SOCIO-ECONOMIC SURVEY OF RECREATIONAL BOATING AND FISHING IN THE U.S. VIRGIN ISLANDS

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by

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FORWARD

Virgin Islanders have been blessed with a remarkable environmental inheritance. That inheritance, until recent times, included a unique, culturally cosmopolitan, yet not urban, set of small islands, traditional values, a rich multi-ethnic history, incredible natural beauty, spectacular marine life, dramatic coastlines, clear water and a salubrious climate. It was not paradise, because poverty, remnants of colonialism and a lack of opportunity limited the development of human resources. Nevertheless, it was a unique insular society in which a balance had been struck between man and nature.

Within the past three decades, all this changed, and Virgin Islanders tasted the fruit of the tree of knowledge called "development". We were innocent no more. In less than one generation, our landscape has been scarred, coastal waters degraded, and the social fabric of the community rent by the strains of massive in-migration and tourism. By the early 1970's, the limited coastal zone of the Virgin Islands was well on its way to becoming a serious environmental problem -- with putrid harbors, congestion, declining fisheries, destroyed mangroves, filled in salt ponds and diminished wildlife.

Competition among users of the coastal marine resources of the U.S. Virgin Islands also accelerated rapidly over the same period of time, under the impact of a burgeoning tourist industry, local population increases, and commercial shoreline development of unprecedented proportions.

Fortunately, other forces were at work in the community, seeking ways to minimize the negative aspects of development. The Virgin Islands Planning Office led the battle for a territorial zoning law. The former Division of Environmental Health led the battle for water quality monitoring, research and sewage treatment programs. Others sought to design a new regulatory agency, the Department of Conservation and Cultural Affairs, which offered some hope. A system of shoreline use permits and earth change permits helped to a degree, as did the independent actions of citizen groups.

More recently, the enactment of a Virgin Islands Coastal Zone Management program (V.I. Act #4248), and the establishment of a regional Fishery Management Council (under U.S. Public Law 94-265) set in motion resource planning and regulatory strategies and processes. Both need reliable quantitative information on traditional and current user practices, numbers and impact regarding the coastal marine environment of the Virgin Islands and neighboring island systems, the British Virgin Islands to the east and Puerto Rico to the west.

The Virgin Islands was not alone in confronting these problems and the National Marine Fisheries Service, in its supporting role vis a vis the Caribbean Fishery Management Council (based in San Juan), elected to fund two studies, one covering Puerto Rico and one for the Virgin Islands, to develop quantitative socio-economic profiles of recreational boating and fishing in each area. The firm of Clapp and Mayne in San Juan was selected to carry out the Puerto Rico element, and the Island Resources Foundation was selected for the smaller Virgin Islands segment. The document which follows represents our final report on this study, the first of its kind ever carried out in the Virgin Islands.

Even before this study was completed, the National Marine Fisheries Service launched a parallel supporting effort to quantify recreational fishing catch levels by species, frequency, method, etc., in order to assess the annual non-commercial "harvest" of fish extracted from natural stocks. The Island Resources Foundation is currently carrying out this 12 month survey project in the Virgin Islands, designed to provide a more solid information base for improved Virgin Islands fisheries development, management and regulation.

Lastly, I note that not all academicians stay aloof from the sticky questions involved in decision making in marine resource allocation and management. Dr. David Olsen who served as principal investigator on this project and is the sole author of the report which follows, has resigned from the Island Resources Foundation and taken a position with a Virgin Islands Government agency dealing with marine and coastal zone resource matters in a more direct fashion.

Edward L. Towle
St. Thomas, U.S. Virgin Islands

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The final product was greatly enhanced by the advice and assistance of Dr. Jerome McElroy of the College of the Virgin Islands and by Mike Justin of the National Marine Fisheries Service who both provided invaluable advice and furnished difficult to obtain literature.

Our thanks to all.

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Principal Investigator
and
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INTRODUCTION

The passage of the so-called "200 mile limit law" (PL-94-265) in 1976 created regional fishery management councils which were mandated to develop plans for the management of the fisheries within their respective jurisdictions. Development of these plans, which were to be based upon "best available information", led to the identification of critical gaps in the data base. In the region under the Caribbean Regional Fisheries Management Council it became apparent that there was very little extant information about the fishermen, catch, or economic characteristics of the recreational sector. Since early information developed in association with management plans for the spiny lobster (Panulirus argus) and the reef fish fisheries indicated that the commercial sector was harvesting nearly the full maximum sustainable yield (MSY) level, this information became crucial in order to assess the need for resource allocation. If the recreational catch was large, then the best available information would indicate that these fisheries were currently subjected to overfishing and some sort of allocation formulation would have to be developed.

In fisheries where there is excess yield available for both groups, planning may be sufficient to meet the need. Where there is no surplus, or where overfishing is indicated, hard decisions for resource allocation must be made based upon best available data. The absence of available data for recreational fishing has necessitated studies such as these. The present study and another national effort currently underway under the auspices of the National Marine Fisheries Service represent an attempt to fill these information gaps so that resource management can be based on a firm understanding of both the resource and the resource user groups.

Management plans are to be designed so as to benefit the greatest number of people. Generally, since consumers outnumber all other resource users, production was considered to be a prime consideration. However, early estimates of the recreational fishing sector have shown that for many fisheries large numbers of recreational fishing units may well be landing in excess of the commercial catch. A 1965 survey (U.S. Bureau of Sportfisheries and Wildlife, 1965) estimated that over 8 million saltwater anglers spent over $800 million annually for fishing related expenses. Deuel (1978) reports that some coastal areas recreational catch may exceed the commercial catch. A national summary of economic activity by recreational fishermen in 1975 (Centaur, 1977) reports $1.8 billion in expenditures. In other words, there is inherent and actual competition for resource yield potentials between the recreational and commercial fisherman.

Another need for characterizing the local recreational resource user arises from the needs of the local government to plan for development. An adequate characterization of the recreational resource user is clearly a prerequisite to planning for the future use of the coastal zone. The Virgin Islands passed a Coastal Zone Management Act (Act No. 4248) in late 1978, calling for implementation in 1979. The results of the present study may be of use in furnishing information on both the characteristics of the resource user group and also the socio-economic dimensions of this sector of the economy. Furthermore, local government policy is beginning to reflect a concern for traditional life styles which are being confronted with a rapidly changing economic and cultural environment. Studies such as this can aid local government by quantitatively establishing the role of these lifestyles within the contemporary society.

In the Virgin Islands, the recreational fisherman is part of a population which may range from resource users that haul up to 100 fish traps three days per week to the snorkeler who may use the aquatic resource once or twice a month. Characterization of this recreational fisherman, an important object of the present effort, is made more difficult by the fact that many part-time fishermen sell their surplus catch. For this survey recreational fisherman is being loosely defined as a person who has either demonstrated fishing activity or else has the capability for fishing activity (i.e., is a boat owner). Recreational fishermen also include non-extractive marine resource users such as snorkelers and underwater photographers. Elements of the catch reported by known commercial fishermen are identified in the results and deleted from calculations.

Although some information has been available for the commercial fishery since 1932 (Fiedler and Jarvis, 1932; Dammann et. al., 1969; Olsen, et. al., 1976), there have been significant changes in the patterns of exploitative marine resource use in this time period. At the time of the first survey, fishing was an important part of food production in a community which numbered around 22,000 inhabitants (McElroy, 1978). For example, in 1930, agriculture and fisheries comprised over 33 percent of the labor force while in 1977 they comprise less than 1 percent (McElroy, 1978). Presently, the commercial fishery only lands around 30 percent of the seafood requirements for the islands (Kumpf, 1978), and a large recreational fishery -- which may make up 75 percent of the registered boat fleet -- catches some unknown figure.

THE VIRGIN ISLANDS POPULATION

In 1960, the U.S. Virgin Islands had a total population of just over 32,000; a decade later, in 1970, this population had more than doubled to 75,151 (V.I. Department of Commerce, 1977). Latest estimates (1977) from the V.I. Department of Commerce put the population at over 98,000. Of this population, a substantial percentage are aliens or "down-islanders", immigrants from other West Indian islands seeking expanded economic opportunities in the U.S. territory; "continentals" from the U.S. mainland; and Puerto Ricans from the neighboring Commonwealth. This sudden, largely unplanned increase in population is clearly evident when one considers that two out of three Virgin Islands residents living in the territory today were not present in 1960 (McElroy, 1978).

A concurrent and equally rapid shift in ethnic composition has transformed the social fabric of the islands in a generation's time. As evidence, one study (McElroy, 1978) reports that

> between 1835 and 1950, native-born residents comprised roughly 70-80 percent of the population. As a result of the increasing proportion of West Indians, Puerto Ricans, and U.S. Continentals, today the resident-born ratio is less than 40 percent.

Although this dramatic shift in the ethnic structure of the Virgin Islands population is widely reported, its exact dimensions are somewhat disputed. Accurate and consistent figures are difficult to obtain, with figures often varying greatly from one government agency to another.

A United Nations working paper prepared by the Secretariat for its sub-Committee on Small Territories (of the Special Committee ... on Decolonization, document A/AC.109/L.1234) states that in 1970 approximately 40 percent of the inhabitants of the territory were Virgin Islanders by birth, 24 percent were from other West Indian islands, 15 percent from Puerto Rico, 12 percent from the Continental United States and 9 percent were from Europe. These figures are compared in Table 1 with statistics provided by three Virgin Islands government agencies based on information from the present decade and with the results from the present survey.

However one wishes to interpret the various studies, it would seem evident that the native born population clearly has rapidly become a minority within its own society. Residents from other West Indian islands (exclusive of Puerto Rico) comprise the next single largest ethnic group, accounting for approximately 30 percent of the total population. In-migration from North America has also reduced the proportionate size of the native born population. It should be noted from the ethnic makeup of the current survey respondents that there is considerable over representation by the "Continental" ethnic group in that survey. (See Table I.)

The influx of West Indian in-migration, in conjunction with an ongoing Hispanic (primarily Puerto Rican) and North American in-flow, serves to make the Virgin Islands one of the most complex, heterogeneous communities under the American flag. Further, it must be noted that within each of the major ethnic groupings -- Natives, Continentals, West Indians, Puerto Ricans, and Others -- there are further sub-groupings. Thus, while the "native-born" category generally refers to black Virgin Islanders, it can be further sub-grouped, e.g., those of French ancestry who form the nucleus of a prominent, north-side St. Thomas fishing community. Likewise, "continentals" can further be sub-grouped by race: black continentals and white continentals, two groups of varying cultural and social characteristics but grouped "ethnically" within one category in the Virgin Islands. Finally, the "alien" or West Indian group is comprised of various foreign nationalities, representing virtually every major island or island group within the Caribbean archipelago, e.g., Kittitians, Dominicans, Haitians, "Bajans", Antiguans, etc. Consequently, baselines for ethnicity are difficult to obtain.

There are also differences in ethnicity between the Virgin Islands. Mills (1978) reports that native born residents make up 45 percent of the population of St. Thomas and only 37 percent on St. Croix. Residents of Puerto Rican background represent 16 percent of the population on St. Croix and only 4 percent on St. Thomas. The population on St. John has over 48 percent residents of continental origins while the other two islands have less than 15 percent.

THE BOATING REGISTRATION LIST (SAMPLING UNIVERSE)

The sampling universe was based upon the boating registration list provided by the Virgin Islands Department of Conservation and Cultural Affairs. This list was made up of all of the registered boats as of January 1, 1978, and had 1,789 entries. This list was taken at about the mid point of the boat registration year and had somewhat fewer entries than an end of year list would have contained. In later economic calculations we used an assumed fleet size of 2,000 boats.

The survey questionnaire (AppendixII) was mailed to all of the addresses on the list after sorting out obviously undeliverable addresses. The distribution of the mailing is shown in Table 2 along with the responses and interview results. The questionnaire was mailed bulk rate with an accompanying letter and post-paid, pre-addressed return envelope. The interviews were obtained at meetings of dive clubs, yacht clubs, fishing tournaments, and chapter meetings of the Virgin Islands Conservation Society. Some interviews were obtained at marinas. The results from interviews were combined with the mailout in the analysis. Bias resulting from this combination is discussed subsequently.

We made a very subjective attempt to assess the ethnic makeup of the population represented by the registration list. The technique was suggested by a sociologist at the College of the Virgin Islands and consisted of a review of the boating registration list and an assigning of all identiable names to several ethnic categories. The subjectivity of this method cannot be over-emphasized, but it does supply some information for comparison with the general census and response data. The "panel" which undertook this effort consisted of an economist and a sociologist from the College of the Virgin Islands, both of whom were familiar with the techniques employed and have undertaken similar survey efforts in the Virgin Islands; a 10 year resident of the Virgin Islands who has been active in community action conservation programs; a historian who has been living and working in the Virgin Islands for 10 years; and a fishery biologist who has been working in the Virgin Islands for 8 years.

The results of this subjective survey are shown in Table 3. There was considerable agreement among the results furnished by the 5 panel members (C. V. = 8.4%) although the results were at variance with both the general census figures and the survey respondents. This subjective survey assigned 39.7 percent of the identifiable names into either West Indian (including Virgin Islanders), Puerto Rican, or West Indians of French ancestry. The general census data indicate that approximately 76 percent of the population should be in these combined

categories. If this survey has any parametric verity, then it may indicate that continentals (assumed as individuals that could not be assigned to these groups) own a disproportionate amount of the registered boating fleet.

