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Economic Impacts of Recreational Boat Fishing In the Houston-Galveston Area of the Texas Coast

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IN THE HOUSTON-GALVESTON AREA OF THE TEXAS COAST

by

Robert B. Ditton, Alan R. Graefe and Gary Lapotka

Texas Agricultural Experiment Station
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Texas A&M University System
College Station, Texas

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ABSTRACT

The saltwater fishing patterns and economic impacts generated by recreational boat fishermen in the Houston-Galveston area of the Texas coast were investigated. Data were obtained through a mail survey of registered boat owners residing in an eight-county area surrounding Galveston Bay.

About 31 percent of the boats in the study area were used for saltwater fishing in Galveston Bay or adjacent offshore waters during 1978. Saltwater boat fishermen spent more than 31 million dollars for their fishing trips in 1978, with bay fishermen spending \$26,460,000 and offshore fishermen spending \$5,046,000. Non-local bay fishermen spent \$7,439,000 in bayshore communities and non-local offshore fishermen spent \$1,970,000 in coastal communities. The economic impact of saltwater boat fishing trips in the region was \$79,751,000.

Since this study does not present the total economic influence of saltwater boat fishing in the study region, some factors which should be considered when assessing the values and benefits of saltwater boat fishing are discussed.

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INTRODUCTION

Assessing the values of varied uses of marine fisheries is one of the most difficult tasks confronting resource managers. Historically, emphasis has been placed on the commercial uses of fisheries. As a consequence, most of the available data concerning the economic impact of marine fisheries utilization pertain to commercial fishing. In recent years, however, marine recreational fishing has begun to receive increased recognition in fisheries decision-making. In Texas, this is evidenced by the increased amount of time and resources dedicated to creel census and harvest studies (Heffernan et al., 1975; Breuer et al., 1977) and by changes in fishing regulations such as the passage of the Red Drum Conservation Act (Texas Session Laws, Chapter 270, 65th Legislature, 1977-78). Some of this new emphasis is based upon the realization that recreational fishing results in significant direct and indirect contributions to regional and local economies.

Recreational uses of marine fisheries are associated with two important types of economic benefits. The first type of economic benefit is received by the participants in the recreational activity. This includes the utility and satisfaction derived from the fishing experience. Anglers' willingness to pay for such experiences is taken as a measure of the economic value of the fishery for recreational fishing. However, true markets do not exist for publicly owned goods such as marine fisheries. Therefore, researchers have had to rely on techniques which simulate market conditions to measure the economic value of recreational uses of fisheries (North, 1976).

The second type of economic benefit includes the commercial impacts

which result from expenditures made by recreational fishermen. Such expenditures become income to the suppliers of goods and services which support the marine recreational fishing industry. In particular, bait shops, marinas, fishing equipment stores, and boat dealers all derive income from recreational fishermen. In addition, food stores, gasoline distributors, restaurants, and the motel industry are examples of the many ancillary businesses which benefit from fishing related expenditures. In fact, many localities rely heavily on recreational fishing as a means of economic support for their community. Moreover, initial expenditures for fishing-related goods and services generate additional spending which further contributes to the overall economic development of the region. This report is concerned with this second type of economic benefit.

Many studies have shown that saltwater fishermen's expenditures contribute to local economies by stimulating additional employment, providing increased incomes, and generating further output and sales. For example, a study in Hawaii revealed that the economic impact of marine sport fishing to the state was around 11.5 million dollars in increased incomes over a two-year period (Hoffman and Yamauchi, 1973). Equipment and transportation costs accounted for four-fifths of the impacts. In another study of marine sport fishing on the Mississippi Gulf coast it was found that the average fisherman contributed about \$22.00 in expenditures to the local areas (Daniel, 1974). However, since most of the fishermen were local residents, little new money was spent in local areas for recreational fishing. The highest daily expenses were for bait, tackle, and food. An ongoing study of marine

sport fishing in Rhode Island estimated that the cost of a day's fishing, in terms of daily expenditures, was \$11.11 for out-of-state and \$2.81 for in-state anglers (McConnell and Smith, 1978). A study of recreational fishing in the San Antonio-Lavaca Bay area sponsored by the Texas Water Development Board showed that daily expenditures were \$6.24 per person, resulting in a total economic impact of \$2,218,796 in 1973 (Threadgill, 1974). The 1970 National Survey of Fishing and Hunting estimated that each man-day of saltwater fishing on the Texas Gulf coast cost \$11.36 in gross expenditures. The study further reported that total marine recreational fishing expenditures along the U.S. Gulf coast amounted to \$405.65 million dollars (U.S. Department of Interior, 1972). Finally, a study of charter fishing on the Texas Gulf coast revealed that charter fishermen spent approximately \$4,209,058 in coastal communities during 1975. This resulted in a total contribution of \$13,767,169 to the state economy (Ditton et al., 1977).

Until recently, fisheries managers have focused most heavily on the biological aspects of fisheries. However, several pieces of legislation at the federal level (Fisheries Conservation and Management Act of 1976 and the Coastal Zone Management Act of 1972) have mandated a broadened approach to fisheries management, which has led managers and other resource decisionmakers to pay increased attention to social, economic and political considerations. In Texas, there have been only a few studies that have focused on fishermen's expenditures. In particular, detailed state or regional expenditure data related to saltwater fishing have been conspicuously lacking. Hence, coastal decision-making has had to rely mostly on crude estimates of the commercial value

of recreational fishing. As a result, marine recreational fishing has been an under-recognized component in the economy of the state and coastal communities. In recent times, several organizations, most notably the Gulf Coast Conservation Association, have called for studies of the economic values of recreational fisheries in Texas.

Objectives

A long-term sport-fishing research program was initiated at Texas A&M University in 1974 with a program statement proposed by Ditton and Jarman. The ultimate goal of the program is the attainment of predictive understanding of the nature and extent of sport fishing behavior and related expenditures in the Texas coastal zone. The 1974 program statement recognized the complexity of sport fishing and the concomitant necessity to limit the scope of any individual study. Subsequently, several components of Texas coastal fishing activity have been investigated (Graefe and Ditton, 1976; Ditton et al., 1978^a; Ditton et al., 1978^b; Woods, 1977). Several major fishing sectors, including boat fishing, pier fishing and surf fishing remain to be studied.

