SOCIO-ECONOMIC CHARACTERISTICS, USE PATTERNS, AND EXPENDITURES OF MICHIGAN SALMON AND TROUT ANGLERS IN 1967

> Thesis for the Degree of M. S. MICHIGAN STATE UNIVERSITY JAMES EDWARD FOX 1970





#### ABSTRACT

#### SOCIO-ECONOMIC CHARACTERISTICS, USE PATTERNS, AND EXPENDITURES OF MICHIGAN SALMON AND TROUT ANGLERS IN 1967

By

James Edward Fox

A mail questionnaire survey was undertaken in 1968 to define socio-economic characteristics, attitudes, and expenditures of Michigan salmon and trout anglers in the 1967 season. A rate of return of nearly 80 per cent was obtained through the use of five follow-ups plus the original questionnaire.

Nearly all respondents were married, male, Michigan residents and experienced Michigan anglers. They tended to reside in populous counties or in counties with salmon and trout fishing close at hand. Most respondents resided in a city or village. Ages and occupations covered very broad ranges. Reported incomes tended to be higher than for state residents as a whole.

Angling preferences among respondents prior to the coho introduction heavily favored trout and inland lake fishing. Overwhelmingly respondents plan to continue coho fishing; although many suggestions for improving the fishery were given.

A total mean expenditure of \$931.00 was reported for durable fishing, boating, and camping equipment; while trip expenditures averaged \$13.00 per day and \$25.00 per trip. The trip expenditures included mainly purchases of food and beverages and gas and oil. The average fishing trip lasted about two days, and the mean party size was approximately three individuals. Respondents mainly were boat fishermen. Reported catches averaged slightly more than three coho per trip per party. Manistee and Benzie counties led all others in fishing effort. Most anglers fished within 400 miles of home.

Recreational activity preferences among respondents covered a broad range of activities, with most respondents reporting participation in hunting and fishing.

Several needed improvements in survey methodology became apparent during the course of the study. The angler sample should be selected from license holders, rather than from creel census interviewees. The questionnaire form should be shortened and several individual questions deleted or made more clear or concise.

It was concluded that the coho salmon program should be considered along with other recreational programs in planning for optimum utilization of public funds. State planning of fishery-related facilities is seen as a highly desirable management goal.

Continuing annual surveys of anglers should provide useful information for planning sport fishery programs.

# SOCIO-ECONOMIC CHARACTERISTICS, USE PATTERNS, AND EXPENDITURES OF MICHIGAN SALMON AND TROUT ANGLERS IN 1967

Ву

James Edward Fox

#### A THESIS

Submitted to Michigan State University in partial fulfillment of the requirements for the degree of

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#### INTRODUCTION

#### Significance of the Study

In recent years, the Michigan Department of Natural Resources has been searching for fast-growing predator fish species suitable for introduction into the Great Lakes. After considering several possible species, the coho salmon, <u>Oncorhynchus kisutch</u> (Walbaum), was selected as the first of possibly several species of anadromous fish to be planted in Michigan waters.

In the spring of 1966, yearling coho salmon were released in three Michigan streams: The Platte River, Bear Creek, and the Big Huron River.<sup>1</sup> Before the end of June, most of the young fish or "smolts" were close to Lake Michigan or actually in the lake, where it was anticipated they would feed on the abundant forage fishes available. If the introduction proved to be successful, it was believed that the coho would return to the site of planting to spawn in the fall of 1967.<sup>2</sup>

<sup>&</sup>lt;sup>1</sup>Unpublished records of the Fish Division, Michigan Department of Natural Resources.

<sup>&</sup>lt;sup>2</sup>David P. Borgeson and Wayne H. Tody, <u>Status Report</u> <u>on Great Lakes Fisheries</u>, Fish Management Report No. 2, Fish Division (Lansing, Mich.: Michigan Department of Natural Resources, 1967).

Two significant biological factors made the commencement of the coho planting a timely event. First the sea lamprey, <u>Petromyzon marinus</u>, which for years had decimated commercial and sport fishing in the Great Lakes, had finally been brought under a high degree of control. Secondly the prolific alewife, <u>Alosa pseudoharengus</u> (Wilson), had become firmly established in vast numbers in the Great Lakes. The alewife was considered an ideal forage fish for predatory salmonid species.

Like the sea lamprey, the alewife is indigenous to the Atlantic Ocean and apparently migrated into the Upper Great Lakes only since completion of the Welland Canal, which by-passes Niagara Falls.<sup>1</sup> Prior to the entry of the lamprey into the Great Lakes, these waters supported large commercial and sport fisheries. The primary fish species sought was the lake trout.<sup>2</sup>

Basically the management goal of the Department of Natural Resources is to derive the maximum benefit from the fishery resources of the Great Lakes. More specifically the anadromous fish program is intended to utilize the

<sup>&</sup>lt;sup>1</sup>U.S., Outdoor Recreation Resources Review Commission, <u>Sport Fishing--Today and Tomorrow</u>, Study Report No. 7 (Washington, D.C.: Government Printing Office, 1962), p. 66.

<sup>&</sup>lt;sup>2</sup>Milton B. Trautman, <u>The Fishes of Ohio</u> (Baltimore: Waverly Press, Inc., 1957), pp. 145, 180.

abundant and low-value alewife population to support desirable native and introduced predator species.

Although the coho is the first of such introduced species, the long-range plan calls for possible introduction of a number of additional predators. The striped bass, <u>Roccus saxatilis</u> (Walbum), chinook salmon, <u>Oncor-</u> <u>hynchus tshawytscha</u> (Walbum), Kokanee salmon, <u>Onchohynchus</u> <u>nerka</u> (Walbum), and Atlantic salmon, <u>Salmo salar</u> have been carefully studied to determine the biological characteristics and adaptability of each for possible introduction into the Great Lakes.<sup>1</sup>

The availability of sufficient eggs for the hatchery program and an apparent biological suitability resulted in the coho salmon being selected as the first of the anadromous species to be introduced. Eggs for the initial release in 1966 were provided by the State of Oregon. Eggs for the 1967 planting were obtained from the States of Oregon, Alaska, and Washington.<sup>2</sup>

The coho salmon has a three-year life cycle. Therefore three successive years of planting (1966 through 1968) were required, using eggs from other states. After the first three years of planting, the hatchery program

<sup>&</sup>lt;sup>1</sup>Wayne H. Tody and Howard A. Tanner, <u>Coho Salmon</u> for the Great Lakes, Fish Management Report No. 1, Fish Division (Lansing, Mich.: Michigan Department of Natural Resources, 1966), p. 1.

<sup>&</sup>lt;sup>2</sup><u>Ibid., pp. 24-25.</u>

will continue using adults from each year's fall run to obtain eggs and milt to support a continuing hatchery program.

The anadromous sport fishery program ultimately may reach very large proportions in terms of economic benefit to Michigan. It is considered important at this time to estimate the present and potential impact of the anadromous sport fishery upon local communities and upon the state as a whole. In addition to the economic factors, the characteristics of the coho anglers, the amount of angler interest, and the degree of public acceptance of the new sport fishery are highly important in justifying support for continuation and expansion of the program.

#### Study Objectives

The objectives of the study might best be considered in four broad categories. The first goal was to evaluate the state of the fishery in the 1967 season in terms of angler interest, attitudes, opinions, and expenditure patterns. The second goal was to determine whether or not significant correlations exist among variables measured by the survey. Such correlations may prove useful in forecasting future demand, economic impact, and opportunities for entrepreneurship in providing goods and services to fishermen. The third goal was to improve the methodology for conducting questionnaire surveys of fishermen. Instruments and techniques used in the 1967 survey are reviewed

and critiqued in the light of problems encountered. Finally the fourth goal was to obtain data needed for a report justifying Federal expenditure for the state's anadromous sport fishery program.

### Objective I: Evaluate the 1967 Coho Fishery

The first goal of the analysis was to evaluate the coho fishery for the 1967 season. It was intended to determine the residence and socio-economic status of the coho angler, attitudes and degree of satisfaction among fishermen with the anadromous fishery program and with Great Lakes fishing in general, the willingness of the fishery users to spend money to pursue their recreational activities, and to obtain specific data relating to individual fishing trips.

The first broad objective of the data analysis included, in part, a determination of the economic importance of the sport fishery to local communities, as well as to the state in general. It was further intended to show if any cost limitations exist which may restrict participation in the coho fishery to individuals of relatively high income.

It was also desirable to find what opportunities exist for private enterprise, as well as for public agencies, to satisfy demands for specific improvements in goods, services, and facilities for Great Lakes sport fishermen.



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Within the first general category of study objectives, the following specific goals were outlined for the survey:

- To determine the geographical distribution of coho fishermen by state and county.
- 2. To examine residence and the socio-economic characteristics of the coho fishermen popu-lation.
- To find whether or not previous non-fishermen are participating in the coho fishery in large numbers.
- To determine previous fishing preferences and amount of Michigan fishing experience among 1967 coho fishermen.
- 5. To determine the degree of interest and angler satisfaction with the coho fishery.
- To determine the major areas of dissatisfaction with Great Lakes sport fishing among anglers.
- 7. To determine various characteristics of individual fishing trips taken.
- 8. To determine the amounts spent by coho fishermen in 1967 for individual fishing trips and for durable equipment, including fishing tackle, boating equipment, and camping equipment.
- 9. To determine the preferences among coho fishermen for certain types of recreational activities.

#### Objective II: Correlations Among Variables Tested

The socio-economic factors and angling characteristics measured by the survey were tested for valid interrelationships. Such characteristics as age, income, occupation, and angling success were examined. (For example, is angling success related to occupation?) The chi-square test was used to determine whether or not such relationships possibly exist.

#### Objective III: Develop Improved Survey Methodology

The third objective of the study was to refine and revise techniques in order to obtain more reliable and meaningful data in future surveys. Since the 1967 survey was the pilot study of coho fishermen, it is understandable that numerous flaws in methodology and analytical procedures were found.

All instruments used in the survey were reviewed, and suggestions for improvement made. Particular attention was given to revising the format of the questionnaire. The author believes that many of the problems encountered during the 1967 survey could be avoided if the questionnaire were improved in format, length, and degree of complexity. Specific recommendations for improving individual questions were also made.

Procedures used for coding responses for automatic data processing were reviewed, and recommendations

for improvement made. Techniques of data analysis and presentation were critiqued.

#### Objective IV: Justify Federal Expenditure

The coho program is supported, in part, by Federal funding. One of the provisions of the Federal Anadromous Fish Act is that each state receiving such funds conduct a study of the benefits derived from the fishery and submit a report. The data obtained from this study were used to fulfill this Federal requirement.

#### Limitations of the Study

The study was intended to determine socio-economic characteristics, expenditure patterns, and attitudes of anglers. Although limited biological information is included in the introductory comments, detailed consideration of the fisheries management and biological aspects of the Great Lakes anadromous fishery is considered beyond the scope of this study.<sup>1</sup>

Only the factors pertaining to the 1967 season are evaluated in the present study.

<sup>&</sup>lt;sup>1</sup>For a discussion of the biological characteristics of the coho salmon and other salmonid species, the reader is referred to the following Michigan Department of Natural Resources publications: <u>Coho Salmon for the Great Lakes</u>, published in 1966; and <u>Status Report on Great Lakes Fisher-</u> ies, published in 1967.

The survey is concerned solely with the sport fishery. No consideration is given to any aspect of commercial fishing.

Lake trout and rainbow-steelhead anglers were included in the sample, as well as anglers seeking only the coho. Therefore it would be impractical, if not impossible, to confine the study solely to coho anglers. While interviewees were asked to report angling success for rainbowsteelhead and lake trout, as well as for coho, it is felt that nearly all of the anglers in the sample were primarily seeking coho. As the focus of the present study is on the impact of the coho salmon sport fishery, no attempt is made to evaluate or discuss in depth lake trout or rainbowsteelhead sport fishing or any type of Great Lakes, stream or inland lakes fishing other than coho salmon fishing.

The economic evaluation of the fishery is limited to discussion of reported angler expenditures. No attempt is made to expand the economic data obtained to the coho angler population as a whole. Nor is any attempt made to derive a "net value" of the fishery to the state or to individual communities.

#### CHAPTER I

#### METHODS AND PROCEDURES

#### Sampling Procedures

Prior to the 1968 fishing season, a fishing license was not required of Michigan's Great Lakes fishermen. Consequently it was necessary to obtain a sample of the coho fishermen population for this study from names of anglers contacted during a creel census of Lake Michigan and Lake Superior fishermen and stream anglers. The censuses were conducted to determine angling effort and to estimate the total catch of coho salmon, lake trout, brown trout, and rainbow or steelhead.

A detailed, long-range interview schedule was followed. The attempt was made to sample each area during six-hour periods, staggered to ultimately cover all periods of the day and each day of the week.<sup>1</sup>

For the Lake Michigan and Lake Superior censuses, shore anglers and boaters were selected and interviewed. During the interview period, counts were made of the total

<sup>&</sup>lt;sup>1</sup>Detailed instructions for census interviews are shown in Appendix A.

number of observable boaters, excluding freighters, and the total number of shore anglers. The total counts were used to measure total angling effort. Interviewers were instructed to contact boaters without regard to the nature of their activities, so that a ratio between fishing and non-fishing activity could be established.

For the stream census, "floating" or drifting between two points along the stream in a canoe was the method employed to obtain an estimate of angling effort. As with the lake census, interviews were made with anglers selected at irregular intervals.

Interviews of Lake Michigan boat and shore anglers were conducted at the following locations: Manistee, Arcadia, Frankfort, Platte River mouth, Pentwater, and Ludington. Stream interviews were conducted along the Platte, Bear, Manistee, and Little Manistee rivers. The following Lake Superior locations were chosen for the census: Portage Entry, Keweenaw Bay, Huron Bay, Huron River mouth, Big Bay, Marquette, Laughing Whitefish River, Munising, and Grand Marais.

Names and addresses of fishermen interviewed during the creel census were transferred from creel census forms to serialized punch cards. The names and address punch cards were used to obtain machine-printed, gummed labels for use in all mailings of questionnaires and follow-ups. Thus the method used for obtaining a sample of coho fishermen was actually designed primarily for purposes other than

a mail survey. While flaws in the sampling method used do exist, methods of obtaining a more satisfactory sample were not feasible at the time.<sup>1</sup>

Several other aspects of the creel census procedures may possibly have introduced bias. Although it is known that a great deal of fishing activity occurred in Lake Superior from April through June, shortages in personnel prevented any survey effort during this period so this area is not represented as strongly as other parts of the state.<sup>2</sup>

Another factor possibly introducing a bias into the sample is the fact that for the boat interviews, boatowners or operators were generally contacted. Passengers usually were not interviewed. Quite possibly boat owneroperators differ from the total angler population in income or other important variable. The degree of such bias and its significance to the results of the study are not known.

<sup>&</sup>lt;sup>1</sup>William G. Cochran points out the problems of bias in samples which are not randomly selected and the advantages of using reliable sampling procedures. See Chapter I in his <u>Sampling Techniques</u> (New York: John Wiley & Sons, 1963), pp. 1-16.

<sup>&</sup>lt;sup>2</sup>Ronald W. Rybicki, Fisheries Management Evaluation Specialist, Michigan Department of Natural Resources, Personal Communication, July 9, 1968.

#### The Questionnaire

To carry out the initial survey of the coho sport fishery, a questionnaire was prepared. A copy of the questionnaire and each of the other instruments used in the survey are in Appendix B. The questionnaire was patterned rather closely after a form used for a study of economic benefits of the salmon-steelhead sport fishery in Oregon.<sup>1</sup>

The questionnaire might best be discussed in four sections: (1) The first section, on pages one and two, deals with individual characteristics of the fishermen. (2) The second section requests detailed information concerning each coho or trout fishing trip taken during the 1967 season. Information on angling success, type of fishing done, and trip expenses is requested. (3) The third section of the questionnaire requests a listing of all expenditures made in 1967 for durable equipment (fishing tackle, boating equipment, and camping equipment). The use made of newly-purchased equipment in 1967 is also requested. (4) The final section of the questionnaire is designed to determine recreational activity preferences and patterns among coho fishermen.

<sup>&</sup>lt;sup>1</sup>William G. Brown, Ajmer Singh, and Emery N. Castle, <u>An Economic Evaluation of the Oregon Salmon and</u> <u>Steelhead Sport Fishery</u>, Technical Bulletin 78, Agricultural Experiment Station (Corvallis: Oregon State University, 1964), pp. 44-45.

#### Pre-testing the Questionnaire

A sub-sample of fifty individuals was selected from the name-address punch cards prepared for each fisherman interviewed in the creel census. Each angler in the subsample was mailed a copy of the questionnaire with a covering letter of explanation attached. The response to the pre-test is summarized in Table 1.

TABLE 1.--Response to the pre-test of the Coho Fisherman Survey Questionnaire, January-March, 1968.

Mailing	Date	Number of Respondents	Percentage of Re <b>sp</b> onse
Initial	January 16	16	32
First reminder	February l	10	20
Second reminder	February 28	13	26
Total		39	78

After reviewing the results of the pre-test, the following changes were made in the questionnaire: (1) the information was multilithed on good-quality paper; (2) drawings were added on pages one through four; (3) question two was added to identify urban and town dwellers; (4) question three was expanded to include marital status; (5) question nine was added to determine how many firsttime Michigan fishermen were attracted by the coho sport fishery; (6) question 11 was added to determine the preferred type of fishing prior to introduction of the coho; (7) question 14 was added to elicit suggestions for improving sport fishing conditions on the Great Lakes; (8) the chart in question 15 was expanded to include a number of additional recreational activities. Also the caption "approximate amount spent on equipment" was dropped from question 18 because of low response on the pre-test; and (9) the request for names and addresses of other coho fishermen was dropped after the pre-test.<sup>1</sup>

Judging from the results of the pre-test, a high rate of return was anticipated from the survey. Initially it was hoped to achieve at least a 90 per cent total response by following the original mailing with four to six reminder letters and post cards, as needed.

#### The Revised Questionnaire

In its revised form, the questionnaire consisted of seven pages, stapled together. The questionnaire requested the following specific information from coho fishermen:<sup>2</sup>

- The state and county of residence, and whether or not the individual resides in an urban area.
- 2. The sex, age, marital status, occupation, income, and number in household of individual.

<sup>2</sup>See questionnaire in Appendix B.

<sup>&</sup>lt;sup>1</sup>Cochran, <u>Sampling Techniques</u>, p. 8, reports, "It has been found useful to try out the questionnaire . . . on a small scale. This nearly always results in improvements in the questionnaire. . . ."

- The number of years of Michigan fishing experience of individual and the nature of such experience.
  - Fishing experience in Michigan streams,
    inland lakes, and Great Lakes.

b. The species of fish sought in past years.4. 1968 coho fishing plans.

- a. If individual does not wish to fish for coho in 1968, he is asked for the reason.
- Aspects of Great Lakes fishing which anglers feel should be improved.
- Specific information relating to each coho fishing trip taken by the fisherman in 1967.
  - a. The month and date or dates of each trip.
  - b. The number of people in the fishing party: from immediate household, others, and total in party.
  - c. The site of fishing activity.
  - d. The numbers of lake trout, coho, and rainbow or steelhead caught by the party.
  - e. The number of hours the party fished on the trip.
  - f. The type of fishing done (i.e., shore or dock versus boat).
  - g. The number of miles from home to the fishing site, one-way.

- h. The number of people for whom the respondent paid trip expenses.
- The type, location, and cost of overnight lodging, if any.
- j. Expenditures on the trip for food and beverages, gas and oil for individual's own car and boat, gas and oil expenses for other car or boat, rental of boat and motor and for tackle and gear, and other expenditures.
- Expenditures for durable equipment purchased in 1967.
  - Tackle including rod, reel, line, lures, boots, waders, and other.
  - Boating equipment including boat, boat trailer, outboard motor, and accessory equipment.
  - c. Camping equipment including tent, tent trailer, camper, house trailer, sleeping bag, lantern, camp stove, and other.
- 8. Approximate days of participation in 1967 in each of the following recreational activities: bicycling, horseback riding, golf, tennis, other outdoor games or sports, fishing, canoeing, sailing, other boating, swimming, water skiing, hunting, camping, walking and hiking, bird watching, other nature study, wildlife
and bird photography, picnics, automobile driving for pleasure, watching outdoor sporting events, attending outdoor concerts, plays, etc., ice skating, snow skiing, sledding and toboganning, snowmobiling, and other.