The boating registration list also furnishes additional information about the recreational fleet. These data are summarized in Table 4. They indicate that the average boat in the Virgin Islands is powered by an outboard engine of 99.3 horsepower and is 23.1 feet in length, constructed of fiberglass. The results of the table also indicated that the boats owned by persons having Puerto Rican addresses have nearly twice the horsepower and are an average of 8 feet longer. Also, it is interesting that the Puerto Rican owned fleet is 97 percent fiberglass and less variable in length (C.V. = 29%) than the rest of the fleet combined (C.V. = 45%). These data are used here as a baseline against which the response results can be compared. Statistical identity with baseline data is desirable. In fact, just as the boating registration list appears to be a non-representative ethnic representation of the Virgin Islands community, the sample respondents appear to be a non-representative sample of the boating registration list. An example of this "bias" can be shown by comparing the average size boat from the registration list (mean length = 23.1 feet) to the average sized boat from the respondents to the survey (mean length = 25.1 feet). This difference was statistically significant (t_s=5.26, $p < 0.001$, df=1936). The respondents therefore appear to own larger boats than the average for the fleet. This finding is in keeping with the over-representation by "continentals" in the sample respondents since there are subjective reasons to feel that the average income levels (therefore ability to purchase larger boats) are higher in this group.

SAMPLING AND RESULTS

Data from the survey came from both interviews and the mail out survey summarized in Table 2. The boating registration list contained 1,789 entries. One hundred forty-seven of these entries were redundant (ownership of multiple boats), foreign, or obviously undeliverable addresses. The initial mail out was 1,642 questionnaires. A total of 62 questionnaires were returned because they were addressed to undeliverable addresses, leaving a total of 1,580 forms which we could assume reached the addressees. The response rate was 11 percent or 183 forms (Table 2). With the exception of St. John, where the response rate was 24 percent, there was relative uniformity between the response rates from the various islands and the continental United States.

This 11 percent response rate is significantly lower than that reported for other studies in the literature. Abramson (1963) and Abramson and Berude (1969) obtained 35 percent and 39 percent response rates to recreational surveys in California. Brown (1977), in a review of factors affecting recreational fishing surveys, reported that most other surveys that have been attempted elicited an approximate 20 percent response. He also reported that the kind of postage, sponsoring organization, and title of the author of the cover letter all may affect response to mail out surveys. The bulk mailing rate employed in the present survey, according to Brown, would decrease response.

McElroy (personal communication) has suggested that a number of other factors may have contributed to the low response rate. Among these are secrecy associated with multiple job holding, apathy towards government, literacy, and the fact that the survey period included was during a particularly intense political campaign. It is also evident that the questionnaire, which was adapted from a similar Florida study, may have been too long and complex for the local situation.

The other source of completed questionnaires came from direct interviews which took place at meetings of various interest groups (yacht clubs, dive clubs, fishing clubs), at marinas, and other places where resource users congregate. We obtained an additional 74 interviews in this manner. The results were combined in the analysis.

The total cost for mailing out the questionnaire (printing, stuffing envelopes, mailing, etc.) was $1,048.06 or $5.73 per response. The total cost of the interviews was $175.15 or $2.37 per completed response. This represents a significant difference in cost-effectiveness although, admittedly, most of the interviewing took place at locations where many interviews could be completed in a short period. Subsequent interviewing efforts were not as productive.

We also attempted to assess the parametric verity of the boating registration list by undertaking a telephone survey whereby persons to be surveyed were selected by a random process. The interviewer made 197 calls and only completed five, all from the island of St. John. Most of the calls were terminated by the interviewee. Before aborting the effort a final attempt was made to assess whether the negative response indicated a small proportion of fishermen in the general population or a negative response to the telephone survey. This assessment consisted of randomly selecting ten individuals from the boating registration list and determining if each owned a boat. Nine of the interviews replied no. The one positive response did not allow the interview to continue. The results of this telephone survey have not been used other than as an indicator pointing to a lack of data on that proportion of Virgin Islands households containing recreational fishermen. Another project is currently underway to furnish these data.

The results of the survey are furnished in the following discussion with Coefficient of Variation (C. V.) so that the reader can compare the variability of parameters with different units. The Standard Deviation can be easily calculated by multiplying the value of the Mean by the proportional equivalent of the C. V. (the proportional equivalent of a C. V. = 89% is 0. 89). The data are highly variable. On 41 questions where the Coefficient of Variation was calculated, the average C. V. was 127 percent (S. C. = 93. 2). We have not tested for differences between the respondents from the different islands since with 127 percent C. V. it would require over 330 respondents from each island (total greater than 1, 980 responses) in order to have a 90 percent assurance of detecting a significant difference between two of the groups at the five percent significance level.

The reason for this high variability may possibly be indicated by analyzing the frequency distribution of the respondents' incomes (Tables 5 and 6). The average family income ($18, 551.) was significantly higher than the $9, 973. average earnings of workers employed in manufacture (V. I. Department of Planning, 1978) and higher than the $13, 500. average gross income of a group of locally employed primarily professional workers recently surveyed (McElroy and Caines, 1979). Per capita annual income in the Virgin Islands (McElroy, 1978) is $4, 743. In spite of this difference, the frequency distribution was not skewed towards the higher incomes but rather had a non-significant skew towards respondents with lower than average incomes ($g_1 = -0.23$, $t_s = 1.28$, p. n. s.). On the other hand, the frequency distribution was significantly platykurtic ($g_2 = 1.86$, $t_s = 5.31$, $p < 0.001$). The result of combining dissimilar economic groups is a population which is not overly weighted by a modal income group, with a broad range of possible incomes, and little measure of central tendency. The source of this kurtosis arises from the dissimilarity between the incomes of respondents born in the continental United States (average income = $21, 087., C. V. = 39%) whose frequency distribution is skewed towards the higher income groups ($g_1 = 0.60$, $t_s = 2, 86$, $p < 0.01$), and the frequency distribution of incomes for non-U. S. born respondents (average income $13, 359., C. V. = 64%). This latter figure is very similar to the income figure reported by McElroy and Caines (1979).

This observation may also account for the relatively lower variability in response among the 17 respondents from Puerto Rico. Most boats registered in the Virgin Islands by Puerto Rican citizens are owned by members of the upper classes. This selection process tends to increase the trend towards central tendency in the data.

Table 5 also indicates that the incomes of interviewees were not significantly higher than mail out respondents ($t_s = 0.42$, p. n. s., df=194). Ethnically, the interviewees were 82. 4 percent continental (Table 7), while only 39 percent of the mail out response was from continentals. Both of these figures are much higher than the proportion for the Virgin Islands population in general. Although this ethnic response heterogeneity exists,

we combined the results of the interviewing and mail out respondents in order to increase the sample size for subsequent analysis. The basis for this combination was the economic homogeneity of the respondents.

The response rate to the various questions also varied. On 69 questions, the response rate averaged 66.2 percent (C.V. = 35%). Part of this lower response rate may be due to the fact that the questionnaire was designed to acquire information from a variety of user groups ranging from charter operations to occasional snorkelers. Consequently, sections of the questionnaire did not apply to various of the user groups. Only 14 percent of the respondents answered the questionnaire from records (Tables 8 and 9).

CHARACTERIZATION OF RESPONDENTS

The average respondent to the survey was 42.8 years of age (Table 10) and has lived in the U.S.V.I. for 14.3 years (Table 11). Nearly 52 percent were born in the U.S., 13 percent in the U.S.V.I., 12.5 percent were born in Puerto Rico, 9.9 percent were born in the other islands of the Eastern Caribbean, and 7.6 percent were born in the British Virgin Islands (Table 12).

The average household had 3.3 members at home (Table 13). This figure is considerable lower than the 3.9 figure found by Mills (1978). Nearly 61 percent of the respondents lived in single family housing, 16.3 percent in apartments and 9.6 percent in boats (Table 14). Sixty-four percent of the respondents were engaged in day work, 21.5 percent worked at night, 11.5 percent were retired, and only 2.6 percent were unemployed (Table 15).

McElroy (1974) reported that only 6.5 percent of the population was retired at the time of that survey. The V.I. Department of Health (Bureau of Vital Statistics) reports that 3.8 percent of the 1975 population was 65 or older. McElroy also reports (McElroy, personal communication) that there has been a current increase in the over 65 portion of the population locally. It is his opinion that this increase represents in-migration of continental retirees, and older dependents of West Indians who are achieving resident status. Certainly, retirees are over-represented in our sample.

Our sample unemployment rate (3.1 percent) shown in Table 15 was also significantly lower than the 8 percent figure for the Virgin Islands economy as a whole (V.I. Employment Security Agency, personal communication) as might be expected. McElroy (personal communication) says that this figure is probably closer to 6 percent at present.

FLEET CHARACTERIZATION

The major capital expenditure for the sector involves the purchase of boats. The average reported value was $17,680 with an estimated fleet value of over $35 million (Table 16). Sixty-nine percent of the fleet were power boats (Table 17). The average respondents' boat is 25.1 feet (Table 18). It was built in 1970 (Table 19) and bought by its present owner in 1975 (Table 20). Sixty-seven percent of the boats are gasoline powered (Table 21). Sixty-seven percent have a single engine (Table 22). Sixty-one percent are powered by outboard engines (Table 23), twenty-eight percent by inboards, and eleven percent by inboard/outboard engines. Average total horsepower (Table 24) was 144.7. Forty-two percent of the fleet have ship-to-shore radios, 28 percent have fathometers, and only twenty-one percent have any other electronics (Table 25). Nearly eighty percent of the fleet is built of fiberglass (Table 26). Sixty-seven percent of the fleet is purchased used and nearly sixty percent is purchased from brokers and dealers (Table 27).

FLEET UTILIZATION

About 34 percent of the respondents kept their boats in marinas and paid a monthly average of $69.47 in slip rent (Table 28). Dingy fees averaging $29.69 per month are paid by 15 percent of the respondents (Table 29). The remaining portion of the fleet is stored by different methods including dry storage (6.1 percent), trailered storage (11.9 percent), and moored or anchored out (36 percent) as shown in Table 30.

The geographical distribution of the fleet is shown in Table 31. Two thirds of the respondent fleet is based in St. Thomas. The locations for potential boat storage in case of hurricanes are shown in Table 32.

Fuel is a major expenditure, adding up to over $1.5 million annually (Table 33). Over 70 percent of the fuel purchases and 29 percent of the other purchases associated with boating are made at marinas (Tables 34 and 35). Estimated fuel consumption by the recreational fleet is around 1.4 percent of the 168 million gallons of petrochemical products consumed annually in the Virgin Islands (Texaco, personal communication). The fuel price increases of the early part of the decade caused 12 percent of the respondents to reduce their level of boating activity (Table 36). Only 27 percent of the respondents said that the fuel price increases affected the type of boat that they bought (Table 37). Since only 41 percent of the fleet was purchased after fuel

prices began going up (Tables 20 and 38) fuel price increases affected 66 percent of the possible boat purchases.

The respondents felt that they had to use their boats 3.8 times monthly in order for boat ownership to be worth the costs of ownership (Table 39). Since average use reported (Tables 40 and 41) was seven trips per month (with no significant variation from summer to winter), Virgin Islands boaters are apparently more than successful at maintaining cost-effective (from their point of view) operations.

At an average of seven trips monthly, respondents carry 3.6 persons per trip (Table 42). The average trip duration was 33.9 hours although 72 percent of the trips are 12 hours or less (Table 43). It is clear that the proportion of trips involving extended cruising has skewed these results towards the longer trips. The average day trip begins at 8:59 a.m. and ends at 4:52 p.m. (average duration 7 hours and 53 minutes), as shown in Table 44. The boaters travel an average of 19 minutes (Table 45) or 7.8 miles (Table 46) to get to their boats and expend $6.74 per day for this travel (Table 33). Sixty-two percent of all boating activity takes place on weekends (Table 47).

Over 83 percent of the respondents made an average of 5.1 trips to the British Virgin Islands last year (Table 48) and spent an average of $74.75 per trip (Table 49), or, in total, Virgin Islands boaters made a total of 8,364 trips and contributed over $625,000 to the B.V.I. economy. Again, the fact that the present survey did not sample the documented vessel fleet adequately has probably resulted in a significant underestimate in the magnitude of this expenditure.

Less than 2 percent of the registered fleet carries passengers for hire (Table 50). Most of the charter fleet consists of documented vessels which were not adequately sampled in this survey. There are probably between 200 and 300 vessels employed in the charter business locally.

Only 9.7 percent of the boat owners employ professional crew (Table 51) with a total work force of around 270 crew. Only one respondent reported his pay rate which was $35 per day.

The respondents reported spending an average of 26.6 days repairing their boats last year (Table 52). This fairly high figure indicates a significant repair service industry which may not be included in our economic analysis.

BETWEEN ISLANDS COMPARISON

There appear to be demonstrable differences between the respondents from the three islands (Table 53), the British Virgin Islands and Puerto Rico. The island of St. John was anomalous in many ways. Actual differences between St. John and the rest of the Virgin Islands have been demonstrated in other survey work (Mills, 1978). St. Johnian respondents were nearly six years older than the average for the remainder of the survey respondents and had an average income $5,500 lower than the remainder of the respondents. Nearly 30 percent of the respondents were native born Virgin Islanders and the average length of residence in the Virgin Islands was 25.2 years. The boats owned by St. Johnians were smaller and were worth nearly $10,000 less than the average for the remainder of the respondent fleet. Nearly 60 percent of the fleet in St. John is either moored or anchored.

The respondents from St. Thomas appeared to represent a more biased sample of upper income residents. The incomes reported were the highest for the study (excluding the small sample size of U.S. residents) and the boats were nearly five feet longer than the average from the boating registration list, with an average value of $19,650. The St. Thomas respondents were made up of only 11.1 percent native born Virgin Islanders and the average residence here was 12.4 years. Over 50 percent of the fleet in St. Thomas is stored at marinas and 33 percent is moored or anchored.

The Cruzan respondents were similar to the St. Thomians although the discrepancy between the average boat length from the DCCA boat registration list and the respondent boat lengths were not as great. The Cruzan response contained only 8.8 percent native born Virgin Islanders and the average length of residence was 11.9 years. The storage of the Cruzan fleet is different than for the other islands in that nearly a third of the boats are trailered and stored at home while the other two thirds are stored in marinas and moored.