This study will examine one of the most significant components of saltwater fishing: bay and gulf private boat fishing. To most effectively meet the information needs of resource managers at various levels of government, the study will focus on a particular region, the Houston-Galveston area, to:

- 1) identify patterns of saltwater fishing participation by a regional population of registered boat owners.
- 2) identify the expenditure patterns of boat fishermen and their

effects on the state, regional, and local economies, with special attention paid to differences between bay and offshore fishermen and to whether expenditures were made in the home or destination community.

- 3) illustrate the complexities involved in estimating the "total economic impact" of sport fishing in any particular region.

Since many previous studies have emphasized total impact figures, with little attention to the underlying, often unstated, assumptions needed to reach such figures, emphasis was given to better understanding the component variables in an economic impact analysis. It was recognized that some types of expenditures can be attributed directly to fishing, while other types of variables present problems to the analyst because they can only be partially attributed. Because of these allocation difficulties, conservative total impact figures are derived from fishing trip expenditures only. Additional data are provided relative to other expenditures which can be partially attributed to saltwater boat fishing according to some set of assumptions. Those resource managers who are interested in more comprehensive economic impact figures can use the data presented in this report to test their assumptions and to calculate the "total economic impact."

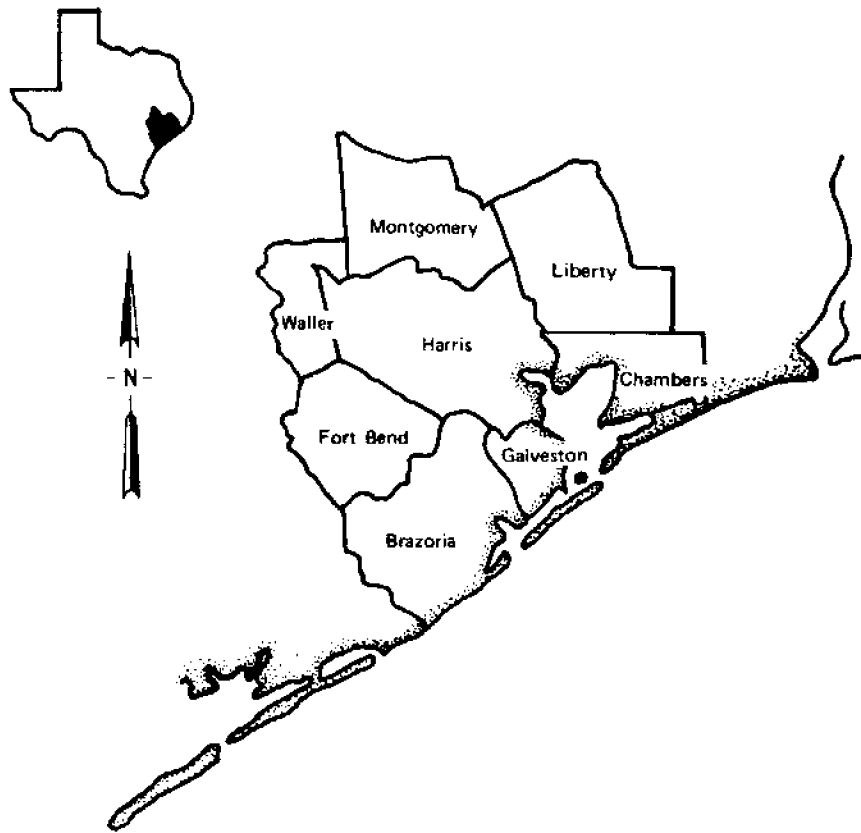
METHODS

Study Area

To meet the objectives of the study, a survey of a regional population of boatowners was conducted. An eight-county area surrounding Galveston Bay was selected as the study area (Figure 1). This area is one of the major fishing and boating areas in the State of Texas. The total number of fishing licenses and boat registrations for the eight-county area account for about 20% of the state totals. In addition, the population of these counties has been growing at a rate greater than double the statewide rate of population growth, so it is likely that this region will continue to grow in importance as a Texas boating and fishing center (Skrabanek and Upham, 1974).

A 1975 Texas Parks and Wildlife Department survey of finfish harvest in Galveston Bay indicated that over 90% of all Bay anglers come from Harris, Galveston, Chambers, and Brazoria counties, all of which border Galveston Bay (Heffernan et al., 1975). A second tier of counties, including Fort Bend, Liberty, Montgomery, and Waller, was added to the previous four counties adjacent to Galveston Bay to form the study area for this survey. Therefore it is probable that nearly all private boat fishing use of Galveston Bay and adjacent offshore waters is done by residents of the study area. It is important to recognize that the focus of this study is on fishing participation and associated expenditures by people residing within the eight-county study area, not on total fishing use of Galveston Bay and adjacent offshore waters. Some additional fishing in this area is contributed by private boat fishermen

FIGURE 1: MAP OF THE EIGHT COUNTY STUDY AREA



entering from outside of the study area, but as indicated above, this is a very small portion of total use.

Sampling Design

The Texas boat registration file, maintained by the Texas Parks and Wildlife Department (TPWD), provided access to the population of boat-owners residing within the study area. There were 119,802 registered pleasure boats in the eight-county area as of December 31, 1978. A previous survey conducted in the same study area found that about one-third of the registered boats are used for saltwater fishing (Ditton and Graefe, 1978). Based on this information it was determined that a sample size of 2,000 was sufficient to provide accurate representation of the full population. The number of boats needed from each of the eight counties to provide this sample size was calculated in proportion to the number of boat registrations in each county. The specified number of entries from each county was then selected using systematic sampling with a random start.

Data Collection

The owner of each boat selected in the sample was mailed a survey questionnaire in April 1979. Survey materials sent included the questionnaire, a cover letter and a business reply, postage-paid return envelope. A post card reminder and second questionnaire were mailed to sample members who had not responded after intervals of 10 and 21 days, respectively. All survey materials were sent via first class mail.

The survey questionnaire asked respondents to estimate how often

they had used their boat (the specific boat selected in the sample) to do a variety of types of fishing and other boating activities during the previous year. It was felt that a one-year study period was a reasonable length of time for which respondents could remember their general extent of fishing activity. The questionnaire did not ask respondents to recall exact dates or places of fishing and therefore avoided some of the "recall problems" that have hampered many previous fishing surveys (Hiatt and Worrall, 1977). The survey questionnaire also obtained a record of typical fishing trip expenditures for salt-water boat fishing during the study year.

Table 1 summarizes the survey response rates. The total usable response rate was 58.2%. Unusable types of response included incomplete questionnaires, questionnaires received after the cut-off date for data analysis, questionnaires which were undeliverable by the U.S. Postal Service, and questionnaires which were not responded to or were unaccountable for some other reason such as being lost in the mail.

