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RECREATIONAL FISHING
Its Impact on State and Local Economies

Robert G. Hoffman and Hiroshi Yamauchi

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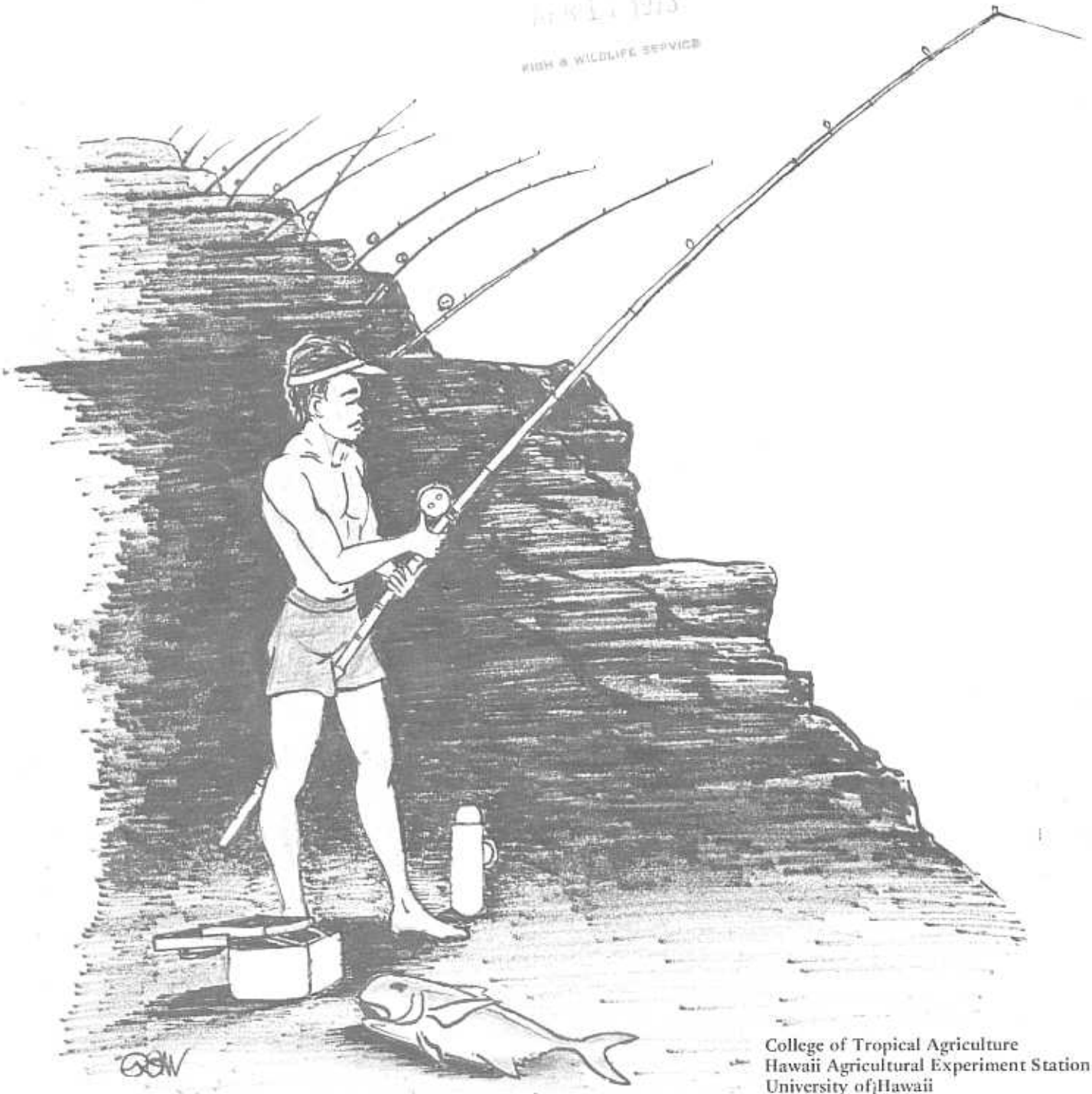

College of Tropical Agriculture
Hawaii Agricultural Experiment Station
University of Hawaii
Departmental Paper 3 — August 1972

ACKNOWLEDGEMENTS

The study upon which this report is based was made possible through the financial support of the Division of Fish and Game, Department of Land and Natural Resources, State of Hawaii. Some assistance in the form of support for student-help was also received through the Sea Grant Program of the University of Hawaii.

During the course of the study, many individuals contributed toward its completion. Professor Rufus B. Hughes, now with Robert R. Nathan Associates, Inc., provided the initial conceptual design for the study proposal. Professor Joseph T. Keeler was project leader during the major portion of the first Oahu survey phase. His assistant, Mrs. Francoise Rutherford, was indispensable in training, coordinating, and supervising the interviewers. They were largely responsible for carrying out the Oahu-wide telephone survey. Dr. Hani A. Afifi, now at the University of Libya, provided the technical input for processing the date for preliminary statistical analyses by computer and also assisted in the preparation of the first preliminary draft report for the Oahu phase.

For the Neighbor Islands phase of the project, the various Community College Provosts, Mitsugu Sumada, Philip K. Ige, and Harold G. Luntey ... on the Islands of Hawaii, Maui, and Kauai, respectively ... made it possible for us to find qualified supervisory personnel on each island. These principle supervisory personnel were Mrs. Andrea Ayers on Hawaii, Mrs. Marion Suda and Mrs. Elizabeth Maciolek on Maui, and Mrs. Jane Sasahara on Kauai. Without their able leadership in supervising the work of more than 40 field surveyors in total, the work on the Neighbor Islands could never have been successfully accomplished.

Dr. Richard M. Bullock and Mr. Edward T. Fukunaga of the University of Hawaii Agricultural Experiment Station made it possible for us to finalize the field work for the Kona area on the Island of Hawaii. Also, Mr. Roman Leverenz, student assistant, had the time-consuming and laborious job of compiling and checking out the survey data as they came in from the field. Mr. C.K. Law, graduate assistant, Department of Agricultural and Resource Economics, in the last stages of the study provided valuable insights in the evaluation and interpretation of the results. And finally to all the clerical staff who worked so diligently in the preparation of this report a very special kind of appreciation is also due.

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COVER

Weekends see favored fishing locations in Hawaii turn into "bamboo forests" as fishermen set their poles. The economic impact of fishing is measured in millions of dollars spent annually.

CONTENTS

LIST OF FIGURES....4

LIST OF TABLES....4

PRELIMINARY CONSIDERATIONS....5
Background of the Study....5
Objectives and Scope of the Study....7
SAMPLING AND SURVEY METHODS....8
Methods of Sample Selection....8
Oahu Survey....9
Neighbor Island Survey....10
Design of the Interview Form....10
Oahu Survey....11
Neighbor Island Survey....11
Summary....13
PARTICIPATION IN RECREATIONAL FISHING IN HAWAII....14
Estimation of Total Number of Recreational Fishermen....15
Socio-Economic Characteristics of Recreational Fishermen....16
Total Number and Distribution of Fishing Days....21
Preference Ordering of Fishing Areas....23
Summary....23
ECONOMIC IMPACT OF RECREATIONAL FISHERMEN EXPENDITURES....28
Expenditures by Recreational Fishermen in Hawaii....28
Economic Impact of Recreational Fishing in Hawaii....29
Method of Measuring Economic Impact....29
Economic Impact on the Local Economy....32
City and County of Honolulu....32
County of Hawaii....32
County of Maui....33
County of Kauai....34
State of Hawaii....34
Summary....35
IMPLICATIONS OF THIS STUDY....35

LIST OF FIGURES

1. Order of Saltwater Fishing Area "Preferences," City and County of Honolulu.....24
2. Order of Saltwater Fishing Area "Preferences," County of Hawaii.....25
3. Order of Saltwater Fishing Area "Preferences," County of Maui.....26
4. Order of Saltwater Fishing Area "Preferences," County of Kauai.....27

LIST OF TABLES

1. Statistical Population: Number of Resident Civilian and Military Households on Oahu, 1968.....9
2. Respondents and Nonrespondents of the Sample Survey for the Counties of Oahu, Hawaii, Maui, and Kauai.....12
3. Distribution of Recreational Fishermen Among Major Fishing Categories.....15
4. Distribution of Recreational Fishermen Among Household Relationships.....16
5. Distribution of Recreational Fishermen Among Age Groups.....17
6. Distribution of Recreational Fishermen Among Ethnic Groups.....17
7. Distribution of Recreational Fishermen by Educational Levels.....18
8. Distribution of Recreational Fishermen by Income Levels.....19
9. Distribution of Recreational Fishermen by Employment Categories.....20
10. Distribution of Fishing Days by Major Fishing Categories.....22
11. Distribution of Average Days Per Fishermen by Major Fishing Categories.....22
12. Fishermen Expenditures for Each County by Major Cost Categories.....28
13. Derivation of Cost Coefficients According to Expenditure Ratios for Various Types of Household Expenditures for 1960 (State of Hawaii).....31
14. Economic impact of recreational fishing expenditures on the local economy, 1968 (City and County of Honolulu).....32
15. Economic impact of recreational fishing expenditures on the local economy, 1970 (County of Hawaii).....33
16. Economic impact of recreational fishing expenditures on the local economy, 1970 (County of Maui).....33
17. Economic impact of recreational fishing expenditures on the local economy, 1970 (County of Kauai).....34
18. Economic impact of recreational fishing expenditures on the local economy, 1970 (State of Hawaii).....34

RECREATIONAL FISHING IN HAWAII AND ITS ECONOMIC IMPACT ON THE STATE AND LOCAL ECONOMIES

Robert G. Hoffman and Hiroshi Yamauchi

PRELIMINARY CONSIDERATIONS

Background of the Study

Recreational fishing is enjoyed by thousands of fishermen each year in Hawaii. From an economic standpoint this activity can also be measured in millions of dollars spent annually. Because of the increased number of fishermen and the limited accessibility to the sea, a great deal of concern for the problem was brought to public attention in recent years.

A lack of data on recreational fishing prompted the Hawaii State Division of Fish and Game to conduct inshore surveys of recreational fishing activities during the period between July 1958 and June 1961. Instantaneous counts of fishermen and their gear were made with the aid of aircraft and boats along the coastal areas. The fishermen were categorized according to the types of fishing and the kinds of gear that they used. During the 3-year period, it was estimated that 550,000 sport fishing trips were made to Oahu's coastline yearly. The weekly counts of fishermen were carried out along the shoreline in each quarter of the year. Approximately 9,000 fishermen were sighted, of which 32 percent were counted on Sundays, 28 percent on Saturdays, and from Mondays through Fridays, each day's count ranged from 6 to 9 percent of the week's total. It was estimated that 4,215,523 fishing hours were expended by the fishermen.1/

Among the recommendations that were made in the earlier reports by the State Division of Fish and Game, it was pointed out that the economic value of inshore sport fishing should be determined in future surveys. However, since no adequate statistical procedure was available for this purpose, the recommendation was never carried out although, it was repeatedly stressed in later reports that, "...the possibility of determining the economic value of local inshore sport fishing should be investigated."2/

1/ Statistical data were obtained from the Survey of Fishermen and Creel Census, Division of Fish and Game, Department of Land and Natural Resources, State of Hawaii, Project Report Numbers F-5-R-7, F-5-R-8, F-5-R-9, July 1, 1958 through June 30, 1961.