### Mailing the Questionnaire and Follow-ups

The first mailing of 2,240 questionnaires was completed on May 3, 1968. Each person was mailed one copy of the questionnaire, an attached letter of explanation, and a postage-paid return envelope. The forms were mailed first-class in order to facilitate contacting people who had moved since the creel survey.

Each individual in the sample was identified by a serial number, which was placed on the first page of the questionnaire. As each day's return mail was received, serial numbers were checked; and address cards of respondents were moved from the "not received" to the "received" file. Thus a continuing record of responses was maintained. Only punch cards from the "not received" file were used for printing labels for each follow-up.

A total of five follow-up was mailed to nonrespondents during the course of the survey. Three of the follow-ups were post-card reminders, one was a letter alone, and one was a letter plus a copy of the questionnaire.<sup>1</sup>

<sup>&</sup>lt;sup>1</sup>Copies of the forms used for each mailing are in <sup>A</sup>Ppendix B.

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Additional copies of the questionnaire were mailed on request to people who reported that they had lost the original form.

Completed questionnaires returned after August 2, 1968, were not included in the study.

### CHAPTER II

### REVIEW OF RELEVANT LITERATURE

In this section only materials are cited which, in the opinion of the author, are directly pertinent to the coho survey. Primary emphasis is given to articles and reports dealing with characteristics and expenditures of fishermen and hunters. Literature concerning opinion and attitude surveys among hunters and fishermen is given secondary emphasis. Finally, selected literature pertaining to survey techniques and methodology is included.

Since about 1955, a considerable amount has been written concerning the social and economic values of recreational resources, particularly sport fishery and game resources. Most studies reviewed were designed to justify public expenditure for continuation or expansion of management programs or else to develop "economic yardsticks" to aid resource managers in planning for optimum resource allocation, where several alternatives exist. Economic evaluations of fish or game resources are based primarily upon real or estimated expenditures of sportsmen.

The degree of sophistication and detail of the studies reviewed varied greatly. Generally the recent

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ission Sverne E con sverne E con sverne E con sverne E con sevene E con sverne E co literature adhered more closely to sound economic principles and statistical measurements. For example, most of the recent literature covered favored determining a "net expenditure" rather than the "gross expenditure," which was usually sought in earlier studies. Also the authors of more recent studies point to the problems of relying upon emotion and aesthetic appeal in evaluating recreational resources, rather than seeking to define the values in monetary terms.

### Characteristics and Expenditures of Fishermen and Hunters

The Outdoor Recreation Resources Review Commission discussed in some depth the reasons for the tremendous increase in participation in recreational activities and increased expenditures in recent years. The growing opportunity to participate and greater affluence of the American public are well-known.<sup>1</sup> The Commission adds that the primary benefits of recreation " . . . are not to be justified on a cost accounting basis. Like education, outdoor recreation is one of those elements of the full life that should be made available to the general public." The report continues that there are, however, economic implications of

<sup>&</sup>lt;sup>1</sup>U.S., Outdoor Recreation Resources Review Commission, <u>Outdoor Recreation for America</u> (Washington, D.C.: Government Printing Office, 1962), pp. 25-46. Also see Reynold E. Carlson, Theodore R. Deppe, and Janet R. Maclean, <u>Recreation in American Life</u> (Belmont, Calif.: Wadsworth Publishing Co., Inc., 1967), pp. 61-65, for a discussion of the reasons for the recent increase in demand for outdoor recreation services.

outioor r initial p long-term 7 recreatio ation in fishing, importan Study Re sport f of fish: sied mi deman.i Froject days of times a fishing leet th alterna <sup>2188105</sup> 5.7 ( outdoor recreation which should not be overlooked. Often initial public investment in outdoor recreation provides long-term economic benefits to a local economy.<sup>1</sup>

The Report discusses itemized expenditures by recreationists. Total annual spending for outdoor recreation in 1962 was reported to be \$20 billion and for sport fishing, \$3 billion. The classes of expenditures and their importance to local economies are discussed.<sup>2</sup>

The Outdoor Recreation Resources Review Commission Study Report No. 7 discusses the economic importance of sport fishing on a national scale.<sup>3</sup> The retail sales value of fishing tackle increased from \$118 million in 1950 to \$160 million in 1960.<sup>4</sup>

The Report also reviews the tremendous increase in demand for sport fishing opportunities in recent years, and projects this trend to the years 1976 and 2000. Fishermandays of effort in the year 2000 are expected to be three times as great as in 1960. The problem of supplying a fishing opportunity of suitable quality and quantity to meet the tremendous anticipated demand is discussed, and alternative solutions are considered.<sup>5</sup>

<sup>1</sup><u>Ibid.</u>, pp. 75-76. <sup>2</sup><u>Ibid.</u>, pp. 78-80.

<sup>3</sup>U.S., Outdoor Recreation Resources Review Commission, <u>Sport Fishing--Today and Tomorrow</u>, Study Report No. 7 (Washington, D.C.: Government Printing Office, 1962).

<sup>4</sup><u>Ibid</u>., p. 11. <sup>5</sup><u>Ibid</u>., p. 1.

Alternative demands upon our waterways and fisheries resources will grow and threaten the continuation of sport fishing opportunities. Both the quality and quantity of water available for recreational use are declining.<sup>1</sup> Waters available to sport fishermen are inventoried and evaluated.<sup>2</sup> The roles and responsibilities of various state and federal agencies are discussed.<sup>3</sup>

The Report discusses changing attitudes among anglers in recent years. The authors feel that crowding actually seems to appeal to a sizable segment of the fishing population.<sup>4</sup>

Outdoor Recreation Resources Review Commission Study Report 24 defines primary benefits as those benefits which accrue to the recreationists. "They differ from other primary benefits of public resource developments in that they do not represent a source of income for the beneficiaries."<sup>5</sup> Government operation or installation of recreational facilities should be decided on the basis of welfare, rather on a purely economic basis.<sup>6</sup> Secondary

<sup>1</sup><u>Ibid.</u>, p. 47. <sup>2</sup><u>Ibid.</u>, p. 16. <sup>3</sup><u>Ibid.</u>, pp. 23-46. <sup>4</sup><u>Ibid.</u>, pp. 62-77.

<sup>5</sup>U.S., Outdoor Recreation Resources Review Commission, <u>Economic Studies of Outdoor Recreation</u>, Study Report No. 24 (Washington, D.C.: Government Printing Office, 1962), p. 60.

<sup>6</sup><u>Ibid</u>., the report continues, "In order to justify government intervention in the market to create or operate

benefits of outdoor recreation are defined as those benefits " . . . accruing to the Nation as a whole, above and beyond any primary benefits to the recreationers."<sup>1</sup> By adding the primary and secondary benefits, and subtracting the costs, one may derive the "net benefits from recreation."<sup>2</sup> The report continues that the major difficulty in determining the primary benefits a particular recreational facility is the absence of a market price.<sup>3</sup>

Study Report 24 further points out that utilization of a particular resource for recreational purposes can be justified only if no other use of that resource would result in greater benefit to the community. The problem, then, lies in attempting to measure precisely the value of recreation.<sup>4</sup>

In 1953, the New Hampshire Fish and Game Department carried out a survey to determine the gross expenditures made by hunting and fishing licensees in 1952.<sup>5</sup> After the initial mailing, two follow-up letters were sent to

recreational facilities it must simply be shown that the distribution of total output in welfare terms is altered favorably by such intervention.

<sup>1</sup><u>Ibid</u>. <sup>2</sup><u>Ibid</u>., p. 61. <sup>3</sup><u>Ibid</u>., p. 68. <sup>4</sup><u>Ibid</u>., p. 49.

<sup>5</sup>David L. White, <u>How New Hampshire Attached the</u> <u>Dollar Sign to Its Fish and Wildlife</u>, Technical Circular <u>11</u>, Management and Research Division (Concord: New Hampshire Fish and Game Department, 1955).

non-respondents at three-week intervals. Approximately 30 per cent of the resident non-respondents were contacted in person by representatives of the department following the cessation of mailing.<sup>1</sup> A total response rate of nearly 70 per cent was achieved, and non-response was not considered a problem of major significance.<sup>2</sup>

An average total expenditure of \$144.66 was calculated. Average expenditures were determined for each category of licensee and for fourteen categories of expense.<sup>3</sup> The estimated total gross value of 22 million dollars is thought to be an extreme minimum figure, since numerous New Hampshire hunters and fishermen are legally unlicensed, and some types of expenditures were not included in the survey.<sup>4</sup>

Sport fisheries economic research on the West Coast has long been oriented toward evaluating potential economic effects of proposed dams on rivers used by anadromous fishes for spawning runs. Economic values derived from dams can be expressed in understandable terms; however, the effects of dams on fisheries are often difficult to assess economically.

Pelgen attempted to measure the economic values of California striped bass, salmon, and steelhead sport

> <sup>1</sup><u>Ibid.</u>, p. 2. <sup>2</sup><u>Ibid.</u>, p. 9. <sup>3</sup><u>Ibid.</u>, pp. 4-5. <sup>4</sup><u>Ibid.</u>, p. 12.

fishing.<sup>1</sup> He felt that the most understandable and usable expression of value was the average cost per angler of one day's fishing. Pelgen pointed out that values of any wildlife resource are practically intangible, and that determining the amount people spend reflects the importance of these values.<sup>2</sup>

Pelgen obtained his data by means of a questionnaire mailed to fishing license holders. A follow-up was mailed to non-respondents three weeks after the initial mailing. A total return of 90 per cent was obtained. Of the respondents, 75 per cent mailed in usable questionnaires.<sup>3</sup>

Pelgen found that striped bass fishermen spent an average of \$9.00 per angler day; salmon anglers, \$16 per angler day; and steelhead anglers, \$18 per angler day. The major items of expenditure among anglers included transportation, food and lodging, and services and supplies.<sup>4</sup> Those who responded after the follow-up letter reported lower expenditures than those who responded earlier.<sup>5</sup>

<sup>&</sup>lt;sup>1</sup>David E. Pelgen, "Economic Values of Striped Bass, Salmon, and Steelhead Sport Fishing in California," <u>Cali-</u> <u>fornia Fish and Game</u>, XLI (January, 1955).

<sup>2</sup> Ibid.,	p.	6.	<sup>3</sup> Ibid.,	p.	7.
4 <u>Ibid</u> .,	p.	13.	<sup>5</sup> Ibid.,	p.	11.

Following Pelgen's study, Mahoney published "An Economic Evaluation of California's Sport Fisheries in 1960."<sup>1</sup> As with numerous other economic studies of fish and game resources, the objective was to obtain a value for sport fishing which could be used in evaluating alternative uses of land and water. As with Pelgen's study, the aim of the survey was to obtain gross expenditure information from fishermen to indicate the economic status of sport fishing in California. However, Mahoney's work is more extensive than that of Pelgen in that the total statewide expenditures for both saltwater and freshwater angling and for hunting were estimated. A mailed questionnaire with two follow-ups yielded a response rate of 70.5 per cent. Per capita expenditures on a daily and annual basis and the total annual expenditure were estimated.

A study by Wallace<sup>2</sup> represents an early attempt to determine the economic values of fish and wildlife resources to a state, based on projections of gross total expenditures by hunters and fishermen. The author used a mail questionnaire to determine sportsmens' expenditures.

<sup>&</sup>lt;sup>1</sup>John Mahoney, "An Economic Evaluation of California's Sport Fisheries," <u>California Fish and Game</u>, XLVI (January, 1960), 199-209.

<sup>&</sup>lt;sup>2</sup>Robert F. Wallace, <u>Economic Aspects of Wildlife</u> <u>Resources in the State of Washington</u>, Economic and Business Studies, Bulletin No. 19 (Pullman, Wash.: The State College of Washington Press, February, 1962).

The author was concerned with developing a suitable measure for the economic values of sport and commercial fisheries to compare with projected values of proposed hydroelectric projects, usually detrimental to anadromous fisheries. He points out that relative importance of goods and services can be measured only by the amounts people are willing to spend to obtain them. Therefore, the social value of wildlife resources can be measured only be expenditures of members of society to enjoy these resources.<sup>1</sup>

Wallace feels that total expenditures by sportsmen provides a measure of the gross economic value of fish and wildlife resources. Further, such a measure is useful to administrators in obtaining the fullest development and utilization of the state's resources and in making policy decisions where conflict among alternative uses of the resource occurs.<sup>2</sup>

Wallace mailed out questionnaires to licensees, in some cases, eighteen months after the individual had purchased his license. A return rate of 94 per cent was obtained through the use of two mailings, plus telephone and personal contacts of non-respondents.<sup>3</sup> The author concluded that indeed fisheries and wildlife resources are responsible for a significant portion of income in the

<sup>1</sup><u>Ibid.</u>, p. 2. <sup>2</sup><u>Ibid.</u>, p. 3. <sup>3</sup>Ibid., p. 6.

state's economy as compared to other goods and services.<sup>1</sup> No determination of net values was made.

Brown, Singh, and Castle carried out a study to determine both "gross" and "net" economic values of the Oregon salmon-steelhead sport fishery in 1962.<sup>2</sup> Questionnaires were mailed to licensees at intervals throughout the season. A rate of return of nearly 80 per cent was obtained.<sup>3</sup> Many respondents failed to complete the portion of the questionnaire relating to itemized expenses. This failure was thought to be due to the complicated nature of the questionnaire.<sup>4</sup> As in the study by Pelgen, it was found that those who responded earlier to the questionnaire reported greater expenditures, both for durable equipment and for trip or "current" expenses. Mean seasonal expenditures for durable equipment and trip expenses were calculated, while mean values for non-respondents were extrapolated.<sup>5</sup>

To refine the data on total economic importance of the fishery to the state, the net economic value was calculated. The net economic value is defined as the estimated

<sup>1</sup><u>Ibid</u>., p. 24.

<sup>2</sup>Brown, Singh, and Castle, <u>An Economic Evaluation</u> of the Oregon Salmon and Steelhead Sport Fishery.

<sup>3</sup><u>Ibid.</u>, p. 15. <sup>4</sup><u>Ibid.</u>, p. 19. <sup>5</sup><u>Ibid.</u>, pp. 20-25.

monetary value of the sport fishery resource if the resource were owned by a single individual, and a market for fishing opportunity existed. The net value, then, approximately would equal the value of the sport fishery to an owner, who could charge for permission to fish.<sup>1</sup>

Brown, <u>et al</u>., expanded total expenditures for durable equipment and for trip expenses to the total fishing population, and calculated the gross and net economic value of the fishery to the state.<sup>2</sup> The total gross value of the sport fishery was determined to be approximately \$18 million, while the net value was approximately \$2.5 to \$3.1 million per year. Travel distance and family income were shown to be important variables affecting demand.<sup>3</sup>

Castle points out that recreation, along with flood control and pollution control, is an example of an "extramarket good" to be assigned a value in considering alternative uses of a resource.<sup>4</sup> The use of gross expenditure data in the evaluation of recreational use provides impressive figures, but avoids a true evaluation of "recreational experiences." The author feels that such measurements are

<sup>1</sup><u>Ibid.</u>, p. 28. <sup>2</sup><u>Ibid.</u>, pp. 27-28. <sup>3</sup><u>Ibid.</u>, pp. 3-4.

<sup>4</sup>Emery N. Castle, "Activity Analysis in Water Planning," in <u>Econonics and Public Policy in Water Resource</u> <u>Development</u>, ed. by Stephen C. Smith and Emery N. Castle (Ames, Iowa: Iowa State University Press, 1964), pp. 171-85.

of little real value in view of the growing and conflicting demands being placed on our resources.<sup>1</sup>

The author attacks the notion that recreation benefits are intangible and incapable of measurement. He compares benefits of recreation to those of baseball, music, and other human experiences, which are largely emotional or aesthetic. Indeed measurement of recreational benefits (primary) is necessary if recreation is to be considered equally with other uses of the resource.<sup>2</sup>

Marion Clawson compares fishing with other forms of outdoor recreation.<sup>3</sup> Clawson points out that the value of the sport fishery resource depends upon what people are willing to pay for the recreational experience, rather than upon the inherent value of the fish.<sup>4</sup> He discusses the difficulty of obtaining data concerning fishermen's expenditures and the problems of reliability of such information, once collected. Problems of memory bias and deciding which expenditure to include in evaluating the resource are discussed.<sup>5</sup> Clawson concludes that total expenditures incurred by fishermen reflect the cost of recreational experience, however, this does not necessarily

<sup>1</sup><u>Ibid</u>., p. 181.

<sup>2</sup>Ibid.

<sup>3</sup>Marion Clawson, "Economic Aspects of Sport Fishing," <u>Canadian Fisheries Reports</u>, IV (May, 1965), 12-24.

<sup>4</sup><u>Ibid</u>., p. 21. <sup>5</sup><u>Ibid</u>.

reflect the value of the resource to the user. Fishermen might be willing to pay considerably more than they actually do to enjoy their sport.<sup>1</sup>

Scott has explored some of the theoretical aspects of evaluating sport fisheries.<sup>2</sup> He pointed out that the best way to determine accurately the true market value of fish and game resources is to impose a toll. If a toll were levied upon all users of a fishery resource and the level of the toll were such that local users of the resource changed their frequency of visits to equal that of remote visitors, the optimum toll could be called the "value of the resource to the visitors."<sup>3</sup> The author discusses the importance of determining the values of recreational resources in order to allocate such resources among several competing user groups.<sup>4</sup> Scott concludes that visitors from near the recreation site will tend to be predominantly people of lower income, making shorter visits than visitors from farther away.<sup>5</sup>

<sup>1</sup>Ibid., p. 22.

<sup>2</sup>Anthony Scott, "The Valuation of Game Resources: Some Theoretical Aspects," <u>Canadian Fisheries Reports</u>, IV (May, 1965), 27-47.

<sup>3</sup><u>Ibid.</u>, p. 27. <sup>4</sup><u>Ibid.</u>, p. 45. <sup>5</sup>Ibid., p. 33.

Spargo discusses some of the procedural errors in past economic evaluations of sport fisheries.<sup>1</sup> Most of such evaluations have been attempts to determine the economic value of the resource within a certain political boundary. Usually the evaluation is in terms of gross expenditures. Impressive total values are presented, and an optimistic outlook is projected for future demand. Although no definite value has been proven for such studies, they are often used to justify increased public investment in the fishery resource. The weaknesses of such an approach to fishery valuations are discussed.<sup>2</sup> The author points out that expenditure studies often incorrectly report secondary benefits as primary benefits.<sup>3</sup>

The danger of evaluating the resource strictly on an economic basis is pointed out. Often primary benefits, which accrue to persons with little or no expenditure, are overlooked.<sup>4</sup>

Spargo concludes that the gross expenditure method is considered useful chiefly in determining economic benefits accruing to a local area. In addition to the gross expenditure method of valuation, the following methods are

<sup>1</sup>R. A. Spargo, "Methods and Techniques of Evaluation of Sport Fishing," <u>Canadian Fisheries Reports</u>, IV (May, 1965), 53-69.

> <sup>2</sup><u>Ibid.</u>, p. 54. <sup>3</sup><u>Ibid.</u>, p. 59. <sup>4</sup><u>Ibid.</u>, p. 62.

discussed: educated guess, catch, time, distance traveled, imputed prices and values, and alternatives.<sup>1</sup>

In 1966 the Bureau of Sport Fisheries and Wildlife published the results of a nationwide study of the socioeconomic characteristics, participation patterns and expenditures of hunters and fishermen.<sup>2</sup> Comparisons were made with similar studies conducted in 1955 and in 1960. Data were fathered from personal interviews of 16,000 households.<sup>3</sup>

Fishermen were reported to have spent an annual total of nearly \$3 billion, or a mean per capita amount of \$103.00 in pursuit of their sport. The report itemizes expenses in various classes. No estimation of net economic values of hunting and fishing is given.<sup>4</sup> It was felt that the amount of money spent by hunters and fishermen provided a reliable indication of the value of the sports to the users of the resources. Gross expenditures were presented as an indicator of business values of hunting and fishing. The report expresses the feeling that the "intangibles" of enjoyment and satisfaction are beyond economic appraisal.<sup>5</sup>

1<u>Ibid.</u>, pp. 60-64.