The boaters of Puerto Rican origin obviously represent an economic elite. The boats of the fleet are nearly 10 feet longer than the Virgin Island average with a total value over $ 14,000 higher than the average for the remainder of the respondents. The relatively small sample size of the Puerto Rican respondents as well as for the British Virgin Islands and United States has precluded further analysis.

PATTERNS OF UTILIZATION

St. Thomas waters are the site for 53 percent of all the boating activity reported (Table 54 and Figure 1), while 36 percent takes place in British Virgin Islands' waters and 11 percent in St. Croix. The results indicate that 55.4 percent of the people list cruising as a preferred activity, 18.8 percent list non-extractive uses of the water (snorkeling, diving, photography, swimming, water skiing, etc.), 12.7 percent list non-extractive commercial activities, and 10 percent list extractive use of the marine resources (Table 54). This picture changes when the results are analyzed in terms of the number of days spent in these activities (Table 55). Non-extractive water use takes up 29.6 percent of the total reported days, while extractive activities accounted for 22.3 percent of the reported days, business related activities accounted for 22.3 percent of the reported days, and 14.6 percent of the reported time was spent cruising.

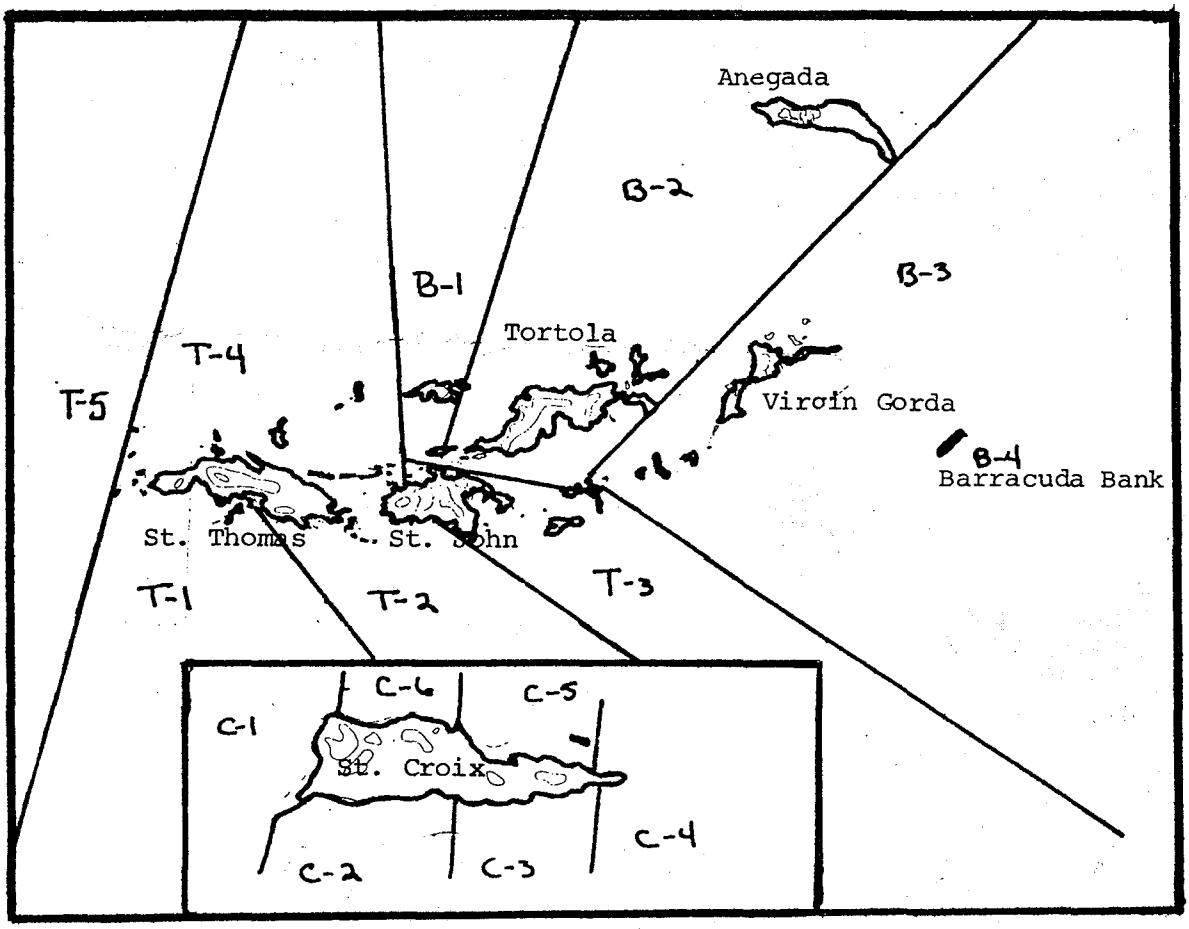
These results tend to substantiate the high average length of trip figure previously discussed. Because a large number of people are involved in cruising, a single trip may greatly increase the calculated average trip length since cruising trips generally involve several consecutive days.

Sixty-one percent of the respondents (as opposed to the previous question in which a respondent was given a choice among multiple responses) listed some sort of extractive use of the marine environment. Line fishing (24.4%) was the most common activity (Table 56), followed by spear fishing (7.6 percent) and trap and net fishing (5.3 percent combined).

When these results were analyzed by rank, the most preferred techniques were lobster diving, spearfishing and diving for conch (Table 57). Forty-three types of finfish, two molluscs, and spiny lobster were listed in the catch (Table 58). In terms of effort (most frequently sought) the dolphin (Coryphaena hippurus) is the most preferred fish, followed by snappers (Lutjanus sp.), grouper (Epinephelus and Myctoperca), kingfish (Scomberemorus cavalla), and mackerel (S. maculata). The most frequently caught fish are snappers, followed by mackerel, barracuda (Sphyraena barracuda), kingfish and groupers.

There is considerable agreement between the results of this segment of the survey in the Virgin Islands and Austin et. al.'s (1977) survey in Dade County, Florida. Fishermen in the Virgin Islands tend to seek the same species as fishermen in Florida. The 11 most frequently sought species were significantly rank correlated to the Florida list (Spearman rank correlation coefficient, $r_s=0.97$, $p<0.01$). The strength of this correlation decreases if all of the species are included due in part to faunistic differences between the two areas but also due to the

Figure 1. Map of the Virgin Islands showing Department of Conservation and Cultural Affairs area designations which were used to assess the geographical distribution of recreational boating and fishing activity in the present survey.



cultural patterns in species preference. Virgin Islands consumers pay one price for most fish species, while Floridian consumers exercise greater selective choice.

A follow up questionnaire (Appendix III) was sent to 81 of the respondents who indicated that we could contact them again for further information. The response rate was 63 percent. Ninety-six percent of these respondents answered the questionnaire from memory. Tables 59 and 60 summarize the results. These tables show that the diving-related fishing activities were most frequently utilized by the respondents (75 percent of the total responses as compared to 37.2 percent in the first survey). Thirty percent of this total involved non-extractive use of the marine environment, such as snorkeling or underwater photography (as compared to 29.6 percent in the first survey). Extractive activities made up the remaining 45 percent of diving activity. Line fishing accounted for 24 percent of the total (trolling made up 22 percent, bottom fishing 2 percent).

The catch per unit effort (CPUE is given in lbs. per person/day) indicated that most of the techniques average between 5 and 10 lbs. per person/day (Table 59), with the exception of two known commercial fishermen who reported averaging 484 lbs. per day (Virgin Islands commercial fishermen normally have two men in the boat so this figure should probably be halved).

We collected two other sources of catch and effort data during the study. The first came from an intercept survey of game fishing boats at the Lagoon Marina in Red Hook, St. Thomas between August 9 and 23, 1978. During this period boats went fishing on 10 days (43 boat days) and carried 2.2 anglers per day. They landed 11 blue marlin averaging 266 lbs. (38 percent C.V.), tagged and released 17 others, (a tag-release tournament took place on 4 of the days of the survey), and caught one shark, 1 sailfish, 1 wahoo (30 lbs.), 1 barracuda (20 lbs.), and one yellowfin tuna weighing 39 lbs. The catch per unit effort of blue marlin was 0.12 fish per angler per day.

The other source of data was furnished by the local dive clubs and came from the catch records of spearfishing tournaments from 1975 to 1978. These data cannot be legitimately used for CPUE analysis because the clubs regularly change the rules of the contest in order to change the scoring value of different species. Regardless of this limitation, they probably approximate the CPUE and do serve as a cross check to the other data. The results indicate that in 37 tournaments totaling 303 diver days (averaging 8.2 divers per day, C.V. = 42 percent), the competitors speared 9.68 lbs. per day (C.V. = 59 percent). The average size of these fish was 4.68 lbs.

Such spearfishing figures are interesting primarily because they are very close to the 10.5 lbs. per day reported by spearfishermen during the follow-up survey (Table 60). The trolling data listed above (around 30 lbs./angler day) are over three times higher than reported in the follow-up study (9.3 lbs./angler day).

The most frequently caught species reported in the follow-up survey were the mackerels (Scomberemorus regalis and S. maculatus) listed in 13.7 percent of the reports, lobsters (12.9 percent), groupers of various species (10.8 percent), snappers (9.2 percent), kingfish (6.1 percent), and the molluscs Cittarium pica (whelks) and Strombus gigas (conch), each listed on 6 percent of the forms. The results were in fairly good agreement with the responses to the main survey (Table 58) except that the respondents to the second questionnaire were dominated by divers and spearfishermen, hence the domination of the catch results by those species likely to be preyed upon by divers.

Total landings were calculated from the results of the follow-up questionnaire and, again, by using the combined effort estimates from the first survey with the CPUE from the follow-up survey (Table 61). The calculations are given as a range of results which may seem dismaying in the magnitude of the differences but do represent a first estimate of the recreational landings.

The results indicated that annual landings for linefishing techniques may be between 163,000 and 195,000 lbs. Approximately 60 percent of these landings may be landed by trolling techniques. We feel that the commercial line fishery does not represent a significant portion of these landings based on the fact that forms were not returned by many known commercial line fishermen.

The two commercial trap fishermen reported landings that extend to between 1.5 and 3.3 million pounds annually. It is interesting that this small sample is in near agreement with the estimates of Dammann in 1969 (1.3 million lbs.), and Olsen, et. al., in 1975 and 1976 (1.0 million lbs.). Olsen felt that his figure resulted from under-reporting and that the actual catch was closer to 1.6 million lbs.

The current results furnish a first estimate of the magnitude of the recreational spearfishery which involves between 8,000 and 13,000 person days annually and lands between 84,000 and 141,000 lbs. annually. The species breakdown (Table 60) indicates that about 75 percent of this effort is directed towards a variety of reef fish and about 25 percent towards more migratory or pelagic species.

The higher estimate of the recreational catch of reef fish (105,000 lbs. annually), when combined with Olsen's estimate of the commercial catch (1.6 million lbs. annually), gives a combined landings figure (1.71 million lbs. annually) that is extremely close to Kumpf's (1978) estimate of MSY (1.85 million lbs. annually). It is clear that the user groups are approaching a situation where allocation may be required.

Recreational exploitation of the lobster resource involves between 1,200 and 11,000 person days annually. Estimated landings range between 9,500 and 82,000 lbs. annually. We personally feel that the actual figure is closer to the lower end of the range and that the high figure arose from the high response rate by divers to the follow-up questionnaire. If the upper estimate of lobster landings by recreational fishermen is correct, then they would be landing an amount equivalent to 72 percent of the current commercial landings (estimated by the Caribbean Regional Fisheries Management Council at 114,000 lbs. annually). The combined catch represents 90 percent of the Maximum Sustainable Yield figure (218,000 lbs.) for Virgin Islands waters. If the "catch" from lost traps is substantial, then certainly the resource is in danger of overfishing. Regardless of the actual figure, it is apparent that recreational divers are significant users of the Virgin Islands' lobster resource.

Conch (Strombus gigas) is sought by divers between 400 and 2,500 person days annually and landings may be as high as 14,000 lbs. Dammann (1969) reported that total 1967-68 commercial conch landings were around 20,000 lbs. If current landings are similar, then recreational landings may nearly double the total. Another mollusc, whelks, (Cittarium pica), may be subject to similar fishing pressure and landings may be as high as 17,000 lbs. Dammann's (1969) reported commercial landings were 22,000 lbs. Again recreational catch is nearly equivalent to the best available data on commercial landings. All of these results are summarized in Table 60 where the value of the recreational catch is also calculated at between $402,000 and $755,000 annually.

Non-extractive use of the marine resource environment (59,580 person days annually) may well represent between 50 and 60 percent of the recreational use when calculated on a daily basis. Future planning for resource management should take precautions to insure that a reasonable share of the resources are preserved for this constituency.

ECONOMIC IMPACT

Analysis of the economic impact of the recreational boating/fishing industry on the Virgin Islands economy is made difficult by the fact that one of its major products is an intangible element, recreational enjoyment. As just mentioned, non-extractive use of the resources may occupy over 50 percent of the effort. The average boatowner uses his boat 84 days per year. He spends $51.00 daily for trip related expenses and $2,709.00 annually for equipment purchase. The total expense of each person's boating for one day equals $23.13 (total daily expenses / 3.6 persons per boat per day). When the product of extractive use is

calculated by dividing the annual catch value ($578,600, the average of the ranges) by the average for the two estimates of extractive recreational activity (43,200 person days/year), the product value is $13.39. The recreational fisherman then pays approximately $10 per day for the recreational aspects of his endeavor. The non-extractive user of the marine environment pays $23.13 daily for the recreational aspects.

