

# **Demographics, Motivations, and Participation Patterns of Sport Divers in the Flower Garden Banks National Marine Sanctuary**

CAROL E. THAILING AND ROBERT B. DITTON  
*Department of Wildlife and Fisheries Sciences  
Texas A&M University  
College Station, Texas 77843-2218 USA*

## **ABSTRACT**

To establish whether a potential marine protected area (MPA) is an area of special national significance requires knowledge of the area's resource, ecological, historical, cultural, and archeological qualities. Socio-economic understandings include the public benefits to be derived from recreational use and tourism activity. Managers at the Flower Garden Banks National Marine Sanctuary (FGBNMS) are required to facilitate all public and private uses of sanctuary resources (not otherwise prohibited) "to the extent compatible with the primary objective of resource protection". This paper provides estimates of the total economic impacts of FGBNMS sport divers on the Texas coastal community where they boarded their dive charter boats (Freeport, Texas). FGBNMS managers wanted a baseline understanding of the extent of new money entering the local and state economy as a result of the marine sanctuary. We sent an 11-page mail questionnaire to a sample of 1,059 sport divers using dive charter boats along the Texas coast; 528 were returned for a response rate of 56%. FGBNMS divers spent an average of \$259 in the local community and \$94 "elsewhere in Texas" on their last diving trip. Most (74%) of local expenditures were made for charter dive boat fees. We estimated the expenditures of non-local Texas residents in the Freeport area at between \$363,079 and \$407,344. Non-residents of Texas spent an additional \$204,068 to \$407,346 in the local community. Using a multiplier of 1.8169 (number of times money is spent and re-spent before leaving the local economy), diver direct expenditures resulted in \$1,030,450 to \$1,155,800 of total economic output in the local area. This level of economic output also generated 21 to 24 jobs. The total value-added (or income and taxes that remain in the local community) was estimated at between \$653,921 and \$733,467. Various uses of economic impact data will be discussed.

**KEY WORDS:** Human dimensions, marine sanctuary, Scuba diving

## **Impacto Económico del Buceo Deportivo en el Santuario Marítimo Nacional Flower Garden Banks**

### **RESUMEN**

Para determinar si un área marítima protegida (MPA) es de especial importancia nacional, se requiere del conocimiento de sus recursos ecológicos, históricos, culturales y arqueológicos. El entendimiento socio-económico incluye los

beneficios públicos derivados del uso recreativo y de la actividad turística. Los responsables del manejo del Flower Garden Banks National Marine Sanctuary (FGBNMS) deben permitir el acceso a los recursos del santuario para su uso público o privado (usos no prohibidos) "hasta donde este uso sea compatible con el objetivo prioritario de proteger los recursos". Este artículo reporta estimaciones del impacto económico del buceo deportivo en el FGBNMS en la comunidad costera de Texas, donde los buzos abordan las embarcaciones que arrendan (Freeport, Texas). Los responsables del manejo del FGBNMS deseaban conocer la cantidad de dinero que ingresa a la economía local y estatal por efecto de estas actividades en el santuario. Enviamos por correo un cuestionario de 11 páginas a buzos deportivos que rentan embarcaciones en la costa de Texas; se recibieron 528 cuestionarios contestados por lo que la respuesta fue del 56%. En su último viaje, los buzos que visitaron el FGBNMS gastaron en promedio \$259 USD en la localidad y \$94 USD "en cualquier otra parte de Texas". El 74% de los gastos realizados en la localidad fueron dedicados al pago de la renta de las embarcaciones. Estimamos que la derrama económica en el área de Freeport por parte de visitantes del estado de Texas estuvo en el rango de \$363,079 a \$407,344 USD. Adicionalmente, los visitantes de otros estados gastaron en la localidad entre \$204,068 y \$407,346 USD. Utilizando un multiplicador de 1.8169 (número de veces que el dinero es gastado antes de salir de la economía local), los gastos directos de los buzos deportivos produjeron en la localidad una salida económica total de \$1,030,450 a \$1,155,800 USD. Este nivel de respuesta económica además generó entre 21 y 24 empleos. El valor agregado total (o ingresos e impuestos que se quedan en la localidad) se estimó entre \$653,921 y \$733,467 USD. Se discuten varios usos de la información sobre impacto económico.

