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PERE MARQUETTE RIVER ANGLER SURVEY AND
BROWN TROUT EVALUATION

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PERE MARQUETTE RIVER ANGLER SURVEY AND BROWN TROUT EVALUATION

By

Kyle Morse Kruger

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ABSTRACT

PERE MARQUETTE RIVER ANGLER SURVEY AND

BROWN TROUT EVALUATION

By

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A year long creel survey and brown trout (Salmo trutta) evaluation was conducted on a portion of the Pere Marquette River near Baldwin, Michigan in order to examine the use patterns of a free flowing coastal stream which experiences runs of anadromous trout and salmon. The Pere Marquette River fishery has changed drastically over the past 100 years, a function primarily of land use patterns, changes in the watershed and introduction of exotic species. The research area was open year round to trout fishing and was divided into four sections (F,C,A and B). Section F and section C were seven miles in length with section F being restricted to use of "flies only" as bait. Sections A and B were four miles in length and were not restricted by bait types. The estimated angler trips were 13,142 (F), 2,254 (C), 2,409 (A) and 1,045 (B). The estimated angler hours were 56,260 (F), 7,818 (C), 6,999 (A) and 3,217 (B). The estimated harvest was 6,933 (F), 732 (C), 366 (A) and 36 (B). Estimated overall catch per effort was .1230 (F), .0963 (C), .0523 (A) and .0112 (B)

fish per hour. The anglers primarily fished for rainbow trout/steelhead (S. gairdneri) and salmon (Oncorhynchus spp.). Brown trout were only sought by 3.6% of the anglers interviewed. The brown trout population appears to be declining in abundance in portions of the river but shows some stability in other portions. The Pere Marquette was estimated to have an average abundance of 155 fish per acre with 60 fish being eight inches or greater in length. The number of rainbow trout appears to be increasing in the river with an estimated average abundance of 3,205 fish per acre with 84 being eight inches or greater in length. The brown trout in the Pere Marquette exhibited more rapid growth after age II than the average for several Michigan trout streams.

To My Father

ACKNOWLEDGEMENTS

The Pere Marquette River creel survey was a unique combined effort. This project brought together the efforts of concerned sportsmen, fisheries students, and trained professionals. Several of Michigans sport fishing groups, most notably Trout Unlimited, Federation of the Fly Fishermen, and Michigan Steelhead and Salmon Fishing Association joined with the Michigan Department of Natural Resources - Fisheries Division, the United States Forest Service and the Department of Fisheries and Wildlife at Michigan State University to conduct this survey.

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INTRODUCTION

The Pere Marquette River is one of the few remaining free flowing coastal streams in Michigan. It has been designated a "wild and scenic" river and is highly regarded for both its environmental and esthetic qualities (Goldie 1982). The Pere Marquette River has long been considered a high quality trout stream, attracting numerous anglers to fish for its resident and anadromous salmonid populations. In recent years, however, many trout fishermen who frequent this river have expressed a perceived decline in the quality of the brown trout (Salmo trutta) fishery. This perception prompted the Michigan Council of Trout Unlimited to join with the Michigan Department of Natural Resources - Fisheries Division, the United States Forest Service, and the Department of Fisheries and Wildlife at Michigan State University to begin an investigation into the history, angler use and harvest and brown trout population levels of the Pere Marquette River.

Little information is available about the history of the Pere Marquette River. The information that is available is important to this study because man's influences have had significant physical and biological impacts on natural systems. The Pere Marquette River is no exception. The effects of man on this system have not only changed the

Pere Marquette itself but also the species of fish which populate it. Of all the major salmonids which exist in the river today, not one of them is endemic. They were all introduced for some social or economic reason. Therefore, if we are to understand this river system today, an understanding of what has happened previously must be considered.

This thesis presents some of the local history, a history of the fishes in this river system, results of a year long creel survey which began in April 1982 and ran through March 1983, and population estimates of the Pere Marquette River brown trout conducted in 1970, 1973, 1981, 1982, 1983, and 1984. It may help to bring to light some of the important factors that happened previously and what some of the conditions are now. Although this is an incomplete overview of a tremendously complex and dynamic system; it will serve as a foundation to build on and improve our understanding of the Pere Marquette River.

REGIONAL HISTORY

Written evidence of the early history of the Pere Marquette River and surrounding areas is sparse. The earliest humans to inhabit the region were the hunters and gatherers of the Ottawa Tribe. Their arrival in Michigan has been estimated to have occurred between 2000 and 6000 years B.C. (Hawley 1980, Dunbar 1981). These early inhabitants lived off the land and did not begin to develop sedentary methods of agriculture until about 100 B.C., which was brought about by the influences of the Hopewell Indians (Dunbar 1981). Archeological examinations of Mason County have shown that there were at least fifty-two indian villages during the prehistory of the region since the retreat of the most recent glaciers to cover Michigan (Hawley 1980).

The first whitemen in the Great Lakes region were French explorers and Jesuit missionaries, beginning in the 1620s when the explorer Etienne Brule arrived (Dunbar 1981). The earliest explorers concentrated their efforts in the region of Lake Superior around what today is Sault Ste. Marie. Jean Nicolet explored portions of the Lake Superior basin and portions of the northern lower lakes in the 1630s but he did not go ashore on the lower peninsula. There was continued exploration of the upper lakes by the

French, but it was not until 1669 that any record of explorations of the lower peninsula began, when a group of whitemen traveled up the eastern shore of what is today Michigan (Bald 1961, Catton 1976, Dunbar 1981).

In the fall of 1672 Louis Joliet was commissioned to explore in the west a large river now known as the Mississippi. They were hoping that the river emptied into the Pacific Ocean and would provide the French with an all water route to the orient. He was informed that a young Jesuit missionary - Father Jauques Marquette - would be interested in joining him on his journey. Jolliet went to Father Marquette's mission in St. Ignance to ask Father Marquette to join him on his trip. Father Marquette anxiously agreed. In the spring of 1673 they left the mission for Green Bay then moved on to the mighty river in the west. When they reached as far south the mouth of the Arkansas River the group decided that the river did not enter the Pacific Ocean and did in fact empty into the Gulf of Mexico. During the return trip north Father Marquette and Jolliet met members of the Illinios tribe and stayed until fall to preach to these indians. Later the explorers continued north to Green Bay where Father Marquette stayed to recover from an illness contracted on their journey and Joliet went on to the east. The following fall in 1674 Father Marquette returned to visit and preach to the Illinios tribe. The next spring his illness became worse and he wished to see his mission in St. Ignance one more

time before he died. Father Marquette departed the Illinois tribe and headed north along the eastern shore of Lake Michigan. When he felt that his illness had become critical, he asked to be put ashore. The party came ashore near the mouth of a small river entering Lake Michigan, shortly after which Father Marquette died. The Pere Marquette River is named after him. The location of his death is thought to be where Ludington, Michigan now stands (Bald 1961, Catton 1976, Dunbar 1981), although some historians believe that Father Marquette died where Frankfort, Michigan is today (Dunbar 1981).

The interior of the state of Michigan was not explored by these early visitors to the region, although it is felt that French and American trappers who followed did frequent inland areas (Bald 1961, Dunbar 1981).

The first recorded evidence of inland exploration in the Pere Marquette region begins in 1835 in the area on the southside of Pere Marquette Lake near Ludington, Michigan where a fur traders cabin was built and trappers brought beaver skins to be sold (Hawley 1980). Beaver trapping began to decline around 1840, about the time a new form of industry began to move into the area, lumbering. Timber became an extremely important commodity to this area of Michigan in the mid to late 1800s. At times there were sawmills able to produce up to 100,000 board feet of lumber in a single day of operation. The majority of the sawmills were located on Pere Marquette Lake near the mouth of the

Pere Marquette River, although there was at least one mill in operation as far upstream as 2.5 miles east of the Mason and Lake County line (Hawley 1980). The river was used to float logs to the sawmill consequently almost all logging was done in close proximity to the river. The technology of the day also required lumbermen to use iced roads to sled the logs to the river where they were stacked until the weather warmed and ice melted. When the ice melted efforts were concentrated on moving the logs to the sawmills in the spring high water.

In 1874 the Flint and Pere Marquette railroad was completed and operated between Ludington and Port Huron, Michigan (Hawley 1980, Dunbar 1981). This event was significant in that streams were no longer needed to transport logs to the sawmills. All a lumberman needed to do was get his logs to the railroad or railspur to have them transported overland. Water transportation was still cheaper and used but it was no longer a necessity. As more track was added to the state, new types of equipment to haul timber overland were developed. "Big wheels", large wheels upto fifteen feet high were built which could skid logs in the warmer months and narrow gauge trains built on temporary tracks made almost any timber stand available for harvesting. The railroads and other developments were leading the state away from waterway restricted part time (winter only) lumbering practices of earlier years (Catton 1976).

Baldwin, Michigan was originally named Hanabal in 1870 after an early settler; later the name was changed to honor Michigan Govenor Henery Baldwin (elected for two terms, served from 1868 to 1872). Baldwin had a population of 536 by 1883. In 1897 a hotel was constructed at Hart, Michigan just south of the Pere Marquette River which catered almost exclusively to sportsmen (Smedly 1935). In 1901 the Hotel Pere Marquette was built near the tracks of the Flint and Pere Marquette railroad in Lake County. The Hotel Pere Marquette was also claimed to be a sportsman's haven (Trout Unlimited 1982). Fishing in the river has continued to be popular. Guided fishing trips were available and very popular through the mid-fifties (Meryl Nolph, Riverside Property Owners Association, personal communication). Today Baldwin has a population of approximately 900 and is considered to be the "headquarters" for fishing the Pere Marquette River. There are ten motels in the area, three canoe liveries and numerous private sportsmen's clubs. The popularity of fishing in the Pere Marquette River has continued to increase every year, with more and more anglers coming to fish for the wide variety of salmonids inhabiting it.

TROUT AND SALMON IN THE PERE MARQUETTE RIVER

Before the introduction of exotic species of salmon and trout in the late 1800s, the primary coldwater sportfish in the Pere Marquette River was the Michigan grayling (Thymallus tricolor). This species only occured in Michigan north of a line extending from near Muskegon to Tawas City in the lower peninsula and in the Otter River in the upper peninsula (Smedley 1935). These fish were reputed to have no equal in beauty, flavor, and fight (Smedely 1935). The popularity of this species was shortlived. During the mid-1800s they were easily caught and heavily harvested, with some anglers using four or five flies on the same line and catching fish on each fly. In addition the booming logging industry of the mid-1800s caused irreparable harm to the habitat of these fish. Grayling were spring spawners depositing eggs in shallow water, where their vulnerability to scouring by sawlogs was great. Thus, in rivers which were used to transport logs to a sawmill, grayling lost their viability (Smedley 1935).

In order to appease the anglers who could no longer catch their favored grayling in lower peninsula coldwater streams, the Michigan Fish Commission began attempts to propigate grayling. Because grayling were spring spawners, efforts to propigate grayling conflicted with the Michigan

Fish Commissions work with whitefish (Coregonus clupeaformis) and lake trout (Salvelinus namaycush). Whitefish and lake trout were commercially important and therefore given top priority. Efforts to propagate grayling were minimal (MFC 1881).

In 1879 the Michigan Fish Commission began stocking brook trout (Salvelinus fontinalis), which were endemic to Michigan's upper peninsula, in streams which were devoid of grayling or whose populations were declining. Brook trout reportedly did very well in these streams establishing themselves and growing at very high rates. The Pere Marquette River was stocked with 1,000 brook trout in 1882. With several of its tributaries received additional fish (MFC 1883).

The first brown trout eggs were imported from Germany into the United States in 1883. A portion of this shipment was sent to the United States Fish Commission Hatchery at Northville, Michigan. The eggs in this first shipment were in poor condition and those eggs which did hatch and survive were held at the hatchery. In February of 1884 a second shipment of eggs arrived from Germany. This second shipment of eggs was in much better condition which resulted in much greater hatching success and survival of fry. On April 11, 1884 4,900 brown trout fry were taken to be stocked in the Pere Marquette River (Clark 1885). These brown trout have been considered the first release of brown trout into North American waters (Luton 1985).

The Michigan Fish Commission continued to increase the diversity of game fish by introducing 25,000 rainbow trout (Salmo gairdneri) into the Pere Marquette River in 1885. These trout were a Mount Shasta strain from California, then refered to as California trout and thought to be non-migratory (MFC 1887). Thus in a period of just over four years the Pere Marquette River was stocked with three exotic species of trout.

During this time efforts at rehabilitating grayling continued. However, in 1888 the United States Fish Commission declared: "The grayling will not stand domestication", and by 1893 abandoned their efforts to restore native grayling to Michigan waters (Smedley 1935). At this time many anglers blamed the new exotic species of fish, especially brown trout, for the graylings decline. Brown trout were considered destructive and guilty of eating all the desired species. Brook trout were considered least objectionable to grayling anglers. In retrospect, it seems that changes to the catchment basins may have altered the stream environment and changed the dominant trout species.

By 1895 brown trout had reached such disfavor with anglers and the Michigan Fish Commission that propagation and stocking was stopped in 1895 because:

> "A few years of experimentation and experience have convinced us that the brown is inferior in every respect to either brook or rainbow. With few exceptions, this conclusion is in harmony with the verdict of anglers and epicures everywhere. A number of streams have

> been sucessfully stocked with brown trout; but being outclassed, from every point of view, by two available species of equal range of habitat, we deem it poor policy to continue their propigation. The stock of adult brown trout has therefore been turned adrift and no further distribution of this species will be made." (MFC 1897).

Brook trout and rainbow trout continued to be stocked with the greatest effort going to brook trout.

Blackspotted trout (Salmo clarki) were stocked in the Big South Branch of the Pere Marquette River in 1895. Today these are known to be the same species as cutthroat trout but in 1895 they were thought to be a distinct species (MFC 1897). There was a second plant of blackspotted trout in the Pere Marquette River in 1911 but this plant was in the Little South Branch (MFC 1913). There is no record of any recoveries of either plant of blackspotted trout (Smedley 1935).

In 1905 the first steelhead trout were imported and some of these fish stocked into the Pere Marquette River. Steelhead trout were considered a different species than the rainbow trout, much the same as blackspotted trout and cutthroat trout. The confusion seems to have come about due to their migratory behavior (MFC 1907).

As catchment basins and rivers in Michigan's lower peninsula continued to change due to increased agriculture and deforestation to the detriment of more preferred species, there was a resurgence of demand for brown trout and the stocking of this fish resumed. The Pere Marquette

River was again one of the first streams to be stocked, with 30,000 brown trout released into the Little South Branch of the Pere Marquette River in 1909 (MFC 1911).

During the early 1900s brook trout declined from the effects that the increased agriculture and deforestation were causing. While the catchment basins continued to change and brook trout declined, brown trout and rainbow trout continued to do well.

In 1914 the Michigan Fish Commission recognized steelhead trout as being a rainbow trout. This was based on observations by Dr David Starr Jordan who had previously concluded that they were different fish and now considered the only difference to be that steelhead trout were a migratory form of rainbow trout. He claimed that he had: "seen perfectly formed rainbow trout from supposedly steelhead eggs and perfectly formed steelhead from supposedly rainbow trout eggs." (MFC 1915).

By 1927 brook trout had all but disappeared from such famous brook trout rivers as the Pere Marquette River. Many years before were noted for the nearly extinct Michigan grayling (Smedley 1935).

Heavy stocking of fish, especially brown trout, to Michigan streams continued and fishing in the fourties and fifties was reportedly very good. Tens of thousands of legally sized (8-9 inch) fish were being stocked throughout the state with many fish going into the Pere Marquette River. There were stories of limit catches on almost every

trip with some people claiming that you could catch your fifteen fish limit in fish over twenty inches without much effort (Meryl Nolph, personal communication).

Although stocking of Pacific salmon into the Great Lakes and tributaries was attempted for several years in the latter part of the nineteenth century, there are no records of plants in the Pere Marquette River before 1967. In 1967 as part of a rehabilitation program for the Great Lakes, the Michigan Department of Natural Resources introduced Pacific salmon into the Pere Marquette River as part of a put, grow and take fishery (MDNR 1967). There is only one recorded stocking of pacific salmon in the Pere Marquette River and that was of coho salmon (Onchorynchus kisutch) in a tributary of the Big South Branch of the Pere Marquette River called Ruby Creek in Oceana County. In subsequent years, chinook salmon (Onchorynchus tschawytscha) have wandered into the Pere Marquette River and established a viable and naturally reproducing population with substantial runs each year (Carl 1982), most notably since 1975 when large numbers of the salmon were reported in the mainstream far upstream from where the Big South Branch enters the Pere Marquette River mainstream (Meryl Nolph personal communication).

In 1977 the Michigan Department of Natural Resources began to stock Atlantic salmon (Salmo salar) in the Pere Marquette River. These fish came from Quebec (1977) and Quebec and Sweden (1978). The most recent effort to

establish Atlantic salmon in the Pere Marquette was focused on the sebago strain which is a landlocked strain (MDNR 1982).

In 1984 the Michigan Department of Natural resources stocked 20,000 skamania rainbow trout (summer run steelhead) into the Pere Marquette River in an effort to provide improved summer trophy trout angling.

Annual stocking of brown and rainbow trout (listed as both rainbows and steelhead) were still being made in the Pere Marquette River and its tributaries through 1984 but brook trout have not been stocked for many years (MDNR 1980, MDNR 1981, MDNR 1982, MDNR 1983)

STUDY SITE

From M-37 to Lake Michigan the Pere Marquette River is open year round to trout fishing. The riparian lands along the river are almost entirely privately owned and access to the river is highly restricted. The study sites began where the Pere Marquette River flows under the M-37 highway bridge just south of Baldwin, Michigan (Figure 1). It was divided into two major and two minor sections. The major sections were longer than the minor sections and surveyed for the entire year whereas the minor sections were surveyed for only nine months.

The first major section (F), was the special regulation "flies only" area which runs from M-37 downstream for approximately seven river miles to Gleason's Landing. The special regulations include:

1. Use of artificial flies only as bait.
2. Ten inch size limit for trout and salmon (increased from eight inches in other areas)
3. No kill of brown trout and atlantic salmon when regular trout season is closed.
4. Reduced creel limits on salmon (reduced from five to three) and steelhead (reduced from five to one) when regular trout season is closed.

The first half of this section is easily waded and contains numerous riffle areas. These riffles provide high quality salmonid spawning habitat that attracts large numbers of

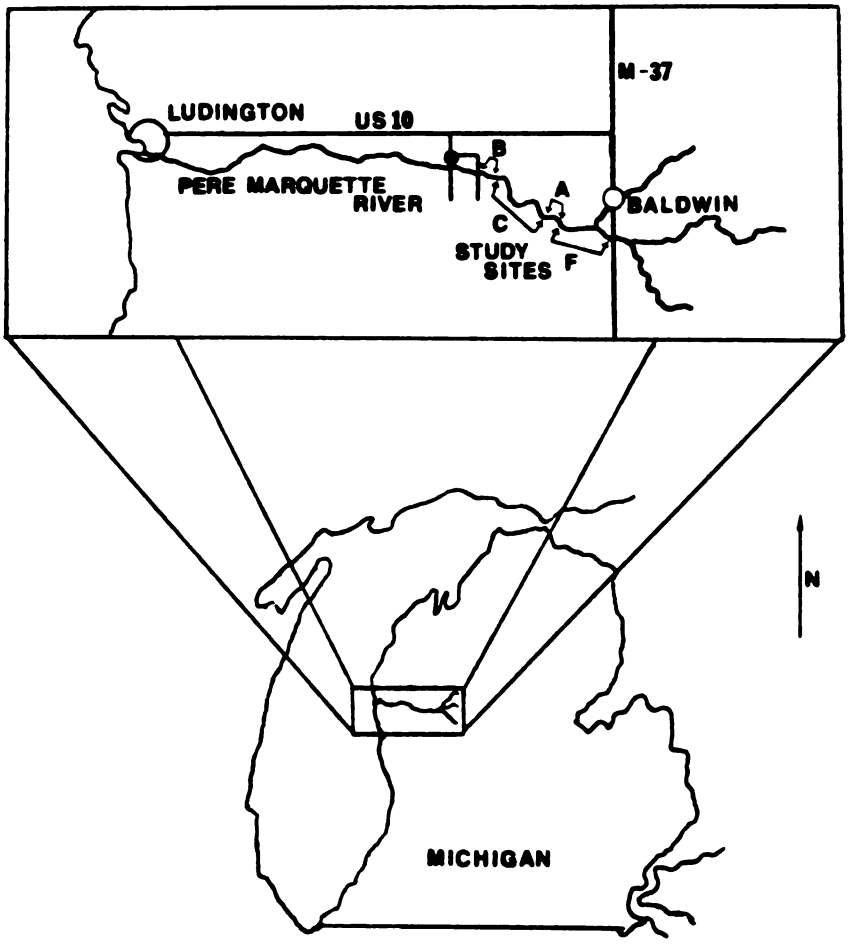


Figure 1. The location of the Pere Marquette River study sites in Michigan.

the anadromous species during the spawning seasons. The lower half of section F contains few riffle areas, deeper water and primarily sand substrate. There are five public acess points on section F, four of which give access to the upstream half of section F.

The second major section (C), begins approximately four river miles downstream from section F. This section runs from Bowman's Bridge Landing to Rainbow Rapids Landing, a distance of approximately seven river miles downstream. This area is similiar to the lower half of section F with deeper water, sandy bottom and few riffle areas. The endpoints of this section are the only public access points although one private location does allow some access in the middle of section C. Most of section C and the lower half of section F is difficult to wade.

The two minor sections, A and B, for the most part are physically similar to section C although there is a long wadable area at the beginning of section A. Section A is the area between section F and section C which runs for approximately four river miles between Gleason's Landing and Bowman's Bridge Landing. The second minor section runs from Rainbow Rapids Landing to Upper Branch Bridge Landing and is also approximately four river miles in length.

MATERIALS AND METHODS

Angler Counts

To estimate the number of angler hours on the Pere Marquette River a series of counts were performed. Two different methods were used during the year-long study. Canoe counts were used for the first nine months (April 1982 through December 1982) and anglers per vehicle counts were used for the last three months (January 1983 through March 1983) to estimate the number of anglers present.