2/ Survey of Fishermen and Creel Census, Division of Fish and Game, Department of Land and Natural Resources, State of Hawaii, Project Report Number F-5-R-7, October 31, 1960.

The survey was discontinued after June 1961 because of a serious shortage of manpower. However, it was the intention of the State Division of Fish and Game to resume the survey and extend it to the Counties of Hawaii, Maui, and Kauai as soon as sufficient personnel were made available.

In 1966, the State Division of Fish and Game directed its efforts at monitoring the activities of certain organized groups, such as shoreline and boat-fishing clubs. Questionnaires were prepared so that fishermen could report the results of their fishing trips. One survey form was designed for the use of inshore fishermen and another for the use of offshore fishermen. It was later recommended that the activities of sport fishermen be monitored through the use of log-book type questionnaires. By this method, information concerning species, compostition of catch, and the variation of fishing success between localities, islands, and seasons could be compared. However, before the project got under way, unforeseen circumstances altered the course of action.

A Marine Resources Advisory Panel was formed around 1967 as part of the Governor's Advisory Committee on Science and Technology to assess the economic potential of the marine resources of the State. The first report of the Panel dealt with both the commericial and recreational resources of the sea. The report pointed out its concern that "...a comparable statistical data-gathering system," such as was employed in commericial fishing, was not available for sport fishing.3/ The report further suggested that "...the assessment of economic and recreational significance of Hawaii's sport fishing would probably entail the implementation of a statewide survey or census."4/ In conclusion, the report added that:

> Information such as number, age, sex of sport fishermen and the expenditures they make ... is not only desirable but essential for planning purposes. The findings of the survey will determine to a great extent how much emphasis to place on the development and management of our marine sport fishery resource and what alternative approaches to pursue in order to achieve our resource development and management objectives.5/

The report by the Marine Resources Advisory Panel to the Governor occasioned a Resolution by the Senate during the Fourth Legislature of the State of Hawaii, Budget Session of 1968. The Senate Resolution stressed that since "...little factual information exists on the economic impact of sport fishing upon the State, it shall be resolved that the Division of Fish and Game, Department of Land and Natural Resources, State of Hawaii, determine what economic studies would be required for evaluating the sport potential of the State."6/

Besides the above criteria, the Senate Resolution also stressed that "Whereas, population growth and the explosion growth of tourism in the next few years will

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3/ Governor's Advisory Committee, Science and Technology, First Report of the Marine Resources Advisory Panel, State of Hawaii, 1967.

4/ Ibid.

5/ Ibid.

6/ Senate Resolution 78, Fourth Legislature of the State of Hawaii, Budget Session, 1968.

put even greater pressures on the recreational resources of the State, including ocean and freshwater game fishing; and, whereas, planning for the best utilization of sport fishing resources requires estimates of their contribution to the economy of the State," that a study on recreational fishing in Hawaii not only be found most useful, but also of necessity.7/

As a result of the Senate Resolution, meetings were held with representatives of the University of Hawaii to discuss the procedures for a recreational fishing survey. The methods and techniques to be applied in the study were left to the discretion of the University. A memorandum of agreement was put into effect on December 23, 1968, between the University of Hawaii and the State Department of Land and Natural Resources. Under the terms of agreement, the Hawaii Agricultural Experiment Station of the University of Hawaii was to obtain for the State Department of Land and Natural Resources adequate information that would make it possible to estimate the economic impact of recreational fishing in Hawaii.

Objectives and Scope of the Study

The primary purpose of the study herein described was to reduce the information gap concerning the socio-economic aspects of recreational fishing in response to the needs expressed in the previous section. The original objectives of the study also included projections of the future demand for recreational fishing. However, since no previous studies had been carried out in Hawaii in detail, the necessary trend for such an analysis could not be adequately established. Attempts were made to apply secondary data to certain parameters by means of econometric functions. The estimates for these functions were of poor quality and, therefore, not expanded upon. However, for future demand analysis the information found in the present study should prove to be most useful.

1. Objectives of the study

   a. To estimate the participation in the various kinds of recreational fishing activities.

   b. To estimate the expenditures of recreational fishermen.

   c. To estimate the economic impact of recreational fishing on the State of Hawaii.

2. Scope of the study

   a. Estimation of the participation in the various kinds of recreational fishing activities.

      The participation in recreational fishing activities is treated and analyzed in several different ways. The method of examining these activities is classified according to saltwater fishing, freshwater fishing, and fishing in unspecified areas. The total numbers and

7/ Ibid.

percentages of fishermen are given for each of the four counties and, finally, for the State of Hawaii. Fishermen are identified according to certain socio-economic characteristics, which are grouped according to the categories of household relationship, age, ethnic background, education, income, and occupation. These categories are summarized in table form accompanied by brief discussions.

The estimations of the total number of fisherman days and of the average fishing days per fisherman are also considered for each of the four counties and the State of Hawaii. The fishing days are examined according to the specified major fishing categories of saltwater, freshwater, and fishing in unspecified areas. Fishermen's preferences for specified fishing areas are also designated as a final discussion on the participation in recreational fishing.

b. Estimation of the expenditures of recreational fishermen.

Recreational fishing in Hawaii may be also analyzed by the amount of expenditures fishermen incur. Three basic categories are considered, namely, (1) transportation costs, (2) food and other additional on-site costs, and (3) equipment costs such as rods, reels, line, lures, bait, etc. The cost data are presented and compared for each of the counties and the State as a whole.

c. Estimation of the economic impact of recreational fishing expenditures on the State of Hawaii.

A local income multiplier model is used to estimate the economic impact of recreational fishing expenditures on the State economy. The model, similar in principle to the Keynesian national income multiplier, takes into account both the direct and indirect income effects of fishermen expenditures and also corrects for import leakages in the first and subsequent rounds of expenditures.

SAMPLING AND SURVEY METHODS

Methods of Sample Selection

Two different survey techniques were used in collecting the data for this study. On Oahu, the survey was carried out by telephone interviews. However, for various reasons including some built-in biases[8/] in the telephone survey and the need to find a more efficient technique for obtaining the necessary data, it was decided to carry out a house-to-house survey on the Neighbor Islands.

8/ The telephone survey excluded some non-telephoned households and also did not have the benefit of a direct face-to-face interview.

Oahu Survey

The statistical population of the Oahu survey was constructed in terms of resident and military households with telephones listed in Honolulu and special military directories. To the extent that military households are scattered throughout the civilian population and their telephones are listed in the Honolulu telephone directory, these military households were, for sampling purposes, treated in the same manner as resident civilian households.

A provisional estimate of the total resident population of Oahu as of July 1, 1968 was reported by the Hawaii State Department of Planning and Economic Development at 633,200 persons. This population, which included roughly 53,000 de facto military persons, was scattered throughout Oahu in 164,329 households with an average of 3.85 persons per household. Out of the total number of households, 77.4 percent, or 127,143, were listed in the Honolulu telephone directory. The remaining 37,186 (22.6 percent) were households with either unlisted telephones or no telephones at all. The figure (127,143), which was corrected for double listing, represents the major component of the statistical population of Oahu. A minor component was the households on military bases.

The best estimate from military sources was that approximately 7,000 military households were located on military bases and had their telephones listed only in the military directory. For practical purposes, no military base household was considered to be without a listed telephone. The 7,000 when added to the previous 127,143 City and County households, increased the total listed telephone households to 134,143 households. Table 1 presents a summary of the statistical population of Oahu from which random samples for the telephone interviews were drawn.

Table 1. Statistical population: number of resident civilian and military households on Oahu, 1968

Category	Population	Percent of population
Total resident population on Oahu	633,200[a/]	
Total households on Oahu	171,329	(100.0)
Households without telephone or with unlisted telephone	37,186	(21.7)
Households with telephones listed in the Honolulu telephone directory	127,143[b/]	(74.2)
Households with telephones listed in the military telephone directory	7,000	(4.1)
Total statistical population	134,143	(78.3)

a/ Provisional estimate of Hawaii State Department of Planning and Economic Development for July 1, 1968 (includes roughly 53,000 de facto military population).

b/ Corrected for households with double listed telephones.

Neighbor Islands Survey

The design of the recreational fishing survey for the Neighbor Islands study was redirected towards house-to-house interviewing. A sample of approximately 1,600 households, consisting of 107 clusters of 15 dwelling units each, was chosen for the Neighbor Islands survey. This was expected to yield a sample size of approximately 1,200 occupied units. The sample design was constructed in three stages. The first stage was the selection of 94 out of a total of 164 Census Enumeration Districts (EDs) from the Neighbor Islands. The 94 EDs are known as the Primary Sampling Units (PSUs). Thirty-five PSUs were selected for the County of Hawaii; 33 PSUs for the County of Maui; and 26 PSUs for the County of Kauai.

The EDs were selected proportionately to the 1970 Census counts. In this way, the EDs with the largest number of dwelling units have a better chance of having been included than EDs with a smaller number of dwelling units. Since clusters of 15 dwelling units were to be selected, each ED was given a value equal to the number of dwelling units divided by 15. This value was called a measure. The measures were cumulated for all EDs and the sample of EDs were selected systematically at the rate of one in 35 measures for Hawaii County, one in 25 measures for Maui County, and one in 16 measures for Kauai County. EDs with more than the specified number of measures had a chance of being included more than once.

The second stage of sampling was the selection of a smaller area within the ED. Each ED was subdivided into areas of approximately 15 dwelling units (DUs) each. These areas were called segments. In practice, these segments varied from zero to over 100, although the average of all segments was very close to 15. The variation was due to the changes in locations of dwelling units and also new construction subsequent to the date of the source materials.

Three data sources were used in segmenting the EDs into areas of approximately 15 DUs in the Neighbor Islands. For the EDs located in Hilo, Lahaina, and Wailuku, the primary source was the 1960 Census block counts. These were used for all EDs in which the 1960 ED counts were within plus or minus 25 percent of the 1970 Census counts. When the 1960 counts varied by more than 25 percent from the 1970 counts, the segments were divided on counts from tax maps. The segmenting of the other EDs on the Neighbor Islands was taken from counts on the geological survey maps. In a few cases where these were not adequate, tax maps were again used.

The next step in the process was to list all the dwelling units within the area of the selected segments. Folders were prepared for each segment. The folder consisted of a map showing the boundaries of the area to be listed and listing sheets were used for writing down the addresses or other physical characteristics of identification of the dwelling units. Only after the DU have been identified for all of the 110 segments did the survey get underway.