**PALABRES CLAVES:** Impacto Económico del Buceo Deportivo, Santuario Marítimo Nacional Flower Garden Banks

## INTRODUCTION

The Flower Garden Banks National Marine Sanctuary (FGBNMS) is one of 13 National Marine Sanctuaries managed under the National Marine Sanctuaries Act (16 U.S.C. 1431- 1445b). The FGBNMS, including the East and West Flower Garden Banks, was designated a Sanctuary in 1992 and is located about 120 nautical miles from shore, almost directly south of the Texas/ Louisiana border. These two banks constitute the northernmost living coral reefs on the U.S. continental shelf. Stetson Bank, which lies 70 miles south of Galveston, Texas, was added to the FGBNMS in 1996. Overall, all three banks encompass about 42.5 square miles and are soon to be administered as a single unit by the Sanctuaries and Reserves Division of the National Oceanic and Atmospheric Administration (NOAA).

The three banks sit atop salt domes that rise above the 300-foot sea floor to within 55 or 65 feet of the surface. Typical recreational dives at the Flower Gardens range from 60 to 80 feet with visibility often exceeding 100 feet. Although not as

biologically diverse as tropical reefs in the Caribbean, the FGBNMS serves as a regional reservoir of shallow-water Caribbean reef fishes and invertebrates in the Gulf of Mexico. This, in addition to protecting the coral reef from damage caused by anchoring, was the basic rationale for designating the Flower Gardens as a National Marine Sanctuary. The main attraction at the Flower Gardens is the high diversity reef (55–140 feet deep) offering large pelagics and 23 species of coral, most of which are star, brain, and fire corals. At the Stetson Bank where the water is slightly cooler, sponges account for most of the growth coverage.

Sanctuary managers are concerned with many of the same human-induced impacts experienced at other coral reef marine protected areas, namely, shipping traffic, oil and gas operations, fishing (commercial and recreational), and recreational diving activity. Because of their offshore location, they have not been as impacted as near shore reefs. The major impacts to date have been from ship anchors. In 2001, the International Maritime Organization (IMO) designated the FGBNMS as a “no-anchoring zone.” Mooring buoys had previously been installed to reduce the anchoring impacts associated with recreational diving and fishing boats.

Overall, there is little known about the extent of various recreational uses of the FGBNMS and their physical and ecological impacts. The FGBNMS staff monitors the annual number of boat trips and divers taken to the Sanctuary by live-aboard dive boats offering overnight trips to FGBNMS. However, they currently have no scientific knowledge of the sport diver population using these charter boats to access the FGBNMS. Previous studies of Texas divers (Graham and Ditton 1975, O'Reilly 1982) and divers elsewhere (Graham 1975, Holecek and Lothrop 1980, Roberts and Thompson 1983, McCawley and Teaff 1995) have profiled this group of recreational participants to some extent. Two studies of Texas divers pointed to the popularity of the Flower Garden Banks as a dive site even before it was designated a National Marine Sanctuary (Graham and Ditton 1975, O'Reilly 1982). With designation as a National Marine Sanctuary and an overnight stay required to access the FGBNMS for diving purposes, we would expect this area to attract a more geographically diverse, better educated, higher income, more dedicated, and more non-consumptively oriented clientele than the general sport diver population.

The objective of this paper was to profile recreational divers who use charter dive boats to access the FGBNMS for sport diving purposes. By understanding the socio-demographics of divers, their level of previous experiences, and their particular reasons for diving at the FGBNMS, managers should have a greater appreciation for this clientele group, and as a result, be more effective in its outreach and education programs. By providing support for this investigation of one of its Sanctuary user groups, the FGBNMS is recognizing that National Marine Sanctuary management is to a great extent user management. In order to protect the coral reef ecosystems at FGBNMS, managers must not only know about coral reef resources but they must know something about their various clientele groups to ensure recreational uses are conforming and experience outcomes are being realized.