Canoe counts were conducted by launching a canoe at the farthest upstream access point of the section to be counted then floating downstream recording the number of anglers and canoes passed until the end of the section was reached. The categories used were (Table 1):

1. Fishing from a canoe.
2. Fishing from shore.
3. Fishing while wading.
4. Fishing from a pier.
5. Not fishing, but with fishing gear on shore.
6. Not fishing and without fishing gear.
7. Non-fishing canoe, pleasure canoeist.

All anglers that were fishing without canoes were counted as individuals. Anglers who were using a canoe or pleasure canoeist were counted as units, with the same value as an

Table 1. The angler count sheet used to record the number of anglers present and the particular activties in which they were involved.

NAME _____ DATE _____ DAY _____

SECTION FLOATED _____ TIME _____

WEATHER _____

COMMENTS _____

FISHING	NOT FISHING
From canoe	Canoe with fishing gear
From shore	With fishing gear on shore
Wading	Canoe w/o fishing gear
From bridges	

angler. For example, if two wading anglers were passed that would count as two in the "Fishing while wading" category. If two anglers in a canoe were passed, that would count as one in the "Fishing from a canoe" category. To avoid confusion, as to how many in the canoe were or were not fishing, at the time of the interview, the occupants of the canoe were asked how many were actually fishing. This gave an estimate of the average number of anglers per canoe.

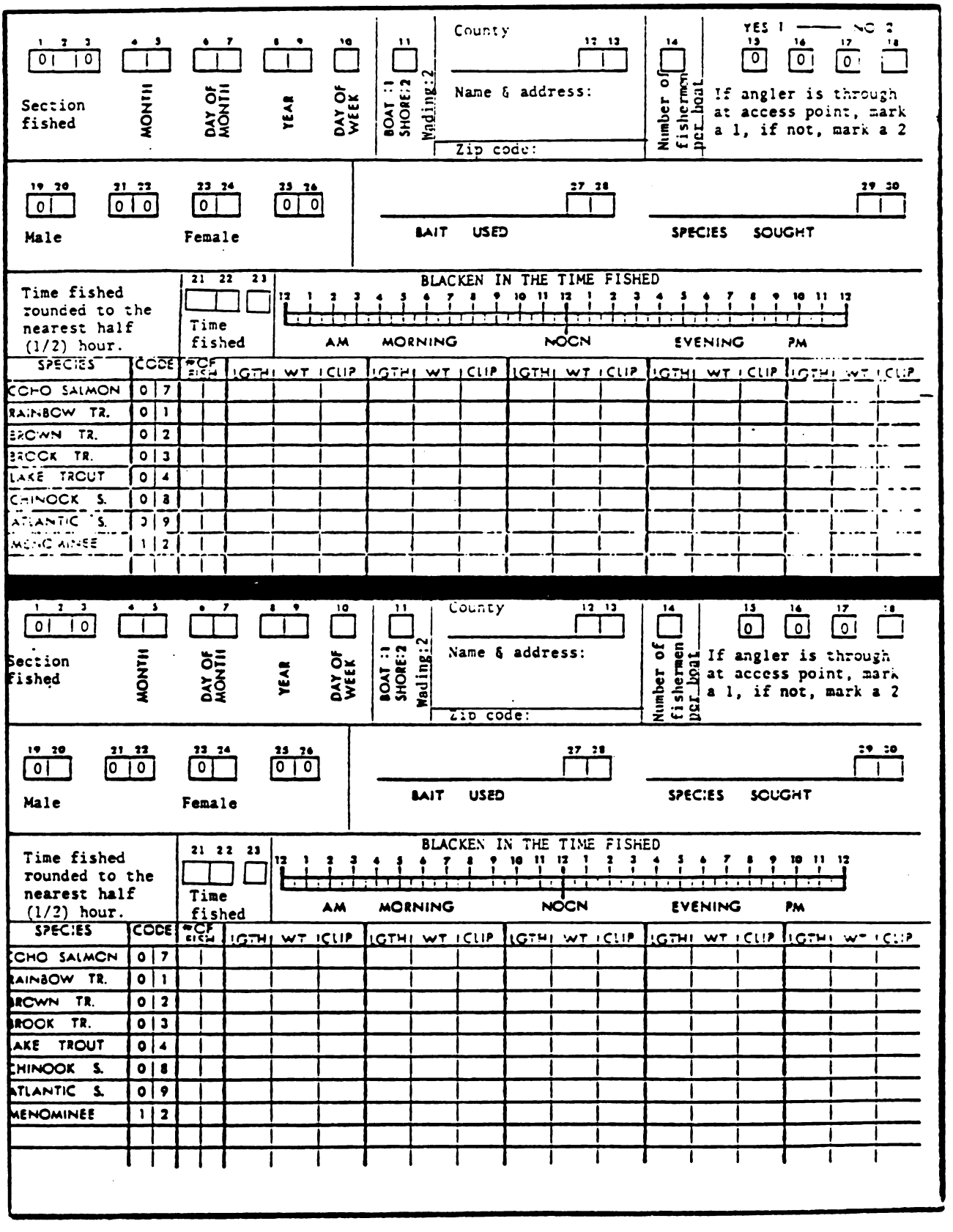
Angler per vehicle counts were used to estimate the number of anglers present during the winter. Snow and ice made conducting float counts unsafe during the winter. Vehicle counts were made by recording the number of anglers per vehicle when interviewed. Then the number of vehicles the access points of the section being checked were counted and multiplied by the average number of anglers per vehicle which gave an estimate of the number of anglers present in the section.

Angler Interviews

Angler were interviewed at various points along the study sections. Attempts were made to interview all anglers at the completion of their trip. A trip was considered the time an angler spendt fishing from when they left the access point until they returned and completed fishing at that site. The information gathered during the interviews was (Table 2):

1. Section fished; F,C,A, or B

Table 2. The angler interview sheet used to record the information gathered during the interviewing process. Information was coded directly onto this sheet.



2. Date and day of the week.
3. Name and address (this was optional).
4. If the angler was fishing from shore or canoe.
5. If fishing from a canoe, how many of the occupants of the canoe were fishing.
6. If the angler had completed fishing at that site.
7. The sex of the angler was recorded.
8. The time the angler was out to the nearest one half hour and time of day.
9. Number and species of fish caught and kept.

Fish which were caught but released were not counted in this survey. Each fish that was creeled was weighed and measured for a total length and a scale sample was taken for age and growth analysis (Bagenal 1978).

Angler Harvest

Estimates of angler harvest, catch per effort, and total effort were calculated at the Institute for Fisheries Research in Ann Arbor, Michigan. These estimates were made using the information gathered during angler counts and interviews. The information was broken down into two strata, weekdays and weekend days, from which estimates were made for each month of the survey. Monthly estimates and variances for weekdays and weekend days were calculated separately. These estimates and variances were summed to give overall monthly estimates and variances. The calculations used for the estimates are listed in Table3.

Table 3. Formulas used to estimate catch per effort, number of angler hours, number of angler trips and harvest.

Catch per Effort by Species = (C/H/S)/(NI)

where:

C/H/S = summation of catch per hour per species

NI = number of interveiws

Angler Hours = (MIC)(DS)(FH/D)

where:

MIC = mean of the instantaneous counts

DS = number of days in strata

FH/D = fishing hours per day

Angler Trips = (EAH)/(H/T)

where:

EAH = estimated angler hours

H/T = mean number of hours per trip

Harvest by species = (C/E)(EAH)

where:

C/E = Catch per effort by species

EAH = estimated angler hours

Population Estimates

Population estimates for resident brown trout, rainbow trout, and juvenile salmon populations were conducted for four consecutive years between 1981 and 1984 by the Michigan Department of Natural Resources. A mark-recapture estimate was used at four locations in section F; M-37 Public Access Site, mouth of the Baldwin River, Pere Marquette Rod and Gun Club, and Gleason's Landing (no 1984 estimate). No sites were routinely sampled in other sections due to access problems and deep water. Samples to estimate trout abundance for at the mouth of the Baldwin station for 1970 and 1973 were available from the Depatment of Natural Resources. The 1970 records did not give size distributions of the fish captured, but all subsequent sample records did.

The Chapman variation of the Petersen formula was used to calculate population abundance estimates from the electrofishing data. This formula was used because it is considered to be unbiased when the number of recaptures is low (Ricker 1975). The equation was of the form:

$$N = ((M + 1)(C + 1))/(R + 1)$$

where:

N = estimated population size

M = number of marked fish

C = number of fish captured on the recapture run

R = number of recaptured fish

Ninety-five percent confidence intervals were calculated

using the number of recaptures as possion variables (Ricker 1975). Because of the low number of trout captured in most inch length classes, overall population estimates were made by grouping together all fish in each category (marked, unmarked, or recaptured) then calculated using the Chapman formula.

The Michigan Department of Natural Resources reviewed these findings and expressed a concern that this method might be biased due to the difference in vulnerability to the gear of the various sizes of fish. Smaller fish are considered less suseptible to the electrofishing collection techniques than larger fish (Nielsen and Johnson 1983). In order to minimize the bias the Department suggested that the trout abundance estimates should be made by breaking the sample into small size groups varing from two to six inches depending on the number of recaptures. The estimates from each group were summed to give an overall estimate. Only one sampling station fulfilled the Departments requirements for enough fish in acceptable size groups, the mouth of the Baldwin station, and even then not all size groups were usable. Only brown trout eight inches or longer and rainbow trout six to eight inches in length had large enough samples to satisfy the Departments requirements. The Department also considered the Bailey estimate more appropriate yielding a more conservative estimate. The Bailey estimate differs from the Chapman estimate by not adding 1 to the number of marked fish (M)

and has the form:

$$N = (M(C + 1))/(R + 1)$$

where M,C and R are the same as the Chapman formula. The Department further explained that the population estimates were intended for management purposes only. The Department's main emphasis for collecting the data was to examine the fishable size portion of the population, fish which were eight inches and longer. Thus the Department considered estimates for young of the year and yearling fish to be of questionable value.

The overall estimates were used to calculate the averages in the comparsion tables enabling all sites to be taken into account. The use of the overall estimates from all sites allowed a more represenitive average to be generated than using only the estimates from the Baldwin site. The grouped data was used for calculating the estimates used in preparing the figures which include eight inch and longer brown trout and six to eight inch rainbow trout.

Volunteer Help

Volunteer help was utilized as part of the data collection process for the creel survey. Most volunteers were members of one of Michigan's larger sport fishing organizations; Michigan Council of Trout Unilimted, Fly Fishing Federation, or Michigan Steelhead and Salmon Fishing Assosiation. Volunteers collected 342 or 21.4% of the angler interviews and 45 or 20% of the angler counts,

a substantial addition to the number of interviews and angler counts collected by the regular field crew.

Volunteers worked on weekends in the spring and fall during the anadromous fish runs when angling pressure was at peak levels. Normally the volunteers came in groups which consisted of a local chapter from one of the sport fishing organizations. Group size ranged from six to twenty. On Friday evenings the volunteers were given an orientation to the study, told where the study sites were, and told how to fill out interview and count sheets. Volunteers were issued the necessary equipment at that time and were informed where to return the equipment when finished. Each volunteer was allowed to chose two of four possible four hour shifts for a total of eight hours per weekend for each member of the group. After each group was finished all interviews and count forms were inspected to see if they had been properly completed. All forms which lacked "vital" information or were improperly completed were discarded. Approximately 25% of the interview sheets were rejected. The total number of interviews and float forms disccused above were properly completed forms only.

RESULTS AND DISCUSSION

The results and discussion are divided into three sections. The first section contains the creel survey results from the two major sections F and C, the second section contains the results of the two minor sections A and B, and the last section contains the results of the brown trout population evaluation.

Creel Survey - Sections F and C

The estimated number of angler trips (two standard errors in parentheses) was substantially different between the two primary sections (Figure 2). There were a total of 2,254 (761) angler trips occurring in section C and 13,142 (3,103) angler trips in section F. Peak months of activity in section C were April, May, August and September for a total of 1,431 angler trips. A similar use pattern was apparent in section F with 2,281 angler trips occurring in April and May and 6,964 angler trips during September and October. Special regulations, higher accessability, and greater amount of spawning habitat are most likely the reasons why more anglers chose to fish in the "flies only" section F. Peaks in the angler trips appeared to indicate a marked preference to fishing when anadromous species were on their spawning runs. In the spring anglers fished for steelhead and in the fall they fished for salmon.

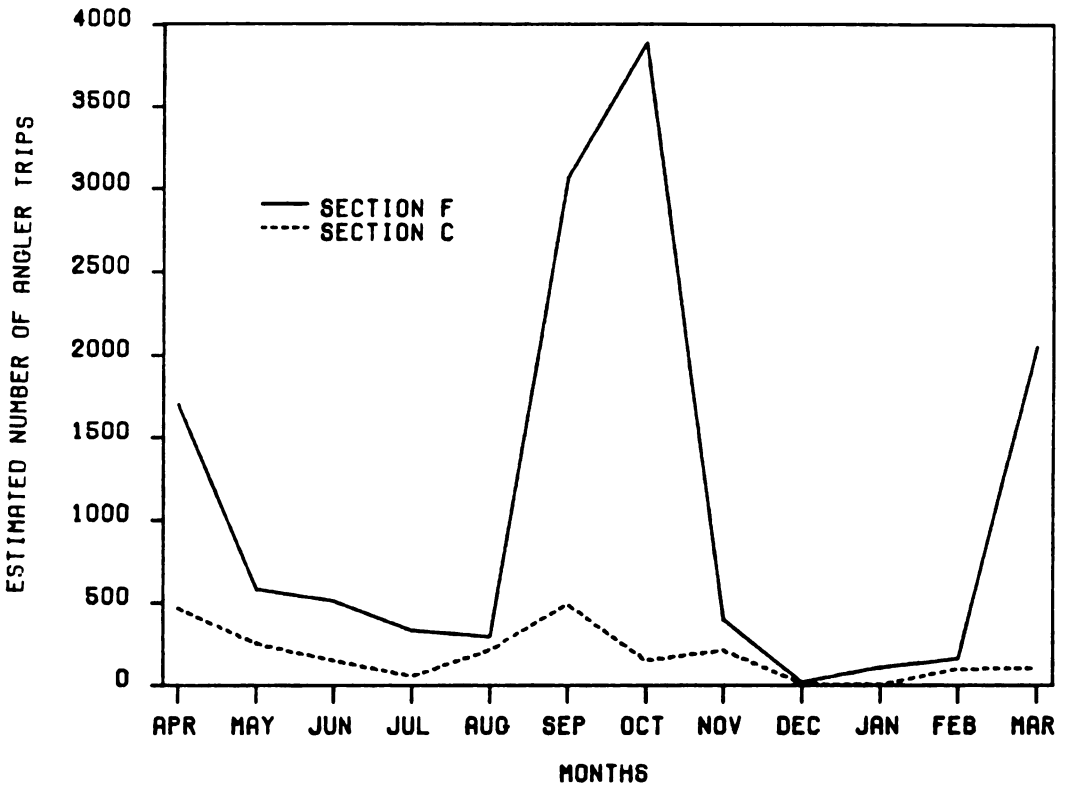


Figure 2. Estimated number of angler trips for section F and section C from April 1982 through March 1983. Pere Marquette River, Michigan.

The estimated number of angler hours followed the pattern of angler trips (Figure 3). There was a total of 7,818 (1,912) angler hours in section C and 56,260 (14,035) angler hours in section F. The division of angler hours between canoe and shore fishermen (this includes wading anglers) were distinctly different in the two sections (Table 4). Canoe fishing accounted for 1,498 angler hours in section C and 433 angler hours in section F. The opposite was noted for shore fishing with 6,444 shore fishing hours being estimated in section C and 55,827 shore hours in section F. This difference in shore versus canoe fishing was primarily a function of the physical characteristics of the two sections and the number of access points. Section F is shallower, comparatively easy to wade and has a greater number of access points. This combined with its greater concentration of fish during spawning runs accounted for the fact that 87.8% of all angler hours recorded during this study, were fished in section F. The majority of the hours fished were recorded in the upper half of this section.

Monthly catch per effort for all species combined went from a low of zero to a maximum of .2222 fish per hour in section C and from a low of .0166 to a high of .2036 in section F (Table 5). The highest catch per effort was in May for anglers in section C whereas in section F anglers acheived the highest catch per effort in October. Overall catch per effort for the year in section C was .0936

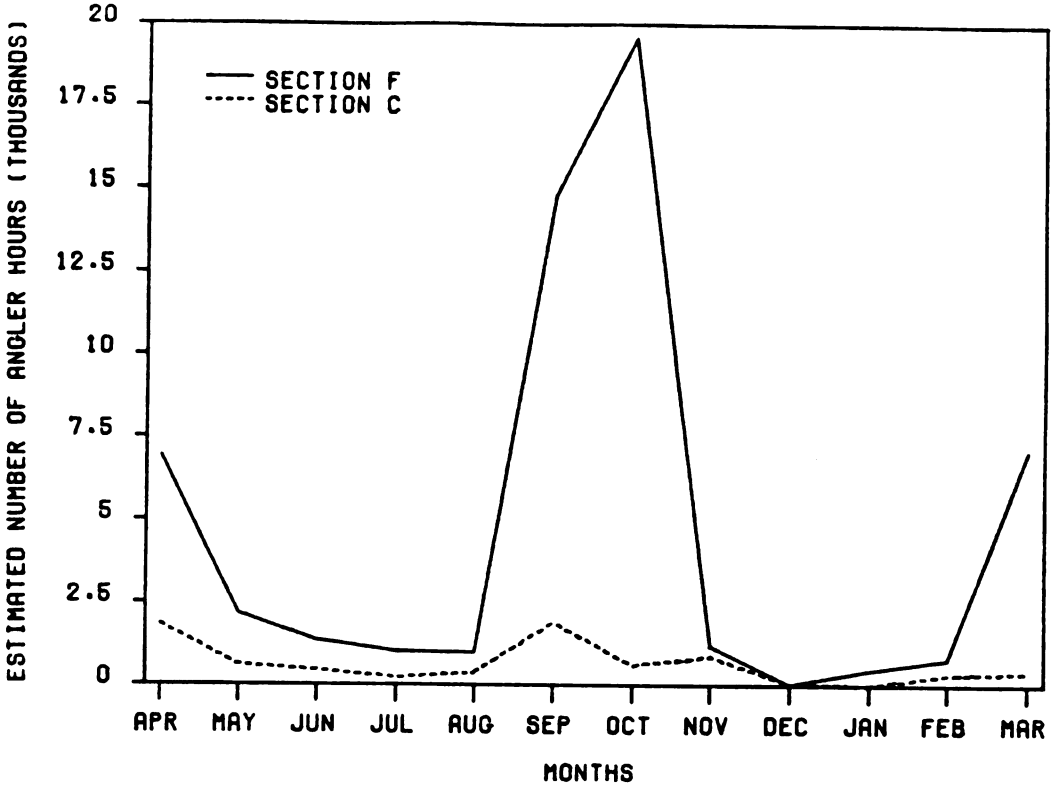


Figure 3. Estimated number of angler hours for section C and section F from April 1982 through March 1983, Pere Marquette River, Michigan.

Table 4: Total monthly estimated shore and canoe fishing hours for section F and section C for April 1982 through March 1983, Pere Marquette River, Michigan. Two standard errors are in parentheses.

Month	Section C			Section F		
	Shore	Canoe	Total	Shore	Canoe	Total
April 1982	1,640 (930)	193 (205)	1,833 (952)	6,885 (4,360)	29 (0)	6,914 (4,360)
May	420 (502)	210 (350)	630 (612)	2,166 (1,080)	9 (0)	2,166 (1,080)
June	248 (204)	214 (296)	462 (359)	1,348 (1,025)	0 (0)	1,348 (1,025)
July	112 (108)	138 (135)	250 (173)	1,022 (1,143)	0 (0)	1,022 (1,143)
August	217 (551)	174 (517)	391 (780)	964 (652)	27 (0)	991 (652)
September	1,710 (677)	190 (184)	1,900 (702)	14,717 (10,521)	94 (161)	14,972 (10,522)
October	525 (434)	90 (120)	615 (450)	19,445 (7,444)	150 (150)	19,595 (7,446)
November	720 (817)	165 (191)	885 (839)	1,200 (806)	0 (0)	1,200 (806)
December	60 (120)	0 (0)	60 (120)	60 (120)	0 (0)	60 (120)
January 1983	28 (168)	0 (0)	28 (168)	427 (640)	0 (0)	459 (642)
February	336 (359)	0 (0)	336 (359)	783 (155)	0 (0)	783 (155)
March	428 (195)	124 (195)	428 (195)	6,778 (2,515)	124 (194)	7,077 (2,520)
Total	6,444 (1,731)	1,498 (913)	7,818 (1,912)	55,795 (14,017)	433 (246)	56,378 (14,035)

Table 5. Monthly catch per effort ratios for primary species creeled from sections C and F from April 1982 through March 1983, Pere Marquette River, Michgan. All estimates are in number of fish caught and creeled per hour. Two standard errors are in parentheses.

Month	Species					
	Rainbow Trout		Brown Trout		Chinook Salmon	
	C	F	C	F	C	F
April	.0420 (.0527)	.0428 (.0407)	.0556 (.1166)	.0049 (.0063)	.0000 (.0000)	.0006 (.0011)
May	.2222 (.3709)	.1099 (.1286)	.0000 (.0000)	.0392 (.0680)	.0000 (.0000)	.0000 (.0000)
June	.0346 (.0585)	.0067 (.0171)	.0996 (.1530)	.0490 (.0764)	.0000 (.0000)	.0000 (.0000)
July	.0880 (.1600)	.0088 (.0185)	.0840 (.0957)	.0078 (.0232)	.0000 (.0000)	.0000 (.0000)
August	.0000 (.0000)	.0202 (.0321)	.0000 (.0000)	.0050 (.0135)	.1437 (.6471)	.0101 (.0193)
September	.0042 (.0100)	.0001 (.0001)	.0000 (.0000)	.0037 (.0070)	.1032 (.1451)	.1028 (.1066)
October	.0000 (.0000)	.0013 (.0017)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.2023 (.1369)
November	.0000 (.0000)	.0833 (.0858)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0133 (.0227)
December	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0067 (.2267)
January	.0000 (.0000)	.0501 (.1170)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
February	.0714 (.1860)	.0856 (.0856)	.0714 (.1860)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
March	.0000 (.0000)	.0530 (.0522)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
Total	.0367 (.0293)	.0207 (.0098)	.0247 (.0293)	.0043 (.0035)	.0322 (.0455)	.0981 (.0506)

(.0646) and .1230 (.0546) in section F (Table 6). The estimated harvest from section C was 732 (472) fish while 6,933 (2,551) fish were creeled from section F. The contribution of the various species to the catch differed between the two sections. The three primary species caught in section C exhibited a fairly equal distribution (figure 4) while chinook salmon comprised 79.6% of the catch in section F (Figure 5). The distribution of catch over time for section C showed even peaks of harvest in the spring and fall (Figure 6), whereas in section F, the spring peak is substantially less than the fall peak of salmon harvested (Figure 7). This disproportionate number of salmon harvested in section F compared to other species harvested in section F was most likely due to the large number of these fish concentrated in the spawning areas during the fall.