Design of the Interview Form

Data used in the study on recreational fishing in Hawaii were obtained through an interview form. A revised form was prepared for the Neighbor

Islands phase, consisting of three parts. Part A was directed toward both fishermen and nonfishermen in the survey. Information regarding the sizes of the households, outdoor recreational activities, and the socio-economic characteristics of the heads of the households was gathered. Since there was no existing record of the number of fishermen in the State, it was necessary to design the interview form so that information on the nonfishermen as well as fishermen could be obtained. The proportion of fishermen to nonfishermen could then be easily estimated. Under the assumption that the heads of the households accounted for the greatest number of fishermen, the form was designed specifically to compare the recreational preferences and socio-economic characteristics of these two groups.

Part B of the survey form was specifically designed to obtain information on the expenditures that fisherman households incurred for recreational fishing. Three broad categories on equipment costs, food and other additional on-site costs, and transportation costs were broken down in detail so that the respondent could more easily recall the cost items. Requests for other information regarding boat ownership costs, hiring and renting boat costs, and boating and fishing club membership fees were also included among the questions. A final question was designed for use in estimating distances traveled to and from fishing locations where fishermen go fishing most often. In some instances, second and third preferences were also obtained.

Part C was directed toward each individual fisherman in the households who was 12 years old or older. On this form, specific information regarding the relationship of the fishermen in the household was noted. Likewise, the types of fishing that fishermen participated in for recreation were recorded. Each category was broken down into further detail and the number of days was indicated. The ages of the fishermen, ethnic origins, schooling, occupation, and incomes were filled in for later tabulation.

A summary of respondents and nonrespondents of the sampling survey for the entire state is presented in Table 2.

Oahu Survey

A sample of 6,400 households was drawn at random for the survey on recreational fishing on Oahu. From the selected households, 3,996 responded to the questionnaires, indicating a 62.4 percent positive response rate. Of those who responded, 30.6 percent identified themselves as fisherman households and 69.4 percent as non-fisherman households. The number of sample fishermen in the fisherman households was 1,928. Various reasons were given for not responding to the interviews, such as direct refusals, noncontacts, disconnected telephones, incomplete interviews, and other reasons not mentioned.

Neighbor Islands Survey

The sample size for the Counties of Hawaii, Maui, and Kauai was determined at approximately 550 households each. The final counts varied for the counties

Table 2. Respondents and nonrespondents of the sample survey for the Counties of Oahu, Hawaii, Maui, and Kauai

Type of survey	County	Respondents				Nonrespondents					
		Sample fishermen household	Sample non-fishermen household	Sample* number of fishermen	Total sample household	Direct refusal	Non-contacts	Dis-connected telephone	Incomplete interviews	Other reasons	Total
Telephone	Oahu	1,223	2,773	1,928	3,996 (62.4%)	379	813	556	183	473	2,404
						Refusal	Not home after 3 calls	Vacant house	Language barrier	Other reasons	
House-to-house	Hawaii	190	243	313	433 (73.1%)	22	74	18	11	35	160
	Maui	220	191	317	411 (73.5%)	29	46	42	10	21	148
	Kauai	214	219	384	433 (73.0%)	42	55	35	4	26	162
	Total	1,847	3,426	2,942	5,273 (64.7%)	--	--	--	--	--	2,874

*This figure represents fishermen who are 12 years old and above.

because of the errors involved in the area sample method. However, all the sample households that were later identified within the selected areas were included in the sample.

In the County of Hawaii, 593 sample households were included in the survey. Out of these, 433 households responded, giving a 73.1 percent positive response rate. Of the households that responded, 43.4 percent identified themselves as fisherman households, and 56.6 percent as nonfisherman households. Three hundred and thirteen fishermen resided in the fisherman households. The reasons that were given for not responding in Hawaii County were direct refusals, no one at home after three calls, vacant houses, language difficulties, and other reasons than those already mentioned.

The number of sample households selected for Maui County (including the islands of Maui, Molokai, and Lanai) came to 559. From the 559 households, 411 households responded positively. The positive response rate for Maui County was 73.5 percent. Of the respondents, 53.5 percent were fisherman households and 46.5 percent were nonfisherman households, indicating a slightly higher proportion of fisherman households to nonfisherman households. However, the number of fishermen in the fisherman households was only 317, nearly the same number as in the County of Hawaii. The reasons for those who did not respond were the same as those for Hawaii.

Five hundred and ninety-five sample households were chosen for Kauai County. From the sample households in the survey, 433 households, the same as identified for the County of Hawaii, represented the usable package. The remaining 162 households were not interviewed, for the same reasons as those given above for Hawaii and Maui Counties. The positive response rate for Kauai was 73.0 percent. The fisherman households tallied at 214 households, 47.1 percent; whereas, the nonfisherman households accounted for 219 households, 52.9 percent.

The total number of the sample households that was randomly selected for the whole State of Hawaii was 8,147 households. Five thousand two hundred and seventy-three households (64.7 percent) did not answer these questions for the various reasons as indicated in the summary tally. The number of fishermen who responded in the survey was 2,942. It should be pointed out that a high degree of uniformity in response rate was prevalent in the Neighbor Islands survey.

The figures given above reflect only the actual returns of the survey. In order to adjust the various units in the sample to their rightful proportions, it was necessary to weight these units in improving the estimates in the study. Hence, these returns cannot be applied directly to any estimates unless properly weighted.

Summary

Random samples of households in each of the four counties in the State were selected and the household members were interviewed with respect to their participation in various types of fishing. Socio-economic data were also collected in the course of the interviews to discover more about fishermen and to evaluate

the economic impact of their aggregate fishing activities on the State and local economies.

The field surveys were conducted in two separate phases, one for Oahu, covering a year's period within 1968 and 1969, and the other for the three Neighbor Island counties, covering a year's period during 1970 and 1971. Experience gained from the first Oahu phase served to modify and improve on the conduct of the survey for the other counties, although essentially the same type of data was collected throughout the State.

The sampling technique employed in the Oahu phase was carried out by telephone interviews. Although a large number of samples was collected, the problem of not including unlisted and non-telephone users resulted in some degree of biasness on the estimates. In improving the statistical data for the Neighbor Islands survey, a house-to-house survey based on area-sampling techniques was used. The change in the sampling procedure also offered keener insight into the problems of the sampling districts.

Out of 6,400 interviews from the City and County of Honolulu, 62.4 percent responded positively. The percentage of response for the Neighbor Islands survey was 73.1 percent for the County of Hawaii, 73.5 percent for the County of Maui, and 73.0 percent for the County of Kauai. The percentage of interview response for the entire State was 64.7 percent.

PARTICIPATION IN RECREATIONAL FISHING IN HAWAII

The concept of "participation" needs clarification, since it is possible to attach various meanings to this seemingly simple term. One interpretation is to consider only the number of individuals in the population who claim to have gone fishing without a license at least once over a given one-year period. Further, only persons 12 years and above may be counted thereby conforming to the practice of the Federal Bureau of Sport Fisheries. Fishermen can be identified according to their various socio-economic characteristics, such as household relationship (and thereby sex), age, ethnic origin, education, occupation, and income, etc. Their participation may be linked to the various types of fishing activities they engage in and the various areas in which they go fishing. Furthermore, their participation in terms of both activities and areas may be weighted according to how frequently they go fishing. This frequency aspect may be expressed in terms of hours, days, trips, or some other convenient unit of measurement. The present study considers these various aspects of participation in recreational fishing, but does not go further into specifying types of gear used and numbers of fish species caught. The latter two types of information are necessary for developing effort-catch statistics necessary for intelligent fishery management decisions. Nevertheless, the various types of participation information developed in the present study should still go a long way toward eventually developing these much needed data.

Estimation of the Total Number of Recreational Fishermen (Table 3)

The estimated total number of recreational fishermen, 12 years old and above, in the State of Hawaii was 122,400. Approximately three-fourths (92,500) of these fishermen were from the City and County of Honolulu. The counties of Hawaii (12,300), Maui (10,600), and Kauai (7,000) then followed at the participation levels indicated. In each of these counties, fishermen participated in all the major categories of saltwater fishing, freshwater fishing, and fishing in unspecified areas. For the City and County of Honolulu only, these categories also included fishermen who went to the Neighbor Islands to fish. As to be expected in all the counties, saltwater fishing predominated. On Kauai, however, approximately 10 percent of the fishermen population were freshwater fishermen, whereas in the other counties, freshwater fishing varied from only 0.5 percent to 3 percent. Within the saltwater fishing category, the largest number of fishermen were shoreline fishermen (68.1 percent), then came boat fishermen (12.1 percent), and finally divers (10.2 percent).

Table 3. Distribution of recreational fishermen among major fishing categories

Fishing categories	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
Saltwater fishing					
From boat	13.0	8.5	12.1	5.8	12.1
From shoreline	66.1[a/]	82.6	65.9	72.2	68.1
While diving	10.0[a/]	6.7	16.5	10.3	10.2
Subtotal	89.1	97.8	94.5	88.3	90.4
Freshwater fishing	2.7	1.3	0.4	9.4	2.7
Unspecified[b/]	8.2	0.9	5.1	2.3	6.9
Number of fishermen	92,500	12,300	10,600	7,000	122,400

a/ Derived from weighted average of the other three counties.
b/ For City and County of Honolulu only, "unspecified" category includes going to Neighbor Islands to fish.

Socio-Economic Characteristics of Recreational Fishermen (Tables 4 to 9)

A fairly consistent pattern predominated with regard to household relationship among all the island counties. More than half of the members were male heads of households. Sons (approximately 20 percent) followed in fishing participation; then wives (approximately 16 percent) and daughters and others (approximately 6.7 percent and 6.1 percent, respectively).

Table 4. Distribution of recreational fishermen among household relationships

Household relationships	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
Head of household	50.2	52.5	55.9	49.2	50.9
Wife	15.5	19.7	14.7	18.8	16.1
Son	21.5	16.2	15.0	18.3	20.2
Daughter	7.1	3.8	6.9	6.5	6.7
Others	5.6	7.7	7.5	7.2	6.1
Number of fishermen	92,500	12,300	10,600	7,000	122,400

Only fishermen who were twelve years and older were considered in the study on recreational fishing. The distribution of fishermen ages is definitely skewed toward the younger age levels. The largest age group was made up of teenagers from 12 to 18 years of age (approximately 19 percent). For the State as a whole, the average age of fishermen is about 30 years old.

The distribution of fishermen by ethnic groups indicated that both Japanese and Caucasians predominated (together approximately 60 percent). Hawaiians, Part-Hawaiians, Filipinos, Chinese, mixed, and others characterized the remaining ethnic variations in the State. As a percentage of total individuals within each ethnic group, the pattern may be expected to differ considerably.