The recreational "product" may also be measured by the gross returns to investment when compared to the commercial fishery. Recreational fishing occupies approximately 75 percent of a 35 million dollar fleet and generates a product (catch) worth $578,600 annually. The gross return to investment is approximately 2 percent. The commercial fisherman occupies the remaining 25 percent of the fleet and generates a product valued at approximately $2.4 million at 1978 prices (1.5 million lbs. of fish valued at $1.50/lb.; 50,000 lbs. of lobster valued at $2.50/lb). There is nearly a 28 percent gross return to investment, 14 times better than the recreational industry. It is clear, therefore, that the recreational "product" must be considered in any analysis of utilization. This statement is not intended to quantitatively evaluate the "products" of commercial and recreational boat use, but rather to indicate the presence of an unquantifiable "recreational product".

The mean family income reported was (Table 5) $18,551 U.S. and fell within 10 percent of the average family income which was backcalculated from the percent of income spent on boating expenses (Tables 62 and 63). The respondents reported spending 16.4 percent of their family income on boating expenses. When these expenses were listed separately (Table 33), however, they only accounted for 12 percent of family income.

The total expenses associated with boat use (Table 33 and 64) amounted to $4,570,000[1] annually (assuming a 2,000 boat fleet). The other major aspect of boating economics is the purchase of equipment (Table 65) which amounts to $2,709 per boat (Table 66) annually. Seventy-one percent of these purchases are made locally. The total for these expenditures annually is $5,418,000. The total expenditure by the owners of the registered fleet is then $10,289,500.

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[1]Subsequent analysis uses the lower fishing gear expenditure estimate shown in Table 64.

Over 67 percent of the boats in the registered fleet were purchased used (Table 66) and nearly 60 percent of the boat purchases were through brokers and dealers. As previously mentioned, the estimated total value of the fleet is over $35 million. This figure does not include the extensive crewed charter boat fleet whose gross income reported by the 110 member V.I. Charter Boat League was 3.5 - 4.0 million dollars in 1978 (Peet, 1978), the extensive bareboat charter operations which may account for as much as 225,000 person days of boating annually (Olsen, 1978), or the extensive privately owned fleet of documented vessels. It also inadequately represents the boating related service industries which one merchant estimated at $ 2.0 million for the marine hardwar component alone (Michel, personal communication). We surveyed six St. Thomas recreational boating related businesses which reported combined 1978 gross income figures at $1.34 million. It is clear that recreational boating and fishing represents a substantial annual element of the local economy.

The data from the present effort can also be used to calculate the economic impact of the recreational fishing fleet. The data for this analysis is listed in Table 66. The methodology and formulation used here is outlined by Hoffman and Yamauchi (1973) who calculated the impact of the Hawaiian recreational fishing sector. Comparitive studies are available for Door County, Wisconsin (Strang and Ditton, 1976) and for import dependent tourist economies in Scotland (Archer and Owen, 1971; Wheeler, 1974). These comparative studies utilized comparable formulation. This analysis has been undertaken with a cognizance of the variability of the data. It does however, furnish a first estimate of the recreational sector's contribution to the overall economy. Additionally, multiplier calculation enables computation of recreational fisheries' contribution to the Gross Territorial Product.

The total impact of recreational boating and fishing expenditures upon the Virgin Islands economy is estimated by calculating a local impact multiplier, M, which is a modification of the more familiar Kenesian income multiplier. This multiplier can be used to calculate Total Income Increase, TII, as follows:

$$TII = A(M)$$

where A is the initial expenditure remaining in the local area, and
M is the local income multiplier given by the equation:

$$M = \frac{1}{(1-BC)}$$

where B is the marginal propensity to consume locally; and
C is the proportion of expenditures by local people that accrue as local income.

In our analysis, the parameter A was calculated as the total local purchases with the import content removed (Table 66). Local fuel suppliers would not supply figures for import content so we have calculated a range for the parameter A (Table 67) based on a lower range of 40 percent to an upper range of 80 percent for the import content of fuel. This latter figure is certainly an overestimate since it represents the proportion of cost to the retailers with road tax added. The range of values is from $4,735,350. to $5,354,550.

The parameter B is the simple propensity to consume which has been estimated locally by McElroy (1974) to be between 50 to 55 percent and by Checchi (1976) as between 55 to 65 percent. We have used an assumed value of 0.55 in this analysis.

The parameter C is estimated here by the percent of local purchases left after the import content is removed. McElroy (1974) has estimated this figure at 0.50 and Hoffman and Yamauchi (1973) used an assumed value of 0.50 for their Hawaiian analysis. The results of this analysis indicate the C may range between 0.54 (import content of fuel equal to 0.80) and 0.62 (import content of fuel equal to 0.40). If the higher figure is valid, it would seem to indicate the recreational boaters may have a greater tendency to spend on local goods than the population as a whole.

The local impact multipliers calculated from this analysis (Table 67) range between 1.43 and 1.52; which is slightly lower than the Hawaii figure (Hoffman and Yamauchi), and for Door County, Wisconsin (Strang and Ditton, 1976). It was higher than the figures for the tourist industry in Scotland (Archer and Owen, 1971; Wheeler, 1974). Total income increase ranges between $6,771,500 and $8,138,900.

The results of this analysis would seem to indicate that recreational boating and fishing are different from other figures for the general economy in the Caribbean (Bryden, 1973) and other elements of the Virgin Islands economy (McElroy, 1974) which consistently range between 0.9 and 1.0. In fact, these latter multipliers are more sophisticated statistics which incorporate a greater knowledge of economic leakages and which are not strictly comparable in formulation. This is also true for the Department of Commerce study (1976) which estimated the income multiplier for the tourism sector between 0.97 and 1.39. Although the variability of the present data are great and there is reason to suspect that the respondents were biased towards the more affluent elements of the economy, the results do seem to indicate that the recreational boating and fishing industry is a highly desirable element of the economy with a positive economic impact.

The results appear to be similar to similar figures which use similar formulation for Hawaii (Hoffman and Yamauchi, 1973) and for the tourist industry in certain import dependent countries in Scotland where similarly formulated multiplier was calculated at 1.33 (Archer and Owen, 1971; Wheeler, 1974).

The total income increase, as calculated from equation (1) was between $6,771,500 and $8,138,900. To this increase might be added the values of the recreational catch ($580,000) and the commercial landings (2.4 million dollars). Recreational boating and fishing represent a significant contributant to the local economy.

These figures do not include the large fleet of documented vessels, the crewed charter boat fleet, the bareboat charter fleet, or many of the service related businesses in the islands. Such an analysis will require additional time and effort and was basically outside the scope of the current survey. There was also no attempt to quantify the impact that this large recreational sector has in attracting other income in different economic elements such as tourism and construction.

The increase also does not include income increases arising from tourists who are attracted to the Virgin Islands because of the recreational and boating industry. The Department of Commerce survey of the tourism sector (1976) says that nearly 27 percent of the arriving passengers are attracted by boating/diving facilities. This represents nearly 13 percent of all arriving tourists.

PUBLIC ATTITUDES

Public attitudes in the Virgin Islands have become an increasingly forceful determinant of government policy in recent years. Some of these attitudes were shown by responses to a question asking the boater to state in his/her opinion the major problems facing recreational and commercial fishing in the Virgin Islands today. This subjective question elicited a broad spectrum of responses including several who said that boating surveys were a major problem! In all, there were 121 responses (47 percent response) which fell into nine general categories. By far the most general complaint pertained to the failure of the government to do enough to solve the problems of the resource users. Twenty-six percent of the respondents felt that government enforcement efforts were lacking, that the Virgin Islands National Park Service rules were unfair, and that there

should be a Coast Guard station in St. Croix. More generally, these respondents felt that government should undertake positive programs in the area of recreational resource use.

Twenty-one percent of the respondents felt that the government should have more active programs for the construction of boat launching ramps, hauling facilities and marinas operated for the use of the general public. Nine percent of the respondents felt that government attempts to control theft of boats and fish traps were a failure. The final category pertaining to the public view of the government function were complaints about the inadequacy of government pollution control efforts. In all, 56 percent of the respondents complained that the local and federal governments were deficient in their efforts regarding the recreational marine resource user. To this can be added another nine percent who voiced complaints about the policies of the British Virgin Islands Government as they affect recreational boaters and fishermen.

The next general category of response pertained to pressures placed upon the marine environment by overcrowding. Over 30 percent responded that there were too many people engaged in water related activities, while 17 percent complained that there were either too few fish or too many fish traps. It is apparent that there is a significant amount of animosity between the purely recreational resource user and the trap fishermen, as both parties complained about the activities of the other.

The final category of response involved general complaints about the availability and cost of services and supplies in the Virgin Islands (6 percent). The response to this question points out the need for both government enhancement and public information activities which should be combined with a meaningful long range use planning activity.

SUMMARY AND CONCLUSIONS

The results of this study begin to supply a first estimate of the role of the recreational sector in the U.S. Virgin Islands. Although Department of Conservation and Cultural Affairs boating registration information furnished a summary of the magnitude of the fleet and its makeup, very little, if anything was known regarding the economic involvement and resource use of the fleet owners.

The present effort indicates a possible economic polarization of the fleet owners since there is statistical evidence that the respondents were concentrated at either end of the economic spectrum. This finding has definite policy implications for government activities within the area. It appears

that there is considerable need to enhance the accessibility of the marine resource base to the lower economic groups through the development of boat ramps, fishing piers and access roads for shoreline fishing. Enhancement for the upper economic groups will probably have to center on marina development and economic incentive.

The magnitude of economic value of recreational boating and fishing was previously undocumented. These results indicate that the registered fleet may be worth 35 million dollars, that annual expenditures may exceed 10 million dollars and that these expenditures result in income increase which is highly desirable in our import dependent economy. Energy consumption by the fleet is a significant portion of the total petrochemical budget for the island.

The resource use by recreational fishermen is also important for planning purposes. The present study documents that non-extractive uses of the resource such as snorkeling, photography and surface contact sports are extremely important in public involvement. Subsequent planning and allocation cannot ignore this element just because they don't show up in catch records. Actual catch by the recreational fishermen is furnished here within a range of probable values. The results indicate that lobster and reef fish management plans should consider that this element of the catch places the total catch very near to maximum sustainable yield levels. The results also indicate species preferences by fishermen as well as their successes in capturing preferred species.

In summary, although the data were highly variable, the survey results indicate that recreational fishing activities are indeed extensive in the U.S. Virgin Islands in terms of both catch and economic importance to the community. As resources and facilities become ever more limited, this element will have to receive the attention of planning in order to avoid problems of resource over utilization and competition.

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APPENDIX I.

TABLES

Table 1. Ethnic makeup of the U.S. Virgin Islands population from various sources of information compared to the response results from the present survey. Table values are given in percentages.

ETHNIC GROUP	1	2	3	4	MEAN(C.V.)	PRESENT STUDY
Native Born	40.	26.	47.	42.	39. (22.1%)	12.8
West Indians	24.	31.	28.	31.	29. (11.6%)	17.5
Puerto Ricans	15.	12.	06.	08.	10. (38.0%)	12.5
Continentals[5]	12.	08.	13.	16.	12. (27.0%)	51.9
Others[6]	09.	23.	05.	03.	10. (89.4%)	5.3

1. United Nations Committee on Small Territories. Document A/AC. 109/1.1234.
2. U.S.V.I. Department of Education. 1973-1974. Resource Guide to the Culture of the U.S. Virgin Islands.
3. U.S.V.I. Planning Office. 1977. Land Use and Housing Elements of the U.S.V.I. Economy.
4. V.I. Economic Policy Council. 1978. Economic Policy Guidelines.
5. Combines whites and blacks from the U.S. mainland.
6. Primarily Europeans.

Table 2. Summary of data acquisition activities for socio-economic survey of the Virgin Islands recreational fishing community.

	Number of Questionnaires Mailed Out						
	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Total
Mail Out							
1. Mailed	940	422	96	19	127	38	1642
2. Undeliverable address	32	23	5	0	2	0	62
3. Net Mailout*	908	399	91	18	125	38	1580
4. Returns	98	37	28	2	13	5	183
5. % Returns	11	9	24	11	10	13	11
6. Interviews	19	43	5	2	4	1	74
7. Total	117	80	33	4	17	6	257

* Net Mailout = (1)-(2)

Table 3. Results of a subjective ethnic analysis of the boating registration list furnished by the Virgin Islands Department of Conservation and Cultural Affairs. Tabled values are given in percentages of the total 1,789 list that could be identified.

	Panel Member						
Ethnic Group	1	2	3	4	5	Mean	C.V.
Native/West Indian	16.9	21.2	17.9	15.3	17.7	17.8	12.0
Hispanic Surnames	14.8	13.9	15.7	10.3	16.7	14.3	17.1
French West Indian	6.7	4.5	4.8	6.5	5.3	5.6	18.5
Corporations	7.8	7.8	7.5	6.1	7.9	7.4	10.3
% of List Identified	46.2	47.3	45.9	38.2	47.6	45.1	8.4

Table 4. Summary of information from Virgin Islands Department of Conservation and Cultural Affairs boating registration list as of January 1, 1978.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Inboard	37	27	28	61	72	63	42
Outboard	63	73	62	39	28	37	58
Horsepower Mean	97.2	103.5	77.4	143.1	172.5	87.3	99.3
C.V.	106%	93%	120%	89%	62%	120%	102%
Wood	22	25	29	12	1	10	21
Fiberglass	73	65	59	88	97	80	72
Metal	3	6	7	0	1	5	4
Other	2	4	4	0	1	5	3
Average Length	21.7 ft.	21.5 ft.	20.2 ft.	26.3 ft.	31.8 ft.	29.8 ft.	23.1 ft.
C.V.	49%	38%	41%	35%	29%	48%	45%
Total Boats	987	469	119	19	141	54	1789

Table 5.
Frequency distribution of reported family incomes (in percent of total) for respondents born in the continental United States and outside the United States; and for direct interviews and mail respondents.