Angler preference was calculated as the percentage of anglers which sought specific species. In section C, rainbow trout (mostly steelhead) were prefered by 54.3% of anglers interviewed (Figure 8). Trout anglers having no species preference comprised the next largest catagory followed in decending order by anglers for brown trout, salmon or trout (no species preference), and Atlantic salmon respectively. Although salmon anglers only comprised 14.5% of the total number of anglers, they accounted for 34.4% of the fish harvested from section C.

Rainbow trout were also the most sought after fish in

Table 6. Overall monthly catch per effort for section C and section F from April 1982 through March 1983, Pere Marquette River, Michigan. Two standard errors are in parentheses.

Month	Section	
	F	C
April	.0495 (.0441)	.0977 (.1328)
May	.1491 (.1527)	.2222 (.3709)
June	.0556 (.0809)	.1342 (.1769)
July	.0166 (.0323)	.1720 (.2059)
August	.0353 (.0440)	.1432 (.6471)
September	.1059 (.1083)	.1074 (.1460)
October	.2036 (.1372)	.0000 (.0000)
November	.0967 (.0943)	.0000 (.0000)
December	.0667 (.2267)	.0000 (.0000)
January	.0501 (.1170)	.0000 (.0000)
February	.0856 (.0237)	.1429 (.2853)
March	.0553 (.0521)	.0000 (.0000)
Overall	.1230 (.0546)	.0936 (.0646)

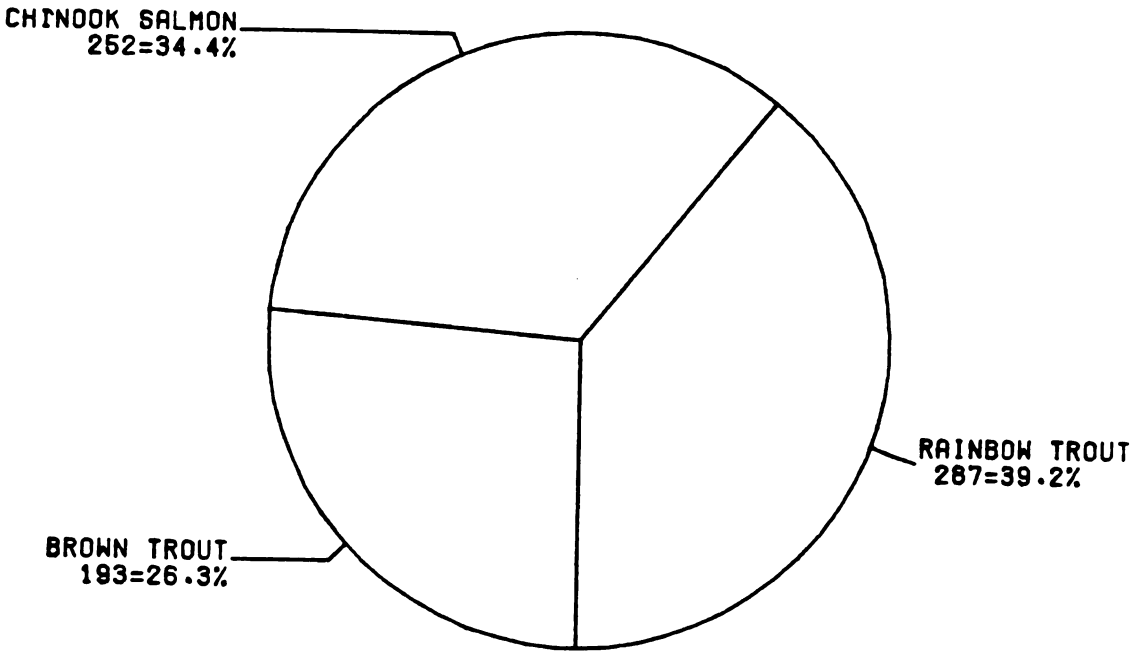


Figure 4. Total estimated angler harvest of fish eight inches or greater in length from section C from April 1982 through March 1983, Pere Marquette River, Michigan.

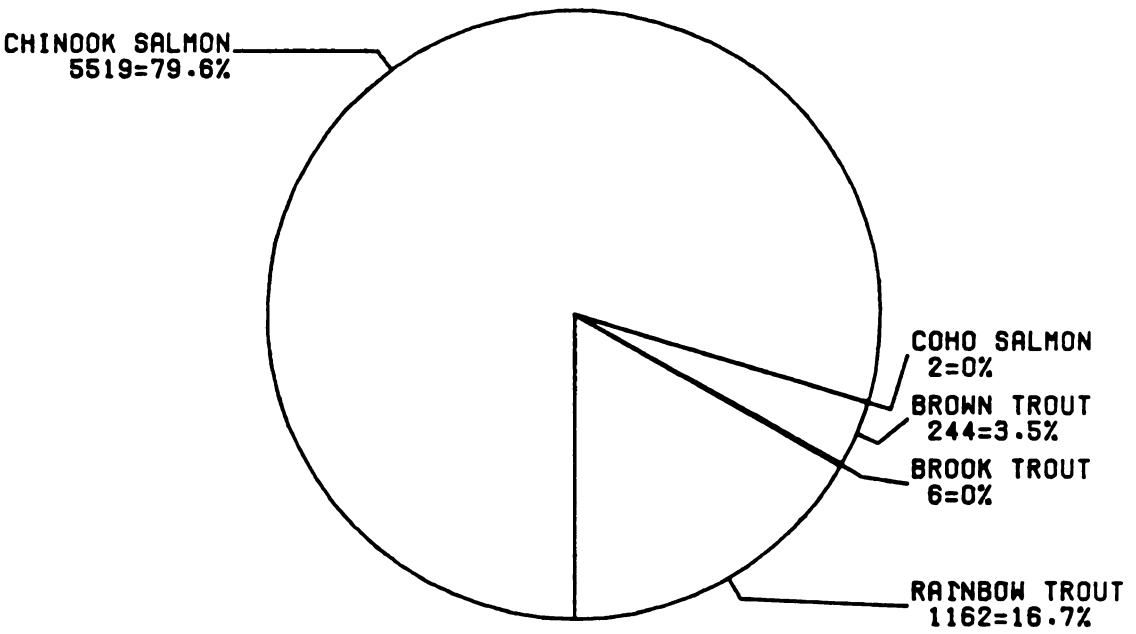


Figure 5. Total estimated angler harvest of fish ten inches or greater in length from section F from April 1982 through March 1983, Pere Marquette River, Michigan.

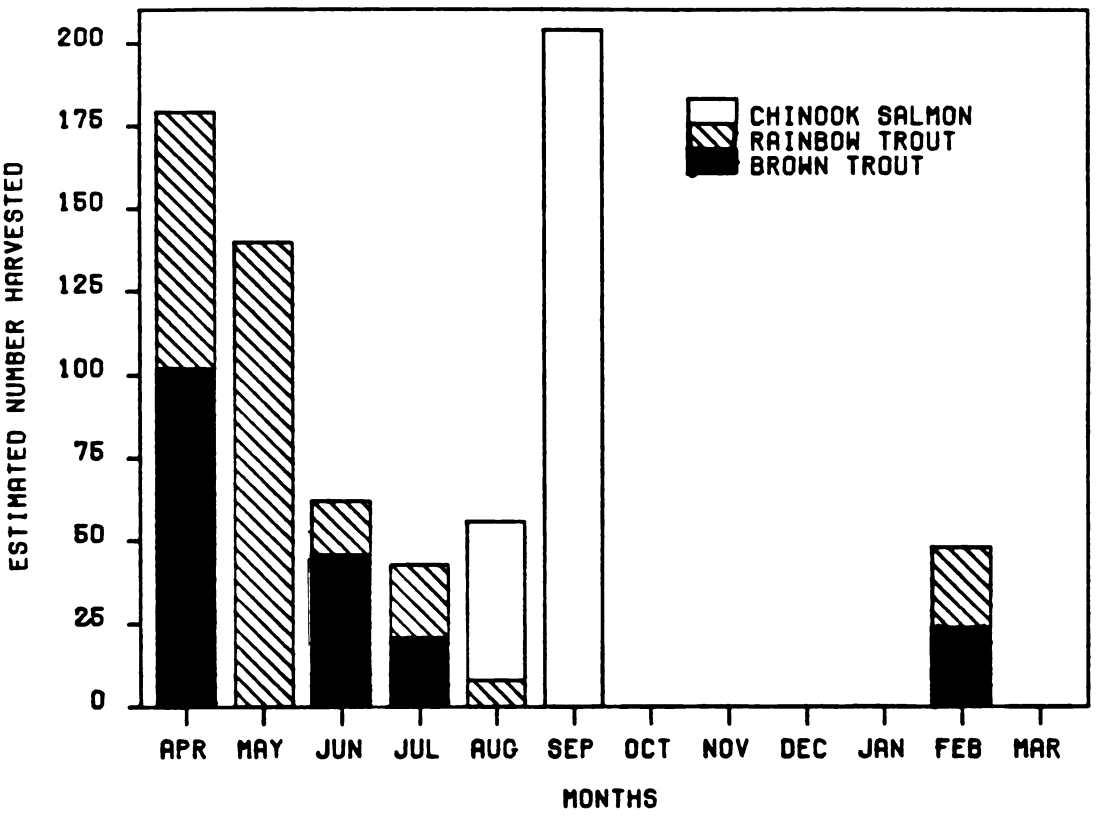


Figure 6. Total estimated monthly harvest of fish eight inches or greater in length and catch composition for section C from April 1982 through March 1983, Pere Marquette River, Michigan. The height of the bar represents the total catch and the divisions within the bars show the relative composition of the catch by species.

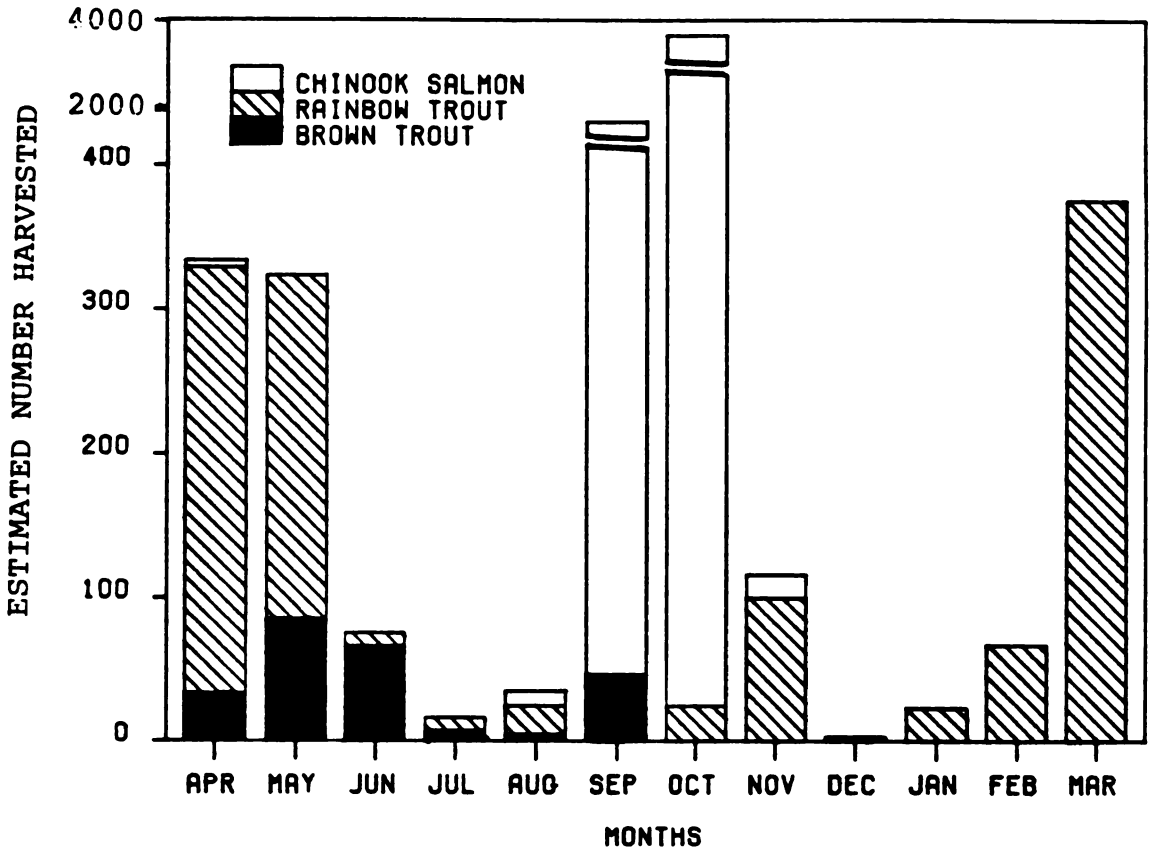


Figure 7. Estimated monthly angler harvest of fish ten inches or greater in length and catch composition for section F from April 1982 through March 1983, Pere Marquette River, Michigan. The height of the bar represents the total monthly catch and the divisions within the bars represent the relative composition by species.

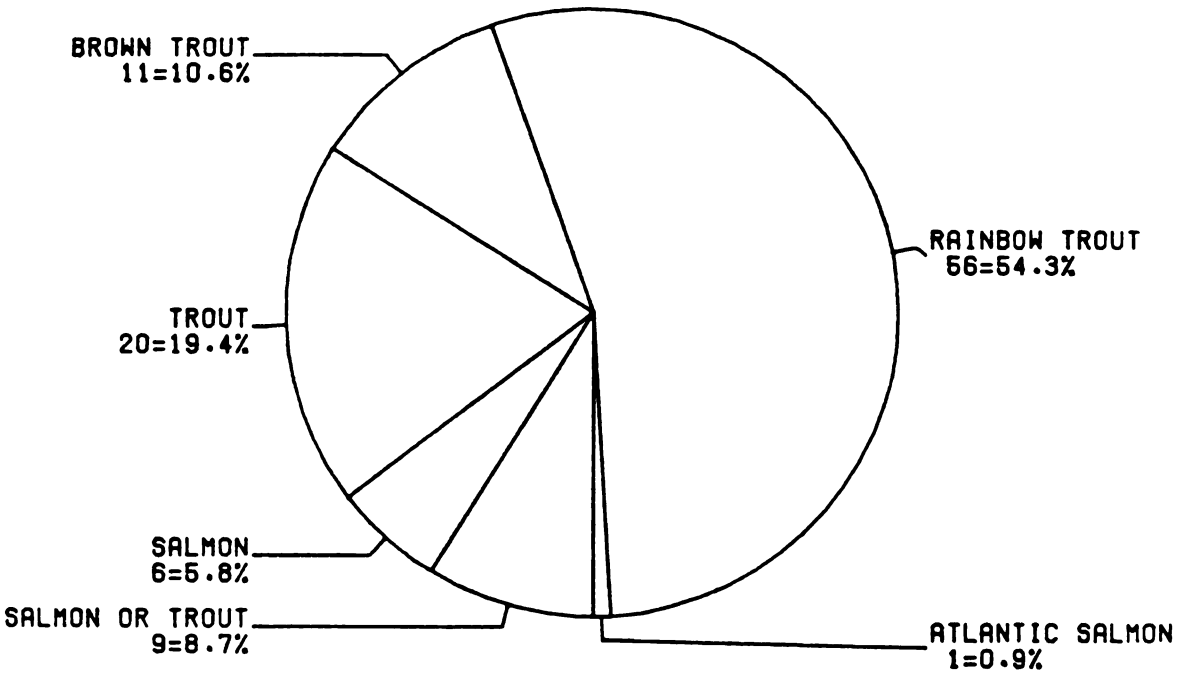


Figure 8. Species sought by anglers (%) in section C from April 1982 through March 1983, Pere Marquette River, Michigan.

section F, with 45.7% of anglers fishing for this species (Figure 9). Salmon anglers comprised a much larger percentage of the anglers in this section, 31.3% of which had no species preference. Salmon or trout were sought by 10.9% of the anglers followed by chinook salmon anglers and trout anglers (no species preference). Salmon anglers which comprised 41.3% of the anglers fishing in section F harvested 79.6% of the fish creeled in this section. While more salmon were harvested from section F than any other species, rainbow trout were still the species prefered by most anglers interviewed. This is most likely a function of the much longer season for this species. The salmon fishery in the Pere Marquette River is essentially limited to September and October whereas small rainbow trout can be caught all year and steelhead generally are available from November through May.

There was a distinct difference in fishing methods used between sections. This is undoubtly due to the bait restrictions of "flies only" in section F. However, only 91.3% of the anglers in this section actually claimed to have fished with flies (Figure 10). Other bait types used were combinations of artificial and natural baits, flies and wigglers, lures, spawn, worms and spinners. In section C flies were also popular, but worms were the most commonly used bait (Figure 11). Spawn, spinners, spoons, and combinations of natural and artificial baits also used in this section was.

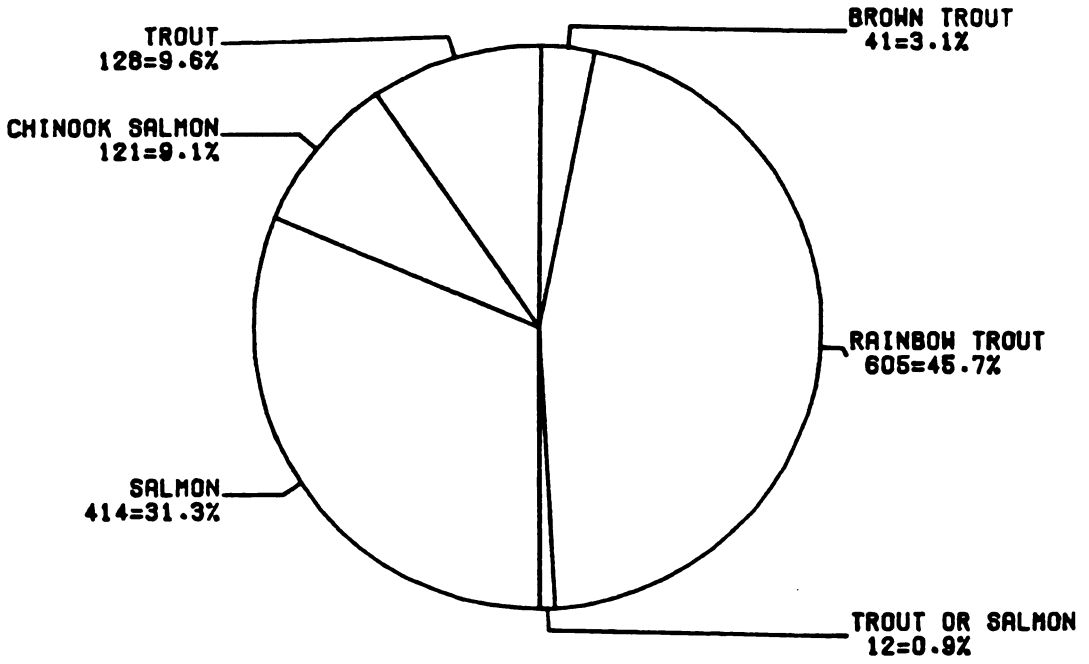


Figure 9. Species sought by anglers (%) in section F from April 1982 through March 1983, Pere Marquette River, Michigan.

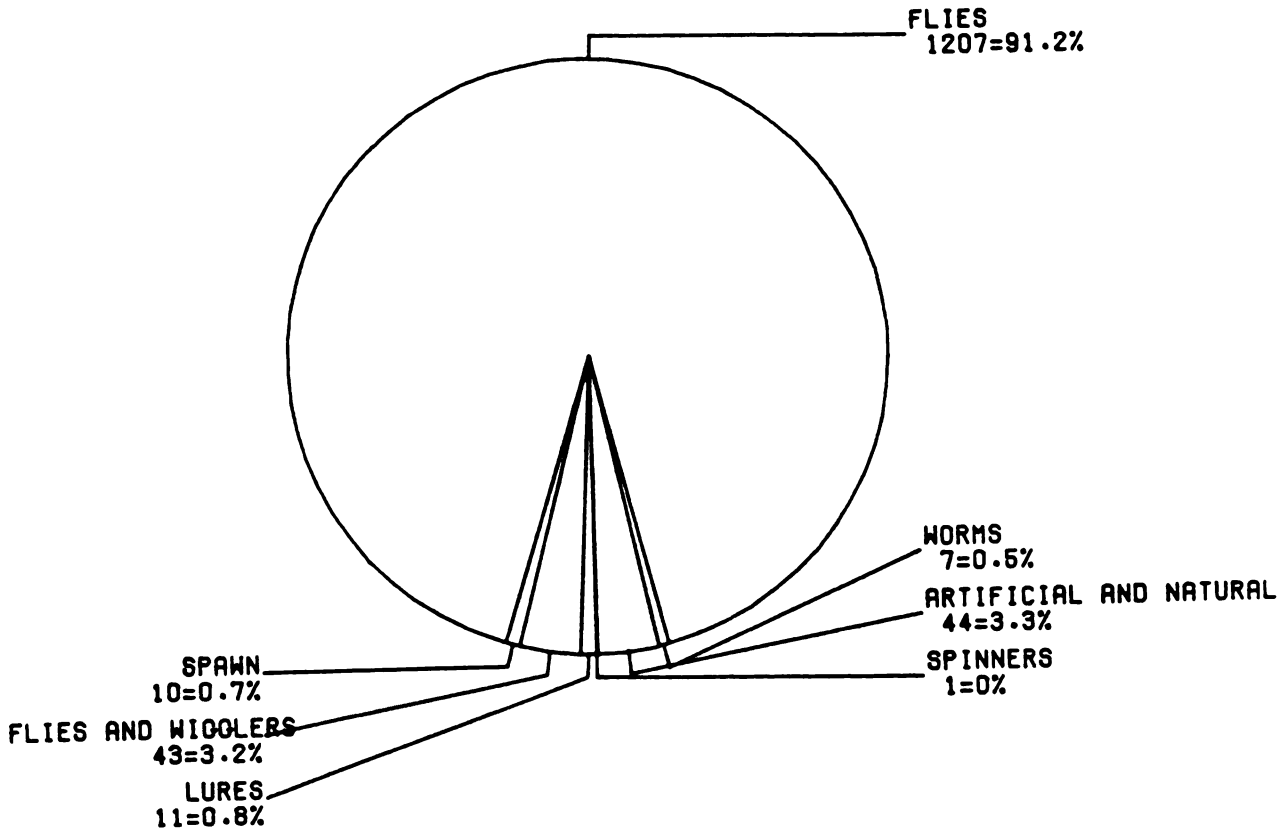


Figure 10. Bait types used by anglers (%) in section F from April 1982 through March 1983, Pere Marquette River, Michigan.