Fishermen were categorized according to the highest level of education attained. The educational composition of fishermen according to this criterion ranged from less than 8th grade to college level and above. Most of the fishermen belonged to the category of having a high school level of education (approximately 46 percent). Also significant was the fact that in all the island counties, 20

Table 5. Distribution of recreational fishermen among age groups

Age group	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
12 - 18 years	19.9	13.5	17.6	17.4	18.9
19 - 25 years	15.7	14.8	13.2	13.5	15.3
26 - 32 years	16.7	19.6	10.1	12.4	16.2
33 - 39 years	15.0	12.6	12.2	12.5	14.4
40 - 46 years	14.9	12.2	15.1	15.7	14.7
47 - 53 years	9.5	13.7	12.9	14.5	10.5
54 - 60 years	5.5	6.5	7.2	8.3	5.9
61 - 67 years	2.2	3.8	8.2	3.9	3.0
68 years and over	0.5	3.2	2.5	1.8	1.0
Number of fishermen	92,500	12,300	10,600	7,000	122,400

Table 6. Distribution of recreational fishermen among ethnic groups

Ethnic group	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
Chinese	6.6	0.6	3.0	0.8	5.4
Filipino	7.1	10.0	15.5	31.6	9.5
Japanese	37.6	38.1	36.5	27.5	37.0
Caucasian	25.5	17.2	9.9	9.8	22.4
Portuguese	1.7	6.9	5.1	7.4	2.8
Hawaiian	1.6	5.4	6.9	7.5	2.8
Part-Hawaiian	10.4	12.3	15.0	12.3	11.1
Mixed	3.3	7.0	6.7	1.8	3.9
Other	6.3	1.6	1.3	1.3	5.1
Number of fishermen	92,500	12,300	10,600	7,000	122,400

Table 7. Distribution of recreational fishermen by educational levels

Educational level	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
College	15.0	11.1	11.0	8.5	13.9
Some college	21.8	11.3	10.5	7.0	18.8
Trade school	1.0	5.5	3.8	6.7	2.0
Business school	0.4	3.7	0.9	2.0	0.9
High school	46.0	48.5	42.0	46.9	46.0
8th grade or less	15.8	20.0	31.7	28.8	18.4
Number of fishermen	92,500	12,300	10,600	7,000	122,400

percent were fishermen with an 8th grade education or less. One-third of the fishermen had completed college or had at least some college education. Very few fishermen reported that they had finished trade or business schools.

Fishermen were asked to report their per capita income levels in categories of $2,000 intervals ranging from $2,000 and less to $18,000 and above. Only a very small number of fishermen indicated that they had an income of $18,000 or more. In the case of Honolulu, income ranges were slightly different ($12,000-$14,999 being 3.8 percent and $15,000 and above being 7.2 percent). Some respondents on Oahu refused to give their income (13.7 percent). In the case of the Neighbor Islands, however, the respondents' refusal rate was reduced to a low degree because of the surveying technique used. Very significant differences existed in the income categories between the City and County of Honolulu and the Neighbor Islands. Income distributions were definitely skewed toward the lower income levels (under $2,000-$6,000). The skewness is particularly pronounced for the Counties of Hawaii and Maui, and to a lesser degree for the Counties of Honolulu and Kauai. On the Island of Oahu, there is a small but significant number of fishermen having incomes $15,000 and above, which is probably explained by the fact that there are more deepsea fishermen at higher income levels in Honolulu.

Recreational fishermen throughout the State consist of individuals representing all sectors of communities, among which are business sectors; federal, state, and local government sectors; students; housewives; retired persons; and others. Predominant among these sectors are students and government employees (federal, state, and local), both categories each representing more than one out of five fishermen in the State.

Table 8. Distribution of recreational fishermen by income levels

Annual per capita income ($)	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
Under $ 2,000	7.0	26.3	26.5	10.7	10.8
2,000 - 3,999	17.7	20.2	20.8	15.6	18.1
4,000 - 5,999	22.7	13.1	18.3	36.8	22.2
6,000 - 7,999	8.9	15.7	15.9	18.5	10.8
8,000 - 9,999	13.2	10.6	10.1	10.7	12.5
10,000 - 11,999	5.7	7.4	2.9	3.9	5.5
12,000 - 13,999	3.8[a/]	3.8	4.1	1.5	
14,000 - 15,999	7.2[b/]	1.6	0.3	1.6	9.7
16,000 - up		1.3	1.0	1.8	
No answer	13.7	--	--	--	10.4
Number of fishermen	92,500	12,300	10,600	7,000	122,400

a/ $12,000 - $14,999
b/ $15,000 - up

Table 9. Distribution of recreational fishermen by employment categories

Employment category	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
State and County Government	8.75	10.55	10.90	10.17	9.2
Federal Government	16.57	1.96	2.26	3.63	13.1
Sugar	0.35	8.56	7.06	19.80	2.9
Pineapple	1.02	0	13.22	0.77	2.0
Agriculture	0.05	4.92	1.27	1.72	0.7
Hotel and tourist	0.95	8.21	5.42	8.64	2.5
Construction	7.42	13.82	6.98	4.71	7.9
Retail & wholesale	15.69	5.92	4.18	4.69	13.1
Manufacturing	0.46	0	1.62	1.02	0.5
Finance, insurance, & real estate	2.37	2.62	0.97	0.51	2.2
Transportation & communication	4.70	2.62	2.57	4.99	4.3
Self-employed	3.83	1.63	2.65	1.55	3.4
Housewife	7.69	11.84	10.32	10.41	8.5
Student	22.93	17.44	22.71	20.63	22.2
Retired	2.38	4.59	6.17	3.64	3.0
Others	4.83	5.25	1.62	3.07	4.5
Number of fishermen	92,500	12,300	10,600	7,000	122,400

Total Number and Distribution of Fishing Days

The number of total fishing days in the State of Hawaii is estimated to be in excess of 4.3 million days, two-thirds of which were accounted for by fishermen from the City and County of Honolulu. The rest of the fishing days were distributed at approximately 10 percent in each of the Neighbor Islands. For all the counties, most of the fishing days were credited to saltwater fishing (approximately 90 percent), with only 2 percent to freshwater fishing and 7.4 percent to fishermen who fished in unspecified areas. (Table 10)

The annual average number of fishing days per fisherman in the State of Hawaii is calculated at 35.8 days. The lowest average (32.0 days) was expended by fishermen in the City and County of Honolulu, with the County of Hawaii (32.9 days), the County of Maui (51.7 days), and the County of Kauai (66.1 days) following in that order. The average number of fishing days spent in saltwater was 33.4 days; in freshwater, 24.8 days; and fishing in unspecified areas, 38.5 days. Although the number of freshwater fishermen was highest for the County of Kauai, the average number of fishing days in the County of Maui (23.8 days) exceeded by far those days spent by fishermen in the County of Kauai (13.7 days). The reason for this variation may be due to the fact that fishermen on Kauai have easier access to both freshwater and saltwater fishing, whereas fishermen on Maui must travel greater distances between the two fishing areas. (Table 11)

Information derived from the estimates on fishermen days for the various fishing activities in different areas is extremely useful in the public management sector of recreational fishing. Although attempts were made to derive this information both in the telephone and house-to-house surveys, it was difficult under the given time constraint to represent accurately the estimates of fishermen days by fishing areas and activities. Some of the major practical problems that were confronted in accomplishing this objective were as follows:

1. A large number of fishermen participated in multiple activities in various areas at different times and even on the same day. For instance, many fishermen indicated that, while they were surfcasting, they may have also engaged in spinfishing or netting or scuba diving. Other fishermen indicated that they sought out better fishing areas to increase their catch. For statistical purposes, it is extremely difficult to measure accurately fishermen's efforts by a definite unit such as "fishing days," since fishermen in practice may vary their fishing activities in one location or travel from area to area on the same day.

2. Fishermen's recall was another problem that arose in accurately estimating fishermen days. Fishermen were able to indicate where they fished most often, but found it difficult to recall with any degree of confidence the number of days they went fishing in that area. Fishermen were able to recall the approximate number of fishing days over a definite but limited span of time. However, they found it more difficult to relate it to specific fishing activities, since many fishermen participated in a wide range of fishing activities.

3. Even for fishermen who may have had better recall, some indicated that they were reluctant to point out their favorite fishing areas for fear of revealing their preferencs to other fishermen.

Table 10. Distribution of fishing days by major fishing categories

Fishing categories	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
Saltwater fishing	87.6	99.1	97.2	95.2	90.7
Freshwater fishing	2.4	0.2	0.2	1.9	1.9
Unspecified[a/]	10.0	0.9	2.6	2.6	7.4
No. of fishermen days	2,961,000 (67.6%)	405,000 (9.3%)	548,000 (12.5%)	462,700 (10.6%)	4,376,700 (100%)

a/ For the City and County of Honolulu only, "unspecified" category includes going to Neighbor Islands to fish.

Table 11. Distribution of average days per fishermen by major fishing categories

Fishing categories	Percentage distribution for each county and in the state				
	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
Average number of fishing days	32.0	32.9	51.7	66.1	35.8
Saltwater fishing	31.5	33.3	53.2	71.3	33.4
Freshwater fishing	25.6	6.3	23.8	13.7	24.8
Unspecified[a/]	40.0	27.0	25.9	74.5	38.5

a/ For the City and County of Honolulu only, "unspecified" category includes going to Neighbor Islands to fish.

Both types of surveys that were used indicated these major problems. However, such problems may not apply to on-site surveys that are oriented toward the fishery resources and the fishing practices in the specific areas. Nevertheless, indication of fishermen preferences can be estimated by tallying the number of fishermen who reported fishing in certain areas.

