their frequency of diving.

There is also extensive diver expenditure data for both charter boat and private boat divers in the Johns et al. (2001) study. We used these expenditures to represent expenditures of divers in our study. The only adjustment we made to the expenditure data was to substitute the average fee for a standard dive trip for dive operators in this study for the original charter operator fee. This was reasonable as fuel prices rose from \$1.46 in 2001 to \$2.45 in 2015 and is the most frequently cited reason for fee changes. The per-person charter fee for a single dive trip in 2001 averaged \$44. The average among charter boat operators in 2016 was \$88. Expenditures for other items such as food and beverages, lodging, transportation, among others, have likely increased as well. Thus, expenditure estimates in this study are likely to be conservative.

### ***Economic Impact Analysis***

To estimate the economic impact of shark diving, it is necessary to have dive operators provide data on the number of trips or divers serviced during a year. It is also necessary to have an understanding of the expenditures divers make during their dive trips. The former information is readily obtainable from most dive operators. However, obtaining diver expenditure data is more problematic because it requires contacting divers and asking them about their spending for dive trips. Because of funding and time limitations associated with this study, it was not feasible to survey divers to ascertain their annual or



daily dive trip expenditures. As a result, previous studies that collected diver expenditure data were reviewed and a representative value was selected to estimate diver expenditures for this study. This procedure and the value selection are discussed more fully in the results section of this report.

The RIMS II methodology is the Regional Input-Output Modeling System (Bureau of Economic Analysis 2006) used in this study to estimate the value added, income and jobs impacts of diving. This system was developed and published by the U.S. Department of Commerce and is one of the primary ways to conduct a systemic analysis of the economic impacts of projects and programs on affected regions.

RIMS II is widely used in both the public and private sector. In the public sector, for example, the Department of Defense uses RIMS II to estimate the regional impacts of military base closings, and state departments of transportation use RIMS II to estimate the regional impacts of airport construction and expansion. In the private sector, analysts, consultants and economic development practitioners use RIMS II to estimate the regional impacts of a variety of projects, such as the development of theme parks and shopping malls. RIMS II measures the economic impact of an industry, in this case diving, by accounting for three elements of potential economic impacts:

**Direct impacts** include employment, payroll and revenue generated by services and goods purchased by divers.

**Indirect impacts** are what users and employees of the diving-related businesses spend in the local and regional economy as a result of their involvement in the recreational diving industry.

**Induced impacts** include the value of goods and services purchased by money generated by direct and indirect impacts throughout the regional economy -- goods and services not associated with diving and which would otherwise not be available.

The summation of indirect and induced impacts produces a composite **Value Added** coefficient that is expressed as a multiplier which is applied to retail sales associated with a program, project or activity such as diving.

RIMS II multipliers are intended to show the total regional effects on industrial output, personal earnings and employment for any county or group of contiguous counties in the United States resulting from any industry activity. Industry descriptions are defined according to the BEA's 2005 national input-output tables. Impacts for diving-related businesses can be estimated by applying the RIMS II multipliers to activities within the appropriate industrial sector. RIMS II multipliers are given in three tables.

The **output** multiplier measures the total economic output created by the original retail sale.

The **earnings** multiplier measures the total salaries and wages generated by the original retail sale.

The **employment** multiplier estimates the number of jobs supported by the original retail sale.

Each diving-related business is assigned a Standard Industrial Classification (SIC) code. The diving-related business is identified by a corresponding RIMS II code, which identifies the multiplier factor to be applied to that business. Business activities that are most likely encountered in diving-related economic studies are represented by the categories used to measure diver expenditures. To apply the RIMS II model, diver expenditures are each matched to the appropriate output, earnings and employment

multipliers. For example, dollars attributed to gasoline purchases are multiplied separately by the output, earnings and employment multipliers specific to gasoline refinement. The resulting estimates describe the total economic effects, income and jobs supported by the refining industry as a result of fuel purchases made by divers. This same process is repeated for all reported expenditures. Finally, the total output, income and jobs estimated for each expenditure type are summed to produce the total effect for each impact category.