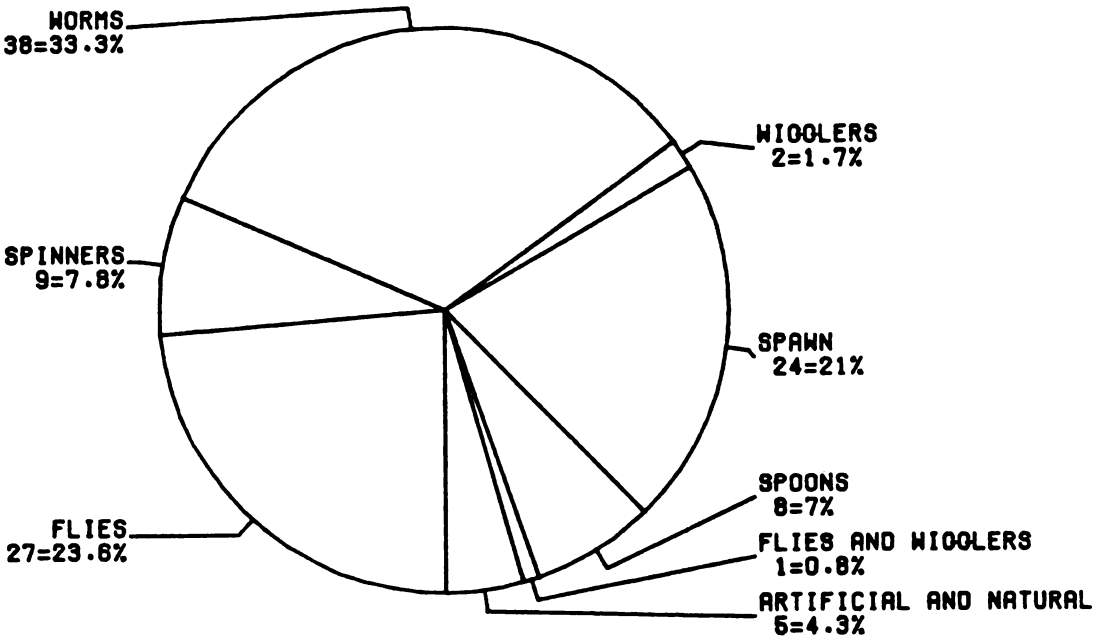


Figure 11. Bait type used by anglers (%) in section C from April 1982 through March 1983, Pere Marquette River, Michigan.

The Pere Marquette River fishery is supported by both resident and anadromous fish and receives a substantial amount of fishing pressure. Fishing pressure in section F was estimated at 8,054 angler hours per mile per year. In section C angling pressure was less at 1,117 angler hours per mile per year. Fishing pressure in section F was greater than the 1981 creel survey data for four AuSable River sites. Two sites on the mainstream and two sites on the north branch (MDNR personal communication). Fishing pressure on the Grand River near the 6th Street Dam in Grand Rapids, Michigan was substantially higher at 53,106 angler hours per mile per year (Table 7). Also higher was the Rouge River with 9,952 angler hours per mile per year (MDNR personal communication). The Grand River and Rouge River were only surveyed September-November 1982 and March-April 1983 therefore this data represents minimum estimates. The AuSable creel survey sites are for the most part rural highly esthetic areas with no runs of anadramous fish. The Grand River site, an urban fishery, and the Rouge River site near Grand Rapids, which has a strong urban influence, are essentially supported only by andromous species. Therefore angling presure on these systems cannot be compared directly but it does give some indication that the Pere Marquette is a highly utilized fishery resource.

Table 7: Angler hours, catch per effort, effort per mile, and number of fish harvested for selected Michigan streams.

	Approximate Length of Site (miles)	Angler Hours	Hours Per Mile	Number Caught	Catch Per Effort
AuSable River, north branch (1981)					
Ranch to Eaman's					
All Trout	5.5	18,200	3,309	3,390	.1863
Brown trout	5.5	18,200	3,309	1,580	.0868
Eamans's to Kellogg					
All Trout	11.0	16,200	1,472	1,850	.1142
Brown Trout	11.0	16,200	1,472	1,101	.0623
AuSable River, mainstream (1981)					
Burton to Wakely					
All Trout	8.7	37,600	4,322	2,790	.0742
Brown Trout	8.7	37,600	4,322	2,120	.0564
Grayling to Burton					
All Trout	10.5	6,000	571	690	.1150
Brown trout	10.5	6,000	571	690	.1150

Table 7 continued

	Approximate Length of Site (miles)	Angler Hours	Hours Per Mile	Number Caught	Catch Per Effort
Pere Marquette River, (April 1982-March 1983)					
M-37 to Gleason's					
All Salmonids	7.0	56,378	8,054	6,935	.1230
Brown trout	7.0	56,378	8,054	244	.0043
Salmon	7.0	56,378	8,054	5,521	.0979
Bowman's to Rainbow					
All Salmonids	7.0	7,817	1,117	732	.0936
Brown trout	7.0	7,817	1,117	193	.0247
Salmon	7.0	7,817	1,117	252	.0322
Pere Marquette River, (April 1982-December 1982)					
Gleason's to Bowman's					
All Salmonids	4.0	6,999	1,750	366	.0523
Brown Trout	4.0	6,999	1,750	60	.0086
Salmon	4.0	6,999	1,750	122	.0174
Rainbow to Upper Branch					
All Salmonids	4.0	3,217	804	36	.0012
Brown Trout	4.0	3,217	804	11	.0034
Salmon	4.0	3,217	804	0	.0000

Table 7 continued

	Approximate Length of Site (miles)	Angler Hours	Hours Per Mile	Number Caught	Catch Per Effort
Grand River, (September 1982-November 1982 and March 1983-April 1983)					
6th street to Butterworth					
All Salmonids	2.0	106,212	53,106	24,412	.2298
Brown Trout	2.0	106,212	53,106	131	.0012
Salmon	2.0	106,212	53,106	17,866	.1682
Rouge River, (September 1982-November 1982 and March 1983-April 1983)					
Childsdale to West River Road					
All Salmonid	4.0	39,808	9,952	2,287	.0575
Brown Trout	4.0	39,808	9,952	174	.0044
Salmon	4.0	39,808	9,952	1,086	.0273

Creel Survey - Sections A and B

There were 2,409 (1,833) angler trips in section A and 1,045 (341) angler trips in section B (Figure 12). Peak months of activity for both sections were April, June and September for 2,087 trips in section A and 971 trips in section B. Angler preference for larger anadromous species was also exhibited in these two sections with 86.6% of angler trips in section A and 92.9% of angler trips in section B taking place during the spring steelhead and fall salmon spawning seasons. As with sections C and F, the pattern of angler hours followed the pattern of angler trips (Figure 13). There was a total of 6,999 (4,565) angler hours in section A and 3,217 (995) angler hours in section B. The percentage of canoe fishing hours was similar between sections. Section A had 578 (8.7%) caone fishing hours and section B had 233 (7.3%) canoe fishing hours (Table 8).

In section A, monthly catch per effort for all species combined ranged from zero to .3333 fish per hour while in section B monthly catch per effort for all species combined ranged from zero to .0563 fish per hour (Table 9). Overall catch per effort for the nine month period was .0523 (.0638) for section A and .0112 (.0132) for section B (Table 10). The basis for the substantial difference in maximum catch per effort between sections is not explained by the data collected. Estimated total number of fish harvested from section A was 366 (377) fish (Figure 14) and

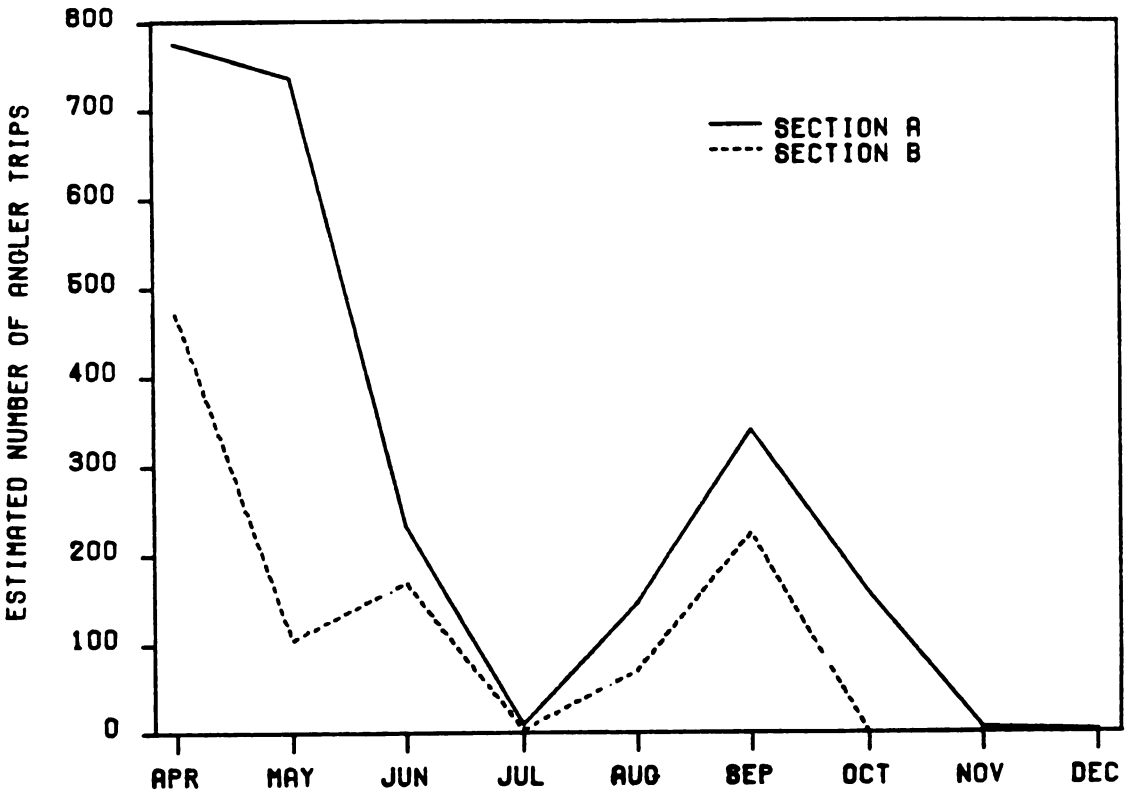


Figure 12. Estimated number of angler trips for section A and section B from April 1982 through December 1982, Pere Marquette River, Michigan.

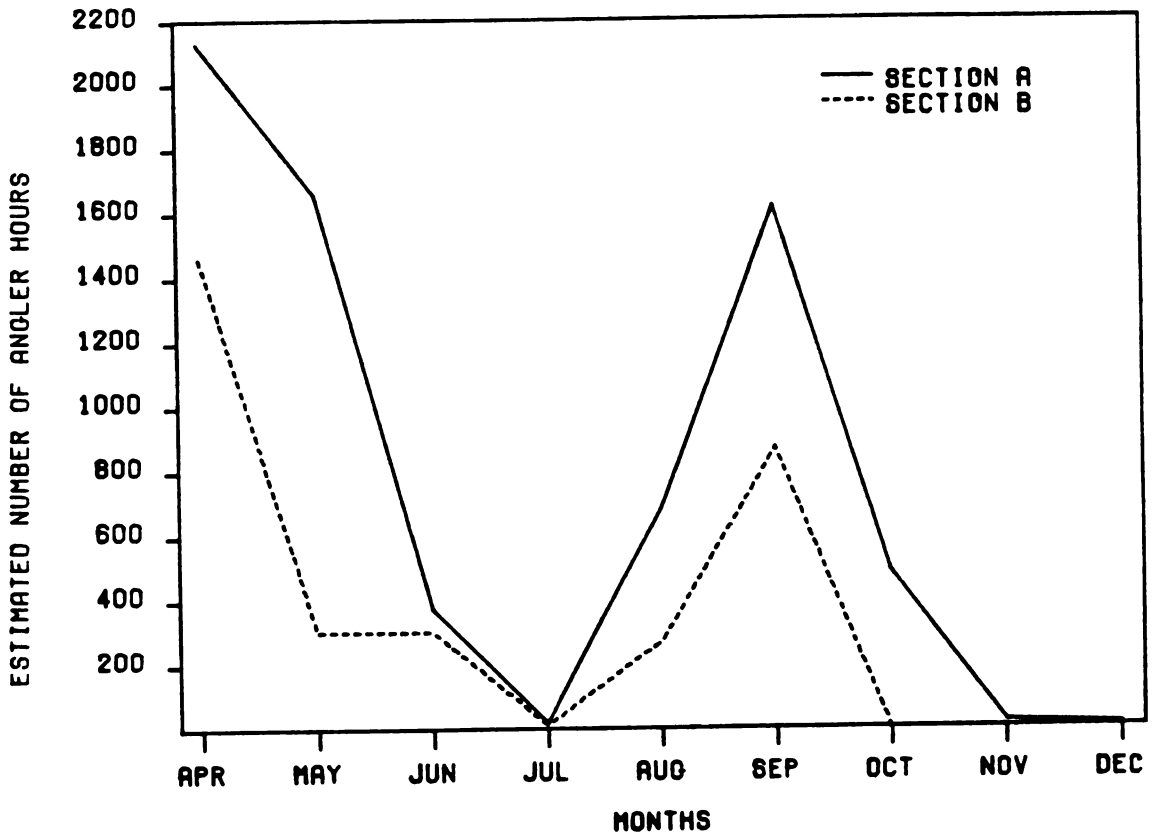


Figure 13. Estimated number of angler hours for section A and Section B from April 1982 through March 1982, Pere Marquette River, Michigan.

Table 8. Total monthly estimated shore and canoe fishing hours for sections A and B from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	Section					
	A			B		
	Shore	Canoe	Total	Shore	Canoe	Total
April	2,124 (3,452)	6 (0)	2,130 (3,452)	1,440 (808)	22 (0)	1,462 (808)
May	1,663 (2,792)	0 (0)	1,663 (2,792)	300 (168)	1 (0)	301 (168)
June	304 (508)	69 (102)	373 (518)	242 (135)	60 (120)	302 (181)
July	18 (0)	0 (0)	18 (0)	12 (0)	0 (0)	12 (0)
August	274 (457)	405 (685)	679 (823)	270 (151)	0 (0)	270 (151)
September	1,560 (240)	60 (120)	1,620 (268)	720 (404)	150 (300)	870 (503)
October	450 (300)	38 (150)	488 (335)	0 (0)	0 (0)	0 (0)
November	18 (0)	0 (0)	18 (0)	0 (0)	0 (0)	0 (0)
December	10 (0)	0 (0)	10 (0)	0 (0)	0 (0)	0 (0)
Total	6,411 (4,508)	578 (719)	6,999 (4,565)	2,984 (941)	233 (323)	3,217 (995)

Table 9. Monthly catch per effort ratios for the primary species creeled from sections A and B on the Pere Marquette River, Michigan April 1982 through December 1982. All estimates are in number of fish caught and creeled per hour. Two standard errors are in parentheses.

Month	Species					
	Rainbow Trout		Brown Trout		Coho Salmon	Chinook Salmon
	A	B	A	B	A	A
April	.0559 (.0559)	.0014 (.0022)	.0000 (.0000)	.0007 (.0014)	.0000 (.0000)	.2000 (.0000)
May	.0000 (.0000)	.0266 (.0589)	.0000 (.0000)	.0299 (.0685)	.0946 (.2057)	.0000 (.0000)
June	.1609 (.3917)	.0000 (.0000)	.1609 (.3919)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
July	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
August	.0000 (.0000)	.0556 (.1189)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0177 (.0426)
September	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
October	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
November	.3333 (.3889)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
December	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)	.0000 (.0000)
Total	.0263 (.0346)	.0078 (.0111)	.0086 (.0180)	.0034 (.0063)	.0157 (.0424)	.0017 (.0037)

Table 10. Overall monthly catch per effort for section A and section B from April through December 1983, Pere Marquette River, Michigan. Two standard errors are in parentheses.

Month	Section	
	A	B
April	.5590 (.1213)	.0021 (.0030)
May	.0661 (.2057)	.0565 (.0920)
June	.3217 (.6382)	.0000 (.0000)
July	.0000 (.0000)	.0833 (.0833)
August	.0177 (.0426)	.0556 (.1189)
September	.0000 (.0000)	.0000 (.0000)
October	.0000 (.0000)	.0000 (.0000)
November	.3333 (.3889)	.0000 (.0000)
December	.0000 (.0000)	.0000 (.0000)
Overall	.0523 (.0638)	.0112 (.0132)

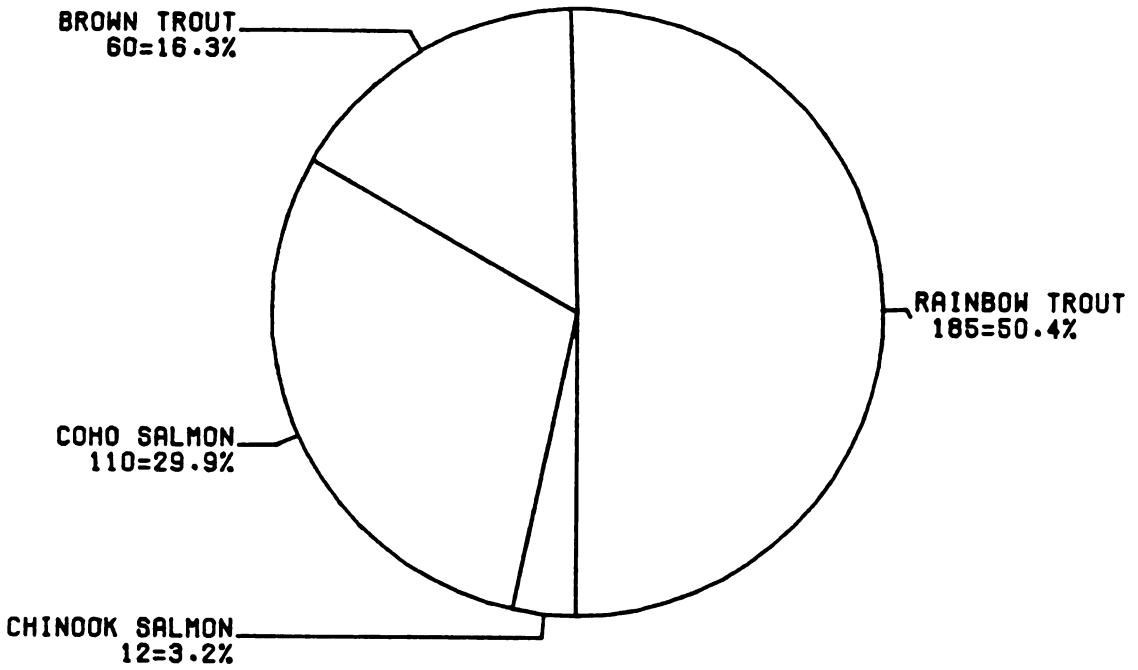


Figure 14. Total estimated angler harvest of fish eight inches or greater in length for section A from April 1982 through December 1982, Pere Marquette River, Michigan.

36 (41) fish from section B (Figure 15). Distribution of catch over time was different between sections. In section A most fish were caught in April, May and June (Figure 16) whereas in section B the number of fish caught was evenly divided between spring and fall (Figure 17). The reason for this difference is not readily apparent. Possibly few salmon built redds in this section, limiting the vulnerability of fish to passage through this section.

The most prefered species in section A was rainbow trout sought by 73.9% of anglers. Anglers who sought trout with no species preference accounted for 14.8% of anglers in this section. Other species sought were salmon, brown trout, salmon or trout with no species preference, and non-salmonids (Figure 18). In section B rainbow trout were also the most prefered species by 66.7% of anglers. Anglers also fished for trout no species preferences, brown trout and salmon or trout (Figure 19).