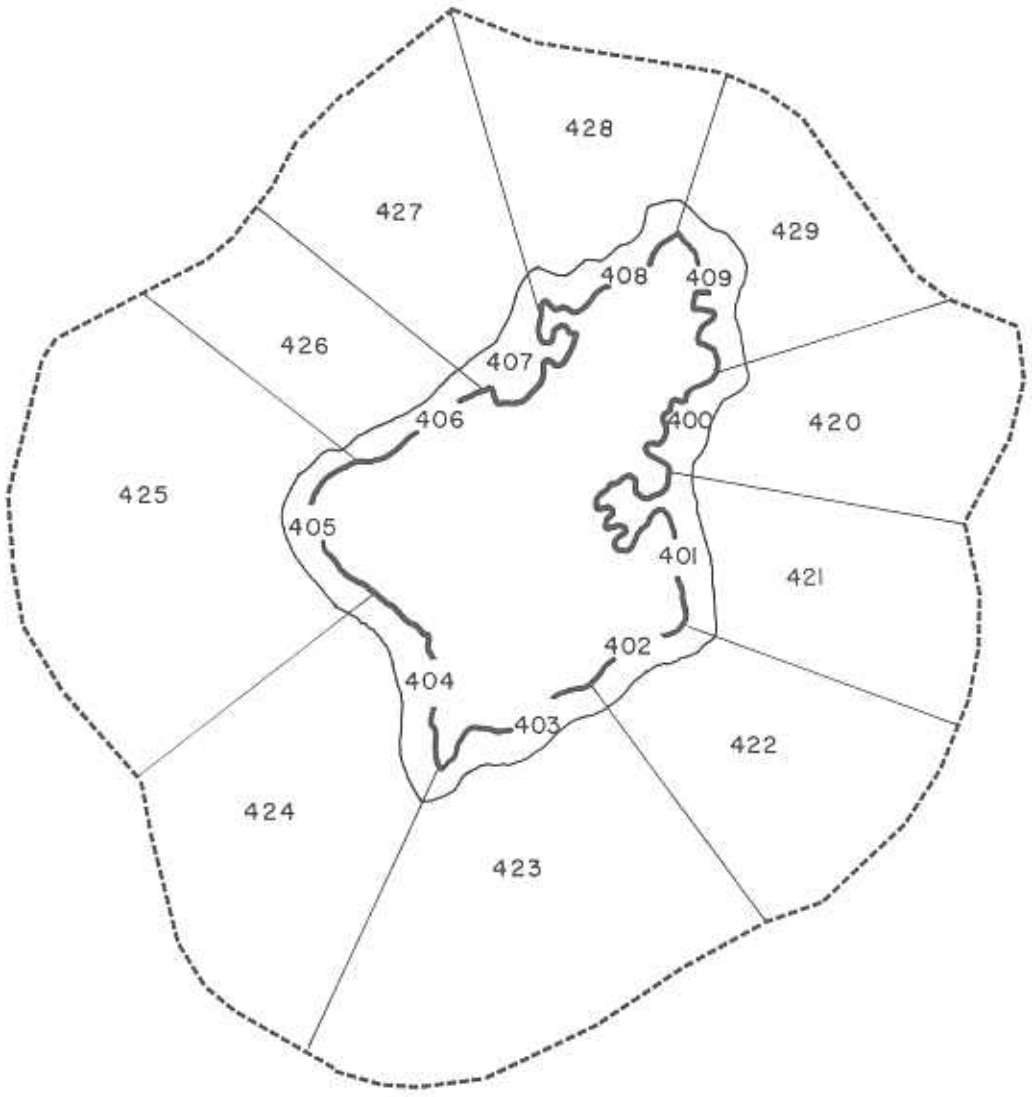
Preference Ordering of Fishing Areas

Figures 1 through 4 show the recreational fishing areas by islands, using the fishing area codes of the Hawaii State Department of Land and Natural Resources. For each fishing area, the percentage of fishermen who frequent the area is indicated. These fishermen are not weighted by days or trips, which might change the preference ordering slightly. For convenience, the area code numbers and the fishing areas they represent together with the estimated percentages of fishermen are listed separately. Fishing areas that are denoted by a dash represent those areas where no fishermen in the survey reported fishing. However, it is quite possible that a few fishermen, rather than none, fish in these areas.

Summary

The total number of fishermen was estimated at 122,400. The age group with the largest number of fishermen was between 12 and 18 years old. Since leisure time is an important variable in recreational fishing, students who enjoy many holidays as well as the long summer vacation have more opportunity to go fishing than working adults. The greatest number of fishermen were of Japanese ethnic origin, followed closely by Caucasians (both groups make up the largest portion of the resident population) except for Kauai, where Filipinos made up the largest number. Level of education is also an indication of the availability of leisure time. Very likely those who finished college require additional working hours after the normal 8-hour day. The study indicates that those fishermen with less education participate more in fishing. At the lower income levels (those below $6,000 per year) as income increases participation rates also increase. Perhaps the additional income for low-income fishermen allows them to purchase better gear or more bait or affords them more traveling expenses. At income levels above $6,000 per year, however, the situation is reversed in that participation rates tend to fall as incomes increase, thus suggesting that income is an important constraint in the real opportunities to take advantage of other leisure activities that may substitute for fishing. Many students, housewives, and retirees indicated that they go fishing with the largest single category being students.

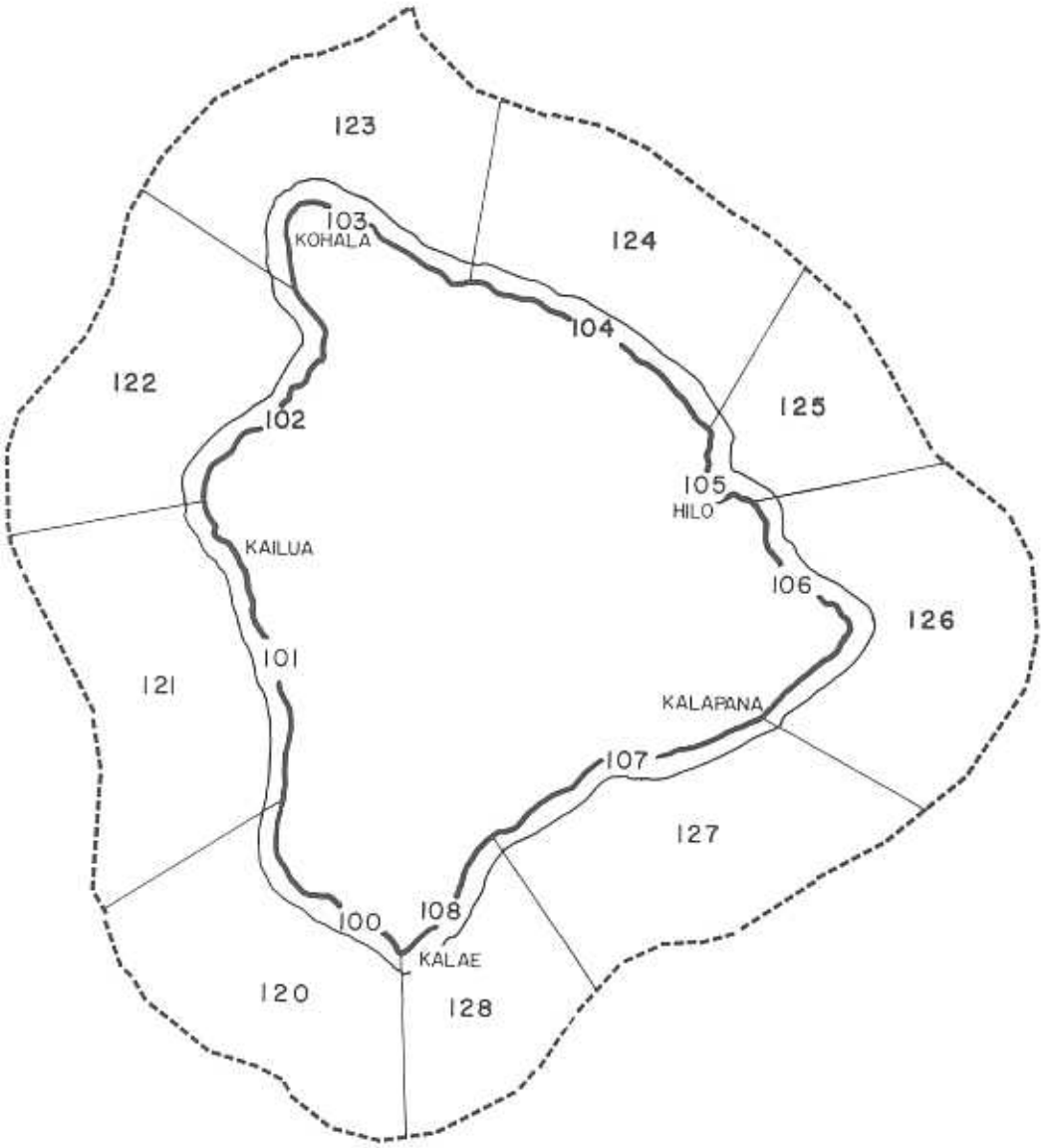
The total number of fishing days was estimated to be in excess of 4.3 million days. Most of the fishing days were credited to saltwater fishermen from the City and County of Honolulu. The average number of fishing days per fisherman in the State of Hawaii was calculated to be 35.8 days. The average number of fishing days per fisherman spent in saltwater was 33.4 days; in freshwater, 24.8 days; and fishing in unspecified areas, 38.5 days.



AREA CODE	INSHORE AREAS	PERCENTAGE OF TOTAL INSHORE FISHERMEN
403	MAILI PT. TO KAENA PT.	14.6
400	DIAMOND HD. TO HONOLULU AIRPORT	13.3
407	KAAAWA PT. TO MOKAPU PEN.	12.3
409	MAKAPUU PT. TO DIAMOND HD.	10.6
408	MOKAPU PEN. TO MAKAPUU PT.	9.7
401	HONOLULU AIRPORT TO BARBERS PT.	9.6
404	KAENA PT. TO PUAMALU	8.6
405	PUAMALU TO LAIE	8.0
406	LAIE TO KAAAWA	7.9
402	BARBERS PT. TO MAILI PT.	5.4
		100.0

AREA CODE	OFFSHORE AREAS	PERCENTAGE OF TOTAL OFFSHORE FISHERMEN
420	DIAMOND HD. TO HONOLULU AIRPORT	22.0
423	MAILI PT. TO KAENA PT.	18.8
427	KAAAWA TO MOKAPU PEN.	18.2
429	MAKAPUU PT. TO DIAMOND HD.	8.7
421	HONOLULU AIRPORT TO BARBERS PT.	8.4
426	LAIE TO KAAAWA	7.0
428	MOKAPU PEN. TO MAKAPUU PT.	6.3
424	KAENA PT. TO PUAMALU	4.9
425	PUAMALU TO LAIE	3.4
422	BARBERS PT. TO MAILI PT.	2.3
		100.0