The Problem of Non-response

If every member of the sample had returned his or her completed questionnaire, it would have been relatively simple to draw inferences from sample findings about the population of boatowners. Table 1 shows, however, that about three-fifths of the questionnaires sent were returned in usable form. Thus, sample findings actually describe only the sub-population of boatowners who would respond to such a questionnaire if they all received one. Before these findings can be legitimately generalized to the population of all boatowners, it is necessary

Table 1: Survey Questionnaire Response

Type of Response	Number	Percent
Usable Response	1165	58.2
Non-response		
Incomplete	41	2.1
Late	12	0.6
Non-deliverable	132	6.6
Not returned	650	32.5
Total Non-Response	835	41.8
Total	2000	100.0

to test the assumption that fishing habits of respondents are the same as those of sample members who did not complete usable questionnaires.

To test this assumption, a sample of 105 non-respondents was contacted by telephone and questioned concerning their fishing use of their boats. These telephone interviews did not obtain the complete information sought in the mail questionnaire, but they did identify the extent of participation in basic types of fishing by non-respondents.

Results of the telephone interviews indicated that findings based on the completed questionnaires were indeed biased towards saltwater fishing participation (Table 2). Non-respondents were more likely than respondents to have sold their boat, stopped using it, or spent more of their time fishing in freshwater. However, no significant difference was found in comparing frequency of fishing participation between

respondents and non-respondents. The non-response bias found is understandable when one considers that the questionnaire dealt mainly with saltwater fishing and therefore was probably of less interest to non-fishermen or freshwater fishermen. This bias does, however, call attention to the fact that generalizing from sample findings directly to the boatowner population would result in overestimates of saltwater fishing participation.

This bias was corrected by weighting findings relative to respondents and non-respondents according to their respective proportions of the total sample. The number of non-respondents in each fishing category was obtained by multiplying the number of non-respondents in the sample (835) times the percentages found in the telephone survey of 105 non-respondents. The resultant weighted sample totals shown in Table 2 represent the best estimates of saltwater fishing participation available from the survey.

Table 2: Saltwater Boat Fishing Participation by Survey Respondents and Non-respondents

Type of Saltwater Fishing	Respondents		Non-Respondents		Weighted Sample total	
	Percent	Number	Percent*	Number	Percent	Number
Bay Only	30.8	359	21.0	175	26.7	534
Bay and Offshore	5.1	59	1.9	16	3.8	75
Offshore Only	1.4	16	0	0	0.8	16

n=1165

n=835

n=2000

*Derived from telephone interviews with 105 non-respondents.

Calculation of Population Estimates

To obtain a total picture of saltwater boat fishing, it was necessary to extrapolate the weighted sample findings to the population of all boatowners within the region. The sample size of 2,000 out of a population size of 119,802 represents a sampling fraction of .0166942. Dividing this sampling ratio into sample frequencies yields estimates of frequencies for the entire population of boatowners. Thus, for example, 609 bay fishermen in the sample of 2,000 boatowners can be extrapolated to yield 36,480 bay fishermen in the population of 119,802 boatowners. Similarly, estimates of participation in other categories of fishing can be calculated for the population.

It is important to recognize that, while such extrapolations are the best population estimates available from the data, they are nonetheless estimates which are subject to error. Slightly different estimates would probably be obtained if the survey were applied to a different sample or the complete census of boatowners. Such variation is inherent and occurs by chance in any sample survey. This sampling error is minimized, however, as sample size is increased. Because the estimates of the number of participants in each category of fishing are based on a sample size of 2,000, it can be said with 95% confidence that the true percentage of boatowners in the population in each category lies within 2 percentage points above or below the estimates given. Estimates of the expenditures by bay and offshore fishermen will be considerably less accurate than this because they will be based on smaller sample sizes composed of the bay fishermen and offshore fishermen subgroups of the sample.

RESULTS

Saltwater Fishing Patterns

About 31 percent of the 119,802 boats in the population were used for saltwater fishing in Galveston Bay or adjacent offshore waters during the study year. Table 3 presents a classification of these saltwater fishing boats into mutually exclusive groups based on where they were used for saltwater fishing. For this study, bay fishing was defined as any fishing taking place inland from the jettied entrance to Galveston Bay, and offshore fishing included all fishing occurring on the open Gulf outside the Galveston jetties (Figure 2).

Bay fishing is clearly the dominant form of saltwater fishing in the study area. Nearly all of the saltwater fishermen fished in the bays. Even among those boatowners who did fish offshore, a large majority fished the bay as well.