There were many types of baits used in section A. Worms were used by the greatest percentage (33.3%) of anglers with spinners and spawn the next most common bait types. Other bait types used in section A were flies, natural and artificial bait combinations, spoons and lures (Figure 20). Anglers in section B used a less diverse array of bait types. In this section worms were again the most commonly used bait (Figure 21). There was a marked similarity between baits used in all three of the unrestricted areas. In each of these sections worms,

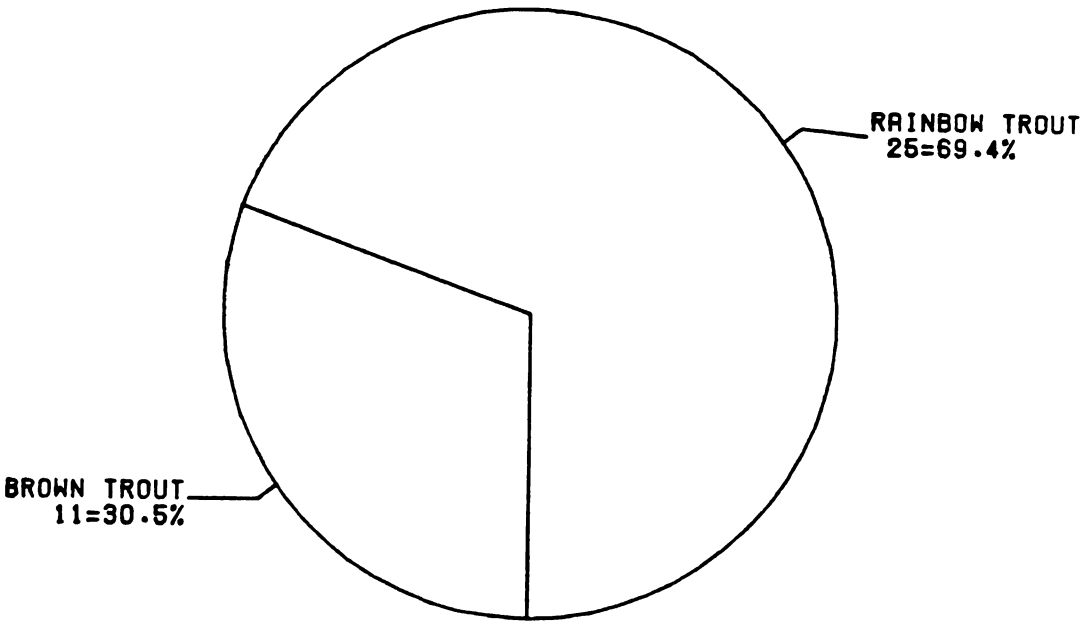


Figure 15. Estimated angler harvest of fish eight inches or greater in length for section B from April 1982 through December 1982, Pere Marquette River, Michigan.

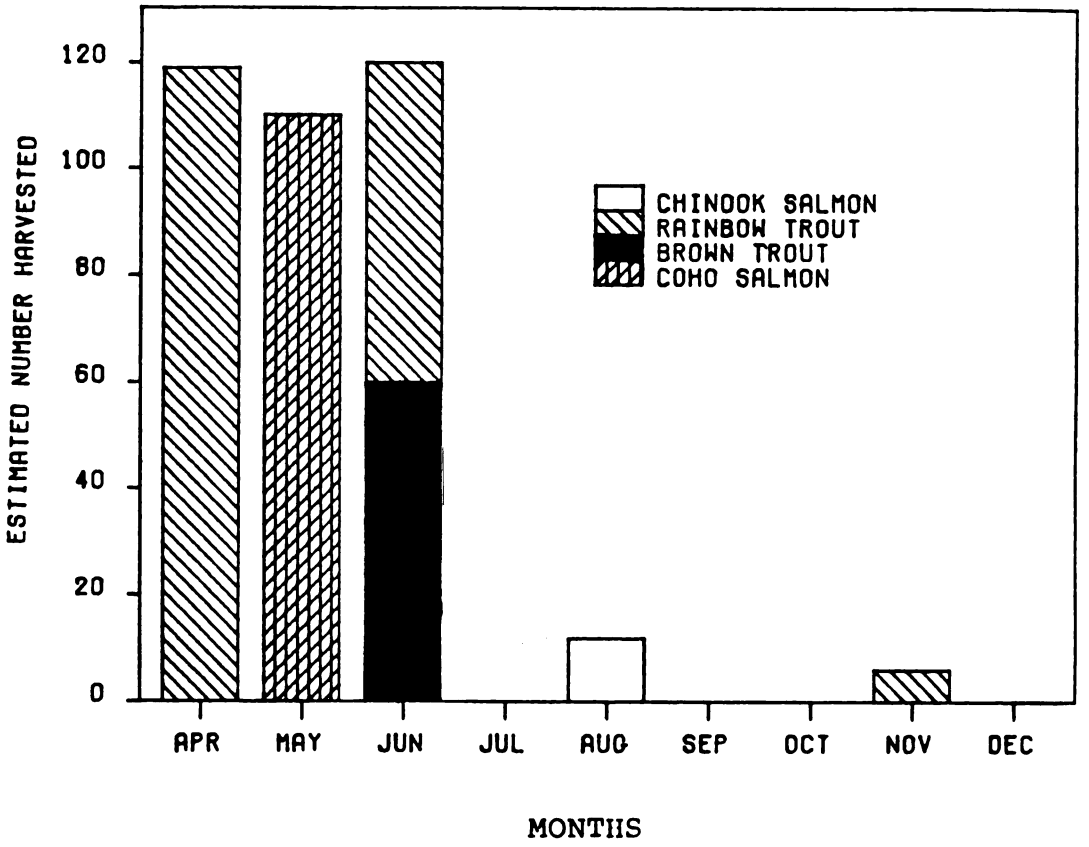


Figure 16. Estimated monthly harvest of fish eight inches or greater and catch composition for section A from April 1982 through December 1982, Pere Marquette River, Michigan. The height of the bar represents the total monthly harvest and the divisions within the bars show the relative composition of the catch by species.

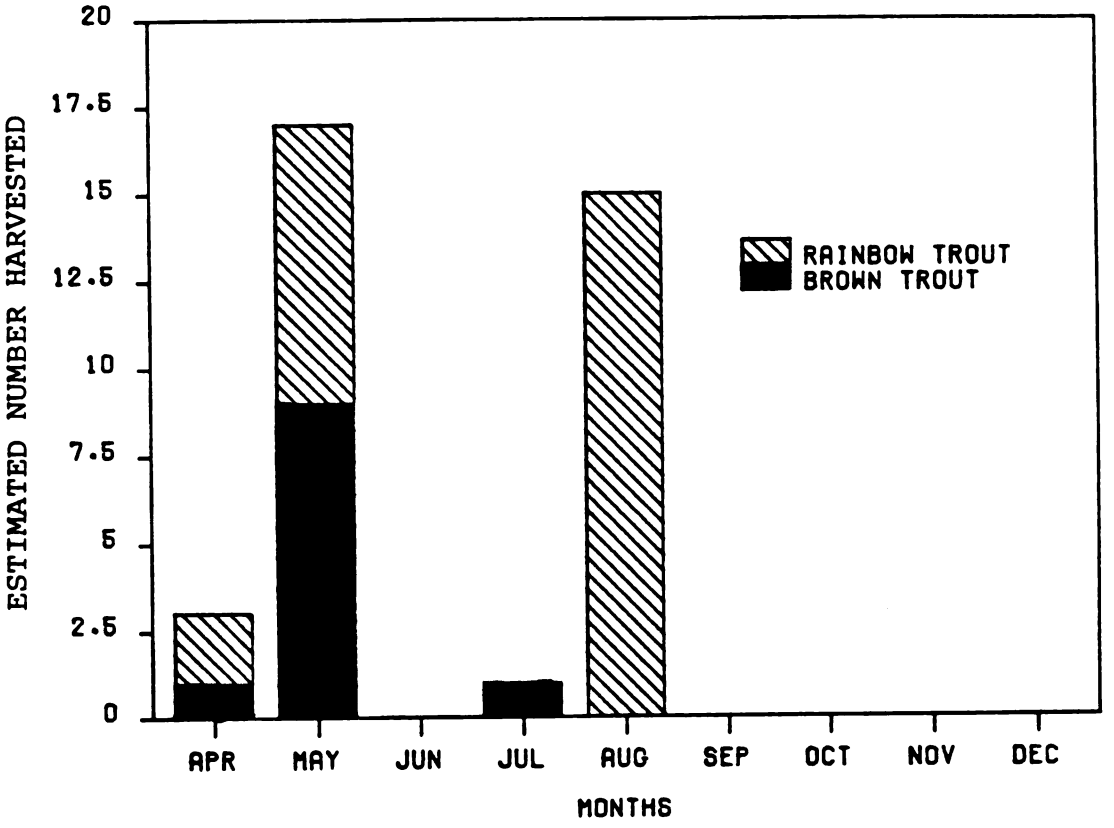


Figure 17. Estimated monthly harvest of fish eight inches or greater and catch composition for section B from April 1982 through December 1982, Pere Marquette River, Michigan. The height of the bar represents the total monthly harvest and the divisions within the bars show the relative composition of the catch by species.

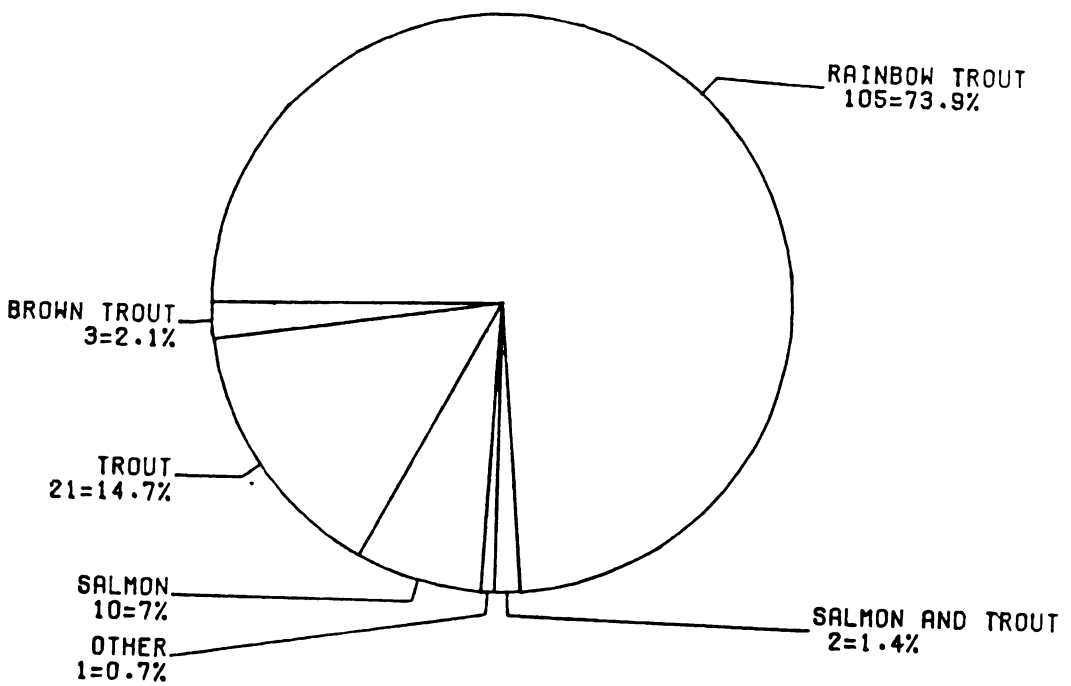


Figure 18. Species sought by anglers (%) for section A from April 1982 through December 1982, Pere Marquette River, Michigan.

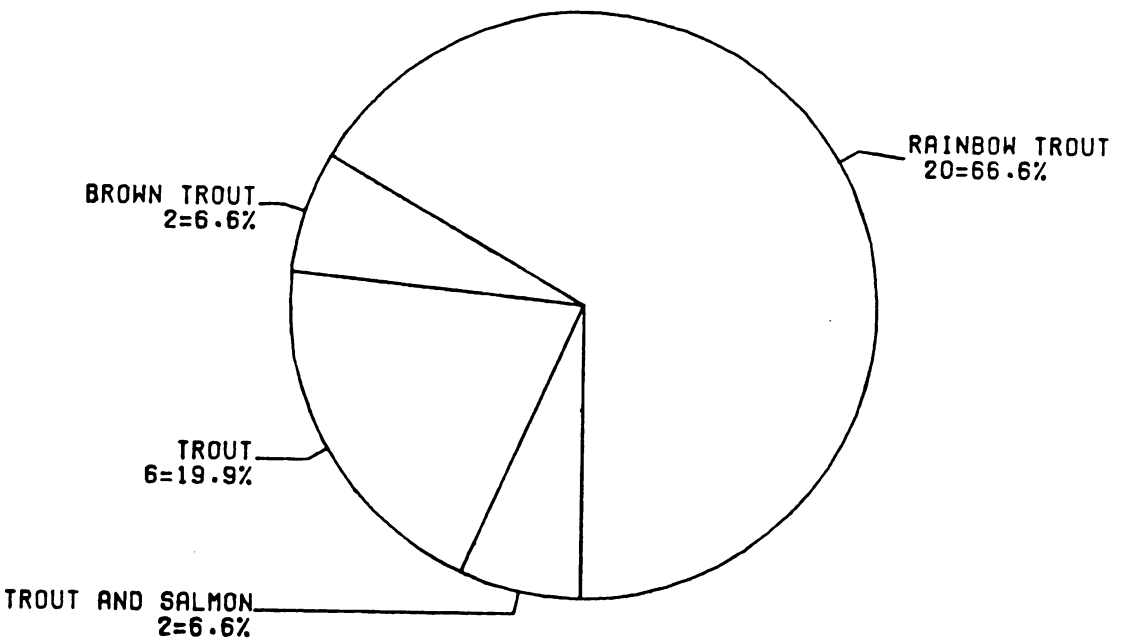


Figure 19. Species sought by anglers (%) for section B from April 1982 through December 1982, Pere Marquette River, Michigan.

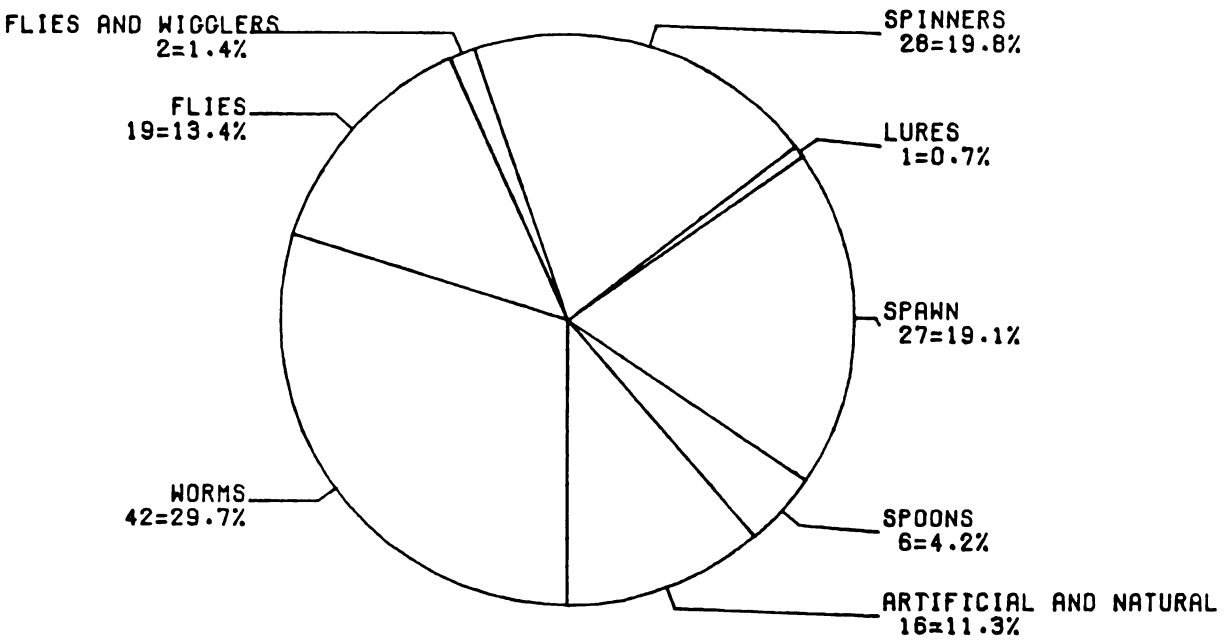


Figure 20. Bait types used by anglers (%) in section A from April 1982 through December 1982, Pere Marquette River, Michigan.

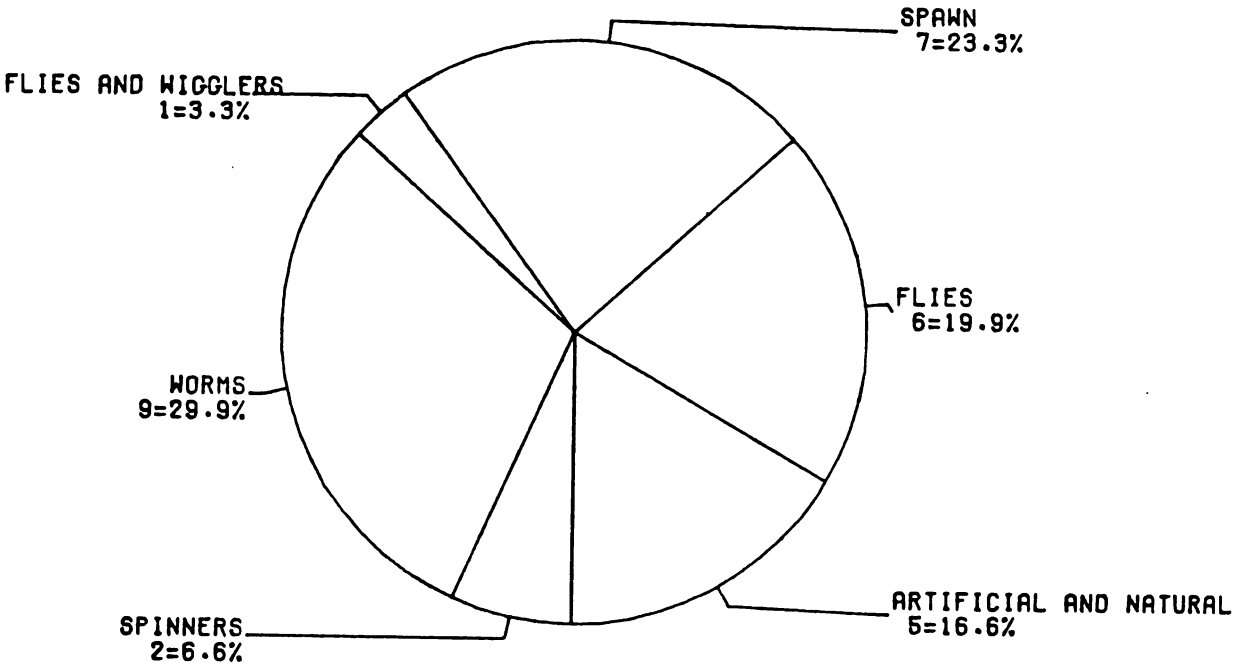


Figure 21. Bait types used by anglers (%) in section B from April 1982 through December 1982, Pere Marquette River, Michigan.

flies, and spawn made up the majority of baits used.

Brown Trout Population

The brown trout population in the study section appears to be declining in abundance. Estimates for the mouth of the Baldwin sampling station from 1970 through 1984 showed a decline in total estimated number of brown trout present (Figure 22). In 1970 it was estimated that there were 588 fish at the station and in 1984 there were only 129 fish present. Reasons for this apparent decline are not known. First appearances indicate a disastrous decline but evaluation of the information on fish eight inches and larger indicates that the fishable size portion of the population has not shown as drastic decline as the overall population. While estimates for larger brown trout drop from 229 fish in 1973 down to 112 fish in 1984, there does not appear to be a significant difference in the number of larger fish from 1981 through 1984 (Figure 23). Some form of compensation may have occurred or the population may have stabilized in recent years. However, the last three point estimates seem to imply a continued but reduced decline.

The total number of fish actually observed at the mouth of the Baldwin sampling station has declined on every sampling date since 1973. The most notable difference was in the number of young of the year fish (Figure 24). Although the number of fish observed has declined in recent

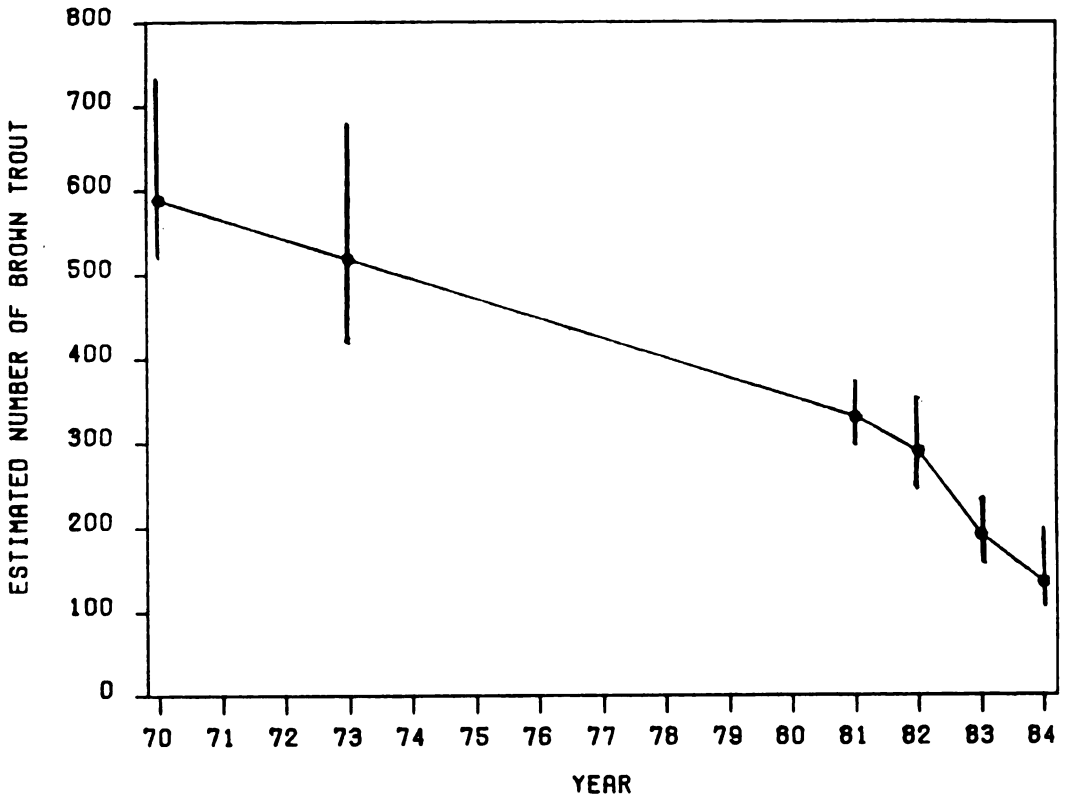


Figure 22. Total estimated number of brown trout for the mouth of the Baldwin sampling station (1.37 acres), Pere Marquette River, Michigan. Error bars represent approximate 95% confidence intervals.