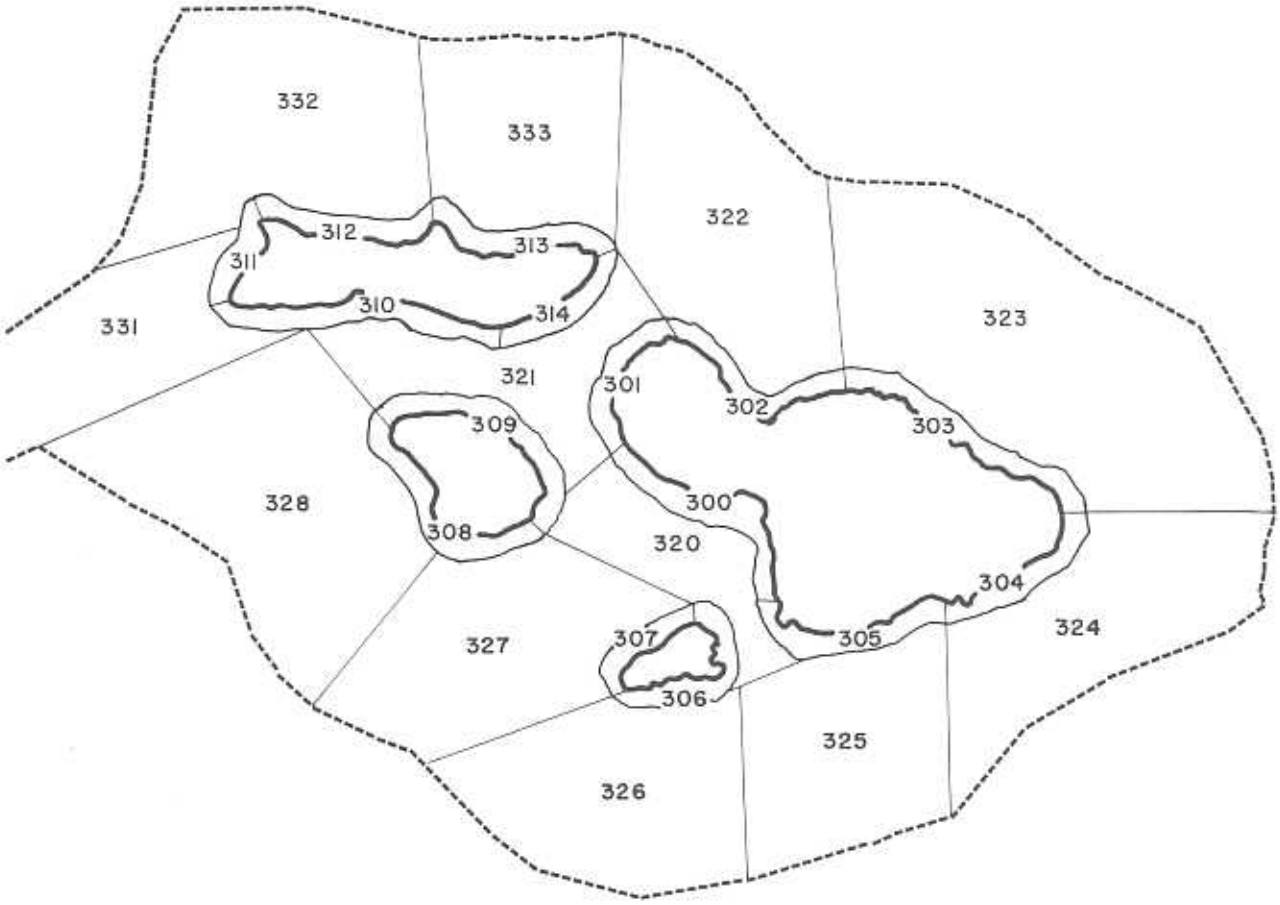
FIGURE 1. ORDER OF SALTWATER FISHING AREA "PREFERENCES," CITY AND COUNTY OF HONOLULU.



AREA CODE	INSHORE AREAS	PERCENTAGE OF TOTAL INSHORE FISHERMEN
101	HOOPULOA TO KEAHOLE PT.	26.9
105	ALIA PT. TO LELEIWA PT.	20.8
106	LELEIWA PT. TO KALAPANA	12.6
102	KEAHOLE PT. TO MALAEA PT.	12.5
108	PUNALUU TO KALAE	11.9
100	KALAE TO HOOPULA	6.0
103	MALAEA PT. TO KUKUIHALE	4.3
107	KALAPANA TO PUNALUU	2.6
104	KUKUIHALE TO ALIA PT.	2.4
		100.0

AREA CODE	OFFSHORE AREAS	PERCENTAGE OF TOTAL OFFSHORE FISHERMEN
121	HOOPULOA TO KEAHOLE PT.	47.5
120	KALAE TO HOOPULOA	26.4
125	ALIA PT. TO LELEIWA PT.	9.2
123	MALAEA PT. TO KUKUIHALE	4.3
126	LAEIWA PT. TO KALAPANA	4.3
124	KUKUIHALE TO ALIA PT.	3.4
122	KEAHOLE PT. TO MALAEA PT.	2.8
128	PUNALUU TO KALAE	1.5
127	KALAPANA TO PUNALUU	0.6
		100.0

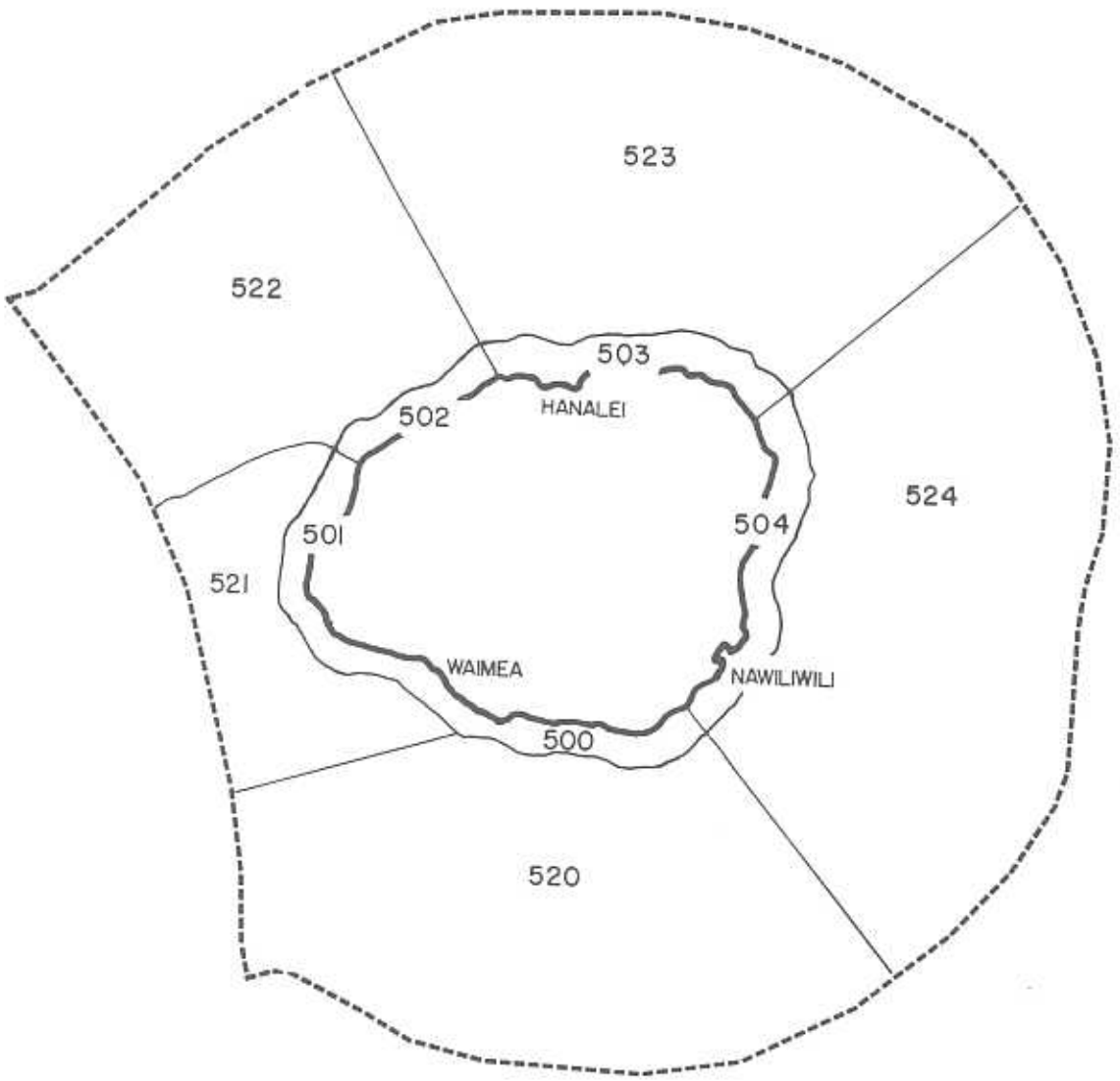
FIGURE 2. ORDER OF SALTWATER FISHING AREA "PREFERENCES," COUNTY OF HAWAII.



AREA CODE	INSHORE AREAS	PERCENTAGE OF TOTAL INSHORE FISHERMEN
300	MAKENA TO PUUNOA PT.	31.6
302	MAKALELE PT. TO PAUWELA	30.8
303	PAUWELA PT. TO HANA	14.5
301	PUUNOA PT. TO NAKALELE	5.0
304	HANA TO APOLE PT.	3.7
312	ILIO PT. TO MAKANALOA	3.6
309	KAENA PT. TO KAMAIKI PT.	2.6
310	KAMALO TO LAAU PT.	2.5
314	CAPE HALAWA TO KAMALO	2.5
306-307	LANAI ISLAND	1.8
308	KAMAIKI PT. TO KAENA PT.	1.2
305	APOLE PT. TO MAKENA	.4
311	LAAU PT. TO ILIO PT.	.0
		100.0

AREA CODE	OFFSHORE AREAS	PERCENTAGE OF TOTAL OFFSHORE FISHERMEN
320	MAKENA TO PUUNOA PT.	47.0
321	PUUNOA PT. TO NAKALELE	21.5
332	ILIO PT. TO MAKANALUA PEN.	7.3
322	NAKALELE PT. TO PAUWELA PT.	7.0
324	HANA TO APOLE PT.	5.0
332	ILIO PT. TO MAKANALUA PEN.	5.0
323	PAUWELA PT. TO HANA	2.4
326	KANA PT. TO KEALAIKAHIKI PT.	2.1
333	MAKANALUA PEN. TO CAPE HALAWA	1.8
327	KEALAIKAHIKI PT. TO CAPE KUIKUI	.9
325	APOLE PT. TO MAKENA	.0
328	CAPE KAEA TO KAENA PT.	.0
		100.0

FIGURE 3. ORDER OF SALTWATER FISHING AREA "PREFERENCES," COUNTY OF MAUI.



AREA CODE	INSHORE AREAS	PERCENTAGE OF TOTAL INSHORE FISHERMEN
504	MOLOAA TO KAWELIKOA PT.	39.6
501	PUOLO PT. TO MAKAHA PT.	21.5
500	KAWELIKOA PT. TO PUOLO PT.	20.4
503	KAILIU PT. TO MOLOAA	18.1
502	MAKAHA PT. TO KAILIU	0.4
		100.0

AREA CODE	OFFSHORE AREAS	PERCENTAGE OF TOTAL OFFSHORE FISHERMEN
524	MOLOAA TO KAWELIKOA PT.	43.3
521	PUOLO PT. TO MAKAHA PT.	31.3
523	KAILIU PT. TO MOLOAA	11.2
520	KAWELIKOA PT. TO PUOLO PT.	10.5
522	MAKAHA PT. TO KAILIU	3.7
		100.0

FIGURE 4. ORDER OF SALTWATER FISHING AREA "PREFERENCES," COUNTY OF KAUAI.

ECONOMIC IMPACT OF RECREATIONAL FISHERMEN EXPENDITURES

Expenditures by Recreational Fishermen in Hawaii

Recreational fishermen expenditures for each county are grouped into three major categories which correspond to different phases in the total recreational fishing experience. The first category includes land transportation expenses which fishermen incur while traveling to and from the fishing area. The second category combines all additional living costs, such as for food, beverages, etc., while the fisherman is enroute to or at the fishing area. The third category includes all equipment, and auxiliary and other miscellaneous expenses, necessary for actual fishing. Table 12 presents the overall pattern of aggregate expenditures throughout the State.