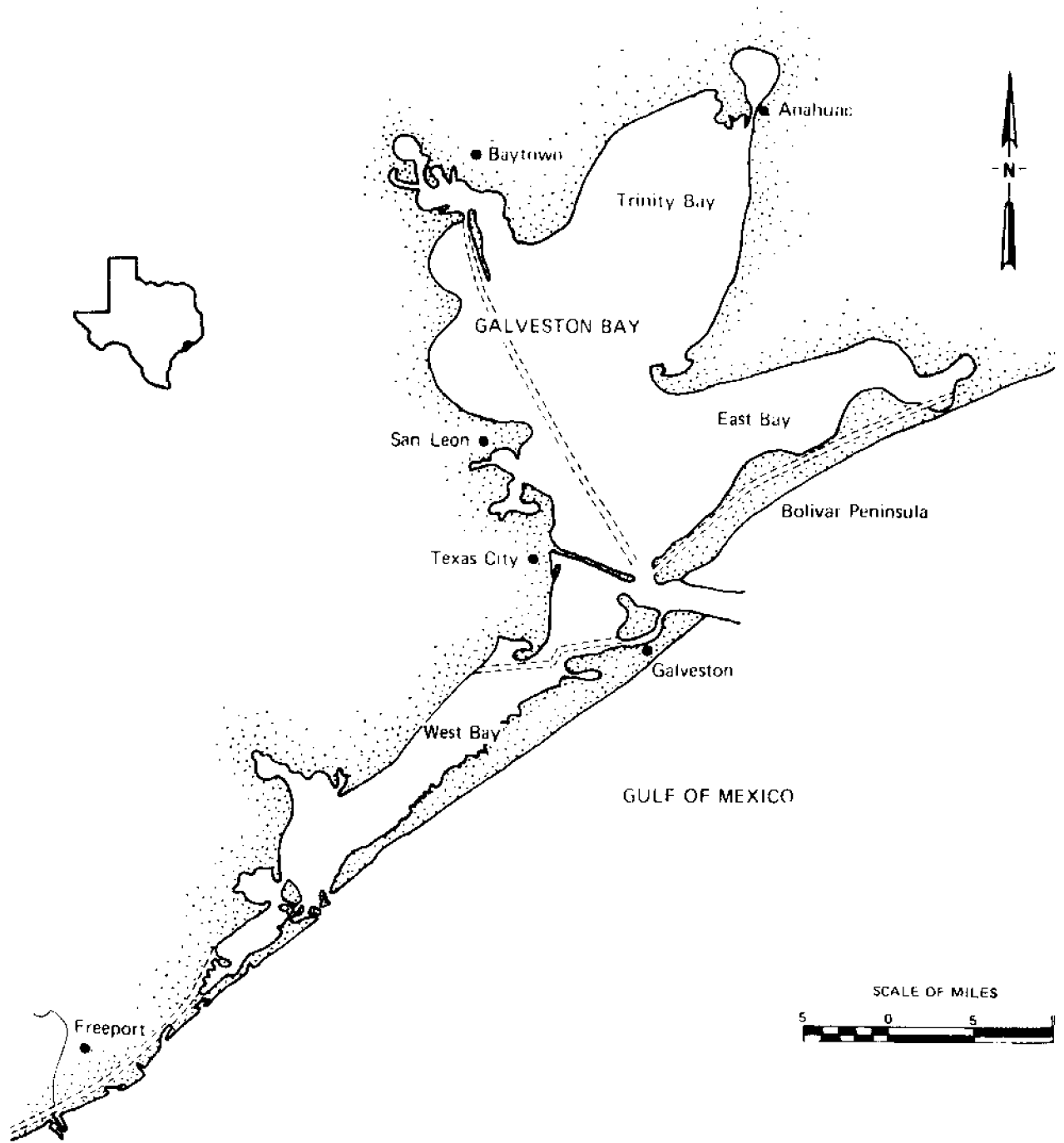
Table 3: Number of Boats in the Population Used for Various Types of Saltwater Fishing

Type of Saltwater Fishing	Number of Boats
Bay only	31,987
Bay and offshore	4,493
Offshore	958
Total	37,438

31,987	}	36,480 Bay Fishermen
4,493		
958	}	5,451 Offshore Fishermen

37,438		

FIGURE 2: MAP OF THE GALVESTON BAY SYSTEM



Seasonality of saltwater boat fishing is shown in Table 4. There was very little difference in seasonal use patterns between bay and offshore fishermen. In both cases nearly all participants fished during the summer and more than four-fifths fished during spring and fall, while less than half fished during winter. Inspection of individual seasonal fishing records revealed that 35 percent of the saltwater fishermen fished during all four seasons and 38 percent fished during three seasons (almost always spring, summer and fall). Twenty-three percent fished during just two seasons (usually summer and spring or fall) and the remaining 4 percent fished during the summer exclusively.

Table 4: Seasonality of Saltwater Boat Fishing

Season	Percent of Bay Fishermen	Percent of Offshore Fishermen
Winter	39	47
Spring	85	84
Summer	94	97
Fall	85	82

Table 5 provides the distribution of frequency of participation by saltwater boat fishermen. Bay fishermen tended to boat fish more often than offshore fishermen, with the mean number of days spent bay fishing about 50 percent higher than the mean number of days spent offshore fishing.

To place saltwater boat fishing in some perspective, it was useful to classify the saltwater boat fishermen according to what other types of fishing they did. As shown in Table 6, bay and offshore fishermen

were similar in their fishing participation patterns. Only about one-third limited their fishing participation to boat fishing, while the other two-thirds indicated they also fished from shore or other fishing platforms. Similarly, about one-third limited their fishing to salt-water environments, with two-thirds indicating they fished in fresh-water as well.

Table 5: Frequency of Participation in Saltwater Boat Fishing

Number of Days Fished During Year	Percent of Bay Fishermen	Percent of Offshore Fishermen
1 - 5	29.3	49.2
6 - 10	22.0	19.7
11 - 15	16.3	9.8
16 - 20	13.0	4.9
>20	19.3	16.4
	99.9	100.0
	$\bar{x} = 15.4$	$\bar{x} = 10.7$

Table 6: Other Types of Fishing Participated in by Saltwater Boat Fishermen

Type of Fishing	Percent of Bay Fishermen	Percent of Offshore Fishermen
Boat Fishing Only	31.4	35.7
Boat and Shore Fishing	68.6	64.3
Saltwater Fishing Only	32.5	35.7
Saltwater and Freshwater Fishing	67.5	64.3

It is important to recognize that other people besides the boat-owners typically were also included in saltwater boat fishing trips. Table 7 illustrates that offshore fishing parties tended to be larger than bay fishing parties.

Finally, the duration of saltwater boat fishing trips is illustrated in Table 8. Offshore fishing days generally entailed more hours of actual fishing time than bay fishing days, but it is noteworthy that a majority of both types of saltwater fishermen reported fishing times of 5 to 8 hours.

Table 7: Saltwater Boat Fishing Party Size

Number of People in Fishing Party	Percent of Bay Fishermen	Percent of Offshore Fishermen
1	1.3	1.5
2	25.2	16.7
3	37.4	21.2
4	23.1	30.3
5	10.1	21.2
>5	2.9	9.1
	100.0	100.0
	$\bar{x} = 3.26$	$\bar{x} = 3.86$

While the fishing patterns illustrated in Tables 3 through 8 provide an interesting description of saltwater boat fishing and fishermen, this information may be most useful in conjunction with the fishing expenditure data presented in the following section. Party expenditures, for example, could be converted to average costs per person by using the

figures given in Table 7.

Table 8: Duration of Saltwater Boat Fishing Days

Number of Hours in Typical Fishing Day	Percent of Bay Fishermen	Percent of Offshore Fishermen
1 - 4	24.5	15.9
5 - 8	62.5	62.3
9 - 12	12.0	15.9
>12	1.0	5.8
	100.0	99.9
	$\bar{x} = 6.2$	$\bar{x} = 7.2$

Boat Fishermen Expenditures

Several important factors were considered in measuring boat fishermen expenditures and assessing the resultant economic impacts. First, expenditures were measured on an annual and per-trip basis to reflect the frequency with which different items are typically purchased. Next, the types of businesses affected were identified and their products categorized into groups or items. Typical expenditures include items such as bait and tackle, which are directly related to fishing, and products like ice and snack foods, which are not necessarily associated with fishing but are frequently purchased by fishermen.