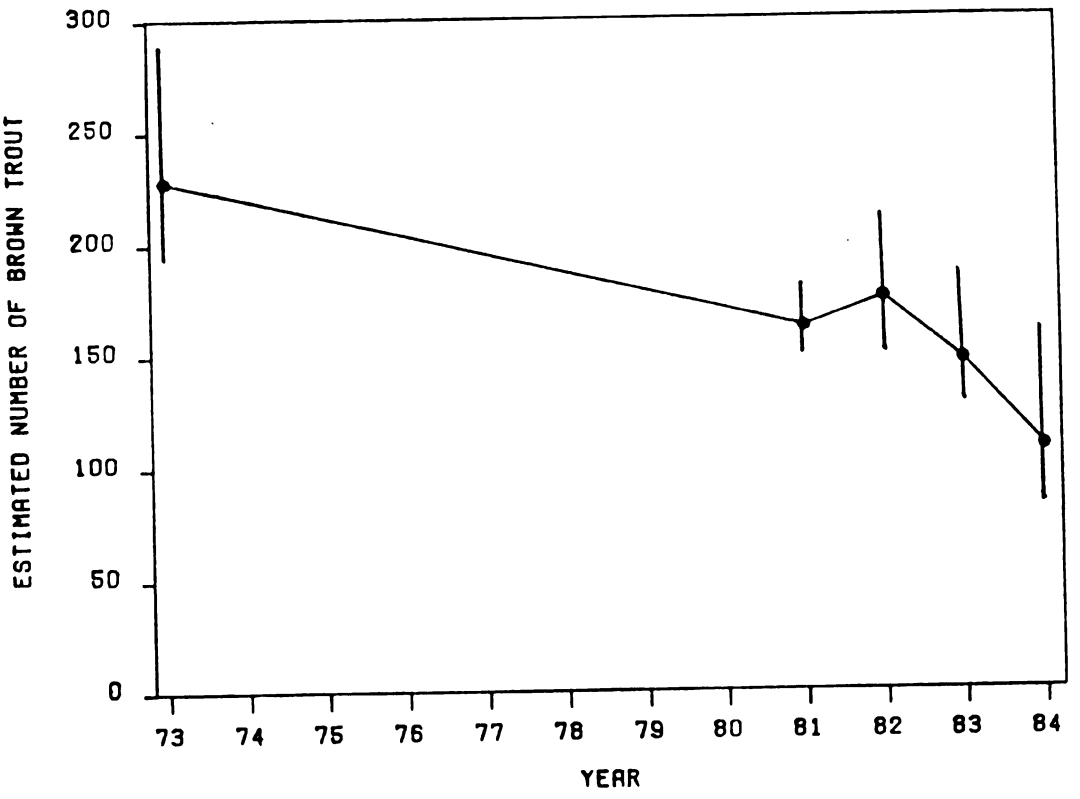
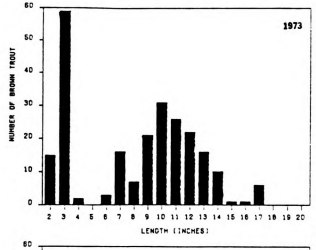
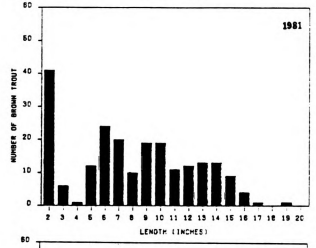
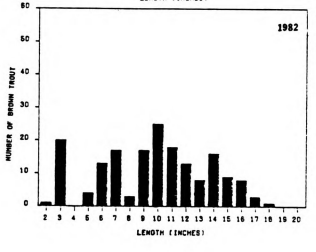


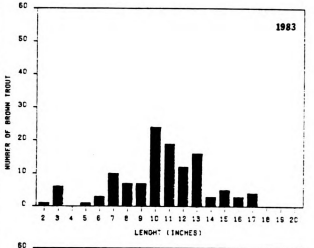
Figure 23. Estimated number of brown trout which were eight inches or greater in length at the mouth of the Baldwin sampling station (1.37 acres), Pere Marquette River, Michigan. Error bars represent approximate 95% confidence intervals.

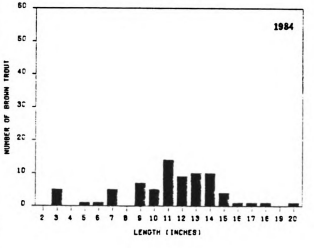
Figure 24. The number of individual brown trout observed during electrofishing at the mouth of the Baldwin sampling station (1.37 acres), Pere Marquette River, Michigan.


1973
NUMBER OF BROWN TROUT
LENGTH (INCHES)


1981
NUMBER OF BROWN TROUT
LENGTH (INCHES)


1982
NUMBER OF BROWN TROUT
LENGTH (INCHES)


1983
NUMBER OF BROWN TROUT
LENGTH (INCHES)


1984
NUMBER OF BROWN TROUT
LENGTH (INCHES)

years all size classes are still represented, with fish as large as twenty inches being observed in 1984. This indicates that no size class has been eliminated from the population.

The remainding sampling stations did not show the steady decline in estimated numbers of brown trout that the mouth of the Baldwin station did (Figure 25). The estimated number of brown trout at the M-37 station droped between 1981 and 1982 but remained relatively stable between 1982 and 1984. The estimated number of brown trout at the P.M. Rod and Gun Club station showed fluctuations erratic fluctuations. The estimated numbwer of brown trout at the Gleasons Landing station showed a slight decline but not as drastic as the decline observed at the mouth of the Baldwin station (Figure 25). When the estimates of brown trout abundance from all stations were compared on a per acre basis the population levels appear highest at the mouth of the Baldwin station than the estimates of brown trout abundance at all of the other station for each year sampled (Figure 26).

The number of rainbow trout in the Pere Marquette River appears to be increasing at the mouth of the Baldwin station in recent years but the estimates were highly variable (Figure 27). Evaluation of length frequency of the fish actually observed at the mouth of the Baldwin sampling station illustrated that a large proportion of the total fish were young of the year fish (Figure 28). The

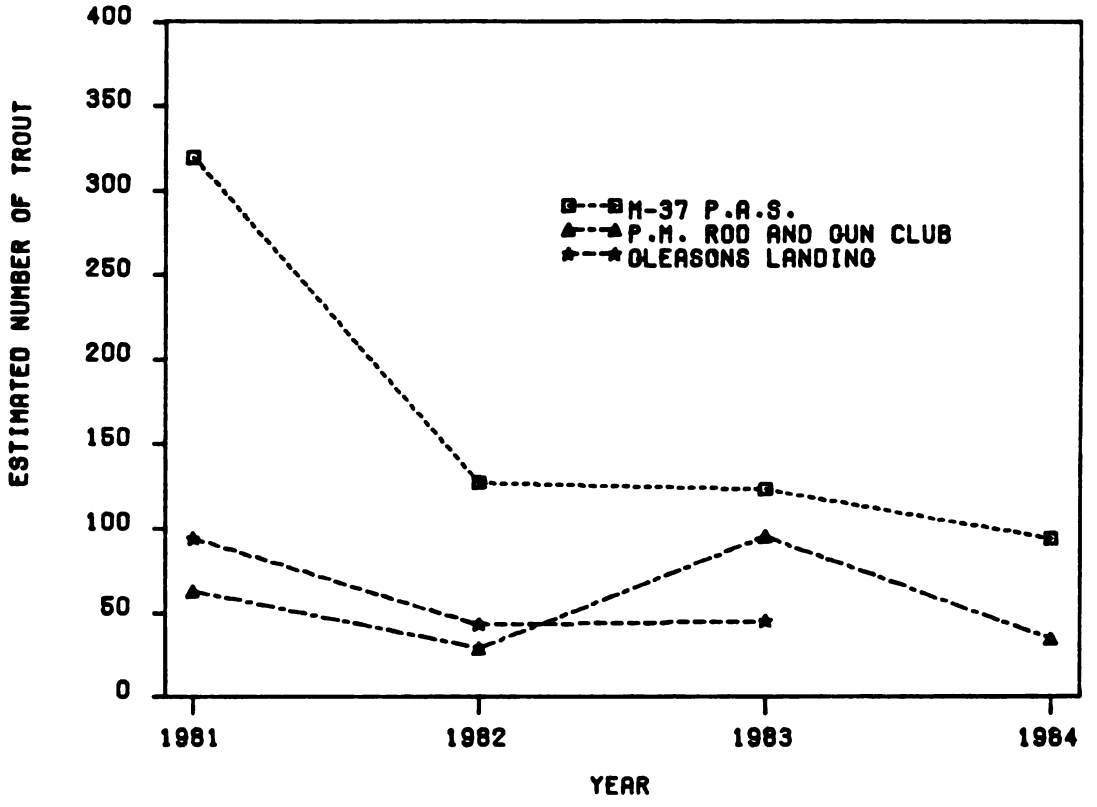


Figure 25. The estimated abundance of brown trout at the M-37 Public Access (1.87 acres), Pere Marquette Rod and Gun Club (1.15 acres), and Gleason's Landing (1.49 acres) sampling stations, Pere Marquette River, Michigan.

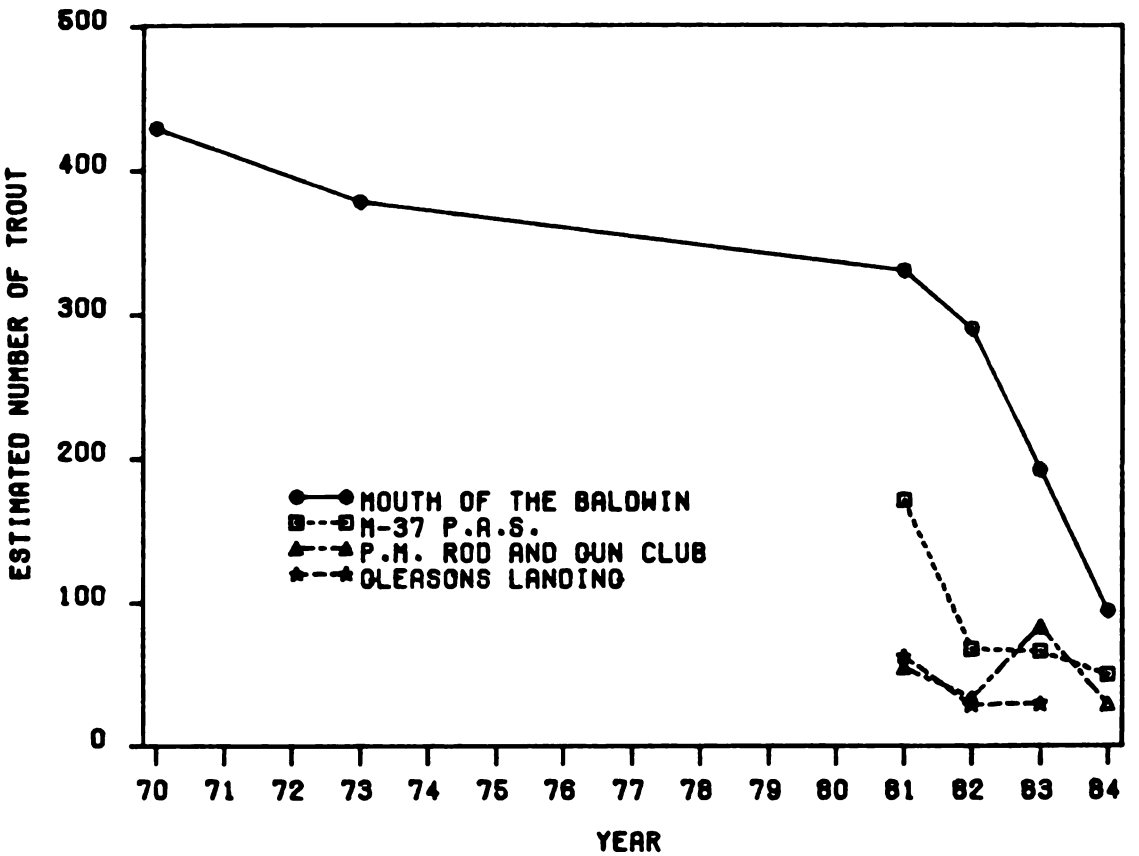


Figure 26. Estimated brown trout abundance per acre for the four sampling stations, Pere Marquette River, Michgan.

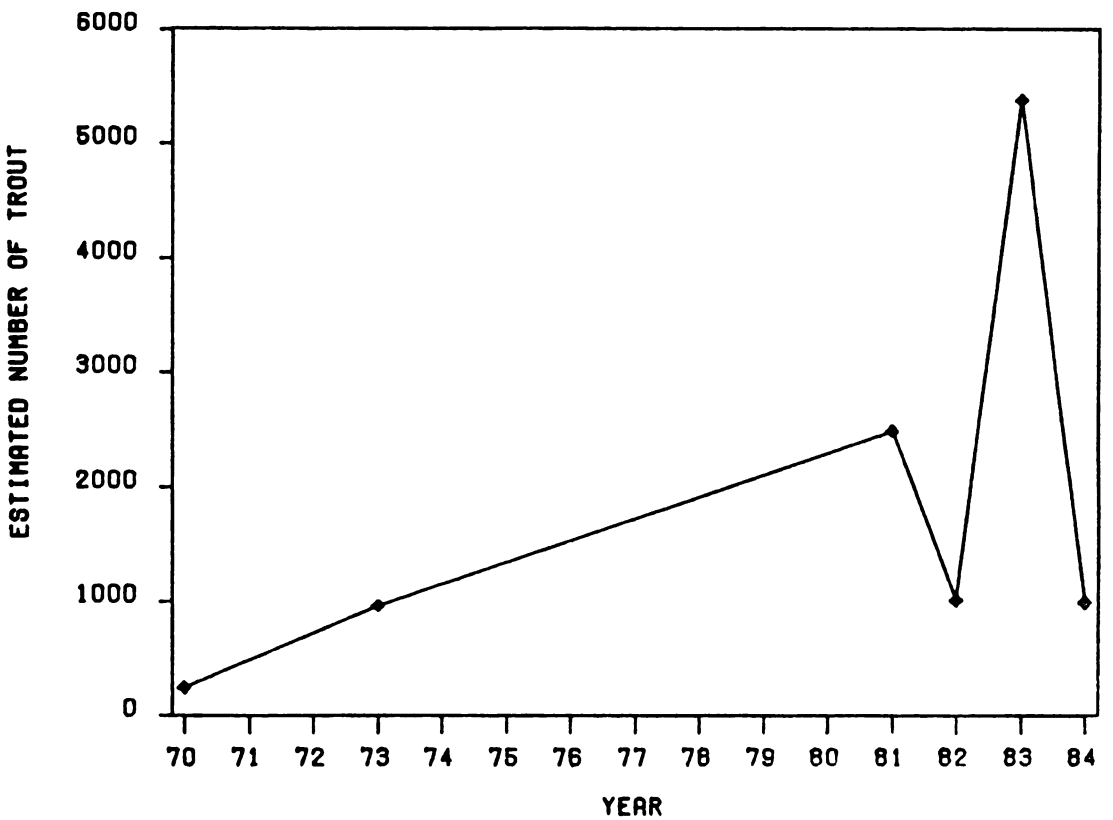
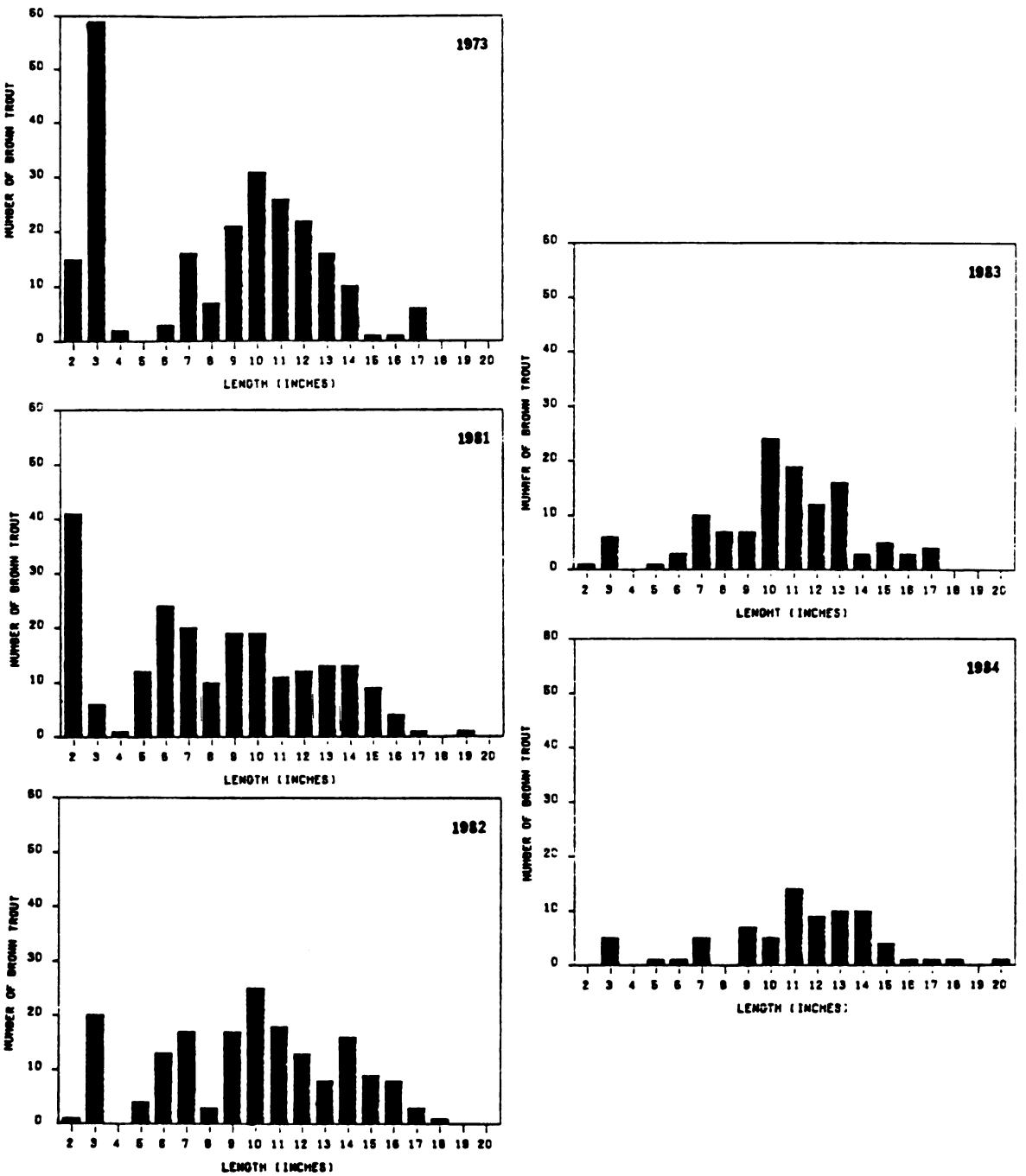


Figure 27. Total estimated number of rainbow trout for the mouth of the Baldwin sampling station (1.37 acres), Pere Marquette River, Michigan. Error bars represent approximate 95% confidence intervals.

Figure 28. The number of individual rainbow trout observed during electrofishing at the mouth of the Baldwin sampling station (1.37 acres), Pere Marquette River, Michigan.


1973
1981
1982
1983
1984
NUMBER OF BROWN TROUT
LENGTH (INCHES)
LENGHT (INCHES)

number of yearling fish present (six to eight inch fish) was substantially less than the number of young of the year fish but does refelect the an overall increase in abundance (Figure 29). The rest of the sampling stations showed fluctuations similar to the mouth of the Baldwin sampling station for overall rainbow trout estimates (Figure 30). On a per acre basis more juvenile rainbow trout were estimated at the P.M. Rod and Gun Club station than at the mouth of the Baldwin station (Figure 31).

Abundance of juvenile salmon was highly variable at the mouth of the Baldwin sampling station and was normally low at the time of sampling (Figure 32). Estimates for the three other stations showed similar low abundances of young salmon (Figure 33). This was most likely due to early migratory behavior of chinook salmon which normally leave the river early during their first year of life (Scott and Crossman 1973). The Pere Marquette system was estimated to have produced an 146,700 salmon smolts in 1979 (Carl 1982). This estimate was second only to the Muskegon River, Michigan for total smolt production for Michigan's Lake Michigan tributaries in that year (Carl 1982). Per acre estimates of juvenile salmon reflected the low and highly variable abundance of salmon between sampling stations (Figure 34).