<sup>2</sup>U.S., Bureau of Sport Fisheries and Wildlife, <u>1965 National Survey of Fishing and Hunting</u>, Bureau of Sport Fisheries and Wildlife Publication No. 27 (Washington, D.C.: Government Printing Office, 1966).

<sup>3</sup><u>Ibid</u>., p. 65. <sup>4</sup><u>Ibid</u>., p. 4. <sup>5</sup><u>Ibid</u>., p. 3.



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Sport tangie and gie tangre er of of tangre er of of tangre er of tangre tangre tangre er of tangre er of tangre tangre er of tangre er of tangre er of tangre er of tangre tangre er of tangre er Factors relating to participation in hunting and fishing, such as age, sex, residence, and distance traveled, are discussed in detail.<sup>1</sup>

In 1967, Davis reported a study of hunting and fishing values in Arizona in 1965.<sup>2</sup> The objectives of his study were threefold: (1) measure economic contributions to the state, (2) determine motivational factors, and (3) discuss recommendations of hunters and fishermen. The author categorizes expenditures made by sportsmen as "primary or direct" contributions to the state's economy, contrary to the definition provided by Spargo.<sup>3</sup>

Only initial expenditures of hunters and fishermen are considered. Subsequent expenditures and net returns to businessmen are not estimated. An itemized discussion

<sup>1</sup><u>Ibid., pp. 49-61.</u>

<sup>2</sup>William C. Davis, <u>Values of Hunting and Fishing in</u> <u>Arizona in 1965</u> (Tucson: University of Arizona, College of Business and Public Administration, 1967).

<sup>3</sup>Spargo, "Methods and Techniques of Evaluation of Sports Fishing," p. 59, also Brockman, discuss "primary" and "secondary" benefits derived from recreation. Intangible values, such as improved efficiency of workers, increased productivity of the nation and reduced need for law enforcement and correctional institutions are included in primary benefits. Such benefits cannot be measured by economic means. On the other hand, "secondary or indirect benefits" are the measurable effects of recreation on the economy of a local community, a state or the nation as a whole. C. Frank Brockman, <u>Recreation Use of Wild Lands</u> (New York: McGraw-Hill Book Company, Inc., 1959), pp. 181-85.





of types of expenditures is provided by the author.<sup>1</sup> Total 1965 expenditures for each species of fish and game are provided.<sup>2</sup>

Davis further attempted to measure social benefits derived from hunting and fishing. Socio-economic characteristics of hunters and fishermen were studied.<sup>3</sup> Sportsmen's attitudes and motivational values are discussed in detail.<sup>4</sup>

The publication is profusely illustrated with sketches of fish and game, and is written in a semi-popular tone.

Scheftel presents another example of a study of gross expenditures.<sup>5</sup> A survey was designed to determine the amounts of money which accrued to those in Minnesota who provided services to sport fishermen. A combination of personal interview and mail questionnaire methods was used to obtain a response rate of 75 per cent.<sup>6</sup> It was

<sup>1</sup>Davis, <u>Values of Hunting and Fishing in Arizona</u> <u>in 1965</u>, pp. 23-26.

> <sup>2</sup><u>Ibid.</u>, pp. 29-43. <sup>3</sup><u>Ibid</u>, pp. 9-14. <sup>4</sup><u>Ibid</u>., pp. 43-72.

<sup>5</sup>Zane Scheftel, "An Economic Evaluation of Sport Fishery in Minnesota," <u>Transactions Twenty-third North</u> <u>American Wildlife Conference</u> (Washington, D.C.: Wildlife Management Institute, 1958), pp. 262-68.

<sup>6</sup><u>Ibid</u>., p. 264.



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found that over three-fourths of the total expenditures went for food, lodging, and transportation. Total expenditure figures calculated for non-respondents corresponded closely with figures obtained by the United States Fish and Wildlife Service 1955 Survey of Hunting and Fishing.<sup>1</sup>

Crutchfield criticizes the use of gross expenditures and gross market values to define the value of a sport fishery.<sup>2</sup> He points out that most of the money spent by anglers in pursuit of their recreation would merely be redirected to another activity if the fishery should be curtailed.<sup>3</sup> While gross expenditures for fishing are a reasonable estimate of the value of the fishery to the user, the great bulk of gross expenditure studies done in recent years on sport fishing values are of no value in determining the relative worth of fisheries, as compared to alternative uses of the resource.<sup>4</sup>

The author suggests the use of "net economic yield," or the amount the user would be willing to pay for the right to fish. This is a difficult value to derive, but is the only sound basis for evaluating fishery

<sup>1</sup><u>Ibid., p. 266.</u>

<sup>3</sup><u>Ibid</u>., p. 341. <sup>4</sup><u>Ibid</u>., p. 342.

<sup>&</sup>lt;sup>2</sup>James A. Crutchfield, "Valuation of a Fishery," <u>Transactions Twenty-seventh North American Wildlife Con-</u> <u>ference</u> (Washington, D.C.: Wildlife Management Institute, 1962), pp. 335-47.



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resources.<sup>1</sup> Several methods of determining the net economic value, or willingness ot pay are discussed.

Thompson, Gram, and McGinnes conducted a mail questionnaire survey to determine total hunter expenditures in Virginia.<sup>2</sup> The sample, drawn from license holders, was asked to indicate an "expenditure interval" rather than to recall a specific amount of expenditures.<sup>3</sup> No follow-up or assessment of non-response were made. Those who hunted in the county of residence were found to spend less money than those who reside in another county or state.<sup>4</sup> The problem of inability to recall expenditures was found to be a significant source of bias.<sup>5</sup>

## Attitude and Opinion Studies

An opinion survey of sport fishermen was carried out by McFadden, Ryckman, and Cooper in Michigan.<sup>6</sup> The

# <sup>1</sup>Ibid.

<sup>2</sup>Emmet F. Thompson, James M. Gary, and Burd S. McGinnes, Estimating Hunting Expenditures in Virginia, Research Report 116 (Blacksburg, Va.: Virginia Polytechnic Institute, Research Division), 1967.

<sup>3</sup><u>Ibid.</u>, p. 2. <sup>4</sup><u>Ibid.</u>, p. 7. <sup>5</sup><u>Ibid.</u>, p. 5.

<sup>6</sup>James T. McFadden, James R. Ryckman, and Gerald P. Cooper, "A Survey of Some Opinions of Michigan Sport Fishermen," <u>Transactions of the American Fisheries Society</u>, XCIII (April, 1964), 183-93.



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attempt was made to obtain an unbiased estimate of public opinion concerning fishery management programs. A geographically stratified random sample of licensees was mailed postcard questionnaires. A response rate of 85.7 per cent was obtained by means of three attempted mail contacts plus one additional attempt by mail, telephone, or personal contact.

It was found that relatively few fishermen felt that too much money was being spent on trout stocking programs. This applied to non-trout and trout-fishermen alike. More trout fishermen preferred stocking trout in streams than in lakes. All fishermen groups agreed that trout stocking should be expanded to meet future needs, and that a greater share of the department's budget should be allocated to this activity. The most frequently selected of several alternative needed management activities was "lake and stream improvement," followed in order by "research on improvement of fishing," and "warm water fish stocking."

A study which amplifies the work by Brown, <u>et al</u>., in Oregon was completed by Stevens. In addition to costs associated with fishing, Stevens pointed out that the quality of the recreational experience should be considered a relevant factor in the demand for sport fishing.<sup>1</sup>

<sup>&</sup>lt;sup>1</sup>Joe B. Stevens, "Angler Success as a Quality Determinant of Sport Fishery Recreational Values," <u>Trans-</u> <u>actions, American Fisheries Society</u>, XCV (October, 1966), 357-62.



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Numerous factors, such as quality of roads, weather, and crowding may affect the quality of the fishing experience; however, only angling success is the one universal, objective, and measurable determinant of such quality.<sup>1</sup>

The author measured salmon angling effort in Oregon coastal waters under varying conditions of angling success. The observations were followed up by mailed questionnaires. Stevens found that angling effort was profoundly affected by angler success.<sup>2</sup> Individuals with higher incomes and longer travel distances to fishing sites showed more pronounced response to changes in success.<sup>3</sup>

Stevens points out the limitations of determining gross values of sport fisheries. While gross value indicates the total amount the anglers contribute to the economy, it does not state how much the angler is willing to pay specifically for the opportunity to fish. Only the "net" value, or the amount the angler would be willing to pay an owner for the privilege of fishing, assuming a market existed for sport fishing, is a true expression of the worth of the fishing.<sup>4</sup>

Alexander and Shetter studied fishing and boating activities on portions of the AuSable River in Michigan.<sup>5</sup>

<sup>1</sup> Ibid.,	p.	358.	<sup>2</sup> Ibid.		
<sup>3</sup> Ibid.,	p.	359.	<sup>4</sup> Ibid.,	p.	361.

<sup>5</sup>Gaylord R. Alexander and David S. Shetter, "Fishing and Boating on Portions of the AuSable River in Michigan, 1960-63," <u>Transactions of the American Fisheries</u> <u>Society</u>, XCVI (July, 1967), 257-67.

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Of major concern was the problem of conflict for space between anglers and boaters, primarily canoeists. Two methods were employed to obtain an estimate of manhouse of use: "progressive counts," which consisted of counting boaters and anglers while paddling or drifting through a test section of the river; and "instantaneous counts," in which observers counted all boaters and anglers visible at a given time at a randomly selected site along the stream.<sup>1</sup> It was determined that conflict indeed does exist between canoeists and anglers along certain portions of the river.<sup>2</sup>

Green and Wadsworth reported on factors influencing participation among boaters, fishermen, and hunters in southern Indiana.<sup>3</sup> It was hypothesized that the following variables determined the participation as measured by number of trips: (1) income, (2) occupation, (3) age, (4) days of paid vacation, (5) age of youngest child at home, (6) education, (7) sex, (8) marital status, (9) number of children living at home, (10) employment status of wife, (11) number of years boat has been owned, and (12) distances traveled.<sup>4</sup>

<sup>1</sup><u>Ibid.</u>, p. 259. <sup>2</sup><u>Ibid.</u>, p. 263.

<sup>3</sup>Bernal L. Green and H. A. Wadsworth, <u>Boaters</u>, Fishermen, Hunters: What Affects Participation and What <u>Do They Want</u>? Research Bulletin 829, Agricultural Experiment Station (Lafayette, Ind.: Purdue University, 1967).

<sup>4</sup><u>Ibid</u>., p. 15.

A mailed questionnaire produced a 50 per cent response among boaters and a 43 per cent response among fishermen. The amount of participation in boating was found to be influenced by the following variables: income, vacation, number of years of boat ownership, distance to place of boat operation, and distance from home to nearest boating area. Among fishermen, five statistically significant variables were found to influence participation. These are occupation (clerical and craftsmen showing significantly higher participation), marital status, employment status of wife, and average distance from home to fishing site.<sup>1</sup>

Peterle determined some of the socio-economic characteristics and attitudes of hunters by means of a mail questionnaire.<sup>2</sup> He concludes that the hunters are an important group in determining the future of our wildlife resources, even though they are diminishing as the population grows.<sup>3</sup>

<sup>3</sup><u>Ibid</u>., p. 388.

<sup>&</sup>lt;sup>1</sup><u>Ibid.</u>, p. 5.

<sup>&</sup>lt;sup>2</sup>Tony J. Peterle, "Characteristics of Some Ohio Hunters," <u>The Journal of Wildlife Management</u>, XXXI (April, 1967), 375-89.

### Survey Techniques

C. E. Richard reported on a survey of ocean sport fishing in Virginia from 1955 through 1960.<sup>1</sup> Angling effort was estimated by means of boat counts at a checkarea, log book entries, interviews and aerial observations. Maximum fishing effort was found to occur between 10:00 a.m. and 1:00 p.m., and week-end day effort was three times as great as week-day effort. Creel census information was obtained from log books, interviews, and postcards. Economic values of the salt water sport fishery were determined using the United States Fish and Wildlife Service, 1966 (Crossley Report) average daily expenditure for Gulf and Atlantic Coast sport fishing. The average daily expenditure was multiplied by the average number of trips per angler to find the average annual expenditure per angler. The average annual expenditure, in turn, was multiplied by the total number of anglers to provide an estimated total value of the sport fishery.

Another study of angling success and total fishing pressure was done by Elser on the Northeast River, a freshwater tidal tributary of Chesapeake Bay, in Maryland in 1958.<sup>2</sup> Fishing pressure was determined by making counts

<sup>&</sup>lt;sup>1</sup>C. E. Richards, "A Survey of Salt-Water Sport Fishing in Virginia, 1955-1960," <u>Chesapeake Science</u>, III (December, 1962), 223-35.

<sup>&</sup>lt;sup>2</sup>Harold J. Elser, "Creel Census Results on the Northeast River, Maryland, 1958," <u>Chesapeake Science</u>, I (June, 1960), 41-47.
of all fishermen on the river at two specified times during the day. The creel census was conducted by one man who interviewed anglers while they were fishing. Fishing pressure was found to vary during the season. Anglers were classified by sex and state of residence. The average length of fishing trips was found to be 5.4 hours, and the average daily catch was 1.5 fish of all species.<sup>1</sup>

Jensen found that California salmon fishermen tended to provide exaggerated reports of angling success in response to postal card surveys. Verification of catch estimates by reviewing party-boat logs and records of skiff livery operators indicates that postal-card respondents may indicate a total catch several times as great as the actual catch, as determined by fishery sampling and party-boat logs.<sup>2</sup>

Frisbie and Ritchie reported on a comprehensive study of sport fishing on the Potomac Estuary from 1959 through 1961.<sup>3</sup> The study made use of aerial surveys, mailed questionnaires and interviews of anglers. The

<sup>1</sup><u>Ibid., p. 45.</u>

<sup>2</sup>Paul T. Jensen, "Landings Estimates of California's Marine Recreational Salmon Fishery," <u>California Fish and</u> <u>Game</u>, L (January, 1964), 48-52.

<sup>3</sup>Charles M. Frisbie and Douglas E. Ritchie, Jr., "Sport Fishing Survey of the Lower Potomac Estuary, 1959-1961," <u>Chesapeake Science</u>, IV (December, 1963), 175-91.

following goals were outlined for the study: determination of angling pressure and angling success, determination of total harvest and the species composition of the catch, evaluation of the economic importance of the sport fishery, and evaluation and improvement of survey techniques.

Response to postcard questionnaires increased from 33.5 per cent in 1959 to 40 per cent in 1960. The increase was attributed to two factors: (1) an additional question was added in 1960, which asked whether or not the respondent was satisfied with the fishing, and (2) a follow-up letter was mailed to non-respondents.<sup>1</sup> The economic portion of the study consisted of a determination of gross trip expenditures.<sup>2</sup> The authors found evidence of bias in reporting of catches in the 1959 survey.<sup>3</sup>

It was felt that personal interviews and postcard surveys were of equal value in determining rate of catch and either could be used alone, if supplemented with aerial surveys. Also interviews and mail questionnaires appeared to be of equal value in determining expenditures.<sup>4</sup>

Johnson and Wroblewski studied sources of error in creel censusing on Minnesota Lakes.<sup>5</sup> The five

<sup>1</sup><u>Ibid.</u>, p. 181. <sup>2</sup><u>Ibid.</u>, p. 188. <sup>3</sup><u>Ibid.</u>, p. 190. <sup>4</sup><u>Ibid</u>.

<sup>5</sup>Merle W. Johnson and Leonard Wroblewski, "Errors Associated with a Systematic Sampling Creel Census," <u>Transactions of the American Fisheries Society</u>, XCI (April, 1962), 201-07.

statistical components of creel census sampling were defined as: "(1) interval boat counts, (2) average number of fishermen per boat, (3) average trip length in hours, (4) average number of fish taken per trip by species, and (5) average weight in pounds of fish taken by species."<sup>1</sup> Creel census information is useful in determining fishing pressure, success, and total harvest. Each of the five components of the creel census is discussed in terms of possible introduction of bias.

The advantages of probability sampling over nonprobability sampling for estimating the number of angler days are discussed by Abramson and Tolladay.<sup>2</sup> Probability sampling is defined as any sampling method in which the chance of selecting any unit in the population is known. On the other hand with nonprobability sampling, or "judgment," the chance of selecting any particular unit in the population is unknown. Using nonprobability sampling the precision of the estimate obtained cannot be determined, however, the authors point out that nonprobability sampling is sometimes the only practical method available.<sup>3</sup>

Abramson and Tolladay define optimum allocation as a plan where " . . . the sample is allocated so that each

<sup>1</sup><u>Ibid.</u>, pp. 202-03.

<sup>2</sup>Norman Abramson and Joyce Tolladay, "The Use of Probability Sampling for Estimating Annual Number of Angler Days," California Fish and Game, XLV (1959), 303-11.

<sup>3</sup><u>Ibid</u>., p. 305.

stratum sample size is proportional to the product of the stratum size and the stratum standard deviation."<sup>1</sup> The optimum allocation plan was found suitable for estimating the total angler days in California in 1957.<sup>2</sup>

Hayne reviewed methods currently employed for estimating catch and fishing effort in marine sport fisheries and suggests a sampling design for such estimates. The author discusses possible exaggeration of angling success among postcard questionnaire respondents. Also the possibility of inflating success figures because of memory bias is considered.<sup>3</sup>

Abramson places possible errors in surveys into three classifications: (1) sampling error; (2) response error, where respondents do not report true values; and (3) non-response error, where respondents differ in some way for non-respondents.<sup>4</sup> Sampling error can be reduced or eliminated by use of suitable statistical methods. Non-response error can be corrected through the use of field surveys to interview all or some of the

<sup>3</sup>Don W. Hayne, <u>The Measurement of Catch and Effort</u> <u>in Marine Sport Fishing</u>, A Report to Bureau of Sport Fisheries and Wildlife, U.S. Department of the Interior, prepared by the Institute of Statistics (Raleigh: University of North Carolina, 1964).

<sup>4</sup>Norman J. Abramson, "Distribution of California Angling Effort in 1961," <u>California Fish and Game</u>, XLIX (July, 1963), 174-82.

<sup>&</sup>lt;sup>1</sup><u>Ibid.</u>, p. 309. <sup>2</sup><u>Ibid.</u>, p. 311.

non-respondents. However, response error is the most difficult type to eliminate. Many respondents have difficulty remembering details while others have a tendency to exaggerate.<sup>1</sup>

Palmer studied the public recreational use of state-owned lands in southern Michigan.<sup>2</sup> The survey covered types and intensity of visitor use, with special reference to hunting. Socio-economic and demographic characteristics of users were determined by means of a mail questionnaire. A return of 84 per cent was obtained with the use of one or two reminder notices.<sup>3</sup>

<sup>1</sup><u>Ibid</u>., p. 175.

<sup>2</sup>Walter L. Palmer, <u>An Analysis of the Public Use</u> of Southern Michigan Game and Recreation Areas, Research and Development Report 102 (Lansing, Mich.: Michigan Department of Conservation, 1967).

<sup>3</sup><u>Ibid</u>., p. 29.

### CHAPTER III

## RESULTS OF THE INVESTIGATION

This chapter is devoted to the analysis of the data obtained by the questionnaire. The following sequence is followed: (1) the validity and usefulness of questionnaire responses in general are considered, (2) the response to the questionnaire is discussed, and (3) tabulations and analyses of the data are presented, and statistical correlations among the variables are shown.

### Questionnaire Surveys

According to Kerlinger, the mail questionnaire has two serious drawbacks if used alone: (1) generally the response rate is too low to make valid generalizations, and (2) the researcher is unable to check on the validity of the answers given. Kerlinger concludes that a rate of return of less than 80 per cent indicates that the response is from a select population, and that results are almost invariably open to question.<sup>1</sup> In the present study, the

Fred N. Kerlinger, <u>Foundations of Behavioral Re-</u> <u>search</u> (New York: Holt, Rinehart and Winston, Inc., 1966), p. 397.

total rate of response was 78.89 per cent of all deliverable questionnaires. This is considered to be a satisfactory return.