Income	U.S. Born	Non U.S.	Interview	Mail Survey	Combined
0 - $5,000.	4.6	26.9	6.9	12.3	10.3
$5,001. - $10,000.	6.8	11.5	4.2	9.8	7.4
$10,001. - $15,000.	12.2	46.2	23.3	18.8	20.6
$15,001. - $20,000.	21.4	15.4	23.3	15.6	18.4
$20,001. - $30,000.	26.0	9.6	26.0	16.4	20.1
$30,001. - +	29.0	13.5	16.3	27.1	23.2
Mean	$21,087.	$13,359.	$18,905.	$18,340.	$18,551.
N	131[a]	52[a]	72	122	194
C.V	39%	64%	42%	53%	49%
Skewness (g_1)	0.60	-0.55	0.28	-0.19	-0.23
t_s	2.86**	1.62	1.00	0.86	1.28
Kortosis (g_2)	2.30	2.49	2.19	1.69	1.86
t_s	6.65**	3.66**	3.78**	3.84**	5.31**

a = some respondents did not report birth place.
** = significant at $p < .01$

Table 6. Average respondent incomes (in $U.S.) for recreational fishing survey.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean	19,500	18,454	12,954	12,500	19,280	26,250	18,551
C.V.(%)	58	45	77	57	30	27	61
% Response	79	69	67	75	100	100	76

Table 7.

Birth places of respondants (in percentages) of sample according to data source compared to the Virgin Islands population from various sources (TABLE I).

	DATA SOURCE			
Birth Place	Direct Interview	Mail out	Combined	V.I. Population (Table 1.)
U.S. Virgin Islands	2.7%	16.9%	12.8%	39%
British Virgin Islands	0	10.9%	7.6%	29%
Eastern Caribbean	1.4%	13.2%	9.9%	
Puerto Rico	1.4%	16.9%	12.5%	11%
United States	82.3%	39.4%	51.9%	12%
Other	12.2%	2.7%	5.3%	10%
No Response				
TOTAL RESPONSES	74	121	195 (76%)	

Table 8. Proportion of the respondents answering the questionnaire from records.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
% Memory	53	61	67	100	59	83	56
% Records	28	3	0	0	6	0	14
Records & Memory (%)	7	16	12	0	45	17	13
% Response	88	75	79	50	100	100	83

Table 9. Percent of respondents who keep records.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
% Yes	14	6	12	0	29	17	13
% Response	77	75	85	25	100	83	78

Table 10. Average age in years of respondents to recreational fishing survey

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Average Age	42.0	42.1	48.7	34.7	41.6	42.5	42.8
C.V.(%)	40	35	30	8	36	30	37
% Response	90	80	88	50	100	100	87

Table 11. Average length of respondent residence in Virgin Islands (in years); non-resident responses were deleted.

	St. Thomas	St. Croix	St. John	Combined
Average length of residence (yrs)	12.4	11.9	25.2	14.3
% Response	90	71	94	84*

*Based on responses from V.I. residents only (230).

Table 12. Summary of respondent birth places.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
U.S.V.I.	11.1	8.8	29.2	0	0	0	12.8
B.V.I.	7.4	5.9	12.5	5.0	0	0	7.6
Eastern Caribbean*	9.3	17.6	8.3	0	0	0	9.9
Puerto Rico	3.7	14.7	0.0	0	7.6	0	12.5
U.S. Mainland	61.1	41.2	50.0	50	24	100	51.9
Other	7.4	11.8	0	0	0	0	5.3
	100.0%	100.0%	100.0%	100%	100%	100%	
% Response	53	50	82	67	100	100	60

* Excluding U.S.V.I., B.V.I., and Puerto Rico

Table 13. Household size of respondents to recreational fishing survey (total number of persons in household)

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Average	3.0	3.6	3.2	2.7	4.0	2.5	3.3
C.V.(%)	54	55	65	78	48	79	57
% Response	83	88	73	75	100	100	84

Table 14. Type of housing (given in % of total responses) where survey respondents live.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Town house	1.0	3.1	3.9	0	5.9	0	2.4
Apartment	18.8	15.4	11.5	0	5.9	17	16.3
Condominiums	8.9	3.1	0.0	0	17.6	0	6.7
Mobil home	3.0	7.7	0.0	0	70.6	0	3.8
Single family houses	53.4	67.7	76.9	33.3	0	56	60.8
Public housing	0	1.5	0.0	0	0	0	0.5
Boat	14.9	1.5	7.7	66.7	0	17	9.6
% Responses	87	95	85	75	100	100	90

Table 15. Employment patterns of respondents to recreational survey.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Day (%)	76.9	87.0	15.0	66.7	0	0	64.4
Night (%)	4.4	3.7	85.0	0	76.5	83.3	21.5
Unemployed (%) *(excluding ret.)	2.2(3.1)	0.0 (0.)	0.0(0.)	33.3(33.3)	11.8(13.3)	0.0	2.6 (3.1)
Retired (%)	16.5	9.3	0.0	0.0	11.8	0.0	11.5
% Response	83	77	77	75	100	100	83

*excluding retired respondents

Table 16. Fleet value ($U.S.) summary of the Virgin Islands recreational fleet.

Table values given in percentages.

Value	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
less than $500	1.9	7.9	24.1	33.3	0	0	6.8
$501-$1,000	3.9	1.6	17.2	0	6.3	0	5.0
$1,00,-$2,000	5.8	12.7	13.8	0	0	0	8.1
$2,001-$4,000	13.5	20.6	13.8	0	6.3	0	14.5
$4,001-$8,000	17.3	15.9	10.3	0	18.8	0	15.4
$8,001-$16,000	13.5	11.1	6.9	0	12.5	33.3	12.2
$16,001-$32,000	24.0	20.6	6.9	33.3	6.3	0	19.
$32,001-$64,000	11.5	7.9	6.9	33.3	25.	66.7	12.7
Over $64,001	8.7	1.6	0	0	25.	0	6.3
Mean	$19,650	$12,890	$7,230	$24,100	$32,300	$36,000	$17,680
C.V.	100%	116%	176%	81%	77%	47%	109%
% Response	79.1	86.3	87.9	75	100	100	93.4

Table 17. Percent of respondent fleet classified as sailboats or power boats.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Sail	38.5	20.9	28.1	75.	17.7	16.7	31.
Power	61.5	79.1	71.9	25.	82.4	83.3	69.
Total # Forms	115	70	33	4	17	6	246
% Response to Question	98.	88.	100	100	100	100	96.

Table 18. Frequency distribution of respondent recreational fleet length (feet).

Table values given in percentages.

Boat Length	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
0-10	0	0	0	0	0	0	0
11-15	7.3	18.2	44.8	33.3	5.9	0	15.2
16-20	20.2	27.3	20.7	0	11.8	0	20.9
21-25	20.2	18.2	13.8	0	17.7	16.7	18.3
26-30	15.6	16.7	13.8	0	11.8	16.7	15.2
31-35	16.5	12.1	0	33.3	5.9	16.7	12.6
36-40	10.1	6.1	0	33.3	23.5	16.7	9.1
41-45	2.8	1.5	6.9	0	17.7	33.3	4.8
46-50	5.5	0	0	0	0	0	2.6
51-55	.9	0	0	0	5.9	0	0.9
56-60	0	0	0	0	0	0	0
Over 60	.9	0	0	0	0	0	.4
Mean	26.81	22.49	18.53	27.72	29.97	33.71	25.11
C.V.	41%	37%	47%	40%	43%	28%	44%
% Response	98	90	91	100	100	100	95

Table 19. Summary of vessel age for recreational fleet

Table values given in percentages.

Year	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Pre 1950	3	0	0	0	0	16.7	1.4
1952	0	0	0	0	0	0	0
1954	1	0	0	0	0	0	.5
1956	0	1.7	5.6	0	0	0	.9
1958	2	0	5.6	0	0	0	1.4
1960	1	3.4	5.6	0	0	0	1.9
1962	2	1.7	5.6	0	0	0	1.9
1964	3	5.2	11.1	0	0	0	4.3
1966	10.1	3.4	16.7	50	0	33.3	9.6
1968	14.1	24.1	16.7	0	6.3	0	15.2
1970	9.1	6.9	16.7	50	6.3	16.7	9.6
1972	18.2	24.1	5.6	0	18.8	0	18
1974	15.2	19	11.1	0	31.3	0	16.6
1976	19.2	10.3	0	0	31.3	33.3	17.3
1978	2	0	0	0	6.3	0	1.4
1980	0	0	0	0	0	0	0
Mean	1970.5	1970.6	1967.1	1968.5	1974.4	1970.8	1970.1
C.V.	8.9%	6.3%	7.8%	3.1%	3.6%	10.7%	7.8%
Response	84.6	72.5	54.5	50	94	100	82.1

Table 20. Summary of purchase date for Virgin Islands recreational fleet.

Table values given in percentages.

Year	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
1950	0	0	0	0	0	0	0
1952	0	0	0	0	0	0	0
1954	0	0	0	0	0	0	0
1956	0	0	5	0	0	0	.5
1958	0	0	0	0	0	0	0
1960	0	0	0	0	0	0	0
1962	0	0	0	0	0	0	0
1964	0	0	0	0	0	0	0
1966	1	3	10	0	0	0	1.4
1968	5	9	20	0	0	0	5.8
1970	5	6	10	0	0	0	5.8
1972	15	8	30	0	2	0	11.4
1974	24	29	20	2	2	33.3	26.4
1976	44	38	5	0	11	66.7	41.7
1978	6	9	0	0	1	0	6.7
Mean	1974.8	1974.4	1972.1	1972	1975.9	1975.8	1975.1
C.V.	3.5%	4.1%	6.6%	0	1.9%	1.5%	4.0%
% Response	86.3%	41.3%	78.8%	50%	94.1%	100%	82.1%
% Purchased New*	43.8%	43.9%	31.6%	0	73.3%	66.7%	45.1%

* Purchased by present owner within one year of date of construction.

Table 21. Type of fuel used by Virgin Islands recreational fleet.

Table values given in percentages.

Fuel	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Gas	59.0	75.8	85.	33.3	50.	67.	67.
Diesel	41.	24.2	15.	66.7	50.	33.	33.
% Response	98	95	91	75	100	100	96

Table 22. Most of the Virgin Island recreational fleet uses single engines.

Table values given in percentages.

No.of Engines	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
1	59.	75.8	84.6	33.3	50.	66.7	66.8
2	41.	24.2	15.4	66.7	50.	33.3	33.2
% Response	98	95	91	75	100	100	96

Table 23. Summary of engine type for recreational fishing fleet.

Table values given in percentages.

Powertype	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Outboard	65.6	64.6	70.4	100	18.2	0	61.2
Inboard	23.	31.3	18.5	0	72.3	0	27.6
Inboard/ Outboard	11.5	4.2	11.1	0	9.1	100	11.2
% Response	99	91	91	75	100	100	95

Table 24. Summary of engine horsepower for Virgin Islands recreational fleet. Table values given in percentages.

Horsepower	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
0-4	2.8	3.1	3.3	0	0	0	2.6
5-9	6.4	4.6	20.	0	5.9	0	7.4
10-19	10.1	10.8	16.7	0	5.9	0	10.4
20-39	17.4	12.3	16.7	0	5.9	66.7	16.1
40-79	16.5	12.3	20.	66.7	11.8	16.7	16.1
80-159	19.3	27.7	13.3	33.3	5.9	16.7	20.
120-319	14.7	16.9	3.3	0	23.5	0	13.9
320-639	11.4	9.2	6.7	0	17.7	0	10.4
640-849	.9	1.5	0	0	11.8	0	1.7
850 -	0	0	0	0	11.8	0	.9
Mean	137.8	144.2	77.1	62.8	346.1	45.0	144.7
C.V.	114%	106%	155%	20%	85%	75%	121%
% Response	99	98	91	75	100	100	97

Table 25. Summary of Virgin Island recreational fishing fleet boats having electronic equipment.

Table values given in percentages.

Type	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Short Wave Marine Radio	29.5	27.5	25.	33.3	32.1	33.3	29.3
CB Radio	14.	15.	25.	16.7	3.6	11.1	13.3
Fathometer	30.2	23.8	0	33.3	28.6	33.3	27.7
Other	26.4	15.	0	0	25.	22.2	21.5
None	0	18.8	50.	16.7	10.7	0	8.2
% Response	99	87	100	100	100	100	97.2

Table 26. Construction materials employed in Virgin Islands recreational fleet.

Table values given in percentages.

Material	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Fiberglass	79.8	80.3	53.3	66.7	94.1	100	77.9
Wood	11.0	10.6	36.7	33.3	5.9	0	13.9
Metal	3.7	4.6	6.7	0	0	0	3.9
Other	5.5	4.6	3.3	0	0	0	4.3
% Response	95	85	91	100	100	100	97

Table 27. Summary of recreational fleet purchasing patterns in U.S. Virgin Islands.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
1. New	32	33.3	21.4	0	47.1	66.7	32.6
Used	68	66.7	78.6	3	52.9	33.3	67.4
2. Broker	30.8	0	16.7	0	0	0	28.1
Dealer	34.6	0	16.7	0	0	0	31.3
Other	34.6	0	66.7	0	0	0	40.6
% Response	66.9	82.5	66	75	100		86

Table 28. Summary of slip rents paid by Virgin Islands recreational boating fleet

Table values given in percentages.

Payment:	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
By the Foot	90.2	50.	100	100	50	75	78.7
By the Slip	9.8	50	0	0	50	25	21.3
Cost/Month	$71.21	$50.11	$25	$150	$104.88	$25	$69.47
C.V.	91%	82%	--	--	46%	--	86%
% Response	44%	12.5%	3%	25%	59%	67%	29%

Table 29. Summary of dingy fees paid by respondents who moor their boats.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Yes	29.2	100	0	33.3	0	33.3	14.6[2]
No	70.8		100	66.7	100	66.7	85.4
Cost/Month	$28.43	$20		$20		$37	$29.69[4]
C.V.	19%						20%
% Response	41	31	70	25	24	33.3	40

Total fees paid = $.36^{1} \times .15^{2} \times 2000^{3} \times 29.69^{4} \times 12^{5}$ = $38,500

1 = % of fleet that is moored or anchored (Table XXXII)

2 = % of moored fleet paying dingy fee

3 = Number of boats in fleet

4 = Monthly rate

5 = months/year

Table 30. Summary of storage methods utilized by Virgin Islands recreational boaters.