Table 12. Fishermen expenditures for each county by major cost categories

	City & County of Honolulu	County of Hawaii	County of Maui	County of Kauai	State of Hawaii
Transportation	$ 4,340,000 (37.4%)	$ 769,000 (41.5%)	$ 777,000 (49.5%)	$ 333,000 (30.2%)	$ 6,219,000 (38.5%)
Additional living costs	$ 2,033,000 (17.5%)	$ 635,000 (34.3%)	$ 341,000 (21.7%)	$ 447,000 (40.6%)	$ 3,456,000 (21.4%)
Equipment	$ 5,238,000 (45.1%)	$ 447,000 (24.1%)	$ 451,000 (28.7%)	$ 322,000 (29.2%)	$ 6,458,000 (40.1%)
Totals	$11,611,000 (100%)	$1,851,000 (100%)	$1,569,000 (100%)	$1,102,000 (100%)	$16,133,000 (100%)
No. of fishermen	92,500	12,300	10,600	7,000	122,400
$ per fisherman	125	150	148	157	132

The estimated annual expenditures made by recreational fishermen throughout the State totaled about $16.1 million. As to be expected, by far the largest proportion (72 percent) of these expenditures was incurred by fishermen from Honolulu with the distribution by counties as follows: City and County of Honolulu, $11.6 million; County of Hawaii, $1.8 million; County of Maui, $1.5 million; and County of Kauai, $1.1 million. For each county, these expenditures were further broken down into three major categories: (1) transportation costs, (2) food, beverages, and additional on-site living expenses, and (3) gear and auxiliary equipment necessary for actual fishing. A considerable degree of variation existed

within these categories among counties, reflecting the differences in the complex mixture of recreational fishing activities being undertaken in each of the counties. On a per fisherman basis, however, the overall average annual expenditures were somewhat more uniformly distributed among the counties, with the City and County of Honolulu fishermen spending $125 per fisherman; County of Hawaii, $151 per fisherman; County of Maui, $148 per fisherman; and County of Kauai, $157 per fisherman.

Economic Impact of Recreational Fishing on Hawaii

The economic impact of fishermen expenditures for recreational fishing is measured in terms of additional income that is generated for a local economy. The initial expenditures in a county in the State of Hawaii will generate still other spendings. One portion will be paid for imports, while another to local suppliers of goods and services. These expenditures in turn will generate additional expenditures. The final result of the expenditure pattern is the multiplier effect. At each successive round, a smaller amount of the original expenditures is gradually spent outside of the community. Although the input in terms of recreational fishing expenditures is spread over a number of rounds, it is not necessary to trace out for each round of spending the additional income that is generated within the local economy. For this purpose, the local multiplier concept is used.

Method of Measuring Economic Impact

In order to estimate the total impact of recreational fishing expenditures on the Hawaiian economy for a given period of time, the application of the local impact multiplier, which is a modification of the more familiar Keynesian income multiplier, will be used. In algebraic terms, the expression may be represented as follows:

$$\text{Total income increase} = A \frac{1}{1 - BC}$$

where A = initial expenditure remaining in local area

B = marginal propensity to spend disposable income locally

C = proportion of expenditures of local people that accrues as local income

Without parameters, A and C, the familiar Keynesian multiplier for the macro-economy, (i.e., 1/1-B) is identified. Both A and C are the factors which adjust for leakages from the economy. The parameter A adjusts for the types of leakages which are specific to the first round of expenditures by recreational fishermen. Subsequent rounds of expenditures are for general consumption and so must be netted out for leakages which are general to all types of consumption expenditures. As additional income accrues in successive spending rounds, the multiplier is adjusted for income leakages due to imports which are invariably imbedded in the goods and services sold locally. Parameter C, the proportion of local expenditures that remains as local income, accounts for this effect.

While the concept of the local income multiplier is relatively simple, the precise empirical magnitudes of the parameters are difficult to ascertain. Values for these parameters can only be reasonably constructed from secondary published sources. The Department of Economic Research of the First National Bank of Hawaii (now called First Hawaiian Bank) published in 1960 a study entitled The Impact of Exports on Income in Hawaii. Local created income to total expenditure ratios for various types of Hawaiian household expenditures were given in the publication. From this data source parameter A was constructed as follows:

$$A = .419t + .498v + .419f$$

where

t = total transportation costs

v = total additional living costs

f = total costs for fishing equipment

The cost coefficients represent that proportion of the respective expenditures which may be expected to accrue to the local economy. Table 13 demonstrates the derivation of the cost coefficients according to expenditure ratios for the various types of household expenditures for 1960. Since the expenditure categories from the secondary source of information were not broken down into finer details to allow closer identification with the recreational fishing cost categories, only those items that were most closely associated in terms of value added locally were chosen.

For subsequent spending rounds, local income may be expected to accrue according to the values assigned to parameters B and C. It is reasonable to expect a fair degree of stability over time for these parameters. For parameter B, the most recent empirical study on the aggregate consumption function for Hawaii derives a long-run marginal propensity to consume of 0.77.9/

In estimating parameter C, again the previously cited study, The Impact of Exports on Income in Hawaii provides the best available information. In 1960, the weighted average proportion of local income created from 13 various categories of household expenditures was calculated at 0.496. Even if household expenditure patterns and local proportions have shifted within the different spending categories since 1960, in the aggregate the weighted average may still be expected to remain near 0.5.

9/ Ghali, Moheb and Bertrand Renaud, "The Consumption Function at the Regional Level: the Case of Hawaii," Annals of Regional Science, Volume V, No. 1, June 1971, pp. 50-61. Published in cooperation with the Western Regional Science Association and Western Washington State College.

Table 13. Derivation of cost coefficients according to expenditure ratios for various types of household expenditures for 1960 (State of Hawaii)

Cost categories	Expenditures out of each family dollar	Local income created by expenditures	Ratios of income remaining in area
	(Cents)	(Cents)	
Transportation costs (t)			
Automobile	16.8	6.7	
Other transportation	1.6	1.1	
Total	18.6	7.8	.419
Additional living costs (v)			
Food	32.1	16.3	
Alcoholic beverages and tobacco	2.0	0.7	
Total	34.1	17.0	.498
Equipment costs (p)			
Furnishing and equipment	6.3	2.9	
Fuel, lighting, and refrigeration	3.0	1.0	
Total	9.3	3.9	.419

Source: The Impact of Exports on Income in Hawaii, p. 19. Department of Economic Research, First National Bank of Hawaii (now called First Hawaiian Bank).

In deriving the numerical value of the multiplier, 0.77 is substituted for parameter B, and 0.5 is substituted for parameter A into the expression,

$$\frac{1}{1-BC} \cdot \qquad \text{Multiplier} = \frac{1}{1-(0.77)\ (0.5)} = 1.63$$

Then the numerical value, 1.63, is multiplied by the estimates of parameter A, namely, .419t + .498v + .419f, which results in the total income increase for a specified time period.

Economic Impact on the Local Economy

The economic impact, in terms of additional income which is accrued to the local economy from recreational fishing expenditures, is calculated for the Counties of Honolulu, Hawaii, Maui, and Kauai in this section. The increase in income will be considered by the three major cost categories of transportation, additional living, and fishing equipment costs. The economic impact on the State of Hawaii will then be estimated in a later portion of this report.

City and County of Honolulu

Table 14 gives both recreational fishing expenditures and the economic impact derived from these expenditures. It is estimated that $8,191,000 results in additional income due to the $11,611,000 of recreational fishing expenditures for the City and County of Honolulu. Equipment costs as well as transportation costs account for the major increase in income.

Table 14. Economic impact of recreational fishing expenditures on the local economy, 1968 (City and County of Honolulu)

Item	Fishing expenditures ($)	Increase in income ($)
Transportation costs (t)	4,340,000	2,964,000
Additional living costs (v)	2,033,000	1,650,000
Equipment costs (f)	5,238,000	3,577,000
Total	11,611,000	8,191,000

County of Hawaii

The increase in income throughout its successive rounds within the economy

for the County of Hawaii is calculated at $1,345,000. Transportation costs together with additional living costs were the major components that accounted for the economic impact from recreational fishing expenditures.

Table 15. Economic impact of recreational fishing expenditures on the local economy, 1970 (County of Hawaii)

Item	Fishing expenditures ($)	Increase in income ($)
Transportation costs (t)	769,000	525,000
Additional living costs (v)	635,000	515,000
Equipment costs (f)	447,000	305,000
Total	1,851,000	1,345,000

County of Maui

Maui County contributed $1,115,000 to the total economic impact from the recreational fishing expenditures in 1970. Transportation costs accounted for approximately half of the impact, while additional living costs and equipment costs were responsible for the other half of the impact.

Table 16. Economic impact of recreational fishing expenditures on the local economy, 1970 (County of Maui)

Item	Fishing expenditures ($)	Increase in income ($)
Transportation costs (t)	777,000	530,000
Additional living costs (v)	341,000	277,000
Equipment costs (f)	451,000	308,000
Total	1,569,000	1,115,000

County of Kauai

The economic impact due to the recreational fishing expenditures for the County of Kauai is estimated at $809,000. Additional living expenditures accounted for the highest portion of the impact.

Table 17. Economic impact of recreational fishing expenditures on the local economy, 1970 (County of Kauai)

Item	Fishing expenditures ($)	Increase in income ($)
Transportation costs (t)	333,000	227,000
Additional living costs (v)	447,000	362,000
Equipment costs (f)	322,000	220,000
Total	1,102,000	809,000

State of Hawaii

The sum estimates of the economic impact from the four counties result in the total impact for the State of Hawaii. It is estimated that the increase in income that is derived from the recreational fishing expenditures amounts to $11,464,000. The impact estimate is calculated from the $16,133,000 attributed to recreational fishing expenditures.

Table 18. Economic impact of recreational fishing expenditures on the local economy, 1970 (State of Hawaii)

Item	Fishing expenditures ($)	Increase in income ($)
Transportation costs (t)	6,219,000	4,247,000
Additional living costs (v)	3,456,000	2,806,000
Equipment costs (f)	6,458,000	4,411,000
Total	16,133,000	11,464,000

Summary

Equipment and transportation costs each contribute approximately two-fifths to the increase in income derived from recreational fishing expenditures, while additional living expenditures are responsible for about one-fifth of the impact. The increase in income due to transportation costs was proportionately higher in the Counties of Hawaii, Maui, and Kauai than in the City and County of Honolulu. Most of the impact in the City and County of Honolulu was derived from equipment costs. However, the economic impact due to transportation costs were also considerably high. The increase in income from equipment expenditures was lowest in the Counties of Hawaii and Kauai. In a similar way, the impact due to additional living costs was lowest in the Counties of Hawaii and Maui and highest for the County of Kauai.