## METHODS

We used a stepwise approach for learning about sport divers in Texas marine waters and their participation patterns. First, an inventory of dive charter boat operators was completed in 1997 (Ditton et al. 1995). Operators were asked to provide data on the number of dive charter trips taken offshore in the previous 12 months as well as the number of divers carried overall on these trips. In some cases, estimates were made; in others, we accessed their records to count their number of trips and customers. Second, we invited dive boat operators to cooperate in a survey of their customers; we needed to access their customer lists in to select a random sample of divers. And third, we used a mail questionnaire to collect data from sport divers.

With initial funding support from the Texas Parks and Wildlife Department, the goal of this study was to learn about the sport diver population that used agency-managed artificial reefs as well as other artificial and natural reefs in Texas offshore waters (Ditton et al. in press, Ditton et al. 2002). The diver sample was derived from the population of charter dive boat operators who were asked to provide a list of their customer names and addresses. The goal of the diver survey was to sample 1,200 sport divers: 600 divers from boats known to take divers to the FGBNMS and 600 divers from boats using mostly manmade dive resources along the Texas coast. Actual sizes of the FGBNMS and artificial reef diver samples were 614 and 445, respectively.

An 11-page self-administered mail questionnaire was used to solicit information from divers regarding their diving activity and experience, their overall level of involvement in the social world of sport diving, diving participation in Texas offshore waters, other dive destinations frequented, and information about their last diving trip to the Texas coast. Finally, a demographic profile of sport divers was sought with questions regarding age, gender, race, ethnicity, education, income, and residence location. Survey questions were based on those proven effective in previous studies of sport divers, birders, and anglers conducted by the Human Dimensions Lab at Texas A&M University and were modified as necessary through a pre-test of members of the Texas A&M University Scuba Diving Club. This study employed the highly personalized survey methodology advocated by Salant and Dillman (1994). Each diver was sent four mailings by first class mail as necessary over a five-week period with an expectation of a 60% response rate.

Two questions on the survey helped identify two groups: those whose total number of trips in Texas offshore waters in the previous twelve months were solely to the FGBNMS and those who went diving at the FGBNMS as well as other places off the Texas coast. Of the total 528 divers who responded to the survey, 461 had been diving in the previous twelve months. Of those, 333 (10 were deleted because they were minors) divers reported they went diving at the Flower Gardens in the previous twelve months; 186 of these went diving only at the FGBNMS (henceforth called FGBNMS only divers) and the remainder went diving at the Flower Gardens as well as other dive sites along the Texas coast (henceforth called FGBNMS plus divers). This paper will focus on the social and demographic information derived

from the diver survey for the two groups identified.

Responses to all questions were tested for statistically significant differences between FGBNMS only divers ( $n = 186$ ) and FGBNMS plus divers ( $n = 147$ ). Differences between groups for interval-scaled variables were tested using t-tests. For variables with ordinal measures (scale items), the Kruskal-Wallis test was used. For nominal variables, chi-square tests for independence were used. All tests were conducted using SAS Version 8 and level of statistical significance was set at  $=0.05$ . Results will only be presented where significant group differences exist; otherwise aggregated results will be presented.

Of the 1,059 questionnaires mailed to divers, 528 were returned usable for an overall effective response rate of 56.2%. This response rate was lower than expected from Salant and Dillman (1994) and lower than reported for most other outdoor recreation surveys. A check on non-respondents was planned to test for significant differences between respondents and non-respondents on selected variables but could not be completed due to a lack of phone numbers for divers. In other previous studies of outdoor recreation participants, non-respondents had fewer years of experience and participated less frequently than respondents; the activity probably has less salience for the former group possibly explaining their non-response to the survey (Filion 1980). Therefore, we would expect survey respondents to report more days of diving experience in the previous 12 months, more years of diving experience, more charter dive boat trips in the previous 12 months, and more trips to the FGBNMS than non-respondents.