Table values given in percentages.

Method	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Anchored out	8.1	14.1	34.5	0	0	0	12.5
Mooring	25.3	15.6	24.1	50	24.0	33.3	23.5
Trailered, at home	0	31.3	3.5	0	29.4	0	11.4
Trailered, dry storage	0	1.6	0	0	0	0	0.5
On beach	7.1	1.6	17.2	0	0	0	5.9
Marina, wet berth	42.2	29.7	6.9	0	35.2	66.7	34.0
Marina, dry berth	8.1	4.7	3.5	0	11.5	0	6.1
Other	9.1	1.6	10.3	50	0	0	6.1
% Response	85	85	91	100	100	100	91

Table 31. Summary of location of Virgin Islands recreational boating fleet.

Table values given in percentages.

Location	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
ST. THOMAS							
Antilles Yachting	8.7						5.1
Avery's Boathouse	10.1					16.7	7.7
Compass Point	5.8					16.7	4.2
Lagoon Fishing Center	8.7		33.3				6.0
Lagoon Marina	10.1		33.3				6.3
St. Thomas Sheraton	13.0			100	22.2		9.4
Shoreline Marine	11.6						6.8
Sapphire Beach Marina	5.8						2.6
V.I. Pleasure Boats	11.6						6.3
Dohms Marina	4.4						2.6
St. Thomas Yacht Club	7.3						4.2
Treasure Sea Port	8.7						5.1
Frenchman's Reef	1.5						0.9
TOTAL							66.7
ST. CROIX							
St. Croix, in town		1.5					0.9
St. Croix Yacht Club		62.1				16.7	14.2
St. Croix Marine Dev.		13.8					3.4
Kings Alley Hotel		6.9					1.7
Skov's Marina		3.5					0.9
Club Comanche		3.5					0.9
Salty Dogs		3.5					0.9
King's Wharf		3.5					0.9
St. John							
Cruz Bay			33.3				0.9
TOTAL							24.7
BRITISH VIRGIN ISLANDS							
West Indies Yachts						16.7	0.9
TOTAL							0.9
PUERTO RICO							
Roosevelt Roads					11.1	16.7	1.7
Club Nautico					22.2		1.7
Villa Marina					22.2		1.7
Sea Lovers					22.2		1.7
TOTAL							6.8
UNKNOWN							
Munroe Harbor						16.7	0.9
% Response	98	84	82	75	100	100	91

Table 32. Location of hurricane storage plans for Virgin Islands recreational boaters.

Location	%*	Location	%*
St. Thomas		St. Croix	
Lagoon	19.6	Salt River	5.2
Sheraton Marina	1.7	Teague Bay	6.4
Avery's Boathouse	0.6	South Shore	0.6
Shoreline Marine	1.7	Tamarind Reef Lagoon	0.6
St. Thomas Harbor	2.3	Coakley Bay	0.6
Water Island	1.7	Christiansted	0.6
Long Bay	0.6		
Hull Bay (on beach)	0.6		
Cowpet Bay	1.2		
Red Hook	1.2		
St. John		General	
Hurricane Hole	8.7	Dry Storage	11.6
Coral Bay	0.6	Trailered	16.8
Cruz Bay	5.2	At Sea	1.7
Lameshur Bay	0.6	On Beach	1.7
Leinster Bay	0.6		
Great Cruz Bay	1.2		
Puerto Rico		British Virgin Islands	
Culebra	4.6	Maya Cove	0.2
Roosevelt Roads	1.2	North Sound	0.2

* % of 173 total responses. Several respondents gave multiple answers. There was 58% response to this question.

Table 33. Partial summary of annual expenditures by recreational boaters in U.S. Virgin Islands in 1977-78.

Expenditure	Daily Expenses	Annual Total [1,2,3]
Fuel	$15.62	$1,548,000
Refreshments	$11.38	$1,377,000
Fishing Gear	$10.76	$1,012,000
Travel to Boat	$ 6.74	$ 793,000
Ice	$ 4.52	$ 410,000
Bait	$ 1.98	$ 223,000
	$51.00	$5,363,000
Monthly Expenses[3]		
Slip Rent (29%)	$69.47	$ 483,000
Dingy Fee (15%)	$29.69	$ 38,500
	TOTAL	$5,884,500
	Per Boat	$ 2,942

1. Based on 2,000 fleet. Total trips/year = (7 trips/month)(2,000 boats)x 12 months.
2. Total expenditure = (# trips)(% response)(Daily expenditure)
3. Annual total = (% response)(2,000 boats)(monthly fee)(12 months).
4. Total person days = (168,000 trips/year)(3.6 persons/trip) = 604,800 person days/yea
5. Daily cost/person = ($51/day) (3.6 persons/day) = $14.16/person/day

Table 34. Percent of fuel purchases made by Virgin Islands recreational boaters at Marinas.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean (%)	80.2	48.2	51.1	98	78.9	95	70.0
C.V.(%)	45	99	92		42	5	53
% Response	76	53	92	25	94	100	66

Table 35. Proportion of non-fuel purchases made at marinas by Virgin Island boaters.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean(%)	31.8	23.8	10.8	20	36.3	58.2	29.27
C.V.(%)	119	128	148		10.3	66	117
% Response	68	48	39	25	88	83	59

Table 36. Did fuel price increases affect Virgin Island boating?

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
% Yes	9	12	14	50	25	0	12
% Response	79	69	64	50	94	67	74

Table 37. Did fuel price increases affect boat purchase in the Virgin Islands? Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
% Yes	36	17	10	0	29	33	27
% Response	72	65	61	50	100	100	70

Table 38. The respondents purchased their boats before fuel prices started going up.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
% Yes	61	55	86	50	0	50	59
% Response	75	84	64	50	100	100	78

Table 39. Summary of use frequency required to warrant ownership of boat in the opinion of the respondent.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
1. Mean number total trips	4.1	2.4	5.0		3.5	5.6	3.8
C.V.	123%	131%	52%		105%	175%	127%
% Response	91	40	24		59	83	63
2. Mean number recreational trips	2.5	2.0	3.7		1.7	1.2	2.4
C.V.	97%	117%	69%		75%	104%	102%
% Response	65	46	33		59	83	54
3. Mean number commercial trips*	9.7	12.2	14.4		14	1	10.2
C.V.	167%	80%	185%				165%
% Response	29	6	15		6	40	18

* Only positive answers used. Zero values ignored.

Table 40. Average Virgin Islands boat use during summer months.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Average Number of Trips	6.5	6.9	13.3	2.5	2.5	3.8	7.0
C.V.	153%	133%	91%	0	0	57%	140%
% Response	87%	66%	58%	78%	77%	100%	74%
% Fulltime Cruising	1%	0	0	0	0	33%	1.5%

Table 41. Summary of Virgin Islands boat use during winter months.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Average Number of Trips	7.0	6.8	12.2	2.5	2.5	3.6	7.1
C.V.	154%	117%	91.5%	0	0	61%	140%
% Response	89%	61.3%	55%	75%	77%	100%	75%
% Fulltime Cruising	0.9	0	0	25	0	16.7	0.8

Table 42. Summary of number of passengers on boats in use in the Virgin Islands

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean	3.6	3.5	2.9	2.5	4.6	3.8	3.6
C.V.	35%	37%	55%	40%	44%	24%	39%
% Response	86	65	88	100	82	100	83

Table 43. Summary of trip length for Virgin Islands boating activity.

Table values given in percentages.

Trip Duration	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
0-3 hours	21.7	20.0	45.0	0	0	16.7	22.1
4-6 Hours	28.3	41.8	25.0	0	18.2	16.7	30.7
7-12 Hours	18.9	16.4	25.0	100	18.2	16.7	19.1
13-24 Hours	6.6	0	0	0	0	0	3.5
1-2 Days	6.6	0	0	0	9.1	0	4.0
2-4 Days	4.7	20.0	5	0	27.2	0	10.1
4-8 Days	10.4	1.8	0	0	9.1	33.4	7.5
8-16 Days	2.8	0	0	0	18.2	0	2.5
16-32 Days	0	0	0	0	0	16.7	0.5
Mean (in hours)	33.4	21.7	8.2	9.5	90.2	146.7	33.9
C.V.	183%	146%	185%		112%	137%	208%
% Response	96	66	41	25	65	100	77
% of Trips less than 12 hours	69	77	95	100	36	50	72

Table 44. Summary of marina departure and return times for Virgin Islands recreational boating activity.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Primary Departure Time, Mean A.M.	9:08	9:11	8:12	7:30	8:20	8:36	8:59
C.V.	105%	38%	16%		56%	59%	76%
Primary Return Time, Mean P.M.	4:56	4:16	6:00	5:30	4:14	6:20	4:52
C.V.	58%	34%	71%		42%	48%	46%
Trip Length	7 hrs 48 min	7 hrs. 5 min	9 hrs 48 min	10 hrs 0 min	7 hrs 54 min	9 hrs 44 min	7 hrs 53 min
% Response	68%	33%	21%	25%	76%	100%	51%

Table 45. Summary of travel time (in minutes) from homes of Virgin Islands recreational boaters to site of boat.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean	16.9	17.9	8.9	18.3	44.0	11.2	18.7
C.V. (%)	80	68	120	126	60	72	79
% Response	76	64	52	75	94	100*	71

* Two respondents listed flight time from U.S. mainland. These were deleted from analysis.

Table 46. Summary of distance traveled (in miles) from Virgin Islands recreational boaters' homes to their boats.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean	4.9	7.5	4.1	5.0	29.2	2.8	7.75
C.V.(%)	135	72	119	100	86	74	94
% Response	74	63	39	75	94	100*	68

* Three respondents listed flight distance from U.S. mainland. These were deleted from analysis.

Table 47. Summary of Virgin Islands weekend recreational boating activity (% of boating done on weekends)

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Percentage	70.5	53.1	39.6	55.0	70.5	69	61.9
C.V.(%)	43	70	83	116	54	45	57
% Response	65	61	55	50	100	100	65

Table 48. Summary of Virgin Islands boating activity taking place in the British Virgin Islands.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Number Visits to B.V.I. last year	7.6	1.5	5.3		2.7	1.8	5.1
C. V.	148%	172%	157%		77%	64%	135%
%Response*	90%	69%	70%		100%	100%	82%

*B.V.I. results deleted from calculations of combined mean.

Table 49. Summary of expenditures (in U.S.$) by U.S. Virgin Islands recreational boaters in the British Virgin Islands.

	St. Thomas	St. Croix	St. John	British[1] V.Isl.	Puerto Rico	U.S.	Combined
Customs	98.23	12.06	20.72	50.00	36.96	24.58	58.59
C.V. (%)	242	266	132		148	109	247
% Response	74	61	55	25	82	67	67
Lodging	60.56	8.10	4.67	100.00	10.75	0.00	32.23
C.V. (%)	323	344	387		273	0	331
% Response	55	53	45	25	71	67	54
Fuel	56.16	21.60	10.27	200.00	171.33	17.50	51.01
C.V. (%)	360	246	243		169	164	341
% Response	57	56	52	25	88	66	58
Meals	141.52	67.26	34.50	2000.00	147.94	195.00	111.77
C.V. (%)	180	257	149		148	190	193
% Response	67	53	55	25	100	67	62
Other	175.06	94.71	20.00	2000.00	143.44	3.33	127.63
C.V. (%)	398	312	165		179	173	362
% Response	58	53	48	25	94	50	57
Total annual average expenditure[2]	$531.53	$203.73	$90.16	$4350.00	$510.42	$240.41	$381.23
Average per trip[2]	69.94	135.82	17.01		189.04	133.56	74.75

1. Deleted from calculations of combined mean

2. Weighted according to % response.

Table 50. Summary of Virgin Islands recreational fleet involved in carrying passengers for hire.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean, on boats carrying passengers	3.75						3.75
% Carrying passengers	3.4	0	0	0	0		1.6
C.V.	29						29
% Response	6.8	53	9	25	53	0	25

Table 51. Summary of crew employment in the Virgin Islands recreational boating fleet.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
% with crew	5.1	3.8	33.3	25	5.9	0	9.7
Average number of crew on boat with crew	1.2	1.7	1.3			0	1.4
C.V.	32	56	47			0	34
% Response	60	64	76	50	71	100	68

Table 52. Time (in days) spent by owners repairing recreational boating fleet.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean	27.4	31.1	23.7	25.0	17.3	3.7	26.6
C.V. (%)	128	234	188	28	141	95	143
% Response	77	68	58	50	94	83	72

Table 53. Selected parameters for between islands comparisons.
Table values given in percentages.