Another matter of consideration was the location where spending takes place. From a state or regional perspective, it is of little importance whether expenditures are made at home, in local communities,

or en route to the fishing destination. On the other hand, from the perspective of the bayshore or coastal communities, it is imperative to know how much is spent in their area.

Finally, fishing participation was divided into bay and offshore use, and expenditures were measured separately for each type of fishing. This permitted comparison of expenditure patterns and made an assessment of each group's economic contribution possible.

Per Trip Expenditures

Certain items, because they are consumed during the course of the day, must be purchased every time a party decides to go boat fishing. For instance, bait, tackle, and fuel are generally needed every time a boat party fishes. Food, ice, and lodging are not always necessary, but are often desired by fishermen.

Some items, like food or tackle, may be purchased by some members of a fishing party and not by others. In contrast, gasoline and bait are examples of items which are used by the entire party but may be purchased by only one member. To account for possible differences in individual purchases among party members, respondents were asked to estimate expenditures on a per-party basis.

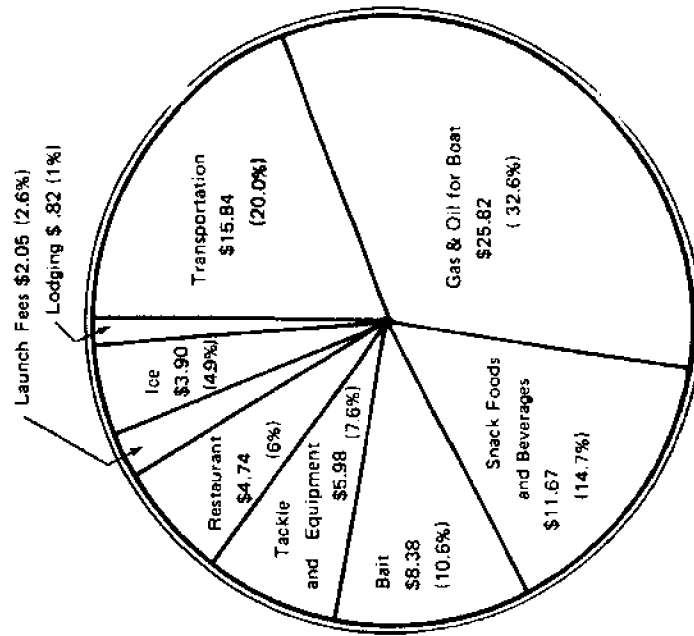
Table 9 illustrates spending patterns for each category of per-trip expenditures for bay and offshore fishermen. Because "trip" is an ambiguous time unit, expenditure measures were standardized on a per-day basis. The proportion of parties who purchased each item category was relatively consistent for bay and offshore fishermen. Almost all parties bought bait, snacks, and fuel for their boat, and most parties

also bought ice. A smaller number of bay and offshore fishing parties also made daily purchases of tackle and equipment, and paid launch or boat slip fees. Eating in restaurants typically was included in the expenditure records of only about one-fourth of the bay fishing parties and one-third of the offshore fishing parties. Very few of the respondents indicated expenditures for lodging, a finding that can probably be explained by the fact that all boaters sampled lived within a two-hour drive from the coast.

Figure 3 shows a breakdown of the party expenditures for a typical day of bay and offshore fishing. The amounts shown are artificial in the sense that they are averages based on all bay and offshore fishermen, rather than just those who incurred each expense category as in Table 9. The diagrams are useful because they indicate the distribution of expenditures for saltwater boat fishing among the various business sectors, and they indicate the average total expense for bay and offshore fishing trips. In addition, costs for transportation to and from the fishing site have been included in Figure 3. Transportation expense was estimated by multiplying round trip travel distance reported by respondents by \$.18 per mile, the personal mileage allowance used by the Texas A&M physical plant during the study period.

The average bay fishing party spent nearly \$50.00 per fishing day while the average offshore party spent nearly \$80.00. The most costly item for bay fishing parties was land transportation to and from the bay, which amounted to just over twelve dollars per trip. Gas and oil for boat use, at \$25.82 per party, or 1/3 the total cost, was the highest per-trip expense incurred by the average offshore fishing party.

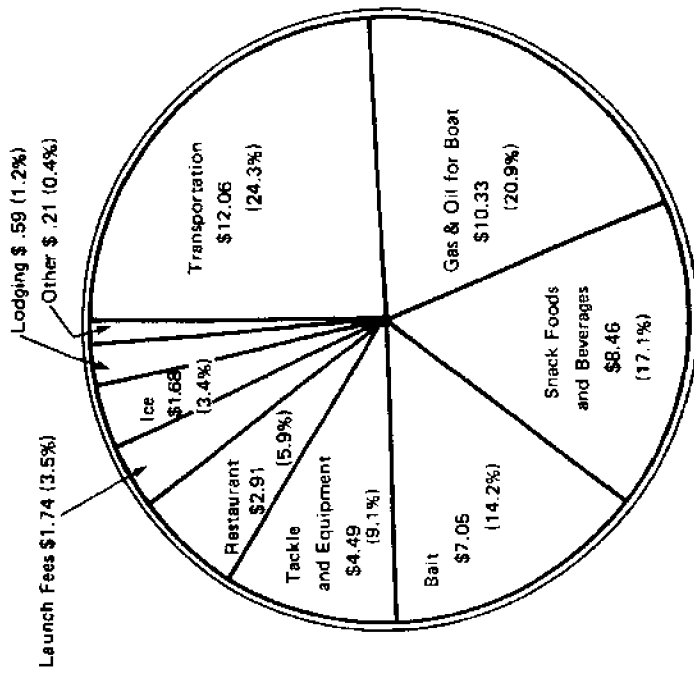
FIGURE 3: AVERAGE DAILY PARTY EXPENDITURES FOR SALTWATER BOAT FISHING TRIPS



TOTAL EXPENSE \$79.20

AVERAGE EXPENDITURES OF TYPICAL

OFFSHORE FISHING TRIP



TOTAL EXPENSE \$49.52

AVERAGE EXPENDITURES OF TYPICAL

BAY FISHING TRIP

Table 9: Daily Expenditure Patterns for Saltwater Boat Fishermen

Expenditure Category	Bay Fishing		Offshore Fishing	
	% of Parties Who Purchased Each Item	Average Expense by Parties Who Purchased Each Item*	% of Parties Who Purchased Each Item	Average Expense by Parties Who Purchased Each Item*
Bait	92	\$ 7.70	89	\$ 9.37
Ice	80	2.10	88	4.44
Snack Foods & Beverages	92	9.19	90	12.83
Restaurants	24	12.29	35	13.61
Tackle & Equipment	61	7.39	65	9.19
Gas & Oil For Boat	95	10.84	97	26.63
Launch Fees or Boat Slips	62	2.81	56	3.65
Lodging	3	17.19	5	18.00
Other	2	12.00	--	--

*Average category expenses are not additive because different numbers of parties purchased each category.