However, Kerlinger's second criticism of questionnaire surveys, concerning the validity of responses, is a matter which can only be speculated upon. It is important to keep in mind the problem of questionable validity in discussing the results of this survey. The questionnaire, like the personal interview, obtains only as much information as the subject is willing to reveal about himself.

Much controversy has developed over the value of individuals' self-reports. It is known that when a person feels threatened by a question, or if truthful reporting may embarrass him or show him in an unfavorable light, the validity of his response is highly questionable.<sup>1</sup>

Some items included in the coho fisherman questionnaire, innocuous as they may seem, possibly elicited untruthful or exaggerated responses from some individuals. Unfortunately there was no feasible way to check on the occurrence of such responses in this study.

A further general problem with questionnaire surveys is the frequently made tacit assumption that the recipient of the questionnaire understands the questions

<sup>&</sup>lt;sup>1</sup>Claire Sellitz, Marie Johoda, Morton Deutsch, and Stuart W. Cook, <u>Research Methods in Social Relations</u> (New York: Holt, Rinehart, and Winston, 1964), pp. 236-237.

and is able to answer, if only he can be motivated to do so. However, it is known that such an assumption often is not warranted. Even commonplace facts, relating to day-today living, are frequently unknown.<sup>1</sup>

Closely related to the problem of lack of knowledge is that of memory lapse. As Payne observed, " . . . recall may differ from fact, and therefore should not be taken as fact."<sup>2</sup> The researcher feels that the problem of memory lapse might be especially great in the present study. In some cases more than one full year had elapsed between the time of fishing activity and the receipt of the questionnaire.

While questionnaire surveys apparently yield a high degree of uniformity, different people frequently respond to a given question in dissimilar ways. Meanings to words and phrases are far from universally accepted, and it would be erroneous to believe that all respondents read and answered the questionnaire with the same level of understanding.<sup>3</sup>

Therefore, it must be borne in mind that the answers provided by the respondents were tempered by time and momory and were made with varying degrees of understanding of the questions and knowledge of the answers.

<sup>2</sup><u>Ibid.</u>, p. 29. <sup>3</sup><u>Ibid.</u>, pp. 16-17.

<sup>&</sup>lt;sup>1</sup>Stanley L. Payne, <u>The Art of Asking Questions</u> (Princeton, N.J.: Princeton University Press, 1951), pp. 138-39.

In addition, lack of sufficient knowledge of the subject to make a reply may account for some of the non-response.

In spite of the weaknesses of questionnaires, there are certain advantages to their use in a survey. The cost of a mailed questionnaire is considerably less than personal interviews or telephone calls. Also, a higher degree of standardization can be obtained through the use of questionnaires than through interviews.<sup>1</sup> A further advantage of the questionnaire type of survey is that the respondent may fill out his answers at his leisure, with little pressure for immediate response. He has ample time to consider each item and to consult personal records or to question other members of his family or group.<sup>2</sup>

## Response to the Questionnaire

Nearly 80 per cent of the total forms mailed and presumably delivered were returned and were usable. Table 2 summarizes the response to the survey.

Questionnaires were returned undelivered by the Post Office for a variety of reasons. The primary causes of nondelivery were "incomplete address," "adressee unknown," and "addressee moved with no forwarding address."

While a rate of return in excess of 80 per cent had been hoped for, the response rate obtained was

<sup>&</sup>lt;sup>1</sup>Sellitz, <u>et al.</u>, <u>Research Methods in Social</u> <u>Relations</u>, pp. 238-39.

<sup>&</sup>lt;sup>2</sup><u>Ibid</u>., p. 240.

considered quite satisfactory for the purposes of the study, particularly in view of the length and complexity of the questionnaire.

TABLE 2.--Summary of the response to the questionnaire mailed to Michigan salmon-trout fishermen, 1967 season.

Item	Number
Adjusted sample size <sup>a</sup>	2,203
Questionnaires returned undelivered	62
Questionnaires presumably delivered	2,141
Unusable responses	36
Usable responses	1,687
Percentage of usable response to question- naires delivered	78.89

<sup>a</sup>Thirty-nine individuals were dropped from the original sample because they were under seventeen years of age.

The following table (Table 3) provides a summary of each mailing and response by waves. It is noteworthy that response dropped off sharply following the first follow-up. Probably the use of more than five follow-ups would not be justified in view of the length they would add to the survey time. It is felt that an improved and shortened questionnaire would yield an equally high rate of total return with fewer follow-ups.

Mailing <sup>a</sup>	Date	No. Forms Mailed	No. Received Prior to Next Mailing	Percentage
Initial Mailing	May 3	2,240	651	38.6
First Follow-up	May 15	1,553	558	33.1
Second Follow-up	May 30	985	128	7.6
Third Follow-up	June 13	882	216	12.8
Fourth Follow-up	June 27	583	92	5.4
Fifth Follow-up	July 12	472	42	2.5
Total Response			1,687	100.0

TABLE 3.--Mailing and pattern of response to Salmon-Trout Fisherman Questionnaire, 1967 season.

<sup>a</sup>The initial mailing consisted of one copy of the questionnaire plus an attached letter of explanation. The first, second, and fourth follow-ups were each of the form of postcard reminders. The third follow-up consisted of a letter plus a copy of the questionnaire. The fifth follow-up was in the form of a letter. All correspondence forms used are included in Appendix B.

### Editing Responses

Upon receipt, each questionnaire was dated and checked for completeness and usability. Questionnaires which were returned blank, unreadable, or with only a few questions answered were discarded.

The sampling method used introduced several problems into the study. Some of the individuals interviewed during the creel census reported that they had never fished for coho or had done no fishing in 1967. This can be explained by the fact that the interviewers were instructed to contact people without regard to their fishing activities.<sup>1</sup> Responses from non-fishermen were not used in the survey.

A few husband-wife teams were interviewed, with both members being included in the sample. This resulted in some duplicated responses; however, the number of such teams in the sample is not thought to be great enough to affect any results. No attempt was made to identify or discard duplicate husband-wife responses.

Another editing problem relating to the sampling method used concerns children. A number of respondents were under seventeen years of age, and therefore would not have been included in a sample made up of license holders. The quality of response from individuals under seventeen was often low, and such individuals will not be included in samples of fishermen in future studies. Therefore it was decided to remove all respondents under seventeen years of age from the sample. It is not possible to determine how many such individuals were originally included in the sample but failed to respond to the questionnaire.

# Coding Questionnaires

All returned questionnaires which were considered usable were coded for later analysis and tabulation by electronic data processing equipment. Since the questionnaire is long and detailed and had several open-ended

<sup>&</sup>lt;sup>1</sup>See instructions for creel census, Appendix A.

questions, the coding process was rather lengthy. The coding procedure was designed to include as much of the given information as possible in the computer analysis.<sup>1</sup>

## Contacting Non-respondents

Non-response is defined as the failure to measure some portion of the selected sample.<sup>2</sup> Clearly the data obtained by means of a mail questionnaire reflect only the characteristics of individuals in the sample who are willing to complete and return the questionnaire.<sup>3</sup> Brown, <u>et al</u>. has shown that non-respondents may differ from respondents in terms of expenditures associated with sport fishing.<sup>4</sup> Where non-response is in excess of 20 per cent, the validity of any projections of data obtained may be highly questionable.<sup>5</sup>

Although the rate of response to the salmon-trout fisherman survey was nearly 80 per cent, it was considered

<sup>2</sup>Kerlinger, <u>Foundations of Behavioral Research</u>, p. 397; also Cochran, <u>Sampling Techniques</u>, p. 357.

<sup>3</sup>Peterle, "Characteristics of Some Ohio Hunters," pp. 375-89.

<sup>4</sup>Brown, Singh, and Castle, <u>Net Economic Value</u>, pp. 20-25.

<sup>5</sup>Kerlinger, <u>Foundations of Behavioral Research</u>, p. 397.

<sup>&</sup>lt;sup>1</sup>A copy of the code book developed for the survey is enclosed in Appendix C.

desirable to attempt to determine if measurable differences between respondents and non-respondents could be found.

By July 19, 1968, 456 individuals in the sample had not yet responded to the questionnaire. A 10 per cent sub-sample of the non-respondents was selected by means of a table of random numbers and contacted by telephone, letter, or personal interview.

The following questions were asked of the nonrespondents: (1) Have you fished in Michigan before 1967? (2) What kind of fish do you usually fish for? (3) Did you fish for salmon or trout in 1967? (4) How many fishing trips did you make? (5) How many lake trout, coho, and rainbow (steelhead) did you catch? and (6) Where did you fish? In addition to the above questions, telephone interviewees were asked whether or not they had received a copy of the questionnaire.

The following three tables summarize the results of contacting the non-respondents and provide a comparison between respondents and non-respondents for selected variables. Of the fifty-six non-respondents in the sub-sample, a total of fifty-one (91.07 per cent) were contacted. After every practical effort to contact the five remaining individuals had failed, they were omitted from further study.

Table 4 shows some of the characteristics of the non-respondents. The non-respondents indicated little dissatisfaction with either the salmon-trout sport fishery or the questionnaire itself. Nearly all the non-respondents

in the sub-sample had received the questionnaire and had fished for salmon or trout in 1967.

TABLE 4.--Characteristics of non-respondents to questionnaire contacted by letter, telephone, or personal interview.

Characteristic	Number	Percentage
Non-respondents contacted	51	100.00
Reported nonreceipt of question- naire	3	5.88
Fished for salmon or trout in 1967	46	90.20
Indicated dissatisfaction with questionnaire	4	7.84
Indicated dissatisfaction with coho fishery	1	1.96

Table 5 compares respondents with non-respondents with regard to previous fishing experience and frequency of fishing trips during 1967. Non-respondents were found to have had significantly less Michigan fishing experience than respondents. No differences in favorite fish species or amount of angling done in 1967 were found to be significant.

The angling success reported by respondents and non-respondents is compared in Table 6. A chi-square test revealed no significant difference between the two groups in terms of angling success.

Unfortunately it was not feasible to obtain full information from the non-respondents contacted. It is

Characteristic	Percentage	Percentage or Mean		
Characteristic	Non-respondents	Respondents		
Fished in Michigan before 1967	90.20	96.62		
Species most sought before 1967				
Trout Other	43.14 47.06	51.73 48.23		
Mean number fishing trips, 1967	6.85	3.22		

TABLE 5.--Comparison of some characteristics of respondents and non-respondents to salmon-trout fishing questionnaire, 1967.<sup>a</sup>

<sup>a</sup>A chi-square test indicated a significant difference between respondents and non-respondents with regard to previous Michigan fishing experience but none for species of fish sought in previous seasons (P > 0.05).

TABLE 6.--Comparison of angling success of respondents and non-respondents to salmon-trout fishing questionnaire, 1967.<sup>a</sup>

Species	Mean Number of Fish Caught During Season per Individual		
	Non-respondents Respon		
Lake trout	0.86	1.35	
Coho	0.90	3.04	
Rainbow-steelhead	0.86	0.93	
Total success	2.62	5.32	

<sup>a</sup>Chi-square test revealed no significant difference between respondents and non-respondents (P > 0.05).



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suggested that non-respondents may have significantly lower income than respondents, or the two groups may differ in some other socio-economic characteristic.

### Tabulations and Analyses of Findings

This section summarizes the responses to the questionnaire and provides a profile of the salmon-trout angler in terms of socio-economic characteristics, angling preferences, expenditures, and recreational activities preferences.

It is important to keep in mind that sampling bias is probably too great to state with certainty that the data summarized here reflect the characteristics of all Michigan salmon and trout fishermen. However, it is felt that the profile presented approximates an accurate portrayal of such anglers.

## Residence of Salmon-Trout Anglers

Table 7 clearly indicates that the great bulk of the respondents were Michigan residents. However, nonresidents may have been excluded from the sample because of the sampling method used. Many non-resident anglers possibly had completed their fishing and left the state before the creel census was undertaken.

Figure 1 shows the residence pattern of Michigan salmon-trout anglers in the sample. Clearly the bulk of the anglers appear to reside in populous counties or in

Residence	Number	Percentage of Total
Michigan	1,626	96.4
Ohio, Wisconsin, Illinois, Indiana	49	2.9
Other	5	0.3
Unknown	7	0.4
Total	1,687	100.0

TABLE 7.--State of residence of Michigan salmon-trout anglers, 1967.

counties where salmon-trout fishing is close at hand. Kent County was the leading contributor, with 185 anglers or 11.38 per cent of the sample. Kent County's high representation is somewhat predictable in that Kent County has both a relatively large population, and salmon and trout fishing is in close proximity.

Figure 2 shows the contribution of each county to the sample, relative to the total county population. Thus Wayne County, with 114 residents in the sample and a very large population, shows a low relative participation. On the other hand, Benzie County, with only thirty-one residents in the sample and a low population, showed a very high relative participation. Generally counties with very high relative participation have salmon-trout within their borders or in very close proximity; while the counties with very low relative participation generally are the counties





<sup>&</sup>lt;sup>1</sup>For each county a "participation coefficient" was calculated by using the following formula: (Number in Sample Residing in County : Total in Sample) : (Population of County : Population of State) × 100. Thus a "location quotient" of 100.0 would indicate that the county is contributing to the resident angler population exactly in proportion of the county's population. Calculated from 1965 population projections, Lynn C. Myers and Lawrence F. Pinson, <u>Michigan Statistical Abstract</u>, Bureau of Business and Economic Research, Division of Research, Graduate School of Business Administration (East Lansing: Michigan State University, 1968), pp. 16-18.

Figure 2.--Participation in Salmon-Trout Sport Fishery Relative to Population of County as Reported by Michigan Salmon-Trout Anglers, 1967 farthest from fishing sites. In other words the percentage of residents of a county that participate in the fishery appears to be influenced by proximity to fishing opportunity.

Table 8 shows the sample primarily was composed of city or village dwellers. As "city or village" was not defined in terms of population size, it is not known how many of the respondents were "rural" or "urban" dwellers, as the Bureau of Census defines these terms.

TABLE 8.--Place of residence of Michigan salmon-trout anglers, 1967.

Place of Residence	Number	Percentage
Within city or village	1,135	67.3
Not within city or village	544	32.2
No information given	8	0.5
Total	1,687	100.0

## Other Socio-Economic Characteristics

Table 9 shows the sex of anglers as reported on the questionnaires. The overwhelming numerical superiority of males among respondents may be attributable, in part, to the sampling method used. As mainly boat owner-operators were contacted, female passenger-anglers in the boats possibly were often overlooked and excluded from the sample. A CONTRACTOR OF A CONTRACTOR O

Sex	Number	Percentage
Male	1,661	98.5
Female	22	1.3
No information	4	.2
Total	1,687	100.0

TABLE 9.--Sex of Michigan salmon-trout anglers, 1967.

Table 10 indicates that most of the anglers in the sample were married.

TABLE 10.--Marital status of Michigan salmon-trout anglers, 1967.

Marital Status	Number	Percentage	
Married	1,544	91.5	
Unmarried	136	8.1	
No information	7	. 4	
Total	1,687	100.0	

Table 11 shows the age distribution of respondents. A total of 1,062 or 62.9 per cent of the anglers were between the ages of thirty and fifty-four; while 1,364 or 80.8 per cent were between the ages of twenty-five and fifty-nine.

Table 12 shows the occupations reported by the respondents. The following four categories account for 996 respondents or 59.0 per cent of the total:

Age Group	Number	Percentage
17-19	22	1.3
20-24	66	3.9
25-29	142	8.4
30-34	188	11.1
35-39	202	12.0
40-44	216	12.8
45-49	255	15.1
50-54	201	11.9
55-59	160	9.5
60-64	108	6.4
65-69	56	3.3
70 or greater	36	2.1
Not given	35	2.1
Total	1,687	99.9

TABLE 11.--Age of Michigan salmon-trout anglers, 1967.

Occupation	Number	Percentage
Professional, technical and kindred workers	237	14.0
Farmers and farm managers	25	1.5
Managers, officials, and proprietors	231	13.7
Clerical and kindred workers	30	11.2
Sales workers	113	6.7
Craftsmen, foremen, and kindred workers	308	18.3
Operatives and kindred workers	220	13.0
Private household workers	0	0.0
Service workers, except private household	86	5.1
Farm laborers and farm foremen	1	0.1
Laborers, except farm	173	10.3
Student	35	2.1
Housewife	14	0.8
Retirees	114	8.5
Military	13	0.8
Unemployed	9	0.5
Other	11	0.7
No information	37	2.2

TABLE 12.--Occupations of Michigan salmon-trout anglers, 1967.

professional, technical, and kindred workers; managers, officials, and proprietors; craftsmen, foremen, and kindred workers; and operatives and kindred workers.

Table 13 shows the income of the respondents. It has been suggested that possible the sampling method used introduced an upward bias in the reported income.<sup>1</sup> Inasmuch as boat owners or operators were generally those interviewed, perhaps a sizable number of less affluent anglers

Income Class	Number in Sample	Percentage in Sample	Percentage in State <sup>a</sup>
Under 3,000	81	5.2	21.6
3,000-5,999	186	12.0	29.6
6,000-9,999	632	40.7	30.0
10,000 and over	665	42.8	14.3
Total reported	1,554	100.7	100.0
Total not reported	133 <sup>b</sup>		

TABLE 13.--Income of Michigan salmon-trout anglers, 1967.

Note: Chi-square significant, P < 0.01. Incomes in sample different from incomes in state.

<sup>a</sup>Incomes for Michigan residents were taken from 1960 figures, Myers and Pinson, <u>Michigan Statistical Abstract</u>, p. 114.

<sup>b</sup>The "not reported" category accounts for 7.9 per cent of all respondents.

<sup>1</sup>Supra, p. 4.

who were passengers in boats owned and operated by others, were excluded from the sample. Then too, it is not known if "shore" and "boat" anglers were represented in the sample in their true proportions. Conceivably boat owners or operators would show higher incomes than anglers who do not own or operate a boat. However, a comparison of incomes of boating and nonboating anglers is not feasible in the present study. Therefore, it was concluded that possibly participation in the salmon-trout fishery is largely restricted to the middle and upper income levels.

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A chi-square test shows a significant difference between respondents to the questionnaire and state residents as a whole with regard to income. The Michigan resident income figures are based on 1960 estimates, and would, therefore, be somewhat lower than actual incomes in 1967. However, the degree of difference shown is great enough to indicate clearly higher incomes among respondents.

The mean household size among respondents was 3.9 individuals.

### Angling Experience and Preferences

Table 14 shows the previous angling experience of respondents. Clearly the bulk of the respondents were well-experienced Michigan anglers. In fact, 96.7 per cent reported at least some Michigan angling experience between

1962 and 1966. Very few (3.4 per cent) first-time anglers were included among respondents.

Number Years Experience, 1962-1966	Number of Anglers Reporting	Percentage
0	57	3.4
1-4	175	10.5
5	1,455	86.2
Total	1,687	100.1

TABLE 14.--Prior Michigan fishing experience among Michigan salmon-trout anglers, 1967.

Among the first-time anglers in the sample, a variety of reasons were given for participating in the salmon-trout sport fishery in 1967. Table 15 summarizes the reasons given.

Table 16 shows the preferred locations of fishing activity prior to the 1967 season. Of course there was a Considerable overlapping among locations indicated by the respondents. Many fishermen previously fished at more than one of the alternative locations given on the questionnaire. Curiously, "Inland Lake" led the other two alternatives in responses, even though no sampling was done on inland lakes to secure the sample for this study, and no coho fishing was available on inland lakes. Possibly respondents confused "Inland Lake" with "Great Lakes," or the resurgence of Great Lakes sport fishing after a long

Reason	Number	Percentage
News of the coho	31	43.1
New resident of the state	13	18.1
Friend induced to fish	3	4.2
Spouse induced to fish	3	4.2
Fished for species other than coho	2	2.8
Fishing incidental to travel or other vacation activities	5	6.9
First time anglers with no response	15	20.8
Total inexperienced anglers	72 <sup>a</sup>	100.1

TABLE 15.--Reasons given for salmon-trout fishing in Michigan, 1967.

<sup>a</sup>The actual number of anglers without experience 1962-66 is forty-four, as indicated in Table 14. While only first-time anglers were asked to indicate a reason for salmon-trout fishing in 1967, a number of experienced anglers also responded. All responses are summarized in this table.

TABLE 16.--Location of fishing activity of experienced Michigan salmon-trout anglers prior to 1967 season.