Variable	St. Thomas	St. Croix	St. John	British V. Isl.	Puerto Rico	U.S.	Combined
Total Responses	117	80	33	4	17	6	257
%Response to mailout	11	9	24	11	10	13	11
Boat Size							
Average boat length (feet) DCCA list	21.7	21.5	20.2	26.3	31.8	29.8	23.1
Average respond. boat length	26.8	22.5	18.5	27.7	30.0	33.7	25.1
Socio Economic							
Aver. fam. income ($U.S.)	19,500	18,454	12,954	12,500	19,280	26,250	18,551
Aver. res. age (years)	42.0	42.1	48.7	34.7	41.6	42.5	42.8
Household size (persons)	3.0	3.6	3.2	2.7	4.0	2.5	3.3
Native born (%)	11.1	8.8	29.2	0	0	0	12.8
Length of res. in the V.I. (yrs.)	12.4	11.9	25.2	-	-	-	14.3
Value of boat ($U.S.)	19,650	12,890	7,230	24,100	32,300	36,000	17,680
Unemployment (%)	3.1	0	0	33.3	13.3	0	3.1
Fleet Storage							
Marina (%)	50.3	34.4	10.4	0	46.7	66.7	40.1
Moored or anchored (%)	33.1	29.7	58.6	50.0	24.0	33.3	36.0
Trailered (%)	0	32.9	3.5	0	29.4	0	11.9
Other	16.6	3.0	27.5	50.0	0	0	12.0

Table 54. Geographical distribution of Virgin Islands recreational boating activity. See figure 1 for areas. Table values are in percent of total responses.

AREA (see map - Figure 1)

Type of Usage	T-1	T-2	T-3	T-4	T-5	B-1	B-2	B-3	B-4	C-1	C-2	C-3	C-4	C-5	C-6	Combined
Business Related Recreation	0.2	0.6	0.6	0.4	0.2	0.4	0.8	0.8								4.5
Cruising	4.5	11.3	6.3	6.3	1.2	7.4	8.5	6.1	0.2	1.4	0.8	0.4	0.8			55.4
Water Surface Contact Sport	0.4	1.0	0.4	0.2	0.2	0.4	0.6	0.4			0.2		0.4			4.3
Snorkeling/ Skindiving	0.6	1.8	1.0	1.2	1.0	1.4	1.4	0.4	0.2	0.4	0.8	0.2	0.2			10.8
SCUBA diving	0.4	1.0	0.2	0.2	0.4	0.2	0.2	0.2		0.2	0.4		0.2			3.7
Chartering	0.2	0.8	2.5	0.4		0.6	0.4	0.2					0.4			5.3
Bareboat Chartering	0.2	0.4	0.4			0.4	0.4	0.6		0.2	0.2					2.9
Commuting	0.2	0.2	0.4													0.8
Line Fishing (recreational)	0.4	1.0	0.6	1.2		0.8	0.4	0.6		0.4	0.6	0.2	0.6			6.9
Spearfishing	0.2			0.8		0.4	0.4				0.4					2.3
Commercial fishing		0.2	0.2								0.4					0.8
Other		0.6	0.4	0.2		0.2					0.2	0.2	0.4			2.3
	7.4	19.0	13.1	11.0	2.9	12.5	13.4	9.4	0.4	2.7	4.1	1.0	2.9			

Total Responses 489
% Response 58%

Location	% of Reported Activity
St. Thomas	53.4
St. Croix	10.7
BVI	35.7

Table 55. Summary of recreational use according to time spent.
Table values are in terms of percent of the total number of reported days.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Business related recreation	9.3	5.0	8.9	12.5	10.9	11.1	4.8
Water surface contact sports	8.7	11.9	8.4	12.5	15.2	11.1	8.7
Cruising	22.1	19.5	6.8	12.5	21.7	16.7	14.6
Snorkeling/ skindiving	13.5	15.7	8.0	25.0	17.4	16.7	11.7
SCUBA diving	9.9	10.1	8.6	0	6.5	16.7	9.2
Chartering	4.5	3.1	8.6	0	2.2	5.6	6.0
Bare-boat chartering	1.9	1.3	9.1	0	0	11.1	5.1
Commuting	5.1	2.5	8.2	0	0	0	5.7
Linefishing (Recreational)	9.3	15.7	7.5	12.5	19.6	11.1	10.0
Spear fishing	4.5	5.7	8.9	12.5	2.2	0	6.5
Commercial fishing	3.2	4.4	8.9	0	0	0	5.7
Other	8.0	9.4	8.2	12.5	2.2	0	8.0
Total Days Reported	312	159	440	8	4.6	18	984
% Response	64.1%	18.8%	100%	25%	47.1%	50%	52.1%

Table 56. Frequency and type of recreational fishing activity in the Virgin Islands.

Table values given in percentages.

Method	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Line fishing	16.8	26.6	18.9	--	33.5	57.7	24.4
C.V.	30	17	26	--	19	12	27
% Response	65	64	42	0	82	50	62
Net fishing	1.5	0.2	6.5	--	1.4	0	1.5
C.V.	225	590	75	--	115	--	364
% Response	65	64	42	0	82	50	61
Trap fishing	4.0	2.9	6.6	--	0.7	0	3.8
C.V.	106	120	74	--	235	--	114
% Response	64	64	42	0	82	50	61
Spear fishing	8.9	6.2	4.3	--	9.5	1.7	7.6
C.V.	53	62	80	--	54	92	71
% Responding	64	64	45	--	82	50	61
Other	3.2	0.8	0	--	0	0	1.8
C.V.	114	262	0	--	--	--	--
% Response	62	64	42	0	82	50	61

Table 57. Rank preference for different recreational fishing techniques by Virgin Islands fishermen.

Method	1 % Response	2 % Using Technique	3 Rank	4 Σ Ranks (frequency)	5 Preference*
Linefishing					
Bottom fishing	56	38	2	205	78
Trolling	58	35	1	338	118
Cast/spin	31	8	10	105	8
		81%			
Spearfishing					
Sling	31	5	11	107	5
Speargun	43	21	4	202	42
Skin diving	37	16	6	161	26
SCUBA	32	8	9	114	9
		50%			
Netting or Hand Catching					
Lobster	43	25	3	217	54
Tropical fish	31	7	11	108	8
Conch	38	7	5	170	31
Whelks	36	16	7	150	24
Other	27	3	14	71	2
		69%			
Net and Trap Fishing					
Gill Net	33	1	16	78	0.7
Trammel Net	33	1	15	82	0.8
Throw Net	33	4	12	93	4
Haul Seine	33	3	13	87	3
Traps	37	9	8	129	12
		18%			

* Preference =(Column 2)(Column 4) High Values Indicate High Preference.

Table 58. Summary of recreational fishing effort by species direction and success in capture. The respondents were asked to list the 'species' that they fished for and that they caught in order of frequency.

	EFFORT			CATCH		
	% Reports	ΣRF	Rank	% Reports	ΣRF	Rank
Coryphaenidae						
Dolphin, dorado (Coryphaena hippurus)	12.7	244	1	6.9	39	7
Elopidae						
Tarpon (Megalops atlanticus)	0.5	5	30	0.0	0	37
Bonefish (Albula vulpes)	0.4	4	32	0.0	0	37
Belonidae						
Gar (Tylosaurus crocodilus)	0.2	1	38	0.3	4	24
Holcentridae						
Redman, wenchman, squirrel fish	0.2	2	33	1.0	5	21
Sphyraenidae						
Barracuda (Sphyraena barracuda)	4.4	60	12	8.6	62	3
Serranidae						
Grouper (Epinephilus, Myctoperca)	8.3	165	3	8.6	48	5
Hind (E. guttatus)	3.1	47	13	3.3	18	13
Butterfish (gaphalopholis fulva)	1.5	25	17	0.6	4	24
Buttersacs (Petrometopon cruentatum)	0.4	2	33	0.0	0	37
Jewfish (E. itijara)	0.2	1	38	0.0	0	37
Priancanthidae						
Bleareye (Priacanthus)	0.4	6	29	0.3	2	29
Carangidae						
Crevalle (Caranx hippos)	0.0	0	44	0.3	2	29
Barjack, carengue, blue runner (C. ruber)	0.6	13	21	0.3	1	32
Hardnose (C. fuscus)	0.6	13	21	0.3	1	32
Pompano (Trachinotus goodei)	0.0	0	44	0.6	4	24
Permit (T. falcatus)	0.4	5	30	0.3	1	36
Jacks (Caranx)	0.6	12	22	1.0	6	20

TABLE 58. (Continued)

	EFFORT			CATCH		
	% Reports	ΣRF	Rank	% Reports	ΣRF	Rank
Istiophoridae						
Marlin (Makaira nigricans)	4.9	89	7	2.3	19	12
Sailfish (Istiophorus platypterus)	1.2	30	16	0.0	0	37
Scombridae						
Mackeral, Spanish mackeral (Scombroremorus regalis, S. Maculatus)	7.5	112	5	9.4	73	2
King, Kingfish (S.cavalla)	7.7	148	4	8.2	58	4
Wahoo (Acanthocybium solanderi)	5.0	91	6	3.0	21	10
Bonito (Euthynnus alletteratus)	3.1	38	15	4.9	32	6
Tuna (Euthynnus, Thynnus)	5.0	68	9	3.9	21	10
Lutjanidae						
Snapper (Lutjanus)	9.0	167	2	12.2	74	1
Yellowtail (Ocyurus chrysurus)	5.2	89	7	4.9	31	8
Silk (Rhombolites aurorubens)	0.0	0	44	0.3	3	27
Pomadasyidae						
Grunt (Haemulon)	1.5	20	20	2.3	11	16
Margate (H. album)	0.0	0	44	0.3	1	32
Sparidae						
Porgy (Calamus)	0.2	1	38	0.6	5	21
Mullidae						
Goatfish (Pseudupeneus maculatus)	0.4	2	33	0.0	0	37
Queen mullet (Mulloidichthys martinicus)	0.2	1	38	0.0	0	37
Kyphosidae						
Chub (Kyphosis)	0.2	1	38	0.3	1	32
Bothidae						
Flounder	0.4	8	26	0.3	3	27
Chaetodontidae						
Flatfish, Angelfish (Pomacanthus, Holacanthus)	0.8	9	25	0.6	5	21

TABLE 58. (Continued)

	EFFORT			CATCH		
	% Reports	ΣRF	Rank	% Reports	ΣRF	Rank
Labridae						
Hogfish (*Lachnolaimus maximus*)	0.2	2	33	0.0	0	37
Scaridae						
Parrotfish, Gutu, Madam Bluefish (*Scarus, Sparisoma*)	3.4	70	8	2.0	10	17
Acanthuridae						
Doctorfish (*Acanthurus*)	1.2	23	18	2.0	14	15
Balistidae						
Oldwife (*Balistes vetula*)	4.6	65	11	4.9	27	9
Diodontidae						
Blowfish (*Diodon*)	0.2	1	38	0.0	0	37
General and Unidentified						
Bonnet	0.2	2	33	0.0	0	37
Tropical fish	0.4	7	28	0.3	1	32
Weakfish	0.4	10	24	0.0	0	37
Mollusca						
Whelks (*Cittarium pica*)	0.6	12	22	1.3	10	17
Conch (*Strombus gigas*)	1.3	21	19	1.3	8	19
Crustacea						
Lobster (*Panulirus argus*)	1.9	40	14	2.0	16	14
TOTAL	% 100.0			% 100.0		
Reports	521			304		

Table 59. Distribution of recreational fishing effort among various activities as indicated from a followup questionnaire (51 returns and 110 responses). The results indicate both the amount of activity and the catch per unit effort (lbs/person/day). Annual average total catch (Column 5) has been calculated by assuming that the recreational fishing fleet is made up of 2,000 boats whose activities are divided up according to the results below. The totals in Columns 6 and 7 were calculated from the results of Question 27 (Table 55) using the estimate of the percent of boat time devoted to the designated activity instead of the % response figure from the followup questionnaire (Column 1).

Method	1 % of Responses	2 Days/Month (C.V.)	3 Catch/Day in lbs.(C.V.)	4 Total # Person days/yr.	5 Total Catch (lbs/yr)	6 Total Person Days/yr.	7 Total Catch (lbs/yr)
Trolling	18.2	3.0 (124%)	9.3 (117%)	13,100	122,000	7,600	163,000
Bottom Fishing	5.5	4.9 (156%)	11.3 (131%)	6,460	73,000		
Traps	1.8	7.5 (28%)	483.5 (37%)	3,240	1,567,000	6,800	3,307,000
Nets							
Spearfishing	12.7	4.4 (75%)	10.5 (97%)	13,400	141,000	8,000	84,200
Diving for lobsters	17.3	2.6 (98%)	7.6 (89%)	10,800	82,000	1,250	9,500
Diving for conch	7.3	1.4 (124%)	5.6 (74%)	2,450	13,700	436	2,450
Whelk fishing	7.3	1.4 (114%)	6.9 (105%)	2,450	16,900	436	3,000
Snorkeling	23.6	8.0 (93%)		45,300			
Underwater photography	6.4	9.3 (111%)		14,284			
			TOTAL	111,490 days		34,500 days	

Table 60. Results of the followup questionnaire indicate the distribution of effort among various marine species. Table values given in percent of respondents reporting.

Species	Technique					
	Trolling	Spear fishing	Bottom fishing	Trap fishing	Diving Wading	Total
Shark		0.8				0.8
Coryphaenidae						
Coryphaena hippirus	1.5					1.5
Holocentridae						
Holocentrus sp.			0.8	0.8		1.6
Synodontidae						
Synodus sp.	0.8					0.8
Muraenidae						
Gymnothorax sp.			0.8			0.8
Sphyraenidae						
Sphyraena barracuda	3.8					3.8
Serranidae						
Epinephelus striatus		1.5				1.5
E. guttatus		0.8				0.8
E. itajara		0.8				0.8
Cephalopholis fulva			0.8			0.8
Myctoperca venenosa		0.8				0.8
M. tigris		0.8				0.8
Grouper		5.3				5.3
Carangidae						
Caranx ruber		0.8				0.8
Elegatis bipinnulatus		0.8				0.8
Trachinotus falcatus		1.5				1.5
Istiophoridae						
Makaira nigricans	0.8					0.8
Scombridae						
Scomberomorus cavalla	4.6	1.5				6.1
S. regalis & S. Maculatus	7.6	6.1				13.7
Acanthocybium solanderi	1.5					1.5
Euthynnus alletteratus	3.0	0.8				3.8
Thunnus atlanticus	0.8					0.8
Tuna	1.5					1.5
Lutjanidae						
Lutjanus apodus	0.8	1.5				2.3
L. jocu		1.5				1.5

Table 60. cont.