It is critical to remember that the results must be veiwed within the studies limitations, especially potential bias which may have been caused by differential selectivity

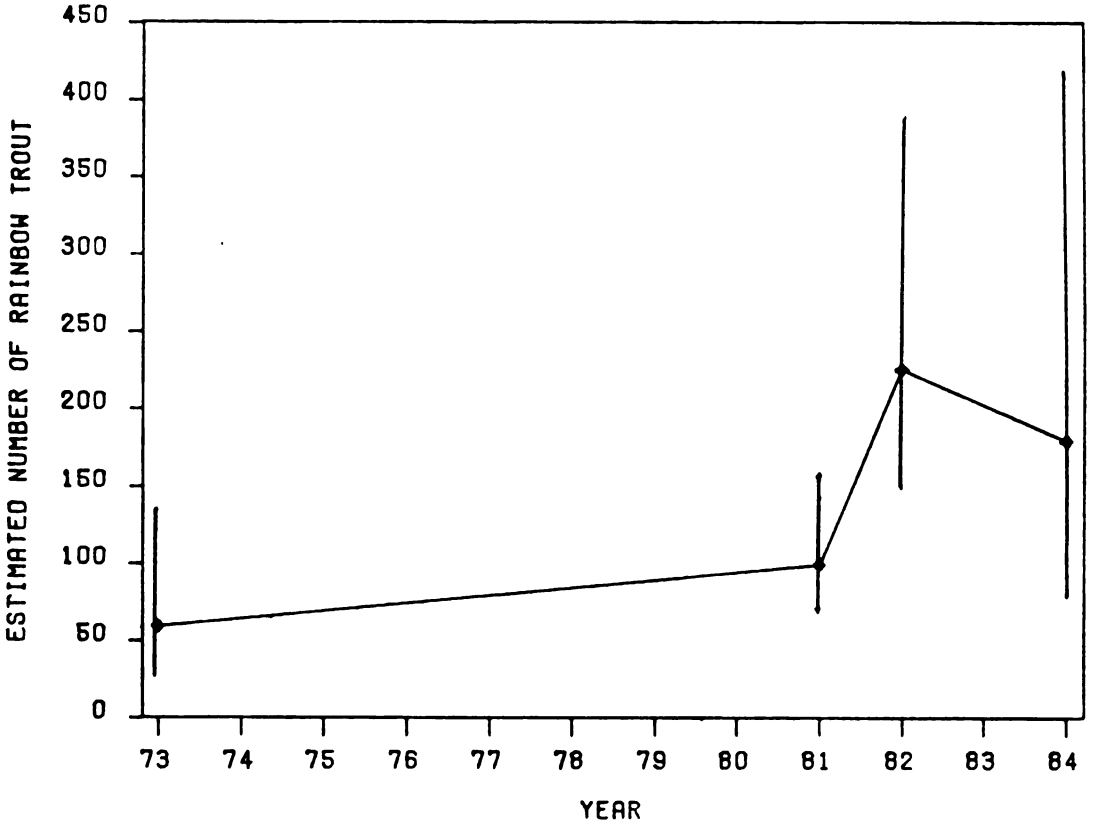


Figure 29. Estimated number of rainbow trout which were six to eight inches in length at the mouth of the Baldwin sampling station (1.37 acres), Pere Marquette River, Michigan. Error bars represent approximate 95% confidence intervals.

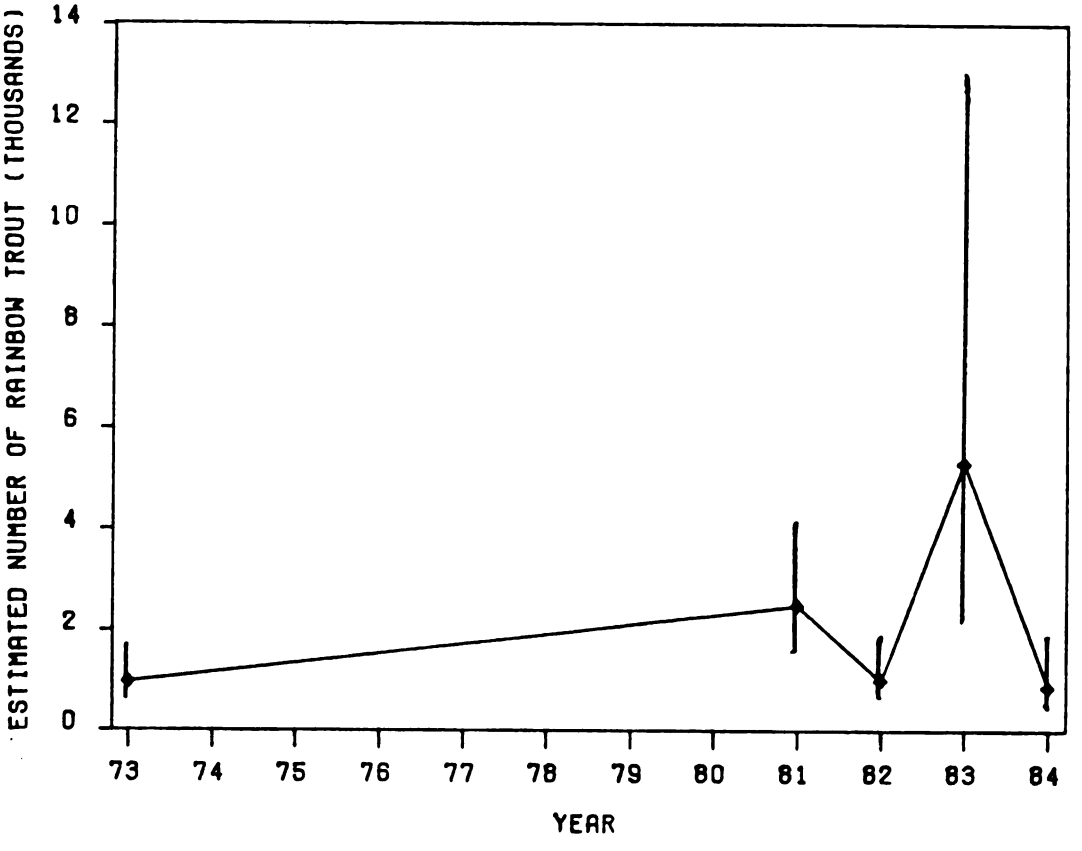


Figure 30. The estimated abundance of rainbow trout at the M-37 Public Access (1.87 acres), Pere Marquette Rod and Gun Club (1.15 acres), and Gleason's Landing (1.49 acres) sampling stations, Pere Marquette River, Michigan.

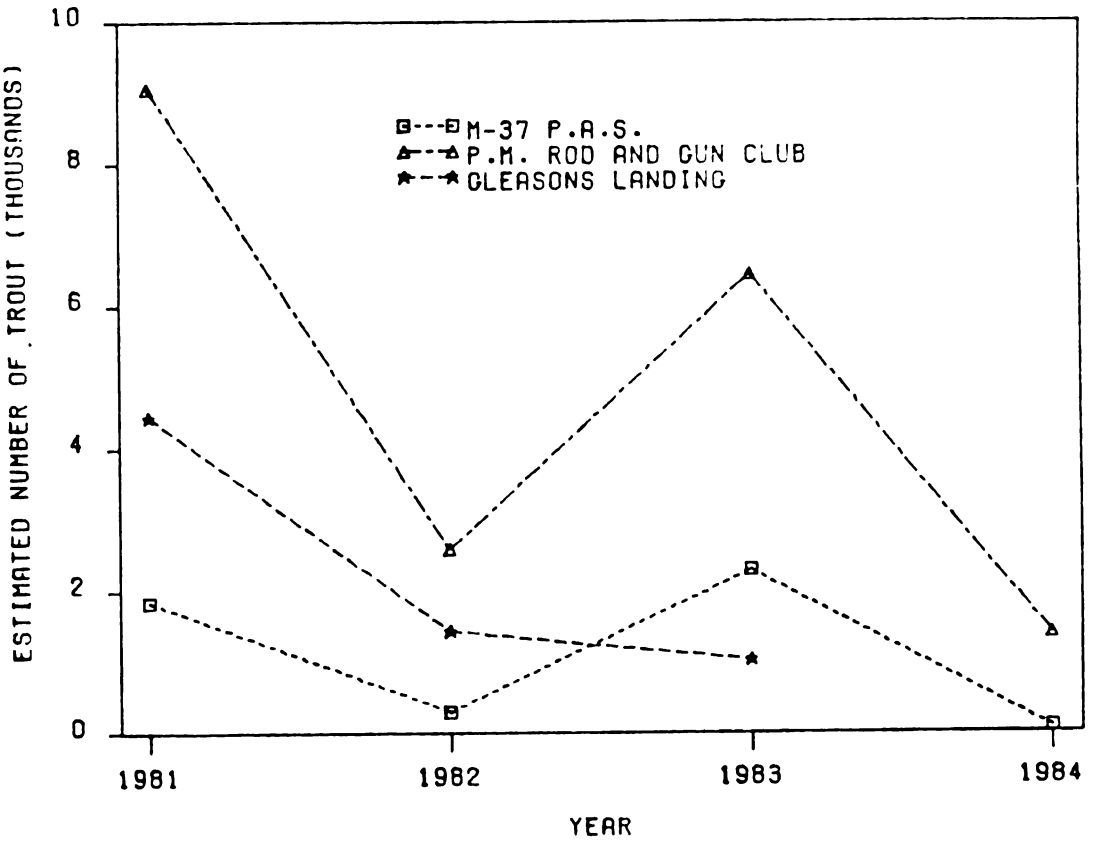


Figure 31. Estimated rainbow trout abundance per acre for the four sampling stations, Pere Marquette River, Michigan.

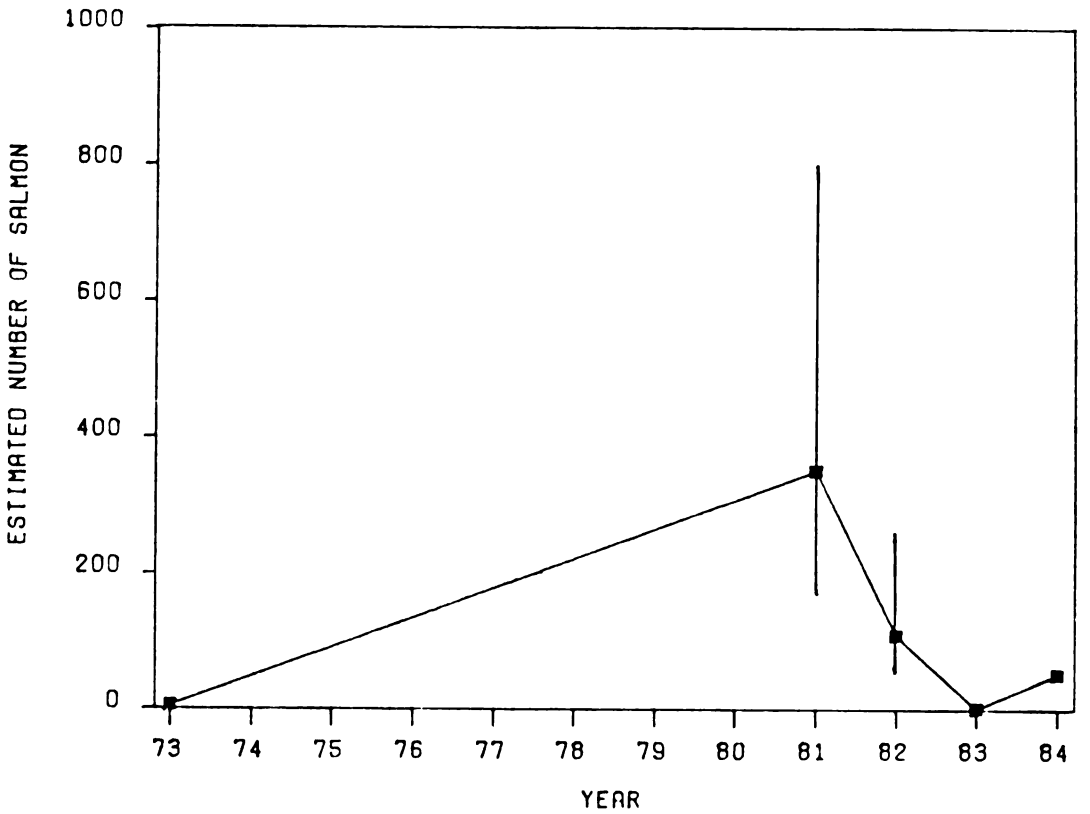


Figure 32. **Total estimated number of juvenile salmon for the mouth of the Baldwin sampling station (1.37 acres), Pere Marquette River, Michigan. Error bars represent approximate 95% confidence intervals.**

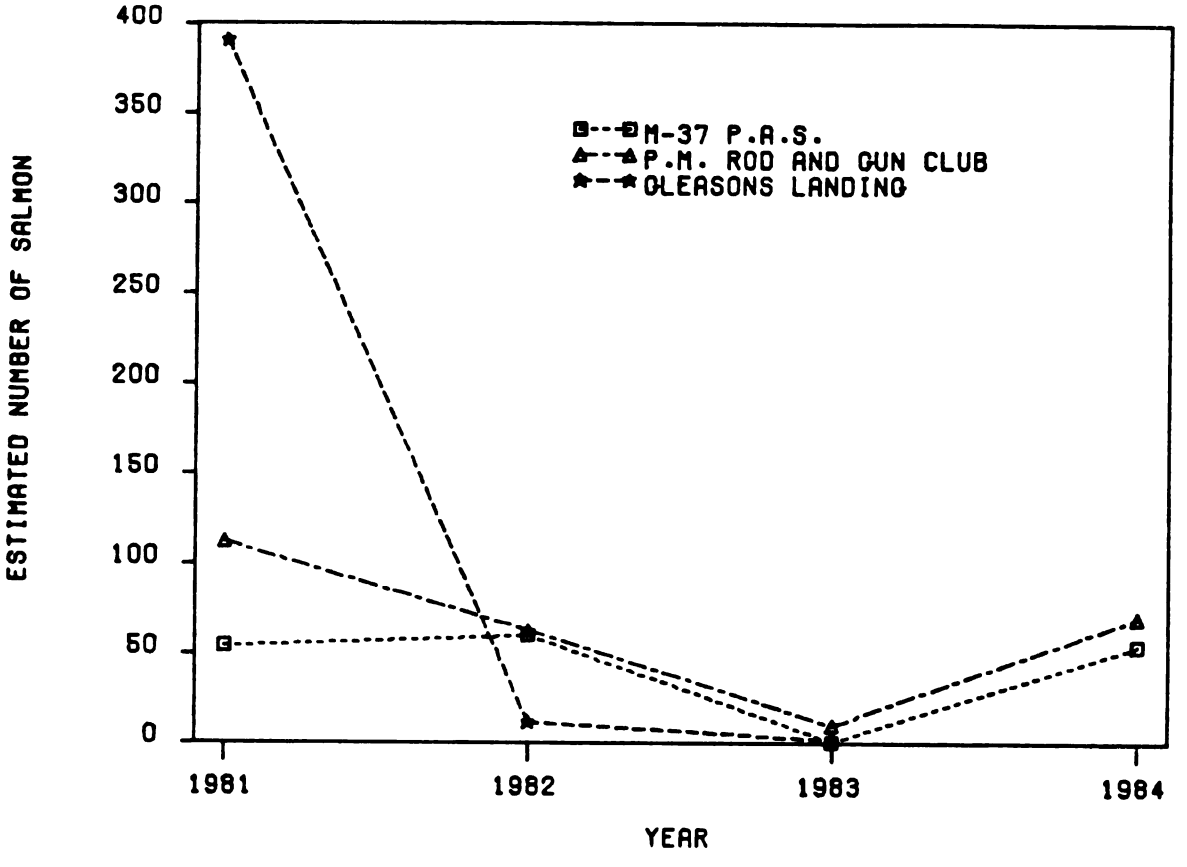


Figure 33. The estimated abundance of juvenile salmon at the M-37 Public Access (1.87 acres), Pere Marquette Rod and Gun Club (1.15 acres), and Gleason's Landing (1.49 acres) sampling stations, Pere Marquette River, Michigan.

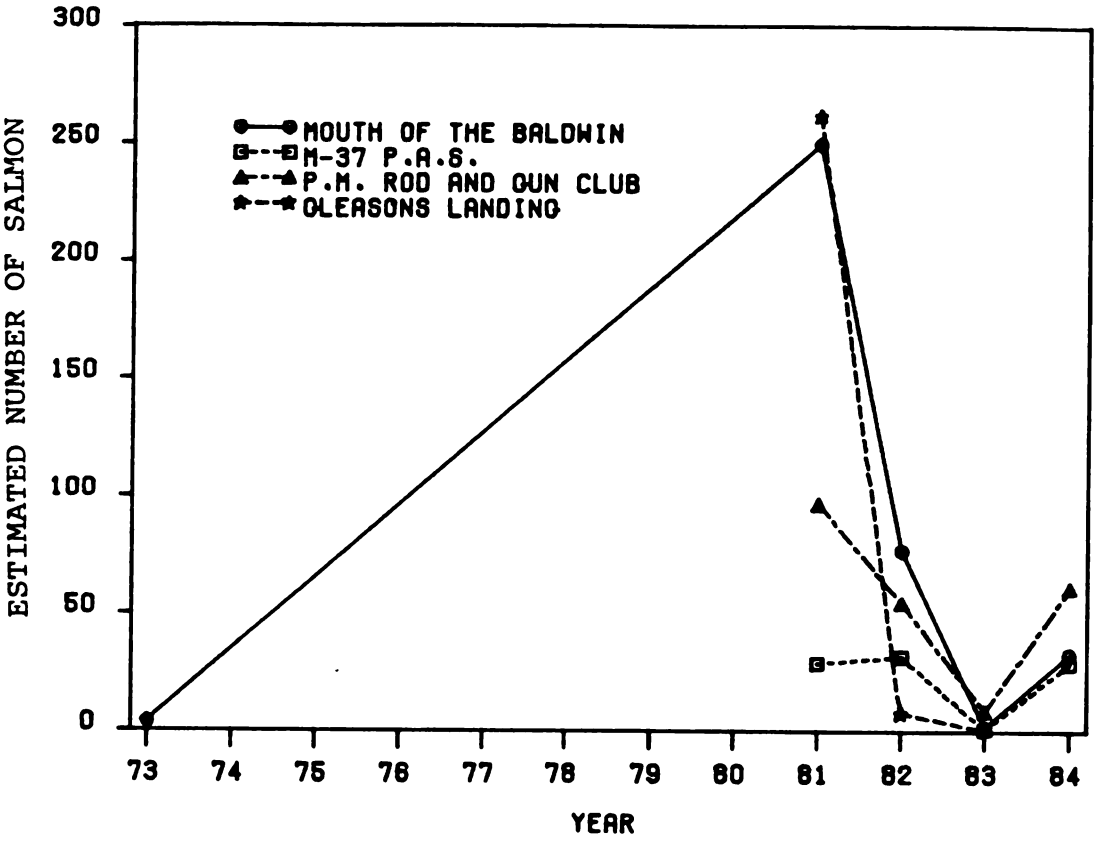


Figure 34. Estimated juvenile salmon abundance per acre for the four sampling stations, Pere Marquette River, Michigan.

of the electrofishing sampling method and/or using overall estimates of the population abundances, taken into account. The results are highly speculative in nature and extreme caution should be observed when appling the results to specific cases.

Comparing the average number of brown trout 8 inches or greater in length in the Pere Marquette to the average number in fourteen other Michigan trout streams (Gowing and Alexander 1980) the Pere Marquette River would have a rank of twelfth out of the fifteen streams (Table 11). Although the Pere Marquette River had a relatively low abundance of legal (eight inches and larger) brown trout compared to other streams listed by Gowing and Alexander it had the highest estimate for legal rainbow trout. This estimate combined with the brown trout estimates would rank the Pere Marquette River sixth overall in number of legal trout per acre (Table 12).

It should be noted that in the "flies only" section the ranking of legal sized fish would not pertain, because of the increased size limit in effect. In section F there were very few rainbow trout greater than ten inches in length observed during the electrofishing, presumably due to out migration of the juvenile rainbow trout to Lake Michigan. Another point of interest is that these estimates of the number of legal sized fish in the Pere Marquette do no include returning salmon or steelhead adults which was a resource above the estimated 144 fish

Table 11. Fifteen Michigan trout streams ranked by average number of brown trout eight inches or greater in length. Estimates are in number of trout per acre rounded to whole numbers. Pere Marquette estimates are for data from the 1973-1983 samples.

Boardman River, south branch	269
Houghton Creek	166
AuSable River	163
Williamsburg Creek	160
Gamble Creek	125
Little South Branch of the Pere Marquette River	123
Poplar Creek	116
Boardman River, north branch	96
Boardman River, mainstream	79
Ausable River, north branch	77
AuSable River, south branch	73
Pere Marquette River	60
Rifle River	49
Pigeon River	11
Hunt Creek	0
Average	104
Average without Hunt Creek	112
Average without Boardman River, s. branch	93
Average without Hunt Creek and Boardman, s, branch	100

Table 12. Fifteen Michigan trout streams ranked by average number of trout eight inches or greater in length. Estimates are in fish per acre rounded to whole numbers. Pere Marquette Estimates were calculated from 1973-1983 samples.

	Brown	Rainbow	Brook	Total
Boardman River, s. branch	269			269
AuSable River, mainstream	163	8	3	174
Williamsburg Creek	160	4	3	167
Houghton Creek	166			166
Poplar Creek	116	34		150
Pere Marquette River	60	84		144*
L.S.B. Pere Marquette River	123	11		134
Gamble Creek	125			125
Boardman River, n. branch	96			96
AuSable River, n. branch	77		10	87
Boardman River, mainstream	79		4	83
AuSable River, s. branch	73		6	79
Rifle River	49			49
Pigeon River	11		4	15
Hunt Creek			8	8

* Estimates do not include returning adults of the anadromous species

per acre shown in Table 12.

When compared to the fourteen other streams for overall trout abundance, the Pere Marquette River had the greatest average abundance (Table 13). This is probably due to the large numbers of steelhead that spawn in the river producing very large numbers of young of the year which remain in the stream at the time of electrofishing. There was a large difference between total abundance of rainbow trout and the number of legal sized rainbow trout that were present during the sampling periods. This difference included losses from smolting and downward migration of juvenile steelhead and total mortality. Total estimated standing crop of trout per acre in the Pere Marquette River was 156.2 pounds per acre. This estimate was second only to Williamsburg Creek which had an average of 159.7 pounds per acre (Table 14).

Growth of the brown trout in the Pere Marquette River was slightly below the average of brown trout observed in the other Michigan trout streams (Gowing and Alexander 1980) until the fish reached age II. After the brown trout reached age II, they grew faster than average (Figure 35) reaching a mean weight of 2.190 pounds by age IV. This weight at age IV was greater than all of the streams listed by Gowing and Alexander (1980) except one, the south branch of the AuSable River (Table 15). The Pere Marquette River brown trout were fully recruited to the fishery during their third year of life (age II) and no fish were observed

Table 13. Average number of trout per acre for 15 northern Michigan streams. Estimates are in number of fish per acre rounded to whole numbers. The Pere Marquette esimates were calculated using 1970-1983 samples.

	Brown	Rainbow	Brook	Total
Pere Marquette River	155	3205		3420 *
Williamsburg Creek	1936	23	241	2200
Hunt Creek			1682	1682
Boardman River, s. branch	1418		47	1465
Houghton Creek	1136			1136
AuSable River, mainstream	682	144	238	1034
Poplar Creek	901	123	4	1034
AuSable River, n. branch	282		649	931
Boardman River, mainstream	577		304	881
Pigeon River	102		663	765
Boardman River, n. branch	633		76	709
Gamble Creek	585			585
AuSable River, s. branch	312		177	489
L.S.B. Pere Marquette River	365	129		494
Rifle River	81			81

* Estimates do not include the returning adults of the anadromous species.