Location of Activity	Number of Anglers
Great Lakes	948
Inland Lake	1,373
Streams	1,153
Total	1,643

period of decline attracted many anglers who had previously fished inland lakes and streams only.

Table 17 shows the species preferences among the experienced anglers within the sample prior to the 1967 season. As with location of previous fishing, many of the respondents indicated more than one of the alternatives. However, only the species most fished for is given in Table 17. Trout was the most popular species by far among the angler sample prior to 1967.

TABLE 17.--Species most frequently sought among experienced Michigan salmon-trout anglers prior to the 1967 season.

Species Most Sought	Number of Anglers	Percentage of Anglers
Trout	814	49.5
Pan fish	192	11.7
Walleye	164	10.0
Bass	199	12.1
Pike	97	5.9
Perch	97	5.9
Other	10	0.6
Not reported	70	4.3
Total	1,643	100.0

### Attitudes and Opinions Among Salmon-Trout Anglers

Table 18 summarizes the response to the question, "Do you plan to fish for cohos in 1968?" Overwhelmingly the anglers in the sample did plan future coho fishing activity. Therefore, clearly the coho fishery is highly acceptable among the respondents. Possibly if the nonrespondents had provided answers to this question, the popularity of the coho fishery might appear to be appreciably lower, although little dissatisfaction with the fishery was found even among non-respondents contacted.

TABLE 18.--Coho fishing plans for following season among Michigan salmon-trout anglers, 1967.

Response	Numbe <b>r</b> Anglers	Percentage of Respondents
Plan to fish coho in 1968	1,537	91.1
Do not plan to fish coho in 1968	150	8.9
Total	1,687	100.0

Respondents who indicated no fishing plans for 1968 were asked for the reason for their decision. Eight categories of response were developed, based on the first wave of responses. Table 19 summarizes the reasons given for not planning to fish for coho in 1968.

A large number of those who did not plan to fish for coho the following season did not provide any reason for their decision. Perhaps they were displeased or bored with the questionnaire, or possibly they were displeased with the fishery but were unable or unwilling to disclose the reason.

A number of respondents provided several reasons for planning no future coho fishing. Where multiple responses occurred, the reason given first was the only one coded for the individual. Three of the reasons, crowding, expense, and preference for another type of fishing, account for 46.0 per cent of the negative responses.

Reason	Number of Anglers Reporting	Percentage
Fishing conditions too crowded	23	15.3
Coho fishing too expensive	15	10.0
Lack of angling success in 1967	5	3.3
Prefer another type of fishing	31	20.7
Creel limit too small	3	2.0
Moved from area	4	2.7
No time to fish	2	1.3
Not reported	67	44.7
Total	150	100.0

TABLE 19.--Reasons given by respondents for not planning to fish for coho in 1968.

• All respondents were asked to suggest facilities or features of Great Lakes fishing which, in their opinion, could be improved to make fishing more enjoyable. As was expected, the responses covered a very wide spectrum. To make useful and manageable tabulations of the data, all responses were placed in four broad categories, and then broken down into more specific sub-categories. Table 20 summarizes the responses given.

The coding method used enabled the researcher to record a maximum of four suggestions from each returned questionnaire, provided each of the four suggestions fell into a different broad category of response. The method did not allow recording of multiple responses if each suggestion fell within the same broad category. For example: if an individual suggested "more boat launching sites, improvement of existing sites, more launching ramps, and more toilets," only one of his suggestions could be coded, since all his suggestions would fall into "Part I: Public fishing or launching sites and associated facilities." In such cases, only the first response appearing on the questionnaire was coded.

A total of 2,000 suggestions for improving Great Lakes fishing was coded, or an average of 1.2 suggestions per angler. Thus while many anglers felt the fishery could stand improvement, overwhelmingly their reasons for

Suggested Improvement	Number Fisherman Responding	Percentage
Part I: Public fishing or launching	sites and associated	facilities
More boat launching sites	515	30.5
Improvement of existing sites	138	8.2
More launching ramps	135	8.0
More toilets	19	1.1
Other	9	0.5
No response	871	51.6
Totals	1,687	99 <b>.9</b>
Part II: Additions or improvement of facili facilities	ties other than boat ;	launching
	· · · · · · · · · · · · · · · · · · ·	

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TABLE 20.--Respondents' opinions concerning facilities or features of Great Lakes fishing that should be improved to make fishing more enjoyable.

More parking	198	11.7
Improved access to rivers and lakes	104	6.2
More or improved state parks	17	1.0
Improved or increased campsites	132	7.8
Improved or increased eating and/or lodging places	21	1.2
More facilities for mooring or docking of boats	46	2.7
More specialized services, such as cleaning and		
freezing of fish	5	0.3
Other	21	1.2
No response	1,143	67.8
Totals	1,687	99.9

### Part III: Regulation or control needed

Reduce crowding of fishermen	35	2.1
Reduce crowding of campers	19	1.1
Reduce littering	29	1.7
More laws or better law enforcement by Coast		
Guard, Conservation Department or police	65	3.8
Improve boating countesy and sportsmanship	26	1.5
Improve Great Lakes water quality, or air or		
water pollution or pesticide control	61	3.6
other	12	0.7
No response	1,440	85.4
Totals	1,687	99.9

Part IV: Federal, State or Local Responsibilities

Improve local weather reporting and storm		
warnings	79	4.7
More information on Great Lakes fishing,		
lodging, services, etc.	49	2.9
Provide broader distribution of stocking or		
planting of coho or other species	79	4.7
Stock more coho or other species	95	5.6
Revise or abolish seasonal restrictions on		
creel limits	25	1.6
Improve the mouth of the Platte River		
for boating	22	1.3
Other	4.4	2.6
No response	1,294	76.7
Totals	1,687	100.1
dissatisfaction were not great enough to cause them to forgo plans for fishing the following season.

Of the total of 2,000 suggestions, 1,158 or 57.9 per cent dealt with "improvements" relating to boating or automobile use. On the other hand, 272 or 13.60 per cent of the suggestions dealt with regulations, restrictions or controls needed for the fishery. A total of 352 or 17.60 per cent of the responses concerned miscellaneous services and facilities, not related directly to boat or automobile use. The response indicates great concern for accommodating the mechanized sportsman. However, relatively little concern is shown for regulation of the fishery or for providing goods, services, and facilities not directly related to power boat and automobile use.

## Expenditures Made by Michigan Salmon-Trout Anglers

Table 21 shows the pattern of expenditure for purchase of durable equipment among the respondents. The questionnaire asked all respondents to list their expenditures regardless of the amount of expenditure or nature of use made of the equipment.

Most respondents indicated purchase of fishing tackle, but the average expenditure shown was relatively low. On the other hand, relatively few respondents indicated purchase of boating or camping equipment; but because of the high cost of such equipment, the average expenditures were high, as compared to that of fishing tackle.

Type of	Fisherme	en Purchasing	Mean Expenditure	
Equipment	Number	Percentage	Among Buyers	Among All Respondents
Fishing tackle	1,332	78.9	\$ 52.70	\$ 41.61
Boating equipment	492	29.2	877.33	330.66
Camping equipment	293	17.4	771.33	558.66

TABLE 21.--Purchase of durable equipment by Michigan salmontrout fishermen, 1967.

Table 22 shows the use made of durable equipment purchased by respondents. Also shown for each category of equipment is the mean expenditure which may be attributed to coho fishing. It is noteworthy that in each category of equipment, less than one-half of the days of use reported were for coho fishing. Therefore, it cannot be assumed that such purchases are a direct response to the coho fishery.

The interviewees were asked to itemize fishing trip expenditures in several categories. Table 23 provides an itemized listing of trip expenses reported by the respondents. Very few of the respondents indicated expenditures for rental of equipment. This may be interpreted as a desire to own, rather than rent, fishing equipment. However, possibly the low number of renters among the respondents indicates that there was little suitable rental equipment available at a fee favorable to the angler.

TABLE 22Use of	durable equipment	purchased by Michi	gan salmon-trout	fishermen in 1967.
Type of Equipment	Mean Days Total Use	Mean Days Use for Coho Fishing	Percentage of Total Use Attributed to Coho Fishing	Mean Expenditure per Respondent Attributed to Coho Fishing <sup>a</sup>
Fishing tackle	20.1	6 . 8	34.0	\$14.15
Boating equipment	21.8	6.4	29.5	100.20
Camping equipment	17.7	4.8	27.3	152.51
a				

<sup>a</sup>Figure obtained for each category of equipment by applying "percentage of total use attributed to coho fishing" to mean total expenditure for all respondents.

TABLE 23Itemized trip e:	xpenses reported by	Michigan salmon-trout fi	shermen, 1967.
Category of Expense	Percentage of Respondents Reporting Expenses	Mean Expenditure Per Trip Among Those Re- porting Expenditure	Mean Expenditure Per Trip Among All Respondents
Lodging	16.3	\$15.41	\$ 2.52
Food-beverage	63.0	15.56	<b>9.</b> 80
Gas-oil: Own car	64.0	10.29	6.58
Own boat	49.5	5.47	2.71
Other car	8.3	6.12	0.50
Other boat	5.9	5.14	0.30
Rental: Boat-motor	3.4	13.74	0.47
Tackle-gear	3.5	10.25	0.36
Other expenses	14.4	12.12	1.74
Mean total trip expenditur	es for all trips		\$24 <b>,</b> 98
Mean daily trip expenditur	es for all trips		\$13 <b>.</b> 28

Most of the respondents reported expenditures for food and beverages and for gas for their own car on fishing trips, and nearly one-half of the respondents reported expenditures for gas and oil for their own boat. On the other hand, less than one-fifth reported any expenditure for lodging. Probably several factors each partially account for the low expenditure figure for lodging: (1) many of the trips were of one day's duration only, (2) many of the anglers camped or slept in their vehicles, and finally (3) lodging accommodations were in short supply during the peak of the coho season.

Few of the respondents indicated purchasing gas or oil for boats or cars other than their own. While this fact probably indicated preference for using one's own car and boat, the low figures given also possibly reflect a sampling bias, favoring boat owner-operators.

## Data from Individual Fishing Trips

In addition to the expenditure data previously discussed, interviewees were asked to provide certain other information concerning individual fishing trips.<sup>1</sup> Trip information is summarized in this section.

The mean trip length was calculated to be 1.9 days. The length of the trip was defined as the entire period of time the individual stayed away from home. Thus for those

<sup>&</sup>lt;sup>1</sup>See questionnaire, Appendix B.

anglers who traveled great distances to fish, the trip length might be several days longer than the period of time actually spent at or near the fishing site.

Table 24 shows the average size of fishing parties reported. It is not known how many anglers included themselves with others of the "Immediate household" in the party as it was intended.

	salmon-t	rout anglers, 19	67.ª
	Immediate Household in Party	Others in Party	Total Members in Party
Mean	1.4	1.1	2.6

TABLE 24.--Size of fishing parties reported among Michigan salmon-trout anglers, 1967.<sup>a</sup>

<sup>a</sup>The above figures are based on 4,618 fishing trips reported.

Table 25 shows the location, by county, of fishing activity among the respondents. The fishing activity was heavily concentrated in the two counties of Manistee and Benzie, which together accounted for 70.0 per cent of the trips reported. Of course unequal sampling effort may have produced a bias favoring counties where such effort was heaviest. Lower Peninsula counties combined accounted for 73.8 per cent of the reported total fishing trips, while Upper Peninsula counties combined accounted for 20.2 per cent.

County	Number of Trips Reported	Percentage of All Reported Trips
Not given	278	6.0
Manistee	1,823	39.5
Benzie	1,418	30.7
Baraga	386	8.4
Marquette	367	7.9
Alger	108	2.3
Mason	75	1.6
Mecosta	38	0.8
Houghton	34	0.7
Other Lower Peninsula	54	1.2
Other Upper Peninsula	37	0.8
Total	4,618	99.9

TABLE 25.--County of fishing activity reported among Michigan salmon-trout anglers, 1967.

Because of the general and ambiguous nature of many of the responses received, it was not considered practical to code fishing sites to categories more specific than county.

Table 26 shows the angling success reported among respondents. The mean total hours of reported fishing activity per party per trip was calculated to be 10.7. The reported average catch of about one coho per trip and three per season probably accounts, in part, for the apparent high degree of angler interest in the fishery.

	Mean Catch			
Species of Fish	Per Respondent for Season	spondent Per Per An Season Trip Hou		
Lake trout	1.35	0.49	0.05	
Rainbow-steelhead	0.93	0.34	0.03	
Coho	3.04	1.12	0.10	
Totals	5.32	1.94	0.18	

TABLE 26.--Angling success reported among Michigan salmontrout anglers, 1967.

Table 27 shows that overwhelmingly the respondents chose boat fishing rather than shore or dock fishing. This might be partially attributed to the fact that coho fishing in the lake and river mouths can be best accomplished from a boat. However, it must be kept in mind that the sampling method used possibly introduced a bias favoring boat owneroperators over non-boating fishermen.

TABLE 27.--Type of fishing reported by Michigan salmontrout anglers, 1967.

Tune of Fighing	Trips Reported		
	Number	Percentage	
Shore or Dock	680	14.7	
Boat	3,603	78.0	
No information given	335	7.3	
Total	4,618	100.0	

Boat fishermen were asked to indicate the boat launching site used for each fishing trip reported. Few responses could be interpreted with certainty as to the exact launch site. Therefore, only the county of boat launching was coded, where possible. Table 28 shows the counties selected by the respondents for boat launching. As could be expected, the counties of launching closely parallel the counties of fishing activity.

TABLE 28.--County of boat launching reported by Michigan salmon-trout anglers, 1967.

County	Launches Reported	Percentage of Total
Manistee	1,318	40.5
Benzie	1,183	36.3
Marquette	304	9.3
Baraga	202	6.2
Alger	85	2.6
Mason	53	1.6
Oceana	28	0.9
Kent	22	0.7
Other	61	1.9
Total	3,256	100.0

Interviewees were asked to indicate the number of miles traveled one-way from home to the site of fishing activity. Table 29 shows that the respondents indicated a willingness to travel considerable distances to participate in the salmon-trout fishery. However, few respondents reported traveling distances greater than one day's automobile drive. The possibility of a sampling bias favoring Michigan resident anglers is discussed on page 60.

Distance Traveled in Miles	Number of Trips Reported	Percentage of Total
0-30	1,317	28.5
31-100	1,112	24.1
101-400	2,100	45.5
401 and over	89	1.9
Total	4,618	100.0

TABLE 29.--Distances traveled one-way from home to fishing site by Michigan salmon-trout anglers, 1967.

### Participation in Outdoor Recreation Activities

Receipients of the questionnaire were asked to indicate the number of days of participation in several selected recreational activities during 1967. Table 30 shows the participation indicated by respondents.

Many respondents provided no information concerning their outdoor recreation activity preferences. In some cases this omission may indicate lack of participation;

Recreational Activities	Percentage of Respondents Indicating Participation in 1967	Mean Days Participation Among All Respondents
Fishing	86,00	31,62
Hunting	65.00	11.10
Auto driving for pleasure	49.91	6.42
Picnicking	49,90	3,90
Swimming	43.01	7.40
Boating	37.90	7.05
Camping	35.10	5.90
Spectator sports	33.10	3.90
Water skiing	23.20	2.71
Golf	20.80	3.82
Walking and hiking	19.85	2.95
Snowmobiling	18.36	2.74
Canoeing	16.70	1.08
Other outdoor games and		
sports	15.61	2.48
Sledding and tobogganing	11.41	0.57
Ice Skating	10.45	0.71
Snow skiing	7.73	0.82
Bicycling	7.31	1.28
Outdoor Concerts, plays, etc.	7.19	0.31
Sailing	6.78	0.62
Other activities	6.71	1.42
Bird watching	4.75	1.41
Other nature study	4.69	0.88
Horseback riding	4.34	0.32
Wildlife and bird photography	4.24	0.36
Tennis	3.44	0.38

TABLE 30.--Recreational activity preferences among Michigan salmon and trout anglers, 1967.

while in other cases apparently the omission reflects an oversight or boredom with the questionnaire. For example nearly 100 per cent of the respondents were fishing at the time of the initial creel census interview. However, only 86 per cent of the respondents indicated "fishing" as a recreational activity on their questionnaires.

### Interrelationships Among the Variables

The questionnaire measured several socio-economic and angling characteristics or variables of salmon and trout anglers. Selected pairs of these variables were matched and tested by means of electronic data-processing equipment to determine whether or not statistically significant relationships could be found.

The set of tables in this section is designed to suggest possible reasons for phenomena observed in tabulating the results of the survey. For example, is boat ownership among anglers related to income, occupation, fishing experience, or to none, or all of these factors?

The significant associations found are not to be considered as definite cause-and-effect relationships. It is believed that the data are not sufficiently representative of all Michigan salmon and trout anglers to state with certainty the causes for angling characteristics observed.

The chi-square test was the primary statistical tool used. This test compares the expected or theoretical results with the actual observed results. The test further

determines the amount of disparity between the expected and actual results and determines the probability of the disparity being due purely to chance.<sup>1</sup> In each case, the null hypothesis is that there is no relationship between the two variables being tested and that the frequency of responses in each category in purely random. Where chisquare is significant, the null hypothesis is rejected, and the paired variables are said to be associated.

Apart from chi-square, no attempt to made to define the exact nature of the relationship between the variables matched. For example, a significant association is shown between purchase of fishing equipment and age. Thus the relationship is not random. However, there is no attempt to show how the two are associated. It is not determined which age group or groups purchased equipment in greater percentage than other age groups.

Tables 31 through 36 match a series of angling variables with each of the four following socio-economic variables: county of residence, age, occupation, and income.

Table 31 matches previous Michigan fishing experience with each of the four selected socio-economic variables. Fishing experience was recorded from the questionnaires as a "yes-no" response, without regard for the amount or angling success of such experience.

<sup>&</sup>lt;sup>1</sup>Herbert Arkin and Raymond R. Colton, <u>Statistical</u> <u>Methods</u> (New York: Barns and Noble, Inc., 1967), p. 112.

None of the pairs tested in Table 30 show statistical significance through use of the chi-square test. Therefore, none of the four variables tested have any apparent association with fishing experience.

Angling Variable	Socio-economic Variable	Chi- square	Degrees Freedom for X <sup>2</sup>
Experience	County of residence	7.64	81
Experience	Age	15.64	12
Experience	Occupation	20.28	16
Experience	Income	8.32	7

TABLE 31.--Prior Michigan fishing experience compared with several socio-economic variables among Michigan salmon-trout anglers, 1967.

Table 32 matches the type of fishing done prior to 1967 with each of the four socio-economic variables. The type of fishing was recorded as "Great Lakes" and "Other." The chi-square test reveals that the type of fishing is associated somewhat with county of residence. Possibly anglers residing near the Great Lakes tend to select Great Lakes fishing significantly more often than residents of inland communities; however, this is not proven.

Table 33 matches the species of fish sought by respondents prior to the coho introduction with each of the four socio-economic variables. Responses to type of fish sought were recorded as "Trout" and "Other." Only county of residence showed a significant association with species sought through use of the chi-square test. Possibly the differences in availability of fish species throughout the state accounts for the significant relationship found.

TABLE 32.--Type of fishing previously selected compared with several socio-economic variables among Michigan salmontrout anglers, 1967.

Ang Var	ling iable	Socio-economic Variable	Chi- square	Degrees of Freedom,X <sup>2</sup>
Туре о	f fishing	County of residence	183.05*	81
Туре о	f fishing	Age	18.89	12
Туре о	f fishing	Occupation	20.11	16
Туре о	f fishing	Income	8.83	7

\*Indicates  $X^2$  significant, P < 0.05.

TABLE 33.--Species of fish sought prior to introduction of coho salmon compared with several socio-economic variables among Michigan salmon and trout anglers, 1967.

Angling Variable	Socio-economic Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
Species sought	County of residence	172.66*	81
Species sought	Аде	13.42	12
Species sought	Occupation	7.98	16
Species sought	Income	9.40	7

\*Indicates  $X^2$  significant, P < 0.05.

Table 34 matches the mean number of fishing trips taken with each of the four socio-economic variables. The variables county of residence, age, and income all show association (chi-square) with the number of trips taken.