## RESULTS

FGBNMS divers traveled an average of 201.6 one-way miles for this diving trip (Table 1). There were no significant differences between FGBNMS only divers and FGBNMS plus divers regarding the distance traveled to their point of embarkation from the Texas coast (Freeport). Most (73.6%) of the sport divers visiting the FGBNMS were residents of Texas, and resided mainly in larger metropolitan areas: 44.5% Houston, 13.9% Austin, 8.2% San Antonio, 4.9% Ft. Worth, 4.1% Beaumont, and 4.1% Dallas. Twenty-six (26.4%) percent of FGBNMS divers resided out of state.

Of the individuals who reported diving at the FGBNMS ( $n = 333$ ), nearly three-quarters (74.5%) were male and the remainder (25.5%) were female. Most divers classified themselves as Anglo (92.4%), with remaining divers classifying themselves as "other" 5.6%, African-American 1%, and Asian 1%. When asked about their ethnic origin, 4.2% indicated they were of Spanish/Hispanic origin. Divers ranged in age from 18 to 68 years with a mean of 39. The median household income category of FGBNMS divers was \$120,000 - \$149,000 with a correspondingly high level of education with an average of 16 completed years of school (or essentially, the completion of a four-year degree). Only 1.2% of these divers had not completed high school. Sixteen years was also the median indicating that 50% of the divers had

post-graduate schooling.

**Table 1.** Frequency Distribution of Divers by Distance Traveled to the FGBNMS

Distance Traveled (miles)	Total	
	Number	Percent
0 - 100	119	39.8
101 - 200	69	23.1
201 - 300	81	20.4
301 - 400	29	9.7
401 - 500	6	2.0
501 - 600	5	1.7
600+	10	3.3
Total	299	100.0

Sixty-one (60.8%) percent of FGBNMS divers subscribed to one or more diving magazines with a mean of 2.2 magazines. The most commonly subscribed magazines were *Skin Diver* (35.0%), *Deep Tech* (30.0%), and *Rodales* (22.8%). Most divers did not belong to a diving club; only 21.4% answered in the affirmative when asked if they belonged to a dive group. The most common dive groups cited by these divers were the Houston Underwater Club (23.4%) and the Bay Area Divers (10.6%). The most common group with whom FGBNMS divers went diving in saltwater most often was friends (54.2%), followed by family and friends together (22.3%), family (11.9%), and club members (11.6%).

When asked to compare sport diving with their other outdoor activities, most (57.2%) reported that diving was their most important outdoor activity. While seventeen percent (17.4%) listed diving as their second most important activity, twenty-one percent (21.1%) of FGBNMS divers indicated that scuba diving was only one of many outdoor activities in which they participated. Divers reported they had been certified for an average of 8.5 years; most received certification through PADI and NAUI (Table 2). Of these 8.5 years of diver certification, nearly all (7.9 years) were spent diving saltwater. About one-quarter (26.2%) of FGBNMS divers indicated their highest level of certification as basic open water; thirty-one (30.5%) percent indicated they achieved advanced open water; fifteen (15.2%) percent achieved divemaster status; fifteen (14.6%) percent achieved the status of dive instructor; and thirteen (13.4%) percent classified themselves as a "specialty" diver (cave, wreck, conservation, navigation, photography, etc.).

In the previous 12 months, FGBNMS divers spent an average of 3.9 days diving in freshwater and 12.9 days diving in saltwater. These divers made between one and four trips specifically to the FGBNMS in the previous twelve months with an average of 1.3 trips. They also indicated making an average of 0.3 trips specifically targeting artificial reefs (including standing oil and gas rigs) in Texas waters in the previous twelve months. Of the total days spent saltwater diving in the past twelve months, FGBNMS divers spent an average of 5.1 days diving in Texas, 0.7 days diving in Florida, 2.0 days diving in Mexico, 3.3 days diving in the Caribbean, and 2.1 days diving elsewhere.