## RESULTS

The results section of this report has three parts. The first focuses on estimating the number of marine dive operators in Florida and weighting survey responses to represent all active dive operators. The second section estimates overall diving days in Florida and the expenditures and related economic impacts. The final section estimated shark-related diver days and associated economic impacts.

### ***Dive Operators and Survey response***

The search for marine dive operators in Florida resulted in the identification of 402 potential businesses (Table 1). Of these businesses, we were unable to contact 37 due to disconnected telephones, non-functional email addresses, or confirmation by a third party that the operator was no longer in business. Of the remaining active 365 businesses, 237, or 65%, responded to the online survey or telephone interview.

Table 1: Dive operators and response characteristics	
Number Identified	402
Unable to contact or out of business	37
Net Number Contacted	365
Number Responding	237
Percent Responding	65%

Results of the study were weighted in order to represent all marine dive operators in estimating the economic impact of shark diving. The weighting of responses was informed by information on non-responding dive operations. When operators did not want to disclose their business information (number of dive trips and/or average divers per trip), they were asked if they would classify their business as large (10,000 or more dive trips per year) or small (less than 10,000 dive trips per year). This classification was based on the distribution of trips from responding operators, which was bi-modal, and helped ensure that non-responding operators did not bias the results either upwards or downwards.

The results of this classification of non-responding businesses were consistent with the weighting shown in Table 2. As seen in Table 2, 11.4% of all businesses were in the large group while the vast majority (88.6%) were in the small business category. The results of this study were weighted to represent all 365 active marine dive operators in Florida.

Table 2: Weighted number of dive operators by operation size

Operation Size	Respondents		Weighted Number
	Number of Respondents	Percent	
Large (≥10,000 trips/year)	27	11.4%	42
Small (<10,000 trips/year)	210	88.6%	323
Total	237	100.0%	365

### ***Diver Days and Economic Impacts***

Total diver days were calculated by multiplying the number days of operation by the average number of dive customers per day, as reported by the individual operators. Table 3 shows the average operating days and average divers per day for large and small operators. About three-fourths of marine diving days in Florida are provided by small dive operators. Large operators, while comprising only 11% of all businesses, but accounting for about 25% of the diver days. These large operators often benefitted from business with cruise ships and dive tours that more than doubled the average number of divers serviced each day.

Table 3: Calculation of the total number of diving days for dive operators by operation size

Operation Size	Number of Operators	Average Number Dive trips per Year*	Average Divers per Trip	Total Diver Days
Large	42	799	25	838,950
Small	323	508	12	1,969,008
Total	365			2,807,958

\*Note: Several dive operators operate more than one boat and make multiple dive trips per day

To estimate the number of private boat diver days, we used the proportion of private boat diver days to charter diver days ascertained from data in Johns et al. (2001). Private boat diver days were found to be 30.04% of charter diver days. The number of charter operator diving days in our study was multiplied by 30.04% to produce an estimated 843,511 private boat diver days for 2016 (Table 4). Together, charter and private boat divers spent 3.6 million days diving in Florida.

Table 4: Estimation of private/rental boat divers from charter operators

Diving Segment	Diving Days
Charter operators	2,807,958
Private boat as a proportion of charter operators	30.04%
Private boats	843,511
Total Diver Days	3,651,469

Note: Proportion of private boat divers is from Johns et al. 2001

We also used the per-day expenditures for 15 dive trip-related products and services reported in Johns et al. (2001) as a proxy for diver expenditures in 2016. We used the daily expenditure amounts, averaged across the four counties (Palm Beach, Miami-Dade, Broward and Monroe) for charter and private boat divers included in the study, with the exception of the charter boat dive fee. The average 2016 dive trip fee of \$88 was substituted for the \$44 average fee in 2001 (Table 5). This is a reasonable substitution as the average fuel price in the U.S. of \$1.42 per gallon in 2001 increased to \$2.45 in 2015 as noted earlier.