TABLE 34.--Mean number of fishing trips taken compared with several socio-economic variables among Michigan salmon and trout anglers, 1967.

An Var	glir iabl	ng Le	Socio-economic Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
Mean	no.	trips	County of residence	1276.15*	782
Mean	no.	trips	Age	298.48*	264
Mean	no.	trips	Occupation	287.28	352
Mean	no.	trips	Income	299.28*	154

\*Indicates chi-square significant, P < 0.05.

Table 35 matches purchase of durable fishing equipment with each of the four socio-economic variables. In each matching a significant relationship (chi-square) is demonstrated. Thus purchase of fishing equipment apparently is related to each of the four socio-economic variables. The variable "equipment purchase" was recorded only as a "yes-no" response.

Angling Variable	Socio-economic Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
Equipment purchase	County of residence	106.76*	81
Equipment purchase	Age	32.27*	12
Equipment purchase	Occupation	42.88*	16
Equipment purchase	Income	75.34*	7

TABLE 35.--Purchase of durable equipment compared with several socio-economic variables among Michigan salmontrout anglers, 1967.<sup>a</sup>

Indicates chi-square significant, P < 0.05.

<sup>a</sup>Durable equipment includes fishing tackle, boats, or boating equipment and camping equipment.

Table 36 matches boat ownership with each of the four socio-economic variables. Only respondents who were using their own boat at the time of the creel census interview were recorded as being boat owners. Chi-square tests indicate significant relationships between each pair of variables matched in this table. Therefore, apparently boat ownership is associated with county of residence, age, occupation, and income.

Table 37 matches length of boat with each of four socio-economic variables. Chi-square tests indicate boat length has significant relationships with county of residence and income. Only data from boat users are included.

Angling Variable	5	Socio-economic Variable	Chi- square-	Degrees of Freedom, X <sup>2</sup>
Boat owner	ship	County of residence	217.66*	162
Boat owner	ship	Age	46.32*	24
Boat owner	ship	Occupation	49.17*	32
Boat owner	ship	Income	40.02*	14

TABLE 36.--Boat ownership compared with several socioeconomic variables among Michigan salmon-trout anglers, 1967.

\*Indicates chi-square significant, P < 0.05.

TABLE 37.--Boat length compared with several socio-economic variables among Michigan salmon-trout anglers, 1967.

Angling Variable		Socio-economic Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
Boat	length	County of residence	2259.87*	738
Boat	length	Age	212.42	264
Boat	length	Occupation	222.06	352
Boat	length	Income	230.12*	154

\*Indicates chi-square significant, P < 0.05.

Boat users are identified as those respondents who were fishing from a boat at the time of the creel survey interview. Tables 38 through 44 match a series of angling variables with each of the following angling or socioeconomic variables: county of fishing activity, distance traveled to fish, county of residence, occupation, income, and previous fishing experience.

Table 38 matches length of fishing trip (days) with each of the selected angling or socio-economic variables. Chi-square tests indicate that trip length is related to county of fishing activity, distance traveled to fish, county of residence, occupation, and income. Previous fishing experience apparently is not associated with length of fishing trip.

TABLE 38.--Length of fishing trip compared with several angling and socio-economic variables among Michigan salmon-trout anglers, 1967.

Angling Angling or Variable Socio-economic Variable Variable		Chi- square	Degrees of Freedom, X <sup>2</sup>	
Trip	length	County of fishing	7609.71*	986
Trip	length	Distance traveled	1496.19*	203
Trip	length	County of residence	3788.90*	349
Trip	length	Occupation	819.42*	464
Trip	length	Income	277.95*	203
Trip	length	Fishing experience	17.69	29

\*Indicates chi-square significant, P < 0.05.

Table 39 matches size of fishing party with each of the selected angling and socio-economic variables. Chisquare tests reveal that size of party is associated with county of fishing activity, distance traveled, county of residence, occupation, and income. Of all variables matched, only previous Michigan fishing experience showed no relationship with party size.

TABLE 39.--Size of fishing party compared with several angling and socio-economic variables among Michigan salmontrout anglers, 1967.

Angling Variable	Angling or Socio-economic Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
Party size	County of fishing	647.88*	510
Party size	Distance traveled	300.25*	105
<b>Party siz</b> e	County of residence	2027.81*	215
Party size	Occupation	440.95*	240
Party size	Income	185.19*	105
Party size	Fishing experience	14.92	15

\*Indicates chi-square significant, P < 0.05.

Table 40 matches the county of fishing activity with each of the selected angling and socio-economic variables. Chi-square tests indicate that county of fishing activity is associated with distance traveled, county of residence, occupation, income, and fishing experience.

Angling Variable	Angling or Socio-economic Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
County fished	Distance traveled	341.20*	42
County fished	County of residence	1912.36*	342
County fished	Occupation	206.45*	96
County fished	Income	97.36*	42
County fished	Fishing experience	31.71*	6

TABLE 40.--Location of fishing activity by county compared with several angling and socio-economic variables among Michigan salmon-trout anglers, 1967.

\*Indicates chi-square significant, P < 0.05.

Table 41 matches coho angling success with each of the selected angling and socio-economic variables. Chisquare tests show each of the following to be associated with success in coho angling: county of fishing activity, distance traveled to fish, county of residence, income, and previous fishing experience. Only occupation of all variables matched shows no statistical relationship with coho angling success.

Table 42 matches the type of fishing done ("shore or dock" or "boat") with each of the selected angling or socio-economic variables. The type of fishing done is that indicated by the respondent for each trip he reported. Chisquare tests indicate that each of the matched pairs is associated. Therefore, each of the following variables is related to the type of fishing engaged in: county of TABLE 41.--Coho angling success compared with several angling and socio-economic variables among Michigan salmon-trout anglers, 1967.

Angling Variable	Angling or Socio-economic Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
Coho success <sup>a</sup>	County fished	2563.41*	400
Coho success	Distance traveled	466.73*	280
Coho success	County of residence	2886.40*	240
Coho success	Occupation	666.36	640
Coho <b>su</b> ccess	Income	308.74*	280
Coho success	Fishing experience	72.46*	40

\*Indicates chi-square significant, P 0.05.

<sup>a</sup>Coho success is defined as mean number of coho caught per trip per fishing party.

TABLE 42.--Type of fishing done compared with several angling and socio-economic variables among Michigan salmon-trout anglers, 1967.

Anglin Variab	g le	Angling or Socio-economic Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
Type of	fishing <sup>a</sup>	County fished	1653.20*	70
Type of	fishing	Distance traveled	525.54*	14
Type of	fishing	County of residence	424.36*	162
Type of	fishing	Occupation	108.26*	32
Type of	fishing	Income	80.14*	14
Type of	fishing	Fishing experience	7.42*	2

\*Indicates chi-square significant, P < 0.05.

<sup>a</sup>Coded as "shore or dock" or "other."

fishing activity, distance traveled to fish, county of residence, occupation, income, and previous fishing experience.

Table 43 shows the relationships between distance traveled to fish and selected angling and socio-economic variables. All chi-square tests indicated significant relationships. Therefore, distance traveled to fish is associated with each of the following: county of fishing activity, county of residence, occupation, income, and previous fishing experience.

TABLE 43.--Distance traveled to fish compared with selected angling and socio-economic variables among Michigan salmon-trout anglers, 1967.

Angling Angling or Variable Socio-economic Variable Variable	Chi- square	Degrees of Freedom, X <sup>2</sup>
Distance County fished	2380.65*	210
Distance County of residence	7418.17*	486
Distance Occupation	486.31*	96
Distance Income	411.92*	42
Distance Fishing experience	20.56*	6

\*Indicates chi-square significant, P < 0.05.

The questionnaire asked for the type of lodging used during each fishing trip reported. The alternatives were the following: your home; friend's home; cottage; motel or hotel; tent, trailer, or camper; car; and other. Table 44 matches the type of lodging selected with each of several selected angling and socio-economic variables. Significant chi-square values were obtained for each pair matched, indicating each of the following factors is associated with type of lodging selected: county of fishing activity, distance traveled, county of residence, occupation, income, and previous fishing experience.

TABLE 44.--Type of lodging utilized compared with selected angling and socio-economic variables among Michigan salmontrout anglers, 1967.

Angling Variable	Angling or Socio-economic Variable	Chi <del>-</del> square	Degrees of Freedom, X <sup>2</sup>
Lodging	County fished	729.54*	245
Lodging	Distance traveled	1600.28*	49
Lodging	County of residence	3204.01*	567
Lodging	Occupation	480.67*	112
Lodging	Income	367.09*	49
Lodging	Fishing experience	16.02*	7

\*Indicates chi-square significant, P < 0.05.

Each significant chi-square relationship found in the tables of this section indicates the two matched variables are associated or related in a non-random manner. However, the nature of each significant association can only be speculated upon without more detailed study.

. . . It is worthwhile to emphasize that although valid conclusions can always be drawn from frequency data by applying the correct tests of significance,

yet the results of these tests are generally of a low order of accuracy. It is usually better to avoid having to present the data as a contingency table if there is any reasonable alternative.<sup>1</sup>

None of the pairs matched showed a significant correlation coefficient. Where chi-square is significant and correlation coefficient is not significant, the nature of the association is unknown.

It must be appreciated that the non-significance of a particular regression coefficient does not in any way imply that the independent variable concerned does not affect, or is not related to the dependent variable. It implies merely that, at the level of significance adopted, the confidence limits for the estimated effect, or slope, include zero as a possible value. . . We may only be justified in concluding further work is required to define the relationship more precisely.<sup>2</sup>

It is suggested that possibly a multiple regression could be demonstrated.<sup>3</sup> Perhaps a group of independent variables, acting in concert, could be shown to influence a given dependent variable; while the individual influence of each independent variable could not be shown. "Frequently a quantity of interest . . . will be dependent on the levels of not one but a number of variables. The

<sup>1</sup>Owen L. Davies, ed., <u>Statistical Methods in Re-</u> <u>search and Production</u> (London: Oliver and Boyd, 1958), p. 297.

<sup>2</sup><u>Ibid.</u>, pp. 235-36.

<sup>3</sup>Dennis C. Gilliland, Associate Professor, Department of Statistics and Probability, Michigan State University, Personal communication, October 31, 1969. situation is often complicated by the fact that these variables are themselves related."<sup>1</sup>

It is suggested that further study, including use of multiple correlation, may help define more precisely relationships between pairs of variables. Further, the use of data more clearly representative of all Michigan salmon and trout anglers will yield more reliable results.

<sup>&</sup>lt;sup>1</sup>Davies, <u>Statistical Methods in Research and</u> Production, p. 208.



#### CHAPTER IV

## CONCLUSIONS AND RECOMMENDATIONS

Several conclusions were reached concerning characteristics and attitudes of respondents, based on analysis of the findings. It should not be assumed that the data concerning angler characteristics and attitudes are fully representative of the Michigan salmon-trout fishing population as a whole. The 1967 survey, augmented with findings of subsequent surveys, will provide a much clearer picture of the fishery and the angler.

Several recommendations were developed from the results of this investigation. These recommendations are concerned mainly with improving survey techniques and insuring more complete and useful data from future surveys. Recommendations concerning sport fishery and recreation management are given, and certain implications of the findings for private entrepreneurs are pointed out.

## Socio-economic Characteristics

Only a very small number (3.6 per cent) of the respondents resided outside Michigan. While an unbiased sample may reveal a higher proportion of non-residents,

clearly the anadromous sport fishery is mainly attracting Michigan resident anglers. Within counties of the state two factors appear to influence participation in the fishery: total population of the county, and proximity to salmon or trout angling.

The respondents were primarily urban dwellers. Nearly 70 per cent reported that they resided within a city or village. Possibly the name-address punch cards could be utilized in making a more accurate determination of residence patterns. Using the cards, 100 per cent of the sample could be identified as to state, county, and city of residence.

The following general identifying characteristics were noted among respondents. Nearly 100 per cent were male, and over 90 per cent were married. Possibly a more representative sample would reveal a higher percentage of females. Reported ages covered a wide range; however, over 80 per cent were between the ages of twenty-five and fifty-nine. Nearly all occupational groups were represented. The four categories "Professional, technical and kindred workers"; "Managers, officials and proprietors"; "Craftsmen, foremen and kindred workers"; and "Operatives and kindred workers" accounted for nearly 60 per cent of the respondents.

Incomes reported were significantly higher than for the population of the state as a whole. Some reluctance to report income was noted.<sup>1</sup>

### Fishing Trip Characteristics

This section summarizes characteristics of individual fishing trips, excluding trip expenditures, which were derived from analysis of returned questionnaires.

The average trip length was about two days, including travel time. The average fishing party consisted of 2.6 individuals. Fishing activity within the two Lower Peninsula counties of Benzie and Manistee alone accounted for 70 per cent of the total reported angling effort. Participation within the three Upper Peninsula counties of Baraga, Marquette, and Alger accounted for a further 19 per cent of reported angling effort.

Nearly all respondents had some success at coho fishing. The mean coho catch was about three fish for the season and one fish per trip. About 80 per cent of the respondents were boat fishermen. It is not known if the sample was biased in favor of boating fishermen.

Nearly one-half of the respondents reported traveling between 100 and 400 miles one-way from home to their fishing site. However, fewer than 2 per cent reported travel distances in excess of 400 miles. Thus nearly all

<sup>&</sup>lt;sup>1</sup>Supra, p. 112.

the respondents fished within one day's driving time of their home.

# Angling Preferences, Attitudes, and Opinions

Nearly all the respondents were experienced Michigan fishermen prior to the 1967 season. Analysis of the returned questionnaires revealed no evidence that many previous non-anglers are being induced to participate in the coho salmon sport fishery. Among first-time anglers contacted, fewer than one-half indicated that the coho introduction caused them to become a fisherman.

Anglers indicated that they previously fished mainly streams and inland lakes, and to a lesser degree the Great Lakes. The resurgence of Great Lakes sport fishing, sparked by the coho introduction, very likely will cause a shift in popularity from inland lakes toward Great Lakes and stream fishing. The majority of anglers reported preference for trout fishing over any other type prior to the salmon introduction.

The author feels that the high rate of response to the questionnaire is somewhat indicative of the amount of interest developed among anglers by the coho introduction. The questionnaire form was lengthy and complex and was sent out long after the actual fishing took place. However, nearly 80 per cent of the mailed forms were completed and returned.

Few respondents indicated that they were so displeased with the fishery that they intended to give up salmon-trout fishing. However, most suggested specific areas of improvement for Michigan fishing. Suggested improvements covered a wide variety of topics. Most suggestions were concerned in some way with aiding the modern sportsman in getting to and from his fishing site with ample space and a minimum of difficulty. It is felt that the suggestions provided by respondents reflect the high degree of mechanization and the amount of high-priced equipment associated with the fishery.

Relatively little concern was shown for needed regulations or conservation practices pertaining to fishing. Perhaps this fact suggests a public information need for the state. The anglers surveyed represent a highly vocal and rather affluent group. It is important that such individuals be aware of the problems facing sport fishing such as maintaining water quality, the threat posed by pesticides, and the influence of other interest groups competing for water resources and for state funds.

Reported recreational activities preferences included the entire range of alternatives provided. Onehalf or more of the respondents participated in hunting, fishing, auto driving for pleasure and picnicking.

#### Economic Data Obtained

#### Data on Expenditures

The mean total reported expenditure per angler for durable equipment attributed to coho fishing was \$267.00. In each category of durable equipment, less than one-half of the total use in 1967 was attributed to coho fishing.

The mean daily trip expenditure reported per angler was about \$13.00. Total trip expenditures averaged \$25.00 per angler. Trip expenditures consisted mainly of food and beverages and gas and oil for the angler's own car or boat. Relatively little expenditure was recorded for rental of equipment or for lodging. Perhaps the anglers preferred ownership of equipment to rental, or perhaps there was simply not sufficient equipment available at a suitable rental fee. Similarly with lodging, perhaps the respondents preferred commuting or sleeping in a tent or car. On the other hand, possibly there was not sufficient lodging available at a price the angler was willing to pay.

While the use of "gross expenditure" studies is generally criticized, Spargo points out that such studies can provide useful data on the importance of expenditures to the local community.<sup>1</sup> Segments of the state's economy are certain to benefit from the angler's expenditures; however, it is not possible to ascertain how much of the

<sup>&</sup>lt;sup>1</sup>Spargo, "Methods and Techniques of Evaluating Sports Fishing," p. 60.

expenditures will be made in the fishing regions. Indeed, most of the larger expenditures for durable equipment and a large portion of the trip expenditures will be made in areas close to the angler's home, rather than near his fishing site. Many anglers invested heavily in boating and camping equipment. Thus sporting goods stores in Detroit, for example, may profit more from angler expenditures (and indirectly from the coho introduction) than entrepreneurs in the salmon-trout fishing region. The fishing regions probably derive the greatest economic benefit from increased lodging receipts, meal and gasoline sales, and to a lesser degree from increased sales of fishing tackle and other durable equipment.

Respondents indicated a willingness to spend sizable sums and reported incomes well above the state average. The possibility exists that participation in the sport fishery is restricted to a relatively high income group. Studies from subsequent seasons should indicate with more validity the income and expenditure patterns among anglers.

## Improvement of Economic Data

While anglers' expenditures for durable goods and for individual fishing trips may provide useful information, such data should not be construed as "net inputs" into the economy of the state or region. As pointed out by Brown, if the fishery suddenly were to be abolished, most of the money previously spent on spent on sport fishing merely would be redirected toward other activities.<sup>1</sup> Thus the expenditures of Michigan salmon-trout anglers may influence the distribution of "wealth" within the state but not necessarily indicate a net increase in expenditures.

The evaluation technique devised by Clawson probably could be applied to the Michigan salmon-trout sport fishery.<sup>2</sup> However, it it beyond the scope of the present study to determine or estimate a gross or net economic value of the fishery. Accurate determination of such values, using data obtained in the present study, is probably impossible. Problems of sampling bias, already discussed, preclude an accurate expansion of the data to the entire angler population. However, a determination of the "net economic value" based on future questionnaire surveys should provide highly useful information. It is recommended that such a determination be undertaken.

It is felt that more meaningful data on the overall economic impact of the salmon-trout sport fishery could be obtained if angler expenditure studies could be supplemented with other studies. Such factors as sales at service stations, restaurants, motels, bait and tackle shops, and other businesses in the fishing regions and elsewhere in the state could be valuable indicators of the local

<sup>2</sup><u>Ibid</u>., p. 272.

<sup>&</sup>lt;sup>1</sup>Brown, Singh, and Castle, "Steelhead Sport Fishery," p. 268.
economic importance of the fishery. It would be expecially useful if sales trends before and after the introduction of the coho could be compared.

## Recommendations for Improvement of the Survey

## Sampling Techniques

Because licenses were not required of Great Lakes anglers at the time of the survey, the Department of Conservation had to resort to creel census data to obtain a sample of anglers. Samples for future surveys will be selected from license holders, thus providing a more statistically reliable sample.

### The Questionnaire

As a general criticism, the author feels that the questionnaire used in the 1967 coho fisherman survey was too long and asked for too detailed information. Of course, shortening the form would result in some sacrifice in the amount of information obtained. However, the loss in information might be well compensated by a higher rate of return and more complete, and more usable responses.

Below are specific changes suggested for the questionnaire format and wording.

The first suggested change is to pre-code, or prepare the questionnaire form for later analysis, prior to mailing. It is felt that all responses to the questionnaire, with the possible exception of those relating to individual fishing trips, could be coded on the questionnaire form, without transferring the data to 80-column grid sheets. Key punchers could then work directly from the questionnaire form. The author feels that a great deal of time and effort could be saved by careful precoding.<sup>1</sup>

It is suggested that question five, requesting the amount of total family income, be placed toward the end of the questionnaire. Nearly 8 per cent of the respondents did not answer the question, and it seemed to generate some antagonism. A few individuals indicated that the question was too personal. Some returned the form completely blank. Others, who indicated displeasure with the question, simply left it blank and completed the rest of the questionnaire. It is felt that a hostile reaction to the question may reduce the validity or completeness of answers to subsequent questions. Perhaps the negative reaction would have been less pronounced if the question on income had been placed in a less conspicuous portion of the questionnaire, such as the last page.