**Table 2.** Frequency Distribution of FGBNMS divers according to where they received their certification.

Certification	Number	Percent
NAUI	98	22.2
PADI	222	50.4
SSI	50	11.3
YMCA	30	6.8
Other	41	9.3
Total*	441	100.0

\* Total number of diver certifications is greater than the total number of divers because divers could have received certification from more than one group

Most FGBNMS divers reported that they participated in night diving (89.5%), underwater photography (58.9%), and marine identification (57.4%); followed closely by wreck diving (44.1%). Only a minority of divers participated in spear fishing. FGBNMS only divers (14.7%) participated significantly less ( $P < 0.05$ ) in spear fishing than FGBNMS plus divers (26.1%). Additionally, significantly more ( $P < 0.05$ ) of the FGBNMS plus divers participated in wreck diving (51.6%) than FGBNMS only divers (39.0%). This was the same pattern for cave diving (13.1% FGBNMS plus divers; 6.3% FGBNMS only divers). However, when divers were asked about the type of diving activity they participated in most often, there were no significant group differences: underwater photography (31.5%), marine identification (28%), and night diving (17.5%).

FGBNMS divers were given a list of fifteen reasons why people dive in saltwater and asked to rate the importance of each scale item on a five-point scale ranging from "not at all important" to "extremely important." A majority of divers rated 12 of 15 reasons for diving as either "very important" or "extremely important" (Table 3). In addition to a low rating of importance for the family recreation reason for sport diving, the standard deviation was highest for this item indicating there was low agreement on this item among divers. Whereas both groups indicated that "for the experience of spearing fish" was not an important reason why they went diving in saltwater, there were significant group differences. Significantly more ( $P < 0.05$ ) of the FGBNMS plus divers indicated that the spearing of fish to eat was either very important or extremely important (12.2%) compared to FGBNMS only divers (7%) (Table 3).

Overall, on a five-point scale ranging from 1 ("not satisfied") to 5 ("extremely satisfied"), most FGBNMS divers indicated they were either "very satisfied" (48.0%) or "extremely satisfied" (33.9%) with their trip.

Table 3. Frequency Distribution of FGBNMS divers by importance of reason for diving on this trip.

Reason for Diving	Not at All important 1	Slightly Important 2	Moderately Important 3	Very Important 4	Extremely Important 5	Mean	S.D.	Median
For family recreation	28.5	14.2	16.4	22.9	18.0	2.88	1.49	3.0
To learn more about the underwater environment	1.2	5.5	24.6	38.6	30.1	3.91	0.93	4.0
To experience unpolluted natural surroundings	0.9	2.75	13.5	37.9	44.95	4.23	0.85	4.0
To look at fish and other aquatic life	0.0	0.6	2.4	30.1	66.9	4.63	0.56	5.0
To be outdoors	1.8	5.5	19.9	35.8	37.0	4.01	0.98	4.0
For relaxation	3.03	2.73	10.9	40.0	43.33	4.18	0.95	4.0
To experience adventure and excitement	1.5	4.24	12.7	31.8	49.7	4.24	0.94	4.0
To get away from the demands of other people	8.8	10.9	20.1	25.5	34.7	3.66	1.29	4.0
To experience tranquility underwater	1.2	3.95	8.8	28.3	57.75	4.37	0.89	5.0
To be with friends	3.35	9.15	27.1	37.5	22.9	3.67	1.03	4.0
For the exercise	16.1	24.2	33.3	17.3	9.1	2.79	1.18	3.0
To develop my diving skills and abilities	3.6	7.0	25.45	35.15	28.8	3.78	1.05	4.0
To get away from the regular routine	5.2	8.5	17.0	36.8	32.5	3.83	1.13	4.0
To experience new and different things	2.1	6.1	14.3	34.35	43.2	4.10	1.00	4.0
For the experience of spearing fish to eat*								
Flower Gardens Only	83.6	4.9	4.9	3.3	3.3	1.38	0.96	1.0
Flower Gardens and Other Places in Texas	71.1	11.3	4.9	5.6	7.04	1.67	1.23	1.0