The largest expenditures, on a per-day basis, for private boat divers was for food and beverage, followed by boat fuel and lodging (Table 5). Excluding boat fees, charter diver spending was primarily for food and beverages, shopping, lodging and auto rentals. This pattern of spending, compared to private boat divers, suggests many divers with charter operators traveled considerable distances and may reflect had a greater proportion of out-of-state and international divers. Overall, private boat divers spent an average of \$114 per day for their diving. Charter boat divers spent nearly twice as much (\$209) per day for their diving experiences. These averages were used in the following tables to estimate total diving expenditures for both diver segments.

Table 5: Average per-day expenditures for private/rental and charter divers

Expenditure Item	Average Expenditure per Day <sup>1</sup>	
	Private	Charter
Boat Fee	0.00	88.00
Boat Rental	4.16	0.00
Boat Fuel	21.59	0.00
Air Refills	2.68	1.82
Tackle	1.92	0.12
Ramp Fees	5.35	0.02
Marina Fees	8.58	1.27
Lodging	13.29	29.30
Camping Fees	3.16	1.64
Food & Beverages Stores	16.99	9.34
Food & Beverages Restaurants/Bars	16.90	27.75
Auto Gas	6.69	5.72
Auto Rental	2.94	11.30
Equipment Rental	0.65	2.15
Shopping	9.55	30.35
<b>Total</b>	<b>\$114.44</b>	<b>\$208.76</b>

<sup>1</sup>Expenditures reported in Johns et al. (2001) with the exception the charter boat fee

Multiplying total diver days for charter and private boat segments by their respective average daily expenditure results in an estimate of total annual direct expenditures for diving in Florida. Marine divers spent nearly \$683 million on their dive trips during 2016 (Table 6). Slightly more than 85% of all diver expenditures were made by divers using charter boats.

Table 6: Expenditure per day of diving and annual direct expenditures made by divers

Diving Mode	Total Days	Expenditure per Day	Direct Expenditures
Charter divers	2,807,958	\$209	\$586,196,332
Private/rental boat	843,511	\$114	\$96,529,242
Total	3,651,469	\$187	\$682,725,574

Applying the average value added, wage and job multipliers from the RIMS II economic (BEA 2006) to Florida diver expenditures resulted in an estimated \$484 million in indirect and induced spending resulting from diver expenditures. When totaled, direct and value added expenditures in 2016 resulting from marine diving in Florida was \$1.166 billion annually. These expenditures resulted in \$360 million in wages being paid to diving and other supporting businesses and led to nearly 12,000 full-time equivalent jobs.

Table 7: Estimated diving value added impacts, wages and employment effects

Diving Mode	Direct Expenditures	Value Added	Total Impact	Wages	Jobs
Charter divers	\$586,196,332	\$415,496,525	\$1,001,692,857	\$309,496,144	10,062
Private/rental boat	\$96,529,242	\$68,420,020	\$164,949,262	\$50,964,884	1,657
Total	\$682,725,574	\$483,916,545	\$1,166,642,120	\$360,461,028	11,719

### ***Shark Diver Days and Economic Impacts***

Estimating the number of diving days targeting sharks involved asking operators to estimate the percentage of their diving trips that featured shark encounters. Operators estimated the percentage of their trips their customers expressed interest in diving where sharks could be encountered and an effort was made to dive at specific sites where sharks were known to commonly occur. They also estimated the percentage of shark trips that specifically advertised and targeted sharks, either by feeding, chumming or using some other method to attract sharks. Thus, targeted shark diving was a subset of shark encounter diving.

Shown in Table 8 are the percentages and diving days for trips promoting shark encounters during the diving experience. Collectively, operators reported that 32% of their trips were to locations to meet customer expectations for having shark interactions. Nearly a third of all diving days focused on divers interested in interacting with sharks.