Question number eleven asked, "Do you plan to fish for cohos in 1968?" In addition to the blocks for "yes" and "no" answers, another block labeled "undecided" should be provided if the question is used in future surveys.

<sup>&</sup>lt;sup>1</sup>Charles H. Backstrom and Gerald D. Hursh, <u>Survey</u> <u>Research</u> (Evanston, Ill.: Northwestern University Press, 1963), pp. 112-13.

Many people wrote in "do not know." or some similar response to the question. Coders were unable to record responses other than "yes" or "no."

Questions fifteen and sixteen requested detailed information concerning each fishing trip taken by the respondent. Many individuals, with otherwise complete responses, were unable to provide usable information on individual fishing trips. Some people wrote in seasonal summaries and approximations, while others wrote that they could not recall, or else simply left the section blank.

Much of the poor response to questions fifteen and sixteen probably can be attributed to the great time lag between the 1967 fishing trips and the receipt of the questionnaire. The 1967 questionnaire was mailed out as long as one year after the fishing activity had occurred, in some cases. The problem of time lag probably will be greatly reduced in future surveys. Subsequent questionnaires will be delivered to the fishermen, at most, four to five months after the fishing has taken place.

In addition to the problem of recall, the great amount of highly detailed information requested in questions fifteen and sixteen, coupled with the overall length of the questionnaire, may have discouraged some people from providing information about their fishing trips. Perhaps a shorter, simpler form and briefer questions would be less discouraging and time consuming to the respondent. Since many of those who completed questions fifteen and sixteen



indicated that their responses were estimates and averages, it is felt that little data would be lost if people were asked merely to summarize the data for all fishing trips made during the season.

The problem of obtaining accurate trip data was particularly great among local fishermen. Many anglers reported that they live within a very few miles of their fishing sites. Many such individuals fish almost daily and undoubtedly account for a large portion of the total man-hours of coho fishing effort; however, these fishermen are often unable to recall any of the details of individual fishing trips. Therefore, a seasonal summary of fishing trip information would be particularly useful in obtaining data from local fishermen.

In question fifteen, the column headed "Day or Days" caused confusion during coding. Some individuals provided inclusive dates of each fishing trip, as was intended. However, many people apparently indicated the total number of days duration of all fishing trips. In many cases it was not possible to determine which meaning was intended by the respondent from the number or numbers he provided. To clarify this problem, another column with a heading such as "Number of Days Fishing Trip Lasted" should be added to the question, and the caption "Day or Days" should be reworded "Inclusive Dates of Fishing Trip."

If it is considered desirable in future surveys to determine the specific site of boat launching, it is

recommended that a sample of the returned questionnaires be reviewed to establish a code for the launch sites used. The American Automobile Association listing of Michigan launching sites proved to be of little value in coding as only a very few of the sites indicated by respondents could be found in the "AAA" listing.

Under the caption "Types of Fishing" in question fifteen, some of the respondents reported that they participated in both "Shore or Dock" and "Boat" fishing on the same fishing trip. Either the question should be reworded to ask for the primary type of fishing engaged in during the trip, or another code should be established for participation in both types of fishing.

In the second column of question sixteen, the following caption appears: "If overnight trip, what kind of lodging was used?" The phrase, "If overnight trip," should be deleted. Many people left the column blank. In such cases it was not possible to determine if they meant the trip was of one day's duration only, or if they neglected to indicate the type of lodging. Each person should be asked to indicate the code letter, regardless of whether or not the trip was "overnight," since the lodging choices include "At your home" as one of the alternatives.

Question seventeen asks for the amounts spent for, and use of, specific items of fishing tackle, boating equipment, and camping equipment. The author feels that



asking the respondents to summarize expenditures for each class of equipment probably would provide information equally accurate as asking for itemized expenditures. Also if the respondent were to indicate sums for fishing tackle, boating equipment, and camping equipment, the coder would not be burdened with the task of adding up the itemized expenditures in each class.

The author recommends that question eighteen be dropped from future questionnaires. The total days of participation in certain recreational activities may prove useful to a study of coho fishing if data could be collected and compared over a period of several years. However, in view of its marginal utility and the great length it adds to the questionnaire, it is recommended that the question simply be omitted.

### Management Recommendations

The findings revealed an apparent high degree of acceptance of the anadromous sport fishery among respondents. It is felt that this acceptance is probably shared by most anglers who participated in the fishery. It is a virtual certainty that demand for sport fishing opportunity and other recreation will continue to grow. The Michigan coho salmon fishery holds vast potential for satisfying this demand. It is recommended that the coho fishery be considered, along with other state supported recreational programs, in planning for optimum use of public funds.

It is recommended that with the growth of the anadromous sport fishery there be a concomitant increase in boat launching sites, access roads, parking areas, and camping areas. Even if additional streams are opened to salmon fishing, the growth in angler participation will probably necessitate improved facilities for the mechanized angler. The state should provide coordinated planning for the needed facilities. Where feasible, private entrepreneurs should be encouraged through tax incentives or other means to assist in providing these facilities. Respondents' recommendations indicated a definite shortage of such facilities during the 1967 season.

The state has a very clear responsibility in the area of maintaining suitable water quality to insure continuation of the sport fishery. Such problems as pesticide contamination and industrial and domestic sewage pollutants require continuing study. A detailed examination of water quality problems is beyond the scope of this thesis, but the relationship of such problems to sport fisheries is certain.

### Correlations

Certain aspects of the data gathered in this study were subjected to correlation analysis on the computer, as described earlier, in an attempt to determine possible relationships between the angling phenomena observed. No linear relationships were found using

correlation coefficients. The chi-square test indicated significant associations between several pairs of variables tested. These associations are summarized below.

Both fishing location and species of fish sought prior to the coho introduction are associated with county of residence. The number of fishing trips taken in 1967 is associated with county of residence, age, and income. The purchase of fishing equipment in 1967 is associated both with county of residence and income. Length of fishing trip and size of fishing party are both associated with county of fishing activity, distance traveled to fish, county of residence, occupation, and income. The county of fishing activity is associated with distance traveled to fish, county of residence, occupation, income, and fishing experience. Coho angling success is associated with county of fishing activity, distance traveled to fish, county of residence, income, and fishing experience. The type of fishing done (boat or shore) and the type of lodging selected are both associated with county of fishing activity, distance traveled to fish, county of residence, occupation, income, and fishing experience. The length of boat being operated is associated both with county of residence and income.

The precise nature of the associations found is unknown, and this may prove to be a fruitful area for further research. For example, it has been shown that the number of fishing trips taken is related in some manner to

county of residence, age, and income. It may be useful to determine which counties of residence and which age and income groups tend to be associated with many fishing trips, and, conversely, which tend to be associated with fewer trips. It is recommended that investigations explore these relationships more extensively once more representative data are available from future salmon-trout angling surveys.

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# APPENDICES

Notes and American States

# APPENDIX A

CREEL CENSUS PROCEDURES

## APPENDIX A

## CREEL CENSUS PROCEDURES

## Procedures for the Lake Michigan and Stream Creel Censuses<sup>I</sup>

## Lake Michigan

It is anticipated that the currently lethargic sport fishery on Lake Michigan will be stimulated into action when salmon and trout begin moving toward the Manistee and Platte rivers for the autumn migration. The most probable areas to receive the anglers' attention are listed in Table 1.

The census schedule is given in Table 2. Even though the census is slated to begin on July 1, sampling at any given port need not begin until fishing activity is readily apparent; therefore, it will be Field's prerogative to judge when angling intensity warrants the implementation and continuation of the creel survey. The schedule can easily be extended should the need arise. The Platte River mouth and Manistee stations are not

<sup>&</sup>lt;sup>1</sup>Instructions prepared by Ronald W. Rybicki, Fisheries Management Evaluation Specialist, Department of Conservation, for the Creel Census of Fall, 1967.

included on the lake schedule after July 31, but will continue to be surveyed as a part of the stream creel census beginning August 1.

The ports have been grouped into statistical districts I through III. The sampling of all ports within a statistical district will require up to eighty hours per pay period, and can be done by one individual per district. Implementation or discontinuation of censusing at any given port will not interfere with the remainder of the schedule.

Instantaneous counts of boat and shore anglers (pier and wading) should be made at the times indicated on the schedule. All boats (except freighters) observable with the aid of binoculars should be counted regardless of activity. It may be difficult to separate pier anglers from nonanglers; in this case, count everyone on the pier. Be certain to note whether the count is for boats or shore individuals. In addition to each count, please record date, time, and location.

As many interviews as possible should be conducted during the sampling day. As with the counts, it is essential that no distinction be made regarding the activity of the potential interviewee. This is necessary so that a ration can be established between fishing and nonfishing activity; the ration will then be used in the angling effort calculation. Where a small boat ramp and a large boat marina are adjacent to each other, attempt to sample large and small craft in proportion to their numbers. Most

Grane ---(m interviews will be at locations where inland boating activity will also occur; it will not be necessary to fill out a census form for boating activity strictly on inland waters. Interviews are to be recorded for completed fishing trips only; a completed trip for boat anglers will be upon landing, and for share anglers, upon leaving the pier or the beach. One interview form is to be completed per share angler, and one form per boat party.

### Stream Census

Discussion with Field regarding the proposed stream census revealed several problems in the design of the survey. The schedule and procedures for this phase of the project will be forwarded to Field as soon as revisions have been made.

The Platte, Bear, Manistee and Little Manistee rivers are the project streams. The creel survey is scheduled to begin on August 1 and terminate on November 25 (sooner if justified). To obtain counts and interviews, two teams of two men each will be needed; one member of the team will float the designated stream and count anglers while the second member conducts interviews. The schedule will require eighty hours per pay period per man.

Creel census forms will be supplied by staff. Please forward all data to Fish Division, Lansing, at the end of each two-week period.

### Stream Creel Census Procedures

The creel surveys for the Platte, Bear, Manistee, and Little Manistee rivers are scheduled for the period August 1 through November 25. The project will require two crews of two men each, with each man working approximately the following number of hours per pay period: August 1-September 2--eighty hours; September 3-October 28 --fifty-six hours; and October 29-November 25--forty-two hours.

In most cases the schedule calls for a work period of from two to four successive days for each crew, followed by a pass period of from two to four successive days. Each work day will be of approximately from six to ten hours-four to eight hours for sampling, and two hours travel time to and from the project area. Each sampling day has been divided into two shifts; the shift hours vary as noted on the schedule.

The Manistee and Little Manistee rivers each have been divided into two sections--I and II--so that each section is statistically equivalent to one stream. The streams have been paired so that one pair can be censused per scheduled day with a minimum of travel time between stations. For the period of October 29-November 25, only one stream per scheduled day per crew will be censused, however, should angling effort be greater than anticipated, the schedule should be expanded.

Floating will be the method used to obtain angler counts. Hopefully, only one man of the two-man crew will be needed for the float trip. Counts are to be made of all boats passed as well as individual bank and wading fishermen. The Manistee and Platte lakes probably can be censused most efficiently by both crew members from the vantage points suggested in Table 2. Please maintain separate records for inland lakes and streams census.

While the float trip is in progress, the second member of the team should be conducting interviews at access points along the stream. The ground rules for interviewing are given in the Lake Michigan Creel Census Procedures. The portions of the creel census form designated as "Maximum Distance from Port" and "Area Where Most Fish Were Caught" may be eliminated for the inland lake and stream census.

The Lake Michigan stations located at Manistee and the Platte River Mouth should be censused concurrently with the Manistee and Platte rivers surveys. STATE OF MICHIGAN



ONSERVATION COMMISSION HARRY H. WHITELEY Chairman CARL T. JOHNSON E. M. LAITALA ROBERT C. McLAUGHLIN AUGUST SCHOLLE

#### GEORGE ROMNEY, Governor

DEPARTMENT OF CONSERVATION

STEVENS T. MASON BUILDING, LANSING, MICHIGAN 48926

RALPH A. MAC MULLAN, Director

Dear Salmon Fisherman:

Last summer or fall you were interviewed during a creel census by a member of the Michigan Department of Conservation. Your cooperation in answering questions at that time was very much appreciated.

As you know, a great deal of interest was stimulated by the success of the coho salmon introduction into the Great Lakes. This interest has prompted the Conservation Department to conduct a much more intensive survey of salmon and trout fishermen. The present survey is designed to measure the recreational merits and economic value of the Great Lakes fish program. The resulting information will help in planning the future fish-stocking program, water access and boat launching and camping facilities.

We again ask you for the spirit of cooperation extended in the past. Enclosed is a list of questions, most of which are related to past fishing trips. Would you please complete this questionnaire as soon as possible, and return it in the pre-addressed envelope provided?

We realize that answering these questions will require some time and effort on your part. Also time dulls the memory and you might not be able to recall your expenditures exactly. But we hope you will do the best you can. We are sure that the time and effort will be well spent, for they will contribute to future fishing and other recreational development in Michigan--besides, it is good to think back and recall the fun we all had being in on the first big salmon "catch."

Your help will be greatly appreciated and, of course, all information that you supply will be treated confidentially.

Sincerely yours,

David H. Jenkins, Chief Research and Development Division Michigan Department of Conservation



**GREAT LAKES SALMON-TROUT FISHING QUESTIONNAIRE** 1. In which county do you live 2. Do you live within the limits of a city or village? Yes No What is your sex \_\_\_\_\_ Age \_\_\_\_ Are you married \_\_\_\_ Single \_\_\_\_\_ 3. What is your occupation \_\_\_\_\_ 4. 5. In 1967, what was the approximate total yearly income of your household? If single, give your income; if married, the total of both yours and your spouse. Under \$3,000 **\$ 8,000 - \$** 9,999 \$3,000 - \$5,999 **\$10,000 - \$14,**999 **\$6,000 - \$7,**999 \$15,000 - \$24,999 **\$25,000** and over 6. How many people are there in your household? 7. Did you fish in Michigan in any of the years from 1962 through 1966? Yes No 8. If yes, check the years you fished. 1962 1963 1964 1965 1966 9. If your answer to question 6 was no, what prompted you to go fishing in 1967?

10. If your answer to question 6 was yes, what kinds of fishing have you usually done in the past in Michigan? Check one or more in both A and B listings:

<b>A</b> .	Location	в.	KING OF HER	•		
	Great Lakes		Trout		Bass	۲ ا
	Inland lake		Pan fish		Pike	
	Streams		Walleye		Perch	
					Other	
Wh	ich one of the a	above kinds of	f fish do you	fish for mos	st?	
Do	you plan to fis	h for cohos in	a 1968? Ye	es 🔲	No	
If n	not, why not?					
Whayou	at facilities or In future fishin	features of G g trips more	reat Lakes f enjoyable?	ishing could	be improved t	to make
Wha you	at facilities or ir future fishin	features of G g trips more	reat Lakes f enjoyable?	ishing could	be improved t	to make
Wha you	at facilities or ir future fishin	features of G g trips more	reat Lakes f enjoyable?	ishing could	be improved t	to make
Wha you	at facilities or ir future fishin	features of G g trips more	Freat Lakes f enjoyable?	ishing could	be improved t	to make
Wha you	at facilities or ir future fishin	features of G g trips more	Freat Lakes f enjoyable?	ishing could	be improved t	to make
Wha you	at facilities or ir future fishin	features of G g trips more	enjoyable?	ishing could	be improved t	to make
Wha you	at facilities or ar future fishin	features of G g trips more	ereat Lakes f enjoyable?	ishing could	be improved t	to make
Wha you	at facilities or ar future fishin	features of G g trips more	ereat Lakes f enjoyable?	ishing could	be improved t	to make
What you	at facilities or ar future fishin	features of G g trips more	Freat Lakes f	ishing could	be improved t	to make

												-		34 25 26 27 38 29 30
	Da	q	Numb	er in P	arty	Where did you fish? For Great Lakes, give nearest town; for stream or in-	Nur	mber ight br	of fish v partv	Hours	Types of fishing	If	boat, here	Approx. one-way distance (mi.) home
rishing	Month	Day or Days	house- hold**	Others	Total	land lake, name of stream or lake***	Lake trout	Coho	Rainbow & steelhead	party fished	Shore or dockB	di oat la	d you unch?	to fish- ing spot
Ex- mple:	Oct.	12 & 13	ю	1	4	Platte River		5		14		X	enzie ate ark	54
1														
2												-		
3												-		
4														
5														
9												-		-
7										-			-	
8			-									-		
6												-		
10					į	B	L'an	1.4.1				1		

on one line. \*\* Immediate household means your spouse and children living at home who were fishing with you. \*\*\* If you fished in two or more localities on one trip, list all of them.



soplating the second se	e in you for, for, ining ielf* mily, p mily, p mily, p nember iemon	If overnight trrip, what kind of lodg- ing was used? From key below** from key below** rry included some <i>m</i> rry included some <i>m</i> resumably you also of your family fishi e other member of y	Where was located? located? embers paid u were our	Lodgin if any # # B D C B A	Food and including liquor liquor Your home Friend's hom Motel or hote Tent, trailer	Gas Gas Car	Your Your boat boat amper	r Trip Costs Paid to Paid to thers ***	Experimentary Experimentary Experimentary Experimentary Experimentary Experimentary Experimentary Experimentary (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	Rent Rent notor notor for the set of the set	al of Tackle & gear your sha your sha	Other expen
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approximate amount of money spent by you on each of the trips listed above. Please liet the

17. Did you purchase any of the following equipment (for any purpose) during 1967? Yes No

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If yes, please fill in appropriate spaces with your best estimates of costs and days of use.

Aller and a state

		Approximately how	Approximately how
		many days did you	many days did you
	Approximate	use each item of	use this equipment
	cost	equipment in 1967?	for coho fishing?
TACKLE			
Rods			
Reels			
Line			
Lures			
Boots & waders			
Qther			
BOATING EQUIPMENT			
Boats			
Boat trailer			
Qutboard motor			
Accessory equipment			
CAMPING EQUIPMENT			
Tent			
Tent trailer			
Campers			
House trailer			
<u>Şleeping bags</u>			
Lantern			

## 17. (continued)

	Approximate cost	Approximately how many days did you use each item of equipment in 1937?	Approximately how many days did you use this equipment for coho fishing?
Camping equipment (contin	ued)		
Camp stove			
Other			
		•	

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18. Please indicate the approximate number of days in 1967 on which you participated in the various outdoor recreational activities listed below:

Activity	Days
Bicycling	
Horseback riding	
Golf	
Tennis	
Other outdoor games or sports (badminton, horseshoes, shuffleboard, etc,)	
Fishing	
Canoeing	
Sailing	
Other boating	
Swimming	

18. (continued)

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Activity	Days
Water skiing	
Hunting	
Camping	
Walking and hiking	
Bird watching	
Other nature study	
Wildlife and bird photography	
Picnics	
Automobile driving for pleasure(sightseeing, color tours, etc.)	
Watching outdoor sporting events (baseball, softball, football, golf, horse races, stock car races, etc.)	`
Attending outdoor concerts, plays, etc.	
Ice skating	
Snow skiing	
Sledding and tobogganing	·
Snowmobiling	
Other	

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First Follow-up<sup>1</sup>

Dear Mr. Fisherman:

This is a reminder about the salmon-trout fishing questionnaire that you received recently. We have been receiving completed questionnaires from other fishermen but at our last check, yours was not among them. We realize that the questionnaire is long and difficult and requires a considerable amount of patience and diligence to complete. It is hard to convey to you in just a few words the real importance of this survey, but survey results will certainly be considered in planning the future of the trout and salmon programs.

Please send us your completed questionnaire!

Thank you,

MICHIGAN DEPARTMENT OF CONSERVATION

Second Follow-up<sup>2</sup>

Dear Mr. Fisherman:

We would like to remind you that we have not yet received your response to the salmon-trout questionnaire. If you are reluctant to return the questionnaire because you think it is too late to be of any value, let us assure you that the questionnaires returned now are just as important as those that were returned earlier.

The information that you can supply us will be an important consideration in planning the future of the trout and salmon programs. Your cooperation will be greatly appreciated.

MICHIGAN DEPARTMENT OF CONSERVATION

<sup>1</sup>Mailed May 15, 1968.

<sup>2</sup>Mailed May 30, 1970.

Third Follow-up

Dear Fisherman:

Several weeks ago we mailed you a salmon-trout fishing questionnaire, asking for information about your 1967 fishing experiences. So far we have not heard from you.