The total economic impact on the State of recreational fishermen expenditures was estimated to be around $11.5 million for the survey years. This statewide economic impact was expressed in terms of additional income generated for the local economies after the initial and successive rounds of spendings. Import components from first-round expenditures were netted out by the application of the following leakage coefficients to the major expenditure categories: 0.419 for transportation costs; 0.498 for food, beverages, and other on-site additional living costs; and 0.419 for fishing equipment costs. For all successive rounds of spending, a local multiplier of 1.63 which accounts for all further import leakages was used.

IMPLICATIONS OF THIS STUDY

The major implications of this report stem from the basic strengths and weaknesses that are inherent in the study. These basic strengths and weaknesses in turn are largely dependent upon the information-gathering methods which were employed. The principal method used was essentially a survey technique which was population oriented rather than site or resource oriented. That is, although the study was concerned with recreational fishing activities and implicitly with the fishery resources upon which these activities impinge, the design of the surveys was actually centered around the population base of the State rather than the various fishing areas and the fishery resources that are found there. This population-oriented approach was more or less predicated by the broad objectives that were charged to the study.

Nevertheless, a fairly comprehensive picture of the total number of recreational fishermen in the State, their socio-economic characteristics, and the economic impact of their expenditures was estimated for the first time where no such information existed at all in the past. As with all aggregate analyses, however, the total and average figures do not reveal all significant aspects of this subsector in the economy, and more detailed analyses of disaggregated data are necessary especially where homogeneous groupings are possible.

Now that a first approximation of the aggregate picture has been developed, it would appear useful to compare the various dimensions of recreational fishing with that of commercial fishing in the State. While no attempts in this direction were made in this study, all indications point to the confirmation of the feelings of many including the members of the 1967 Governor's Marine Resources Advisory Panel, that the recreational fishing sector provides greater benefits to Hawaii than the commercial fishing sector. However, while such a comparison on a more specific basis may be useful for broad policy purposes, the comparison is a much more difficult task than appears on the surface. The economic impact, as estimated in the present study, was determined only from recreational fishermen expenditures (consumption demand). It excluded investment expenditures by fishing supply stores and other businesses which supply the necessary goods and services which fishermen purchase (investment demand). Also, excluded were government expenditures or the expenditures made by the State Fish and Game in their management of coastal fisheries for recreational purposes (government demand).

The study does consider imports of goods and services which are necessary for supporting recreational activities. These are the first and successive round leakage factors built into the local multiplier formula. The formula does exclude exports which consist of expenditures by visitors that involve such activities as charter boat fishing (such as the Kona Billfish Tournament). Vague areas still exist as to what actually constitutes recreational fishing versus commercial fishing. Before such a broad comparative assessment can be fruitfully undertaken, a much more definite separation of these two "sectors" is necessary.

This then leads to an important area of concern to the State. At the present time, there is wide consensus that, although many so-called "recreational" fishermen are not licensed to sell their catches in the fish markets, a substantial amount of these catches nevertheless still find their way into the local markets. The various dimensions that are involved in this gray area between "recreational" and "commercial" fishing were not addressed in this study and deserve further exploration.

Even within the recreational fishing sector as adopted for this study (i.e., all unlicensed fishermen), definitional aspects still remain. Not only is the total recreational fishing experience a complex bundle of activities including the early planning and later recalling phases of the actual act of fishing; but, also, additional complexities are introduced by the overlapping and joint nature of various types of fishing activities that are carried out in one or more areas during a fishing day (or trip) and throughout the year. This is not only true for the more prevalent types of activities within the saltwater fishing category but also across the saltwater and freshwater fishing categories, especially in Kauai County where a high degree of substitutability exists between the two during the course of the year. More homogeneous groupings of different types of fishing and their interrelationships among themselves, fishing areas, and also other leisure time activities is necessary.

Since the gathering of effort catch statistics[10/] was not within the scope of this study, not much can be said about the fishery resources themselves except to emphasize a common complaint that was volunteered by many fishermen who were interviewed. Especially among shoreline fishermen, the often expressed statement was to the effect that, on the one hand, there were too few fish in areas where open and free access to the coastline existed and, on the other hand, in areas where fish were more plentiful, closed or limited accessibility prevented participation from reaching the otherwise desired levels. The historic roots of this problem stem, of course, from the basic land tenure changes under Hawaii's mid-19th century "Mahele" (land reforms) and from the transition in Hawaii's form of government from early monarchy to the present statehood status. The land-use patterns which developed around these and other important institutional changes over time have placed considerable stretches of coastline frontages under the control and restricted use of the military, large private estates, and agricultural plantations, and also contiguous series of small beach properties under several private owners. This problem has, in recent years, been compounded by the so-called further "taking over" of coastline areas by resort developments, on the one hand, and squatter type settlements on the other. The problem here extends far beyond simply fishery resource management and involves more complex institutional issues of easements, regulations, compensation, etc., which is another and perhaps the most important area of concern for the public control of recreational fishing.

On the matter of regulating recreational fishing activities in the coastal waters of the State; since these activities are essentially all directed toward the capture of fugitive resources which dwell in or enter into the common jurisdictional waters of the federal and state sovereigns, and thus subject to potential regulation, there is always the possibility of appropriating additional social benefits by a positive management program which is both efficient and equitable. In most mainland states and in other parts of the world as well, the commonly used approaches usually involve some form of fisherman registration and fee. Except for a brief abortive attempt in 1949, Hawaii has traditionally followed the spirit that fishing is free for all to enjoy and benefit, as expressed in its State Constitution:

> Section 3, Article X, State Constitution, Sea Fisheries: All fisheries in the sea waters of the State not included in any fish pond or artificial inclosure shall be free to the public, subject to vested rights and the right of the State to regulate the same.

At this point, with the new information generated by this study, a strong case can be made for the increased monitoring of certain types of activities. However, the need for a comprehensive registration program for all recreational fishermen is not yet conclusively demonstrated, and, furthermore, the likelihood of such a justification appears remote. There is definite evidence that participation in recreational fishing as a whole is distributed among fishermen in

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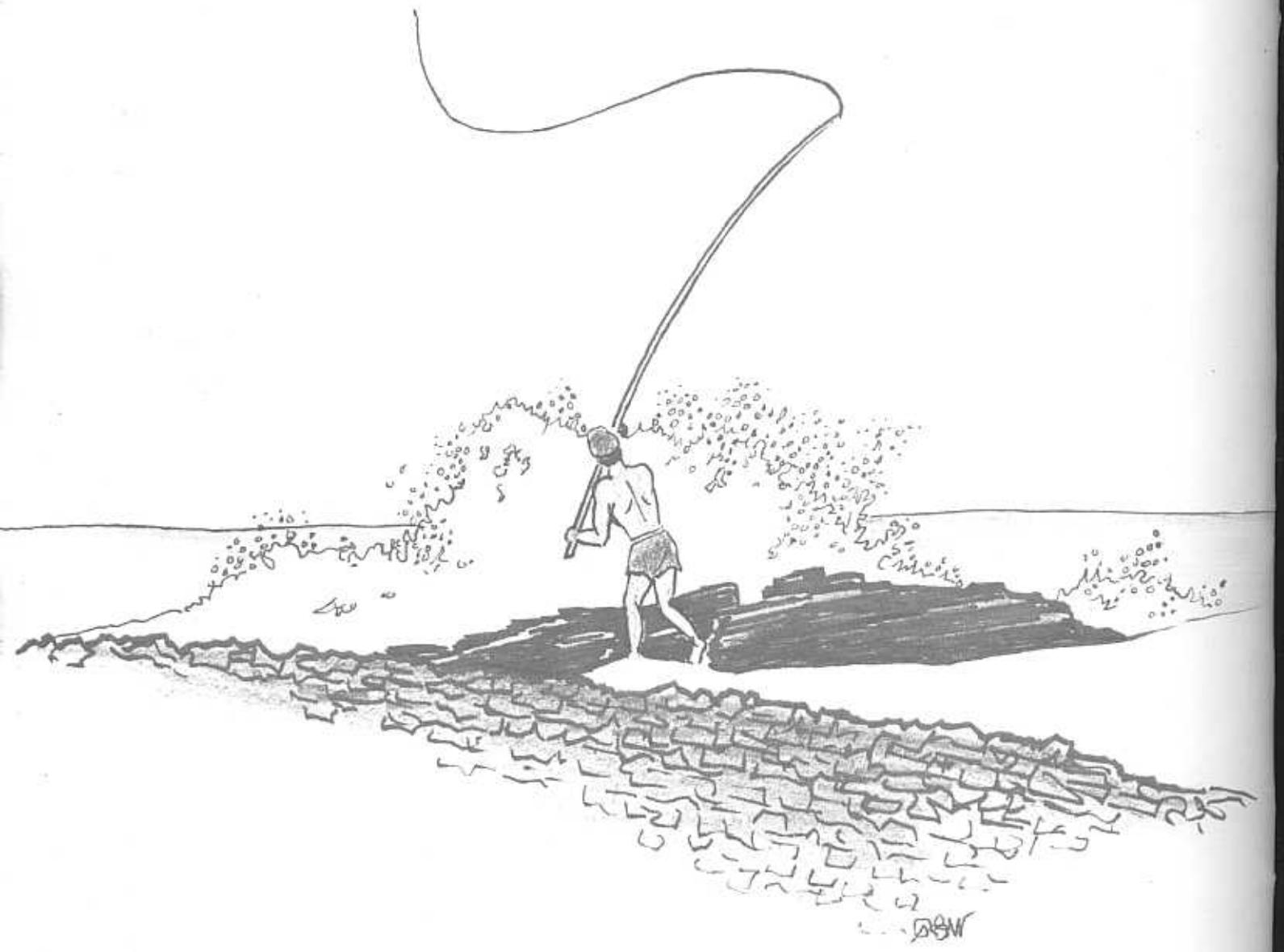
10/ Such information can more effectively be developed through on-site creel censuses and fishermen log-books, etc., which are more resource than population oriented.

a skewed fashion toward the younger age groups and for older persons in the lower income earning occupations, which suggests the strong possibility of a highly inequitable restriction of the total leisure time activities available in the State. Also, it is not yet altogether clear what potential social benefits can be derived from such a comprehensive program and where such social benefits exist, whether they would exceed not only the administrative costs but also whatever social costs which may attend the implementation of such a comprehensive registration program. Again, further refinement of the data generated here in conjunction with additional information which might be developed through more concentrated site and resource oriented surveys, could go a long way toward developing the kind of selective registration and variable fee schedules which would be compatible with an efficient and equitable coastal fishery resource conservation program. Such increased efforts are, without a doubt, called for and should be given the highest of priorities and at the earliest possible time.



College of Tropical Agriculture
Hawaii Agricultural Experiment Station
University of Hawaii
Departmental Paper 3 — August 1972 — 1.5M