As shown in Table 8, about 19% of Florida dive trips specifically targeted sharks. This percentage did not differ significantly between large (18%) and small (21%) operations. Thus, nearly one in five Florida divers was interested in specifically targeting sharks during their diving experience. Overall, nearly 679,000 diver days were spent targeting sharks during 2016.

Because there is no information on the percentage of private boat divers that actively seek shark encounters or specifically target sharks while diving, the percentages from charter boat divers in Table 8 were also applied to private boat divers.

Diving Segment	Total Diving Days	Percent Shark Encounter Diving Days	Shark Encounter Diving Days	Percent Days Targeting Sharks	Targeted Shark Diver Days
Charter boat	2,807,958	32.4%	909,778	18.6%	522,280
Private boat	843,511	32.4%	273,297	18.6%	156,893
Total	3,651,469	32.4%	1,183,076	18.6%	679,173

Private boat divers spent an estimated 273,000 days on shark-associated dives and nearly 157,000 dives specifically targeting sharks (Table 8). Together, Florida divers spent over one million days on dive where encountering sharks were a priority. They also spent 697,000 days on dives that specifically targeted sharks.

Direct expenditures for shark encounter and targeted shark diving was estimated in the same manner as for all diving. Targeted and encounter diving days were multiplied by the per-day expenditure of \$209 for charter boat divers and \$114 for private boat divers to yield direct expenditures (Table 9). Direct expenditures for shark encounter dives totaled slightly more than \$221 million. Targeted shark diving expenditures totaled more than \$126 million.

Encounter Type	Total Days	Expenditure per Day	Direct Expenditures
<b>Encounter</b>			
Charter divers	909,778	\$209	\$189,927,612
Private/rental boat	273,297	\$114	\$31,275,475
Total	1,183,076	\$187	\$221,203,086
<b>Targeted</b>			
Charter divers	522,280	\$209	\$109,032,518
Private/rental boat	156,893	\$114	\$17,954,439
Total	679,173	\$187	\$126,986,957

Applying the RIMS II (BEA 2006) value added, wage and jobs multipliers to direct expenditures for shark diving yields value added impacts of \$156 million for shark encounter diving to bring the total impact of expenditures for shark diving to \$377 million. Targeted shark diving had \$90 million in value added impacts to bring the total impact of targeted shark diving to \$217 million (Table 10). Wage impacts for all shark-related diving were substantial as well (Table 10). Shark encounter diving generated slightly more than \$116 million in wages and 3,800 jobs, while targeted shark diving created \$67 million

in wages and accounted for 2,180 jobs (Table 10). Remember, targeted shark diving economic impacts are a subset of shark encounter diving and, thus, are not additive.

Table 10: Estimated shark diving value added impacts, wages and employment effects					
Encounter Type	Direct Expenditures	Value Added	Total Impact	Wages	Jobs
<b>Encounter</b>					
Charter divers	\$189,927,612	\$134,620,874	\$324,548,486	\$100,276,751	3,260
Private/rental boat	\$31,275,475	\$22,168,087	\$53,443,561	\$16,512,623	537
<b>Total</b>	<b>\$221,203,086</b>	<b>\$156,788,961</b>	<b>\$377,992,047</b>	<b>\$116,789,373</b>	<b>3,797</b>
<b>Targeted</b>					
Charter divers	\$109,032,518	\$77,282,354	\$186,314,871	\$57,566,283	1,872
Private/rental boat	\$17,954,439	\$12,726,124	\$30,680,563	\$9,479,468	308
<b>Total</b>	<b>\$126,986,957</b>	<b>\$90,008,477</b>	<b>\$216,995,434</b>	<b>\$67,045,751</b>	<b>2,180</b>

## DISCUSSION AND CONCLUSIONS

Divers in Florida have an affinity for diving where sharks are present. Nearly one-third of all divers seek experiences where there is a good possibility of encountering sharks. Further, one-in-five divers specifically seek encounters with sharks. This interest in shark diving is being actively promoted by charter boat operators, as many specifically advertise providing shark dives on their web pages.