In case the questionnaire has gone astray, we have enclosed another which we hope you will complete and return as soon as possible. This survey is rapidly coming to a close, and it is important that your information be included in the survey results. You may not be able to recall your expenses exactly after almost a year, but we know that you will do the best you can in completing the questionnaire.

The information you supply will be greatly appreciated and, of course, will be treated confidentially. Would you please complete this questionnaire and return it in the pre-addressed envelope provided?

Sincerely yours,

David H. Jenkins, Chief Research and Development Division Michigan Department of Conservation

<sup>&</sup>lt;sup>1</sup>Third follow-up, consisting of letter plus copy of questionnaire, mailed June 13, 1968.

Fourth Follow-up<sup>1</sup>

Dear Salmon Fisherman:

We can only speculate about your reasons for not replying to the salmon-trout fishing questionnaires we have sent you. You may think that we do not want or need your information because you didn't fish much or catch anything, or because you didn't spend much money.

Whatever your reason may be, let me assure you that for the purposes of this study, your information is just as important as any other individual selected. If you don't want to respond or don't think it is necessary, please let us know your reason. We would like to hear from all of you.

Thank you.

MICHIGAN DEPARTMENT OF CONSERVATION

<sup>&</sup>lt;sup>1</sup>Mailed June 27, 1968.
Fifth Follow-up<sup>1</sup>

Dear Mr. Fisherman:

Sometime last summer or fall, you were interviewed about your fishing success by a member of the Department of Conservation. We have had your name and address on file since that time and have used it to try and gather some information about fishing for salmon and trout in and around Great Lakes' waters.

Information about Great Lakes' fishing is mighty important to us at this time for this reason. We are trying to make the best possible use of Great Lakes' waters for sport fishing and we badly need information which we can use for planning to make your fishing trips--and everybody's--enjoyable. Great Lakes' sport fishing is relatively new to us, consequently our present information is very scanty.

The only other thing we can tell you about this survey is something that is true of all surveys. The more people you hear from out of the total number of individuals selected, the better will be any background information from which important conclusions may be drawn. That is why we are still trying to convince you to return a completed questionnaire.

Sincerely yours,

David H. Jenkins, Chief Research and Development Division Section of the COM

<sup>1</sup>Mailed July 12, 1968.

#### Form Used for Contacting Non-respondents by Telephone

Respondent I.D. No.

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This is \_\_\_\_\_\_ with the Conservation Department in Lansing. Recently we sent you a questionnaire requesting information about your trout and salmon fishing success in 1967. Have you received the questionnaire?

Yes\_\_\_\_\_ No\_\_\_\_ (Note: suggest to respondent that he send in the questionnaire)

Since our survey will be completed in a few days, I would like to ask a few questions at this time.

#### Questions

1. Have you fished in Michigan before 1967? Yes No\_\_\_\_

2. (If yes) What kind of fish do you usually fish for?

(If respondent has trouble, use the following list to help him: trout, panfish, walleye, bass, pike, or perch)

3. Did you fish for salmon or trout in 1967? Yes\_\_\_\_ No\_\_\_\_

(If no, thank respondent and terminate interview)

- 4. (If yes) a) How many fishing trips did you make?
  - b) How many of the following kinds of fish did you catch? Lake trout

Coho Rainbow (steelhead)

c) Where did you fish? Give me the name of the river, lake, or nearest town.

(Thank respondent for information)

Note: If he requests information on coho fishing, suggest a telephone call to 373-0908, or writing to Michigan Department of Conservation, Lansing.

#### Form Used for Contacting Non-respondents by Mail

Recently we sent you a questionnaire requesting information about your trout and salmon fishing success in 1967. At this time we still have not received your questionnaire. Since our survey will be completed in a few days, your answers to the following questions will be appreciated. Please use the enclosed postpaid envelope to mail your reply.

1.	Have yo	u f:	ished in Michigan before 1967? Yes No
2.	What one	e k:	ind of fish do you usually fish for?
3.	Did you	fi	sh for salmon or trout in 1967? Yes No
4.	If yes,	a) b)	How many fishing trips did you make? How many of the following kinds of fish did you catch?
			Lake trout Coho Rainbow (steelhead)
		c)	Where did you fish? Name the river, lake, or nearest town.

Very truly yours,

David H. Jenkins, Chief Research and Development Division

APPENDIX C

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CODE BOOK

### APPENDIX C

#### CODE BOOK

### Individual Card No. 1

Column No.	Question No.	Code
		Deck Identifier
1-3		C67 = Deck ID (Coder: Constant, all cards, "Coho Survey, 1967")
		Card Type Identifier
4		l = Individual Card (Coder: Constant, all Individual Cards)
		Card Number
5		1 = Number
	#1	State of Residence
		(Coder: Select applicable two- letter code below or from attached list)
6-7		24 = Michigan 37 = Ohio 16 = Indiana 55 = Ontario
		County of Residence
		(Coder: Select applicable numerica

code from below)

Column No.	Question No.	Code			_	
8-9		01 = Alco	ona 4	43	=	Lake
		02 = Alge	er d	44	=	Lapeer
		03 = Alle	egan 4	45	=	Leelanau
		04 = Alpe	ena d	46	=	Lenawee
		05 = Antr	rim 4	47	Ξ	Livingston
		06 = Arer	lac	48	Ξ	Luce
		07 = Bara	iga 4	49	=	Mackinac
		08 = Barr	У	50	=	Macomb
		09 = Bay		51	=	Manistee
		10 = Benz	1e	52	=	Marquette
		II = Berr	len	53	=	Mason
		12 = Brar	icn	54	=	Mecosta
		13 = Calr	ioun	55	=	Menominee
		14 = Case		56	=	Midland
		15 = Char	levolx	5/	=	Missaukee
		16 = Cher	oygan	58	=	Monroe
		1/ = Chip	pewa	59	=	Montcalm
		18 = Clar	e (	60	Ξ	Montmorency
		19 = CI1r	iton	ρT	=	Muskegon
		20 = Crav	lora 6	62	=	Newaygo
		21 = Delt	a	63	=	Oakland
		22 = D1CK	ienson (	64	=	Oceana
		23 = Eatc	on e	65	Ξ	Ogemaw
		24 = Emme		55	=	Ontanagon
		25 = Gene		b /	=	Usceola
		26 = GIac		68	Ξ	Uscoda
		27 = Goge		69 70	=	Otsego
		28 = Gran	d Traverse	/0	=	Ottawa
		29 = Grat	100	11	=	Presque Isle
		30 = H111	saale	12	-	Roscommon
		31 = Houg	Inton	13	=	Saginaw
		32 = Hurc	n .	/4	=	St. Clair
		33 = Ingr	lam	15	=	St. Joseph
		34 = 1003	.a	/6	=	Sanilac
		35 = 1050		//	-	Schoolcrait
		30 = 100		/ð 70	=	Sniawassee
		3/ = 1		19	=	TUSCOLA
		30 = Jack	son	80	=	van Buren
		39 = Kala		о Ј р Т	=	wasntenaw
		40 = Kalk	aska	82	=	wayne
		4I = Kent		83	=	wextord
		42 = Kewe	enaw	84	=	Non-Michigan

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Individual Card No. 1

Column No.	Question No.	Code
	#2	City or Village
10		0 = Refused or Omitted 1 = Yes 2 = No
	#3	Sex
11		0 = Refused or Omitted 1 = Male 2 = Female
		Age
12-13		(Coder: code number given; code "00" if no age given; if respondent less than 17 years of age, drop from sample)
		<u>Marital Status</u>
14		0 = Refused or Omitted 1 = Married 2 = Single
	#4	Occupational Classification
15-16		<pre>00 = Refused or omitted 01 = Professional, technical and kindred workers 02 = Farmers and farm managers 03 = Managers, officials, and pro-</pre>
		prietors
		05 = Sales workers 06 = Craftsman, foreman and kindred workers
		07 = Operatives and kindred workers 08 = Private household workers
		09 = Service workers, except private household
		<pre>10 = Farm laborers and farm foreman 11 = Laborers except farm and mine 12 = Student 13 = Housewife 14 = Retirees 15 = Military</pre>
		16 = Unemployed 17 = Other

Column No.	Question No.	Code
	#5	Approximate Total Annual Family Income
17		0 = Refused or omitted 1 = Under 3,000 2 = 3,000 - 5,999 3 = 6,000 - 7,999 4 = 8,000 - 9,999 5 = 10,000 - 14,999 6 = 15,000 - 24,999 7 = 25,000 and Over
	#6	Number in Household
18-19		(Coder: code number given; if no number given, code "00")
	<b>#7</b> –8	Prior Michigan Fishing
20		(Coder: if answer to #7 is "no" code "0" in column 20 and code "9" in columns 22 through 32; if answer to #7 is "yes" code total number of years checked in #8 in column 20; if no response given code "9" in column 20)
	#9	Reason for 1967 Fishing if No Fishing 1962-1966
21		<pre>0 = Refused or Omitted 1 = News of the coho 2 = New resident of the state 3 = Friend induced to fish 4 = Spouse induced to fish 5 = Fishing for species other than coho 6 = Fishing incidental to other travel or vacation activities</pre>
		9 = Legitimate skip (Coder: code "9" if answer to #7 was "yes")

Individual Card No. 1

Column No.	Question No.	Code
	#10	Nature of Previous Michigan Fishing
		A. Location
22		Great Lakes 0 = Item not checked 1 = Item checked 9 = Legitimate skip
23		Inland Lake 0 = Not checked 1 = Checked 9 = Legitimate skip
24		Streams 0 = Not checked 1 = Checked 9 = Legitimate skip
		B. Kind of Fish
25		Trout 0 = Not checked 1 = Checked 9 = Legitimate skip
26		Pan fish 0 = Not checked 1 = Checked 9 = Legitimate skip
27		Walleye 0 = Not checked 1 = Checked 9 = Legitimate skip
28		$\begin{array}{r} \underline{Bass}\\ 0 = Not checked\\ 1 = Checked\\ 9 = Legitimate skip \end{array}$
29		Pike 0 = Not checked 1 = Checked 9 = Legitimate skip

Individual Card No. 1

Column No.	Question No.	Code
30		Perch 0 = Not checked 1 = Checked 9 = Legitimate skip
31		Other 0 = Not checked 1 = Checked 9 = Legitimate skip
	#11	Fish Most Sought
		(Coder: code first response if multiple answer given)
32		0 = Refused or omitted 1 = Trout 2 = Pan fish 3 = Walleye 4 = Bass 5 = Pike 6 = Perch 7 = Other
		9 = Legitimate skip
	#12	1968 Fishing Plans
33		0 = Refused or omitted l = Yes 2 = No
		(Coder: if answer to #12 is "yes" code "9" in column 34)
	#13	Reason for No 1968 Fishing Plans
34		<pre>0 = Refused or omitted 1 = Fishing conditions too crowded 2 = Coho fishing too expensive 3 = Lack of angling success in 1967 4 = Prefer another type of fishing 5 = Creel limit too small</pre>
		9 = Legitimate skip

Individual Card No. 1

Column No.	Question No.	Code
'n	#14	Suggested Improvements in Great Lakes Fishing
		(Coder: code first response if two or more suggestions fall in one category)
		A. Public Fishing or Launching Sites and Associated Facilities
35		<pre>0 = No response 1 = More boat launching sites 2 = Improvement of existing launching sites 3 = More launching ramps 4 = More toilets</pre>
		9 = Other
		B. Addition or Improvement of Facilities, Other than Boat Launching Facilities
36		<pre>0 = No response 1 = More parking 2 = Improved access to rivers or lakes 3 = More or improved State Parks 4 = Improved or increased campsites and camping areas 5 = Improved or increased eating and/or lodging places 6 = More facilities for mooring or dock- ing of boats 7 = More specialized services, such as cleaning and freezing of fish</pre>
		9 = Other
		C. Regulation or Control
37		<pre>0 = No responde 1 = Reduce crowding of fishermen 2 = Reduce crowding of campers 3 = Reduce littering 4 = More laws or better law enforcement</pre>

Individual Card No. 1

= More laws or better law enforcement by Coast Guard or Conservation Department 

Column No.	Question No.	Code
		<pre>5 = Improve boating courtesy and sports- manship 6 = Improve Great Lakes water quality, or air or water pollution, or pesticide control 9 = Other</pre>
	#14 (cont.)	D. Federal, State, Local or Con- servation Department Responsibilities
38		<ul> <li>0 = No response</li> <li>1 = Improve local weather reporting and storm warnings</li> <li>2 = More information on Great Lakes fishing, lodging, services, etc.</li> <li>3 = Provide broader distribution of stocking or planting of coho or other species</li> <li>4 = Stock more coho or other species</li> <li>5 = Revise or abolish seasonal re- strictions or creel limits</li> <li>6 = Improve the mouth of the Platte River for boating</li> </ul>
	" <b>7</b> E	9 = Other
39-40	<b>#</b> ⊥5	Number of Fishing Trips Taken (Coder: code number given; if over 99, code "99"; code "00" if no information given)
	<b>#17</b>	Purchase of Durable Equipment (Coder: code "000" or "0000" as applicable if total expenditure for any equipment class is 0; code "999" or "9999" as applicable if total expendi- ture is too large for columns alloted)
<b>41-4</b> 3		Code total dollars spent for fishing tackle
44-47		Code total dollars spent for boating equipment

Individual Card No. 1

#### Column Question Code No. No. Code total dollars spent for camping 48-51 equipment Days Use of Durable Equipment (Coder: code number given if consistent for all items within equipment class. If days use of items is not consistent, code first value given. If days use is greater than 99, code "99"; if no number given code "00") 52-53 Code total approximate days use for fishing tackle 54 - 55Code total approximate days use for boating equipment 56 - 57Code total approximate days use for camping equipment 58-59 Code total approximate days use of fishing tackle for coho fishing 60 - 61Code total approximate days use of boating equipment for coho fishing 62-63 Code total approximate days use of camping equipment for coho fishing Equipment Purchase, Yes or No 64 0 = No purchase of any type of equipment indicated 1 = Equipment purchase indicated Questionnaire Identifier 77-80 Code serial number of questionnaire

Individual Card No. 1

End of Individual Card No. 1

Column No.	Question No.	Code
		Deck Identifier
1-3		067 = Deck ID (Coder: Constant, all cards, "Coho Survey, 1967")
		Card Type Identifier
4		l = Individual card (Coder: Constant, all individual cards)
		Card Number
5		2 = Card Number
	#18	Days of Participation in Recreational Activities
		(Coder: code the number of days of participation reported for each activity; code "99" if 99 days or over; if no re- sponse code "00")
6-7		Bicycling
8-9		Horseback riding
10-11		Golf
12-13		Tennis
14-15		Other outdoor games or sports
16-17		Fishing
18-19		Canoeing
20-21		Sailing
22-23		Other boating
<b>24-</b> 25		Swimming
26-27		Water skiing
28-29		Hunting

## Individual Card No. 2

Column No.	Question No.	Code
30-31		Camping
32-33		Walking and hiking
34-35		Bird watching
36-37		Other nature study
38-39		Wildlife and bird photography
40-41		Picnics
42-43		Automobile driving for pleasure
44-45		Watching outdoor sporting events
46-47		Attending outdoor concerts, plays, etc.
48-49		Ice skating
50-51		Snow skiing
52-53		Sledding and tobogganing
54-55		Snowmobiling
56-57		Other
	<b>#</b> 0	Boat Use at Time of Creel Survey
		(Coder: refer to numerals in red, upper left, page one of questionnaire)
		A. Ownership of Boat
		(Coder: If no letter precedes the two numerals, code "1"; if letter R precedes the two numerals, code "2"; if both numerals are zero, code "0")
58		<ul> <li>0 = No information given</li> <li>1 = Respondent using own boat at time of creel survey</li> <li>2 = Respondent using rented boat at time of creel survey</li> </ul>

### Individual Card No. 2

Column No.	Question No.	Code
		B. Length of Boat
59-60		(Coder: code the two numerals given)
	<b>#</b> O	Date of Receipt of Questionnaire
		(Coder: find on back of page 7 of questionnaire)
		A. Month of Receipt
61		l = May 2 = June 3 = July 4 = August
		B. Date of Receipt
62-63		(Coder: code date of receipt)
		Questionnaire Identifier
77-80		Code serial number of questionnaire

Individual Card No. 2

Column No.	Question No.	Code
		Deck Identifier
1-3		C67 = Deck ID (Coder: constant, all cards, "Coho Survey, 1967")
		Card Type Identifier
4		2 = Trip card (Coder: constant, all trip cards)
	#15	Trip Number
5 <del>-</del> 6		(Coder: code number in left column, page 3 of questionnaire)
		Date of Trip
		A. Month of First Day of Trip
7		0 = No information5 = August1 = April6 = September2 = May7 = October3 = June8 = November4 = July9 = December
		B. Date of First Day of Trip
8-9		Code date given
10-11		Code number of days of trip length
12-13		Code number of immediate household in fishing party
14-15		Code number of others in fishing party
16-17		Code total number in fishing party

Trip Card

# Trip Card

Column No.	Question No.	Code	
		<u>Site of</u>	Fishing Activity
		(Coder: sele areas below o	ct county code from list of r from page l of code book)
			Town
18-19		31 = Houghton	Houghton-Hancock (Portage Entry)
		07 = Baraga	Baraga-L'Anse
		52 = Marquette	e Marquette
		02 = Alger	Munising
		5	Grand Marias
		45 = Leelanau	Empire
		10 = Benzie	Honor
			Frankfort
		51 = Manistee	Arcadia
			Portage Lake
			Manistee
		53 = Mason	Ludington
		64 = Oceana	Pentwater
		Ang	gling Success
20-21		Code number o: party	f lake trout caught by
22-23		Code number of	f coho caught by party
24-25		Code Number of caught by part	f rainbow and steelhead ty
26-27		Code number of	f hours fished
		Typ	pe of Fishing
28		0 = Refused on 1 = Shore or o 2 = Boat	r omitted lock
		(Coder: if "S 29 through 32	Shore or Dock" code columns "9")

## Trip Card

Column No.	Question No.	Code
		Launching Site
29-30		Code numerical code for county of launch 00 = Refused or omitted 99 = Legitimate skip
31-32		Code specific launch site, if given, from AAA listing 00 = Refused or omitted or not ascertained 99 = Legitimate skip
		Distance Traveled, One-Way
33-35		(Coder: code number of miles given; if more than three figures, code "999")
		Number Respondent Paid Trip Expenses For
36-37		Code number given
		Type of Overnight Lodging
38		1 = A $2 = B$ $3 = C$ $4 = D$ $5 = E$ $6 = F$ $7 = G$ $0 = Information not given$
		Location of Lodging
39-40		(Coder: indicate county code for place of lodging, if other than home. If lodging type is "A" give code for county of residence. If information on lodging not given; code "00")
		Trip Expenses of Respondent
		(Coder: for all trip expenses below, if dollar value given is too great for columns alloted, code "99"; if no re- sponse indicated code "00")

## Trip Card

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Column No.	Question No.	Code
41-42		Code Lodging costs in dollars
43-44		Code food and beverage costs in dollars
45-46		Code gas and oil costs in dollars, own car
47-48		Code gas and oil costs in dollars, own boat
<b>49-</b> 50		Code gas and oil costs in dollars, other car
51-52		Code gas and oil costs in dollars, other boat
53-54		Code cost in dollars for rental of boat and motor
55-56		Code cost in dollars for rental of tackle and gear
57-58		Code cost in dollars for other expenses
		Repeat Items from Questionnaire
59-60	#1	Indicate two-letter code for state of residence
61-62		Indicate numerical code for county of residence
63-64	#4	Indicate numerical code for occupational class
65	#5	Indicate numerical code for family income class
66-67	<b>#</b> 6	Code number of people in household
68	<b>#7</b> -8	Code the number of years of Michigan fishing experience
	<b>#17</b>	(Coder: if any value given in #17 is too great for inclusion in the columns alloted, code "99" or "999" as appro- priate)

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Column No.	Question No.	Code
69-70		Code the tens of dollars spent for fishing tackle in 1967
71-73		Code the tens of dollars spent for boating equipment in 1967
74-76		Code the tens of dollars spent for camping equipment in 1967
		Questionnaire Identifier
77-80		Code serial number of questionnaire

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