	Trolling	Spear fishing	Bottom fishing	Trap fishing	Diving	Wading	Total
Lutjanidae (contd)							
L. analis		0.8					0.8
L. mahogoni		0.8					0.8
Ocyurus chrysurus			0.8				0.8
Snapper	0.8	3.0					3.8
Pomadasyidae							
Haemulon (grunt)		0.8	1.5	0.8			3.1
Calamus (porgy)		1.5		0.8			2.3
Chaetodontidae							
Pomacanthus or Holocanthus (flatfish, angelfish)		1.5		0.8			2.3
Labridae							
Lachnolaimus maximus		0.8					0.8
Scaridae							
Scarus		1.5	0.8				2.3
Acanthuridae							
Acanthurus sp.				0.8			0.8
Balistidae							
Balistes vetula		2.3	0.8	0.8			3.9
Mollusca							
Cittorium pica						6.0	6.0
Strombus gigas					6.0		6.0
Crustacea							
Panulirus argus					12.9		12.9
Total:	26.7%	38.3%	6.1%	4.0%	18.9%	6.0%	10.0%

Table 61.

Summary of Virgin Island Recreational fishing landings. The results are given in ranges calculated by using two estimates of effort from the mailout and followup surveys.

Annual Value of Virgin Islands Recreational Catch*

Item	Value ($/lb.)	Catch in lbs. x 1000 (Range)	Value in $ x1000 (Range)
Finfish	$1.50	247 - 336	371 - 504
Lobsters	$2.50	9.5 - 82	23.8 - 205
Conch	$1.50	2.5 - 13.7	3.7 - 20.5
Whelks	$1.50	2.5 - 16.9	3.7 - 25.4
TOTAL			$402.2 - $754.9
			$\overline{X}$ = $578.6

*Excluding fish traping because Virgin Islands Act 3330 requires all fishermen using traps and nets to report their catch in the commercial fishing statistics. Virgin Islands trap catch is around 1.5 million pounds annually (Olsen, et.al., 1976).

Table 62. Proportion (in percent of total) of family income spent on boating expenses by Virgin Island boaters.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean (%)	21.4	7.8	11.9	20	14.9	19.4	16.4
C.V. (%)	118	92	87		120	161	123
% Response	67	50	48	25	94	83	61

Table 63. Monthly ownership costs (in U.S.$) associated with respondents' boating activities.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Mean	256.05	150.75	99.31	500.00	408.24	310.83	234.47
C.V. (%)	102	105	129		107	79	97
% Response	73	50	48	25	100	100	64

Table 64. Average daily expenditures (in $ U.S.) for respondents' boating activities.

Table values given in percentages.

	St. Thomas	St. Croix	St. John	British V.Isl.	Puerto Rico	U.S.	Combined
Fishing gear	$13.17	12.02	2.00	0	17.00	0.46	10.76
C.V.	162%	216%	219%		134%	137%	184%
% Response	52	53	70	50	71	83	56
Ice	$4.23	$2.41	$6.44	$9.00	$4.47	$10.40	$4.52
C.V.	84%	130%	173%	16%	100%	164%	118%
% Response	59	34	70	50	88	67	54
Fuel	$14.38	$9.41	$7.04	$12.50	$48.47	$10.25	$15.62
C.V.	119%	118%	156%	85%	87%	76%	123%
% Response	69	34	70	50	88	66	59
Refreshments	$13.10	$10.26	$5.43	$38.00	$9.40	$10.80	$11.38
C.V.	169%	157%	177%	119%	65%	203%	165%
% Response	82	54	70	50	88	83	72
Bait	$3.70	$0.25	0	0	$0.63	0	$1.98
C.V.	188%	632%			397%		345%
% Response	74	50	70	50	88	83	67
Travel	$4.31	$3.73	$0.39	0	$24.07	$75.25	$6.74
C.V.	300%	389%	253%		149%	66%	296%
% Response	80	54	70	50	82	67	70
Total Average Expenditure Per Day	$52.89	$38.08	$21.34	$59.50	$104.04	$107.10	$51.00

* Averages are only for positive respondents.

Table 65. Summary of equipment purchases by survey respondents.

	Expenditure					
	Local*			Non-Local		
Item	% Response*	Average	V.I. Total**	% Response*	Average*	V.I. Total**
Boats	24	$6,070	$2,913,000	6	$7,635	$916,000
Engines	34	$1,124	$764,000	10	$2,236	$447,000
Electronics	7	$428	$60,000	7	$1,078	$151,000
Fishing Gear	19	$224	$85,000	7	$583	$82,000
Total			$3,822,000			$1,596,000
per boat owner/year			$2,709			

* Results from Question 53

** Equals (% response) (2000 boat fleet) (average/boat)

Table 66. Summary of economic data used in the calculation of the economic impact of the recreational boating and fishing sector on the Virgin Islands Economy.

Expenditure	Local Purchase	Imported Purchases	% Local Purchasing	Import[1] Content	Import Content of Local Purchases
BOATS New (32.6%)	$949,000	$916,000	76%	0.75	$711,000
Used (67.4%)	$1,963,000		100%		
ENGINES	$764,000	$447,000	63%	0.60	$458,000
ELECTRONICS	$60,000	$151,000	33%	0.50	$30,000
FISHING GEAR	$85,000	$82,000	51%	0.50	$42,500
FUEL[2]	$1,548,000		100%	0.40	$619,200
				0.50	$774,000
				0.60	$928,800
				0.70	$1,083,600
				0.80	$1,238,400
REFRESHMENTS	$1,377,000		100%	0.50[3]	$689,000
TRAVEL TO BOAT AND BACK HOME	$793,000		100%	0.50[3]	$396,500
ICE	$410,000		100%	0.05[3]	$20,500
BAIT	$223,000		100%	0.50[3]	$111,500
SLIP RENT AND DINGY FEES	$521,500		100%	0.50[3]	$260,750
TOTAL	$8,693,500	$1,596,000	85%		$3,338,950 - $3,958,150[4]
TOTAL EXPENDITURE	$10,289,500				

1. Unless otherwise stated % import content was obtained from an informal merchant survey.
2. Local sources would not furnish import content figures for fuel. The calculation was made between 40% and an upper figure of 80%. This latter figure represents sale price to retailers and was furnished by local industry sources.
3. Assumed Values.
4. Range calculated from import content for fuel equal to 0.40 and 0.80.

Table 67. Summary of Economic Impact Alaysis.

A	B	C	M	Total Income Increase
$4,735,350[1]	0.55[3]	.54[4]	1.43	6,771,500
		.62[5]	1.52	7,197,700
$5,354,550[2]	0.55[3]	.54[4]	1.43	7,657,000
		.62[5]	1.52	8,138,900

1. Total local purchases after removal of import content assuming import content of fuel at 0.80.

2. Total local purchases after removal of import content assuming import content of fuel at 0.40.

3. McElroy (1974). Checchi (1976).

4. Percent of local purchases left after import content is removed assuming import content of fuel is equal to 0.40.

5. Percent of local purchases left after import content is removed assuming import content of fuel is equal to 0.80.

APPENDIX II.

QUESTIONNAIRES

APPENDIX II. Mail out questionnaire for recreational fishing survey.

ISLAND RESOURCES FOUNDATION

LAGOON MARINA, RED HOOK
ST. THOMAS, U. S. VIRGIN ISLANDS
(809) 775-3225

June 10, 1978

Dear Boat Owner:

In conjunction with the National Marine Fisheries Service, the Caribbean Fisheries Management Council, and with the cooperation of the Virgin Islands Department of Conservation and Cultural Affairs, we are conducting a survey of recreational and commercial fishing and boating in the U. S. Virgin Islands.

The attached questionnaire is being mailed to a selected sample of registered boat owners. We hope that you will take the time to return this questionnaire to us in the pre-addressed enclosed envelope. The results of the questionnaire will provide guidelines for better management of those marine resources which are the vital part of both commercial and recreational boating and fishing. This is your opportunity to make a contribution to the future improvement of facilities and services that support recreational boating. This includes the protection and enhancement of our natural resources. By providing the information, you will help us to demonstrate that the recreational fisherman is an important cultural and economic factor in the Virgin Islands. Parts of the questionnaire may not apply to your particular situation but try to fill out all of the sections that do pertain to you.

I wish to personally assure you that it is worth your time to complete the attached form. The information you provide is considered strictly confidential and will only be released in a form of combined data that will respect your personal privacy. If you fill in your name and address on the questionnaire, we will send you a summary of the results of the survey.

If you have any questions about our project, you may call us at the Island Resources Foundation, telephone 775-3225.

For good (and hopefully better) boating and fishing,

Edward L. Towle, Ph. D.
PRESIDENT
Island Resources Foundation

David A. Olsen, Ph. D.
PROJECT DIRECTOR
Island Resources Foundation

ELT/kmf

enclosures

ISLAND RESOURCES FOUNDATION

LAGOON MARINA, RED HOOK
ST. THOMAS, U. S. VIRGIN ISLAND
(809) 775-3225

Island Resources Foundation/Caribbean Fisheries Management Council, Virgin Islands Recreational and Commercial Boating Survey Questionnaire

Boat Data (boat registry number #_____)

Circle the appropriate item(s) or fill in the blanks. If an answer cannot be adequately expressed by circling the appropriate item or filling in a blank, please feel free to write a longer answer.

1. Type of boat: Power, sail (if sail, rig_____)

2. Overall length of boat in feet:_____

3. Construction material:
   1. Fiberglass
   2. Wood
   3. Metal
   4. Other_____

4. Type of engine:
   1. Gas
   2. Diesel
   3. Outboard
   4. Inboard
   5. Inboard/outboard

5. Number of Engines:_____

6. Total horsepower:_____

7. Year boat was built: 19_____ Where built_____

8. Boat built by whom _____

9. Year you purchased the boat: 19_____
   1. New
   2. Used
   3. Broker
   4. Dealer
   5. Other_____

Indicate on the chart provided on the last page where you most frequently participate in the above activities. For example, if you most frequently cruise in areas T1 and T2, place a letter "B" in these areas on the charts. Also show your marina or customary departure site by marking an "X".

17. Average duration of trip (hours or days)_____

18. Average number of trips per month (April-September)_____

19. Average number of trips per month (October-March)_____

20. Average number of people per trip_____

21. Average number of paid crew (if any)_____

22. Average wages per crew member/per day _____per year_____

23. Average number of paid passengers (if any)_____

24. How did your customers find out about you?_____

25. Do you advertise? Yes No Budget/per year_____

26. In your opinion, what is the minimum number of trips per month that makes it worthwhile for you to own a boat?_____
    1. Recreational trips_____
    2. Commercial trips_____
    3. Combination trips_____

Fishing Activity

27. Estimated percent of boat time/use devoted to fishing
    A. line_____% B. net_____% C. trap_____%
    D. spear_____% E. other_____%

28. Indicate the type of fishing by frequency: (1) most frequent (2) occasional (3) less frequent (4) never

Line fishing:
_____bottom
_____troll
_____cast/spin

Spearfishing:
_____sling
_____spear gun
_____skin diving
_____SCUBA

Netting or hand catching:
_____lobster
_____tropical fish
_____conch
_____whelks
_____other

Net and trap fishing:
_____gill net
_____trammel net
_____throw net
_____haul seine
_____traps

42. Average travel distance from home to marina in miles: _____

43. Primary marina departure time: _____ return time: _____

44. Percent of boating done on weekends:_____%

45. Where will you keep your boat in case of hurricane?_____

46. Age of the owner of the boat:_____

47. Number of years a resident in the Virgin Islands_____ Birthplace_____

48. Number of members in your family living at home_____

49. Type of home:
    1. townhouse_____
    2. apartment_____
    3. condominium_____
    4. mobile home_____
    5. single-family house_____
    6. public housing_____
    7. boat_____

50. Hours of employment: day_____ night_____ shift_____

51. Approximate gross annual family income in thousands of dollars:
    1. 0-5
    2. 6-10
    3. 11-15
    4. 16-20
    5. 20-30
    6. 30+

52. Most important outdoor recreational activity other than boating (please specify):_____

53. How much did you spend last year on the following items of gear? Please give the expected life of any equipment and when purchased and where purchased (local store, catalogue or elsewhere):

ITEM	AMOUNT SPENT	EXPECTED LIFE	WHEN PURCHASED	WHERE
Vessel				
Engine(s)				
Electronics				
Fishing gear				
1. Hooks, line, rods, etc.				
2. Traps with lines and buoys				
3. Net and diving equip.				

APPENDIX III. Follow-up questionnaire for recreational fishing survey.

ISLAND RESOURCES FOUNDATION

LAGOON MARINA, RED HOOK
ST. THOMAS, U. S. VIRGIN ISLANDS
(809) 775-3225

August 30, 1978

Dear Boater:

Thank you for completing our "Recreational Fisheries Questionnaire." We are now asking for one more piece of information about your fishing effort. Could you please fill in the boxes below with the average number of days each month that you fish and the average catch per day in pounds that you get. By furnishing this information, you will help to assure that the people currently engaged in managing our fisheries will set aside a portion of the yield for yourselves and people with similar interests. Please call us if you have any questions or would like to supply further information.

Again, thank you for your help.

David A. Olsen, Ph.D.

APPENDIX III

FOLLOW-UP QUESTIONNAIRES

APPENDIX III. (cont.)

Fishing Method	Average Number Days per Month	Average Catch per day (in lbss. live weight)
Trolling		
Bottom Fishing		
Traps		
Nets		
Spearfishing		
Diving for Lobsters		
Diving for Conch		
Whelk fishing		
Snorkeling only		Not Applicable
Underwater Photography		Not Applicable

Kind of Fish Caught Most Often	Method Used

The above information is based on: Catch Records _____

Memory _____