This can be expected because of the relatively long distances (averaging about 20 miles) traveled by offshore fishing boats (Ditton and Graefe, 1978). When combined, fuel for auto and boat use accounted for slightly over half (53%) of the party expenditures for a typical offshore fishing trip. Similarly, transportation and boat fuel costs amounted to 45%, or just under half, of the total expense for bay fishing parties.

The snack foods and beverages category was the next highest, with about eight dollars being spent by the average bay party and twelve dollars by the average offshore party. Bait and tackle, goods directly relating to fishing, accounted for only 23% and 18% of the total expenditures for bay and offshore parties, respectively. The low expenditure averages for restaurants and lodging reflect the fact that relatively few parties incurred expenses for these items (Table 9).

Although offshore fishing parties spent, on the average, nearly twice as much per day as bay fishing parties, their total spending on the whole was much less because they were fewer in number and they generally made fewer fishing trips. Bay fishing parties fished on average of 15.4 days during the year and offshore parties averaged 10.7 offshore fishing days. Table 10 shows the total yearly expenditures, by categories, for the population of bay and offshore fishermen. Values given in Table 10 are weighted averages which take into account variation in frequency of fishing and amounts spent per day, rather than being simply the result of multiplying average values for fishing frequency and amount spent.

All totaled, saltwater boat fishermen spent over 31 million dollars for their fishing trips in 1978. In summary, the highest categories were fuel-related transportation and boat costs, which combined, amounted to nearly half of all expenditures. Snack foods and beverages was the next highest expense category followed by bait and then tackle and equipment. Again, the small totals given for restaurant and lodging further demonstrate the low demand for these services by this regional fishing population.

Table 10: Total Expenditures, by Categories, for Bay & Offshore Fishing (In Thousands of Dollars)

Expenditure Category	Bay Fishing	Offshore Fishing	Total
Bait	3,925	472	4,397
Ice	927	220	1,147
Snack Foods & Beverages	4,531	703	5,234
Restaurants	1,076	425	1,501
Tackle & Equipment	2,367	395	2,762
Gas & Oil for Boat	5,586	1,676	7,262
Launch Fees or Boat Slips	934	125	1,059
Lodging	213	105	318
Other	136	0	136
Transportation	6,765	925	7,690
Totals:	26,460	5,046	31,506

Impacts to Local Areas

Benefits to bayshore and coastal communities are realized to the extent that these areas receive money from non-local fishermen. Expenditures by non-local residents result in import consumption of local goods and services. What is spent in bayshore and coastal communities by non-local residents becomes, in effect, new money to the local economies. Conversely, similar expenditures by local residents cannot be considered new money, as the money was likely previously spent in

other sectors of the local commerce.

Thus, we need to identify non-local fishermen and determine their spending contributions to the local bayshore and coastal communities. For the purposes of this study, bayshore and coastal communities were defined as those towns or cities located adjacent to the bay or gulf. All those not living in a town or city adjacent to the bay or gulf were considered non-local residents. In the sample, it was found that 81 percent of each category (bay and offshore fishermen) were not local residents, while 19 percent of each category did reside in local bayshore or coastal communities. Table 11 presents the yearly per-trip expenditures for saltwater boat fishing by local and non-local residents.

Because waterfront communities provided boat access to the bay and gulf, it was felt that they would be the most likely communities to receive on-site expenditures. Of course, not all the money spent by non-local fishermen was in local communities. Some was spent at home in preparation, some en route to the fishing destination, and some in a bayshore or coastal community. Table 12 shows location of expenditures for non-local bay and offshore fishermen.

These figures suggest that offshore fishermen are likely to spend a higher portion of their money (54%) in local communities than bay fishermen (45%). However, as a group, bay fishermen contributed nearly four times as much money to the local economies as offshore fishermen.

The expenditures most frequently made in local areas were for bait, ice, restaurants, lodging, and launch fees. Nearly half the gas and oil for boat use was purchased in local communities. No attempt was made to determine where fishermen purchased gasoline for their automobiles.

Table 11: Total Daily Expenditures for Saltwater Boat Fishing by Local and Non-local Residents (In Thousands of Dollars)

Expense Category	Bay Fishing		Offshore Fishing	
	Local Residents	Non-local Residents	Local Residents	Non-local Residents
Bait	549	3,376	36	436
Ice	132	795	26	194
Snack Foods & Beverages	686	3,845	134	569
Restaurants	175	901	30	395
Tackle & Equipment	414	1,953	51	344
Gas & Oil for Boat	1,011	4,575	190	1,486
Launch Fees or Boat Slips	87	847	25	100
Lodging	34	179	0	105
Other	14	122	0	0
Totals*	3,102	16,593	492	3,629

*Totals do not include costs for transportation because of the difficulty in determining where fishermen purchased fuel for their automobile.

Table 12: Location of Total Daily Expenditures for Saltwater Boat Fishing by Non-local Residents (In Thousands of Dollars)

Expense Category	Bay Fishing			Offshore Fishing		
	Bayshore Communities	At Home or En Route	Percent in Bayshore Communities	Coastal Communities	At Home or En Route	Percent in Coastal Communities
Bait	2,514	862	74	296	140	68
Ice	499	296	63	125	69	64
Snack Foods and Beverages	1,074	2,771	28	202	367	36
Restaurants	555	346	62	269	126	68
Tackle & Equipment	414	1,539	21	132	212	38
Gas & Oil for Boat	1,412	3,163	31	741	745	50
Launch Fees or Boat Slips	847	0	100	100	0	100
Lodging*	43	136	24	105	0	100
Other*	81	41	66	0	0	-
Totals	7,439	9,154		1,970	1,659	

*Results for "lodging" and "other" should be interpreted with caution because they are derived from the small number of respondents who reported expenditures for these categories (see Table 9).

Thus, totals given in Table 12 underestimate the total local expenditures to the extent that non-local residents bought gasoline for their vehicles in local communities. In addition, it should be remembered that these total expenses represent initial spending only, without accounting for respending effects.