Marine diving in Florida generates a substantial economic impact in most coastal counties. Divers spend over \$682 million dollars annually to dive reefs, wrecks, and other diving attractions throughout the state’s coastal waters. Nearly 20% of this impact, or \$126 million, involves targeted shark-related diving. When value added impacts (multipliers) are included, the total economic impact of targeted shark-related diving is \$217 million. When considering all divers wishing to have a shark encounter while diving, direct expenditures by these divers reach an estimated \$221 million annually and \$378 million when value added impacts are included. These expenditure impacts translate into \$116 million in income impacts and nearly 3,800 full-time jobs.

It is very apparent that sharks play a significant role in the diving experiences of many Florida divers. Florida’s diving industry is increasingly offering shark encounters as a way to build on their customer’s interest. Maintaining current business levels and future growth in shark diving will rely on healthy and abundant shark resources. Continuing declines in shark populations along the U.S. coasts could have significant business implications for Florida’s dive operators (Gallagher and Hammerschlag 2011). This is particularly poignant as dive operators in The Bahamas, the Caribbean and Central America are increasingly offering shark diving experiences as part of their diving packages.

It is important to reiterate the limitations of this study. First, the primary data for this project came from charter dive operators that were interested in providing their business data to support shark conservation and management. Without this data, we would not have had the opportunity to reliably

estimate the amount of shark diving occurring in their sector. Further, applying findings from charter boat divers to private boat divers is somewhat tenuous. Given greater resources, this project would have benefitted from a comprehensive survey of Florida divers that measured shark diving preferences, activity and expenditures directly.

The estimate of 3.6 million diver days in Florida during 2016 is considerably lower than the 4.5 million diver days estimated by the industry for 2012 (DEMA 2016). Differences in methodologies between the two studies as well as changes in diving activity levels could account for much of the difference. However, the scale is not radically different which allows some confidence in the estimation procedures used in this study. However, estimating diver days in this study was conservative as dive operators we were unable to contact or verify as active were not included in the study.

Equally important would be collecting detailed dive trip expenditure data. Relying on 15-year old expenditure data is sub-optimal and likely may not reflect changes in trip spending patterns that have occurred since 2001. Further, it may not accurately reflect diver expenditures which have likely increased through inflation or other factors since 2001. Although a conservative approach to estimating diver days and expenditures was used in this study, the results do provide a good initial indication of both the extent of shark-related diving activity in Florida and the economic impacts associated with that activity.



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**Appendix A**  
**Text of Shark Survey Email Request**



Dear Diving Business Owner:

Sharks have been on our planet for over 420 million years. Although sharks have survived major mass extinction events, human activities including overfishing, bycatch and the demand for shark fins now pose the greatest threat to their survival. A growing number of dive operators, like yourself, have recognized the value of sharks to their diving business as more divers seek shark encounters during their dive experiences.

The economic value of non-consumptive uses of our shark resources is beginning to be recognized as a powerful conservation tool by those concerned about the decimation of shark populations. Divers seeking these experiences spend millions of dollars annually to observe sharks on reefs and in the open ocean. You can help bring greater understanding of this economic impact to fisheries managers and decision makers by participating in a short online survey of four questions. These questions will help us determine the value of shark diving in Florida.

By clicking on the [Shark Survey](#) link below and answering four short questions about how sharks affect your diver experiences and diving business, you can help us provide powerful economic information to support shark conservation. The survey is anonymous as are your responses. We do not ask for any information to identify your business or you personally.

Please help us put an end to wasteful fishing practices and restore shark populations.

Thank you for your time and commitment to support shark conservation.

Click Here for Shark Survey:

[TAKE SHARK SURVEY](#)

Thank you,

Tony Fedler, Ph.D.

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