\*\*\*Values given are percentages\*\*\*

\* Significant difference at the  $P < 0.05$  level between groups



### DISCUSSION

Like sport divers elsewhere, FGBNMS divers were mostly Anglo males, residents of major metropolitan areas, well educated with four or more years of higher education, and had above average household incomes. FGBNMS divers had notably higher education (Holecek and Lothrop 1980, Vrana 1992, McCawley and Teaff 1995) and income levels (when adjusted to current dollars) (Holecek and Lothrop 1980, Vrana 1992) than other diver samples studied previously. This seems consistent with their propensity for dive-related travel. In terms of age, FGBNMS divers are older than divers in other studies, but this is likely due to the effects of the aging "baby boom" population.

There were few differences overall between the two FGBNMS diver groups. Aside from an overlap between groups for testing purposes, the lack of differences is likely due to the challenges of sport diving in offshore waters that require a certain level of training and diving experience. However, spear fishing with the intent to harvest fish was less of an attraction for the FGBNMS only anglers, indicating they might have been much less interested in visiting the sanctuary for consumptive reasons. Likewise, there was less interest among FGBNMS only divers in underwater environments dominated by manmade structures as evidenced by their lower rate of participation in wreck diving and number of trips to artificial reefs.

When FGBNMS and artificial reef divers were compared, they shared many of the same social and demographic characteristics (gender distribution, age, race and ethnicity, and years of formal education), but there were notable differences in household income, annual diving frequency, and diving resources used most frequently in Texas offshore waters (Ditton and Baker 1999). First, the median household income category of FGBNMS divers was twice that of artificial reef divers (\$60,000-\$69,000) (Ditton and Baker 1999). Second, artificial reef divers averaged more days (26) of diving annually than FGBNMS divers (17). Third, there were a higher percentage of FGBNMS only divers (55%) than artificial reef only divers (40%). More FGBNMS divers appear to concentrate their activity at the FGBNMS than artificial reef users do at artificial reefs. This may be due to differences in household income and their preference for the FGBNMS. Also, in terms of use frequency, FGBNMS divers made fewer trips over a twelve-month period to the FGBNMS (1.3) than did artificial reef divers to artificial reefs (3.25). This is best explained by the cost differences in diving near shore artificial reef sites compared to the FGBNMS, which is much farther from shore. FGBNMS divers appear willing to dive less frequently than artificial reef divers and at a higher cost at their distant location just to be able to dive there.

Besides understanding FGBNMS diver characteristics and participation patterns, other social science perspectives would be useful to management efforts. First, to what extent are there constraints to diving at the FGBNMS besides time and money? These would be worth knowing about so they can be dealt with in diver training and sanctuary education programs. Second, additional insights into FGBNMS diver attitudes and opinions regarding the marine environment and

current and proposed management regulations would provide an important source of user feedback prior to initiating the rulemaking process. Third, managers should know whether sport divers consider other dive sites in the region to be substitutes (where a substitute provides the same diving enjoyment and satisfaction at a similar cost) for the FGBNMS. This would help explain whether the FGBNMS diving experience is viewed as unique and why some divers concentrate their Texas diving activity here. Based on where FGBNMS divers reside and the extent and quality of other dive sites on the Texas coast, we expect there are few, if any, other dive sites on the Texas coast that would be viewed as substitutes for the FGBNMS. If there were no substitutes, FGBNMS divers would be an even more important stakeholder group for the National Marine Sanctuary, one that would likely support future rulemaking efforts that maintain the ecological integrity of the area.

A constraint to future studies of recreational users of the FGBNMS and probably most other National Marine Sanctuaries in the U.S. is the lack of an annual sampling frame or list of users. This can be overcome with a no-cost special use permit for all recreational users accessing the FGBNMS. Such a permit could be made available via the Internet and would provide a database of user names and addresses for follow-up research purposes. This approach is used routinely by the National Park Service and U.S. Forest Service for survey sampling purposes in support of its backcountry and wilderness management responsibilities so that they can monitor users.

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