It was not the goal of this study to determine how much money was spent in each of the many bayshore and coastal communities. Most boat-owners indicated they launched their boats at several different communities throughout the year. Consequently, such information would have required a detailed inventory of expenditures made during each fishing trip. This kind of inventory can be accomplished through on-site interviews, as it is too cumbersome for a mail-out questionnaire.

Fishermen were asked, however, to list their most frequent launch or destination sites. Galveston, San Leon, Texas City, Morgan Point, San Luis Pass, and Baytown were among the most popular bayshore locations listed as launch sites. Texas City, Galveston, and Freeport were the most frequently listed launch or destination sites for offshore fishermen.

Total Contributions to State and Regional Economies

Gross expenditures, by themselves, are not an adequate indicator of the total economic impact of recreational boat fishing. Actually, direct expenditures are respent by the recipients in other sectors of the economy for goods and services needed to maintain their businesses. Some of this money is paid to local suppliers of goods and services, while some will "leak out" of the immediate area to finance imports of

other goods and services. Some of the money remaining in the local area will again be respent; and likewise, a portion of this will go for locally provided goods and services and a portion will go for goods and services imported from other areas. This process will continue until all of the spending generated from the original expenditure is dissipated. Benefits to the local area, then, are derived from the sum of all spending for local goods and services (Devanney et al., 1976).

Such benefits can be analyzed by measuring the employment, income, tax revenues, or total output resulting from local spending (Research and Planning Consultants, 1978). In this study, recreational fishermen have been treated as a consumer group, and their direct economic importance has been assessed through their influence on gross sales or revenues to certain economic sectors (i.e., bait, tackle, food, etc.). Accordingly, their total economic impact can best be described by measuring the final output, or sales, resulting from the flows of expenditures between the many different economic sectors within the area.

An economic input/output model, which takes into account this flow of money, has been prepared for this region by the Office of the Governor (Division of Planning and Coordination, 1972; Research and Planning Consultants, 1978). This model provides a multiplier which can be applied to the original gross expenditure figures to estimate the total economic impact to the region and state. In essence, the multiplier measures the total change in the economy's sales resulting from a dollar change in sales for a given product or sector.

The value of the multiplier varies depending upon the economic

sector impacted by fishermen expenditures. Some sectors generate more intra-regional or state spending than others; thus they would entail a higher multiplier. Also, statewide multipliers have a larger value simply because it takes longer for money to leak out of the state than a region within the state. The multipliers derived for this particular study area are relatively large, however, because they reflect the influence of Houston. Being a strong commercial and industrial center, Houston has a relatively self-contained regional economy and as a result more money should remain longer in the study area.

Multipliers were chosen for the appropriate economic sectors and applied to total per-trip expenditures to assess the economic contribution made by saltwater boat fishermen during 1978. Tables 13 and 14 present a summary of boat fishermen expenditures and their estimated economic impact on the study region and the State of Texas as a whole. The total economic impact to the study region during 1978 was \$79,751,000. Economic activity throughout the entire state was increased by \$107,966,000. Bay fishermen contributed over four times as much as offshore fishermen to the state and regional economies. The major categories affected were fuel-related transportation and boat costs.

Table 13: Total Regional Economic Impact of Fishing Trip Expenditures (In Thousands of Dollars)

Expenditure Category	Type Fishing	Total Direct Spending ¹	X Multiplier ²	= Total Impact to Region
Bait	Bay	\$3,925	2.431	\$ 9,542
	Offshore	472		1,147
Ice	Bay	927	2.623	2,432
	Offshore	220		577
Snack Foods & Beverages	Bay	4,531	2.623	11,885
	Offshore	703		1,844
Restaurants	Bay	1,076	2.226	2,395
	Offshore	425		946
Tackle & Equipment	Bay	2,367	2.623	6,209
	Offshore	395		1,036
Gas & Oil for Boat	Bay	5,586	2.544	14,211
	Offshore	1,676		4,264
Launch Fees or Boat Slips	Bay	934	2.518	2,352
	Offshore	125		315
Lodging	Bay	213	2.176	463
	Offshore	105		228
Transportation	Bay	6,765	2.544	17,210
	Offshore	925		2,353
Other	Bay	136	2.518	342
	Offshore	-0-		-0-
TOTAL				\$79,751

¹From Table 10.

²Source: Division of Planning and Coordination, 1972.

Table 14: Total State Economic Impact of Fishing Trip Expenditures
(In Thousands of Dollars)

Expenditure Category	Type Fishing	Total Direct Spending ¹	X Multiplier ²	= Total Impact to State
Bait	Bay	\$3,925	3.298	\$12,945
	Offshore	472		1,557
Ice	Bay	927	3.592	3,330
	Offshore	220		790
Snack Foods & Beverages	Bay	4,531	3.592	16,275
	Offshore	703		2,525
Restaurants	Bay	1,076	3.307	3,558
	Offshore	425		1,405
Tackle & Equipment	Bay	2,367	3.298	7,806
	Offshore	395		1,303
Gas & Oil for Boat	Bay	5,586	3.425	19,132
	Offshore	1,676		5,740
Launch Fees or Boat Slip	Bay	934	3.597	3,360
	Offshore	125		450
Lodging	Bay	213	3.026	645
	Offshore	105		318
Transportation	Bay	6,765	3.425	23,170
	Offshore	925		3,168
Other	Bay	136	3.597	489
	Offshore	-0-		-0-
TOTAL				\$107,966

¹From Table 10

²Source: Division of Planning and Coordination, 1972.

CONCLUSIONS AND IMPLICATIONS

The purpose of this study was to measure expenditures by boat fishermen in the Houston-Galveston Region and analyze their impact to state, regional, and local economies. This impact can be used as an indicator of the benefits resulting from saltwater fishing.

Daily fishing expenditures were measured for both bay and offshore fishing. Offshore parties spend nearly twice as much per day on the average, but contribute about one-fifth as much as a group, because there were nearly ten times as many bay fishing trips taken during 1978. Altogether, saltwater boat fishermen spent \$31,493,000 during 620,118 fishing trips in 1978. Of this total, non-local fishermen spent \$9,490,000 in bayshore and coastal communities. Saltwater fishing expenditures resulted in a total economic impact of \$79,751,000 to the study area, or \$107,966,000 to the entire State of Texas. Because all of the boatowners sampled lived within the study area (by survey definition), this should not be misconstrued as export sales or new money to the region. Instead, this represents the total contributions in terms of final sales throughout all sectors of the regional and state economy, resulting from the initial spending for fishing-related goods and services by boat fishermen.

This study by no means presents the total economic influence of saltwater fishing in Texas. It focused on only one segment of the saltwater fishing population -- those who fished from boats. Undoubtedly, many more fished from the surf and piers, and surely their expenditures for fishing-related goods and services constitute important components in the local, regional, and state economies as well.

This study did not sample boatowners who resided outside of the Houston-Galveston study area. Hence, the contributions of non-resident fishermen and out-of-state tourists were not included. Although such fishermen probably do only a small portion of the total saltwater fishing in this area, as noted in the methods section of this report, they probably spend more on the average than resident fishermen, particularly in certain business sectors like restaurants and lodging.

This study also was limited to the extent that it only concerned one eight-county section of the coast. When the entire Texas coast is included, the total influence of recreational fishing expenditures will, of course, be much greater.

Several other factors need to be considered when assessing all the values and benefits associated with saltwater fishing. First, per-trip expenditures for fishing-related goods and services represent only a bare minimum of what fishermen would actually be willing to pay for the right to fish. Until now, this report only has considered fishing trip costs because these costs alone can be directly attributed to saltwater fishing in the study area. There are, however, many additional types of expenses fishermen make which could be attributed, in some degree, to saltwater boat fishing. The cost of the boat itself, for example, is a major expense boat fishermen incur periodically. This study found that about 31 percent of the boats in the region were used for saltwater fishing, and further that saltwater boat fishing accounted for about half of the use of these boats. These figures could be used to estimate a proportion of yearly boat sales attributable to bay and offshore boat fishing. Similarly, investments in other

supportive enterprises such as marinas and real estate developments should be recognized as an indirect benefit attributable, in part, to recreational fishing.

In addition to expenses incurred on each fishing trip, boatowners must make major cash outlays for equipment needed to fish bay and off-shore areas. Rods, reels, and various boat accessories are generally more expensive, durable items, which may last for several seasons before being replaced. Nevertheless, in any given year a significant number of fishermen can be expected to purchase new equipment. These purchases, too, become an important component in the state and regional economies.

Respondents in this study were asked to estimate how much they spent during 1978 for four categories of durable goods: rods, reels, tackle, and other equipment accessories. Findings relative to these purchases have been presented in the Appendix rather than the main body of the report because of the difficulties in attributing these expenditures directly to saltwater boat fishing. It is important to emphasize that the figures given in the Appendix include only what was spent by the boatowners themselves. Data was not collected for similar equipment expenditures by other members of the fishing parties. Thus, if all boat fishermen were included, the total contributions of boat fishermen to equipment sales would be considerably larger. On the other hand, there may be some concern as to whether all of the money spent for fishing equipment should be attributed to saltwater boat fishing. Actually, over half the boatowners indicated they also fished in saltwater from piers, and about two-thirds reported that they also fished in freshwater lakes and streams. Thus, it is reasonable to

assume that boatowners' fishing equipment would be used for all these types of fishing, and it follows that equipment expenditures recorded in 1978 could not be attributed solely to saltwater boat fishing.

In summary, the figures obtained for yearly expenditures on durable fishing goods underestimate the impact of recreational boat fishing in the sense that only boatowners are represented, while they overestimate the impact to the extent that the goods are used for other purposes besides saltwater fishing. It is nonetheless interesting that these expenditures totalled nearly \$7,000,000 during 1978, almost one-fourth of the total per-trip expenditures for the same year.

The results of this study pose some important implications relative to the relationship between saltwater boat fishing and the state of the economy in general. The fact that nearly half of the per-trip expenditures were for fuel-related transportation and boat expenses points to a heavy dependence on gasoline. Inasmuch as gasoline prices have risen dramatically during recent years, it appears this dependence may be growing even stronger. Whether or not rising gasoline costs price boatowners out of the recreational fishing market remains to be seen. Not only will this be of concern to the boatowners themselves, but also to the businesses which benefit from their expenditures; for if participation decreases, total spending should decline accordingly.

Up until now, this report has dealt only with the beneficial impacts of saltwater boat fishing. Actually, recreational fishing often creates impacts which are costly to local areas. Large numbers of fishermen can result in increased traffic congestion, excess wear and tear on roads and other facilities, and added demands on law enforcement and other

public services. This impact can be expected to be especially demanding on weekends and during summer months when boatowners reported they fished most heavily. Thus, it is important to consider these public costs along with the commercial benefits when analyzing the economic impact of recreational boat fishing.

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APPENDIX

Annual Expenditures for Durable Fishing Equipment

Boatowners were asked to estimate how much they spent during 1978 for rods, reels, tackle, and other equipment or accessories. Table 15 shows how much the average boatowner spent for equipment during 1978, by type of saltwater fishing practiced. Those who fished offshore exclusively, averaged the most for each category and totaled \$331 in average equipment expenses during the year. Boatowners who fished both the bays and offshore spent less, on the average, than those who fished only offshore but more than those who fished only in the bays.

Table 15: Average Annual Expenditures, by Type of Fishermen, for Major Equipment Items

Item	Bay Only	Bay & Offshore	Offshore Only
Reels	\$ 37.04	\$ 62.66	\$ 91.43
Rods	28.42	44.57	58.79
Tackle	31.60	44.00	54.64
Other Equipment or Accessories	73.65	87.64	126.15
Totals	\$170.71	\$238.87	\$331.01

The highest expense category for each type of fishing was "other equipment and accessories," which ranged from an average of \$73.65 for bay fishermen to \$126.15 for offshore fishermen.

Expenditure amounts varied widely among respondents for all categories, with many boatowners spending large sums and many spending

nothing. Some indicated values well into the thousands of dollars for "other equipment and accessories," which suggested they reported purchases of boats or motors. Such a wide range of expenditures reflects the fact that most equipment lasts for several fishing seasons. The wide variation found also might suggest that some respondents included expenditures for certain items which other respondents did not include, since "other equipment and accessories" is essentially an open-ended category.

Table 16 shows total expenditures, by type of fishing, for major equipment items during 1978. Just as with per-trip expenditures, bay fishermen spend much more as a group because many more boatowners fish in the bays than in offshore areas.

Table 16: Total Annual Expenditures, by Type of Fishermen, for Major Equipment Items (In Thousands of Dollars)

Item	Bay Only	Bay & Offshore	Offshore Only	Total
Reels	\$1,185	\$ 282	\$ 88	\$1,555
Rods	909	200	56	1,165
Tackle	1,011	198	52	1,261
Other Equipment or Accessories	2,356	394	121	2,871
Totals	\$5,461	\$1,074	\$317	\$6,852