Table 14. Average total standing crop of trout in 15 northern Michigan trout streams. All estimates are in pounds per acre. The Pere Marquette Estimates were calculated using 1973-1983 samples.

	Brown	Rainbow	Brook	Total	
Williamsburg Creek	152.9	0.7	6.1	159.7	
Pere Marquette River	61.1	95.1		156.2	*
Boardman River, s. branch	133.0		1.5	134.5	
AuSable River, mainstream	104.8	4.8	6.0	115.6	
Houghton Creek	100.6			100.6	
Poplar Creek	68.9	10.0	0.4	79.2	
L.S.B. Pere Marquette River	63.7	3.5		67.2	
AuSable River, n. branch	45.7		20.8	66.5	
Boardman River, n. branch	60.9		2.2	63.1	
Boardman River, mainstream	48.0		10.6	58.6	
Hunt Creek			56.6	56.6	
AuSable River, s. branch	48.5		7.3	55.8	
Gamble Creek	54.9			54.9	
Pigeon River	9.0		20.3	29.3	
Rifle River	22.0			22.0	

* Estimates do not include the returning adults of the anadromous species.

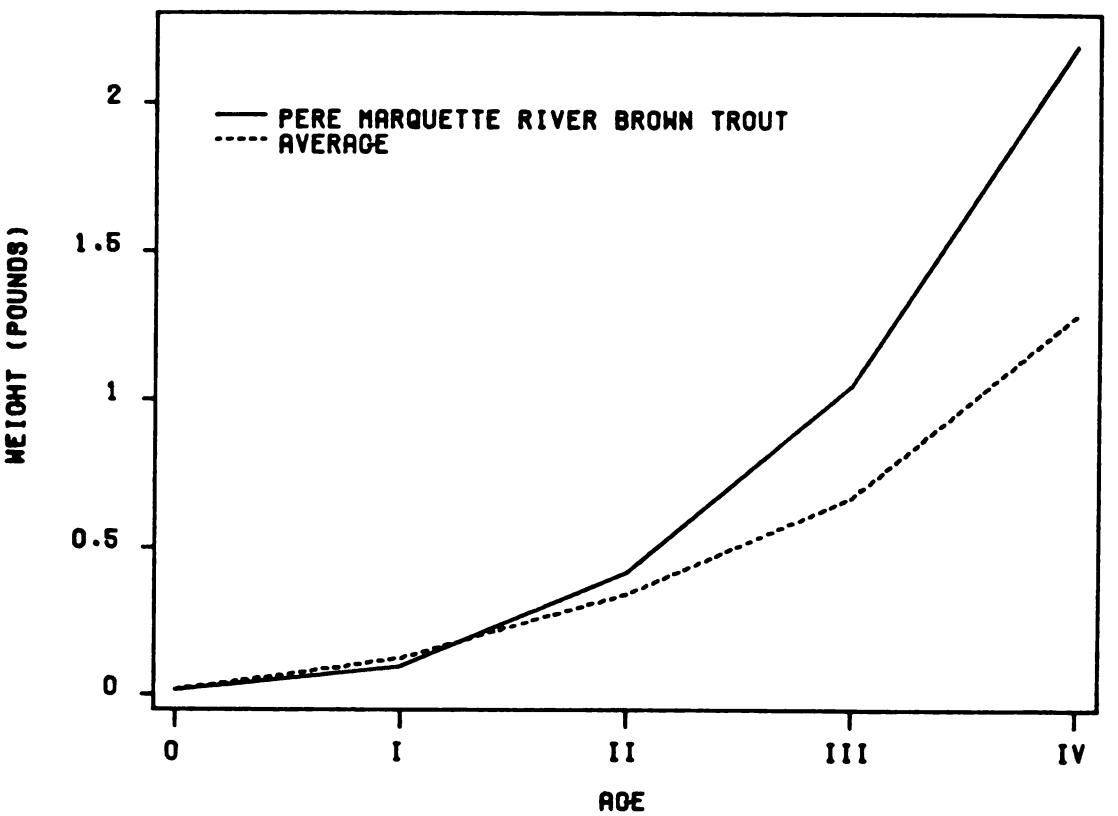


Figure 35. Growth of the Pere Marquette River brown trout compared to the average growth for fifteen Michigan trout streams.

Table 15. Average fall weights of brown trout from 14 northern Michigan trout streams. All estimates are in pounds. The Pere Marquette estimates were calculated using information collected from fish captured in 1982.

Age:	0	I	II	III	IV	V	VI	VII	VIII
Pere Marquette River	0.017	0.098	0.415	1.045	2.190				
AuSable River, mainstream	0.017	0.112	0.276	0.483	0.850	1.832			
Ausable River, s. branch	0.019	0.156	0.458	0.889	2.230	4.315			
Ausable River, n. branch	0.019	0.175	0.537	0.832	1.560	2.963	4.148	4.723	
Boardman River, mainstream	0.020	0.140	0.335	0.671	1.088	2.970	4.447		
Boardman River, s. branch	0.012	0.095	0.243	0.410	0.594	1.860			
Boardman River, n. branch	0.017	0.095	0.260	0.523	1.023	1.988			
Rifle River	0.031	0.171	0.349	0.751	1.381	2.405	3.020	4.608	7.370
Pigeon River	0.016	0.146	0.497	1.179	1.891	2.970	3.809		
L.S.B. Pere Marquette River	0.026	0.215	0.453	0.874	1.799	3.004	5.107		
Houghton Creek	0.017	0.119	0.293	0.526	0.953	1.820	3.230		
Gamble Creek	0.012	0.073	0.177	0.331	0.642	0.880			
Williamsburg Creek	0.016	0.082	0.235	0.446	0.808	1.226	2.844		
Poplar Creek	0.013	0.083	0.280	0.358	1.018	1.104			
Average:	0.018	0.125	0.343	0.666	1.288	2.257	3.801	4.666	7.370

to exceed four years of age.

The effects of anadromous species on the Pere Marquette River brown trout are unknown. Popular belief is that salmon have caused extensive damage to the brown trout population. Most notably interactions between chinook salmon and brown trout have been blamed for the brown trouts reputed decline in abundance since salmon have become established in the river. Taube (1974) observed that during spawning in the Platte River, Michigan brown trout generally chose sites different than that of rainbow trout and salmon. He found that brown trout redds were located near banks and cover, while rainbow trout and salmon redds were generally located in more exposed locations. Salmon in the Platte River were also implicated in reductions of young of the year brown trout, however, this reduction was compensated for by better survival of the remaining brown trout. In addition growth and survival rates of older brown trout were not affected (Taube 1975). This could possibly explain why there was a less dramatic difference in the number of legal sized fish compared to the total population size at the mouth of the Baldwin sampling station and why there did not seem to be a complete absence fish in any one size range.

In addition to the Pacific salmon, there are also rainbow trout and Atlantic salmon in the Pere Marquette. The very low abundance of Atlantic salmon in the river would suggest minimal competitive problems for brown trout.

However, Steelhead are present in the river in large numbers. The juveniles remain in the river for up to two years attaining lengths up to ten inches before migrating lakeward. This could be part of the reason why the Pere Marquette brown trout grew so slowly in the first years of life but grew more rapidly when they reached age II. Juvenile salmonids have been shown to set up territories within a stream channel. The size of the territories is releated to physical and visual separation and food abundance (Kalleberg 1958). Fish which could not set up a territory were forced to migrate out or die (Chapman 1966). Northcote (1978) found that when food was scarce the frequency of aggression between salmonid species was high, territory size was large and nearly 90% ofthe fry emigrated from the stream channel. The similarity of the steelhead and brown trout niches suggests that there is a potential for substantial overlap of utilized resources, with the less competitive species becoming less abundant. It may also be a reason why there are fewer young of the year brown trout present during subsequent sampling periods at the mouth of the Baldwin sampling station. However after age II the few remaing brown trout are exposed to a greatly reduced amount of interspecific competion when the juvenile rainbow trout leave the stream. With the reduced numbers of brown trout, intraspecific competion may be reduced resulting in accelerated growth observed after age II. All of these factors may be possible explainations of

the trends exhibited by the brown trout in the Pere Marquette River. However the extent of the influence of the various potential detrimental factors on the brown trout cannot be determined without further study directed specifically at the brown trout in much greater detail.

SUMMARY

The Pere Marquette River has long been the site of an important coldwater fishery. For well over one hundered years this river has provided angling enjoyment and food to salmonid anglers. While the species sought has changed over time from Michigan grayling to brook and brown trout and now anadromous trout and salmon, the Pere Marquette still maintains its importance as a coldwater fishery in Michigan.

The anglers primarly fished during spring and fall when anadromous fish were spawning. The greatest effort was expended in the "flies only" section. Chinook salmon were most commonly harvested species of salmonid in the river. However, rainbow trout was the most sought after species. Of primary interest to the anglers were the adult steelhead form of this species, but wide availability probably was partially resonsible for the popularity of rainbow trout. Anglers used a wide variety of bait types while in quest of their desired species, generally flies were used in the "flies only" section but not in all cases. Worms, spawn, and flies were used extensively in unrestricted areas. Most of the anglers prefered to fish from shore or while wading as opposed to fishing from a boat or canoe.

Michigan grayling have long gone extinct and the once

famous brown trout fishery has significantly declined in importance. Only 3.6% of anglers who annually visit the Pere Marquette River prefered brown trout. The reasons for the demise of the brown trout fishery are unclear at the present time, but many speculate that andromous trout and salmon have negatively impacted the resident brown trout population. Limited information on trout abundance in the region has indicated a rather precipitious decline in brown trout numbers during the last 10-15 years, but, the causes have not been scientifically ascertained. While this study depicts the brown trout fishery as relatively unimportant today it should be noted that decline of this fishery was probably related to brown trout abundance in the river. Had brown trout abundance remained high, perhaps its fishery would be of greater importance today.

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APPENDIX A

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

INTEROFFICE COMMUNICATION

March 8, 1985

TO: Files

FROM: David P. Borgeson, Assistant Chief, Fisheries Division

SUBJECT: Pere Marquette River Brown Trout

There is great concern over the status of brown trout fishing in the Pere Marquette and enthusiasm for restoring it to former levels is high. Lovers of the river all have their own strong personal convictions on what needs to be done. It is not surprising that many of these convictions conflict, one with another. If we are going to make progress we now need to begin pulling together in areas that show the most promise. We have to find common grounds of agreement and go to work together.

To start with, I have listed below a series of actions that the biologists think will cause brown trout levels to increase in the Pere Marquette. I have listed them in the order of most significant impact to least significant impact and I have explained briefly the logic and facts that support the ranking.

(1) Blocking of all steelhead from the river. Young steelhead are very abundant in the Pere Marquette and are believed to be eating food and occupying space at the expense of brown trout. Steelhead spawning, which takes place after brown spawning, may disturb some brown spawning beds. A substantial increase, perhaps a doubling, of brown trout abundance (standing crop and sport catch) could be expected if we kept steelhead out of the river.

Steelhead, however, are a fine trout in their own right and have their own supporters, as brown trout do. Many brown trout fishermen also enjoy steelhead fishing, which has improved dramatically since 1966 in the Pere Marquette. The Department of Natural Resources does not support action of eliminating steelhead from the Pere Marquette and realizes that few others would support such a move. But it is important for us all to realize that by refusing to do so we are turning our back on what is probably the biggest factor limiting brown trout abundance in the Pere Marquette.

(2) Ceasing chemical treatment of lamprey - It has been pretty well established that insect hatches will improve if chemical lamprey treatments cease. Brown trout abundance can be expected to improve also. If the shift is towards the larger insect forms as expected, browns should be favored more than rainbows (young steelhead) because of their nocturnal habits and preference for larger food items. This shift should favor fly fishermen because it will restore some of the "hatches" they rely on for their sport. Actual abundance increases of brown trout (and of trout overall) will probably be less than 25 percent, however, via this action.

(3) Sediment traps - Sediment traps can be expected to increase brown and rainbow trout abundance in certain stretches of the Pere Marquette. In those particularly troubled areas increases could be as high as 100 percent. But not all of the Pere Marquette is severely troubled by sand problems. And sediment traps are planned for only parts of the stream. Therefore, brown trout increases from this action will not be noticeable in much of the main river.

(4) Other traditional stream improvement measures - These have obvious limitations and are very expensive. Brown trout did not seem to respond favorably to the extensive and costly work done on the mainstream during the late 1970s. Fishermen like these structures and some are important for streambank protection, but they are very much overrated for increasing trout stocks in sizeable rivers. Little chance for noticeable gains in trout abundance here.

(5) Fishing Regulations - These are always a useful tool but current regulations are believed to be quite adequate and desirable for protecting brown trout stocks. Little more can be accomplished. Good law enforcement is always important regardless of regulations and our officers will continue to do their best.

(6) Salmon control - Salmon runs are believed to favor trout abundance, particularly steelhead trout abundance, but probably browns also, for the following reasons:

   (a) Salmon carcasses are rich in nutrients that support the trout stream food chain. The high productivity of the Pere Marquette is believed to be in large measure due to the salmon cycle.

   (b) Salmon eggs are eaten by brown trout just before trout spawning and the onset of winter. This is believed to give brown spawners an important boost of high energy food when they most need it. It also would provide a spurt of growth for younger browns and steelhead.

(c) Small salmon provide a food source for larger brown trout but this is probably offset by competition for food and space among salmon and young browns.

(d) Adult salmon do not cause significant damage to brown trout by eating them or biting them although they will chase them from their redds. And adult salmon do not disrupt brown trout spawning which comes later.

Overall, biologists would expect trout abundance to decline somewhat if salmon were blocked from the Pere Marquette. A partial salmon block, because it would reduce enrichment and the amount of salmon eggs available as trout food without reducing competition by young salmon, would be worse than no block at all. And salmon sport fishing would suffer needlessly.

(7) Brown trout stocking - The mainstream is full of trout even though most are rainbows. Adding hatchery brown trout to such a situation can be expected to accomplish little, except to lower the quality of fishing. Our goal on the prime water of the upper Pere Marquette should be wild, self-sustaining brown trout. A fishery supported even in part by hatchery fish detracts from the character and quality we want. The lower river and the Big South Branch is being stocked now. Perhaps parts of the Little South should be as well. But stocking shows no real promise for the main river.

In summary, this is about how we biologists see the situation and it is out of this kind of analysis we have recommended starting work on items (2) and (3). We agree on them and they rank near the top in expected results.

DPB:daf

cc: Region II
District 6
Don Reynolds
Steve Acker
Doug Carter
Dick Bass
Ben Myler
Jim Wood
Andy Pelt
David Hallberg
Jim Handley
Henry Westerville
Harvey Silver
Don DeFouw
Owen Gasler
John Green
Keith Groty

APPENDIX B

Table A1. Non-fishermen hours for section F from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	NON-FISHING FISHERMEN HOURS									
Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Angler Hours	4,410 (2,556)	1,125 (305)	167 (94)	220 (440)	559 (404)	4,238 (2,744)	0 (0)	0 (0)	0 (0)	10,719 (3,811)
Angler Trips	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table A2. Estimated boat catches for section F from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED BOAT CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Chinook Salmon	0.0388	4	0	0	0	0	8	0	0	0	12
	(0.0645)	(7)	(0)	(0)	(0)	(0)	(17)	(0)	(0)	(0)	(18)
Rainbow Trout	0.0032	0	0	0	0	0	1	0	0	0	1
	(0.0069)	(0)	(0)	(0)	(0)	(0)	(2)	(0)	(0)	(0)	(2)
Brown Trout	0.0162	5	0	0	0	0	0	0	0	0	5
	(0.0226)	(6)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(6)
Total Catch	0.0583	9	0	0	0	0	9	0	0	0	18
	(0.0742)	(9)	(0)	(0)	(0)	(0)	(17)	(0)	(0)	(0)	(19)
Angler Hours		29	9	0	0	27	94	150	0	0	309
		(0)	(0)	(0)	(0)	(0)	(161)	(150)	(0)	(0)	(220)
Angler Trips		4	2	0	0	5	16	26	0	0	53
		(1)	(0)	(0)	(0)	(1)	(28)	(26)	(0)	(0)	(38)

Table A3. Estimated shore catches for section F from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED SHORE CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0146	295	238	9	9	20	0	25	100	0	696
	(0.0083)	(209)	(252)	(22)	(16)	(29)	(0)	(32)	(78)	(0)	(340)
Brown Trout	0.0050	29	85	66	8	5	46	0	0	0	239
	(0.0044)	(38)	(141)	(90)	(22)	(13)	(98)	(0)	(0)	(0)	(199)
Brook Trout	0.0001	6	0	0	0	0	0	0	0	0	6
	(0.0003)	(13)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(13)
Coho Salmon	0.0000	2	0	0	0	0	0	0	0	0	2
	(0.0001)	(5)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(5)
Chinook Salmon	0.1152	0	0	0	0	10	1,512	3,965	16	4	5,507
	(0.0619)	(0)	(0)	(0)	(0)	(18)	(1,148)	(2,220)	(25)	(11)	(2,500)
Other	0.0001	7	0	0	0	0	0	0	0	0	7
	(0.0003)	(16)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(16)
Total Catch	0.1351	339	323	75	17	35	1,558	3,990	116	4	6,457
	(0.0657)	(213)	(289)	(93)	(27)	(37)	(1,152)	(2,220)	(82)	(11)	(2,530)
Angler Hours		6,885	2,166	1,348	1,022	964	14,717	19,445	1,200	60	47,808
		(4,360)	(1,080)	(1,025)	(1,143)	(652)	(10,521)	(7,444)	(806)	(120)	(13,774)
Angler Trips		1,697	578	512	338	289	3,056	3,866	397	20	10,753
		(1,118)	(295)	(380)	(358)	(179)	(2,209)	(1,508)	(232)	(38)	(2,975)

Table A4. Estimated total catches for section F from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED TOTAL CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0145	295	238	9	9	20	1	25	100	0	697
	(0.0082)	(209)	(252)	(22)	(16)	(29)	(2)	(32)	(78)	(0)	(340)
Brown Trout	0.0051	34	85	66	8	5	46	0	0	0	244
	(0.0044)	(38)	(141)	(90)	(22)	(13)	(98)	(0)	(0)	(0)	(199)
Brook Trout	0.0001	6	0	0	0	0	0	0	0	0	6
	(0.0003)	(13)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(13)
Coho Salmon	0.0000	2	0	0	0	0	0	0	0	0	2
	(0.0001)	(5)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(5)
Chinook Salmon	0.1148	4	0	0	0	10	1,520	3,965	16	4	5,519
	(0.0615)	(7)	(0)	(0)	(0)	(18)	(1,148)	(2,220)	(25)	(11)	(2,500)
Other	0.0001	7	0	0	0	0	0	0	0	0	7
	(0.0003)	(16)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(16)
Total Catch	0.1346	348	323	75	17	35	1,566	3,990	116	4	6,475
	(0.0653)	(213)	(289)	(93)	(27)	(37)	(1,152)	(2,220)	(82)	(11)	(2,530)
Angler Hours		6,941	2,175	1,348	1,022	991	14,811	19,595	1,200	60	48,143
		(4,360)	(1,080)	(1,025)	(1,143)	(652)	(10,522)	(7,446)	(806)	(120)	(13,776)
Angler Trips		1,701	580	512	338	294	3,072	3,892	397	20	10,806
		(1,118)	(295)	(380)	(358)	(179)	(2,209)	(1,508)	(232)	(38)	(2,975)

Table A5. Estimated boat catches for section A from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED BOAT CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.1055 (0.2456)	1 (1)	0 (0)	60 (120)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	61 (120)
Brown Trout	0.1038 (0.2445)	0 (0)	0 (0)	60 (120)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	60 (120)
Total Catch	0.2093 (0.3928)	1 (1)	0 (0)	120 (170)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	121 (170)
Angler Hours		6 (0)	0 (0)	69 (102)	0 (0)	405 (685)	60 (120)	38 (150)	0 (0)	0 (0)	578 (719)
Angler Trips		1 (2)	0 (0)	62 (104)	0 (0)	85 (147)	13 (26)	12 (49)	0 (0)	0 (0)	173 (188)

Table A6. Estimated shore catches for section A from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED SHORE CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0193	118	0	0	0	0	0	0	6	0	124
	(0.0301)	(172)	(0)	(0)	(0)	(0)	(0)	(0)	(7)	(0)	(172)
Coho Salmon	0.0172	0	110	0	0	0	0	0	0	0	110
	(0.0465)	(0)	(288)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(288)
Chinook Salmon	0.0019	0	0	0	0	12	0	0	0	0	12
	(0.0041)	(0)	(0)	(0)	(0)	(25)	(0)	(0)	(0)	(0)	(25)
Total Catch	0.0384	118	110	0	0	12	0	0	6	0	246
	(0.0589)	(172)	(288)	(0)	(0)	(25)	(0)	(0)	(7)	(0)	(336)
Angler Hours		2,124	1,663	304	18	274	1,560	450	18	10	6,411
		(3,452)	(2,792)	(508)	(0)	(457)	(240)	(300)	(0)	(0)	(4,508)
Angler Trips		775	737	172	10	60	327	146	6	3	2,230
		(1,274)	(1,255)	(291)	(3)	(98)	(129)	(126)	(3)	(1)	(1,823)

Table A7. Estimated pier catches for section A from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	ESTIMATED PIER CATCHES									
Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Angler Hours	840	1,350	480	0	0	0	0	0	0	2,670
	(0)	(2,284)	(812)	(0)	(0)	(0)	(0)	(0)	(0)	(2,424)
Angler Trips	0	0	0	0	0	0	0	0	0	0
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)

Table A8. Estimated total catches for section A from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

Species	Total C/H	ESTIMATED TOTAL CATCHES Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0263	119	0	60	0	0	0	0	6	0	185
	(0.0346)	(172)	(0)	(120)	(0)	(0)	(0)	(0)	(7)	(0)	(210)
Brown Trout	0.0086	0	0	60	0	0	0	0	0	0	60
	(0.0180)	(0)	(0)	(120)	(0)	(0)	(0)	(0)	(0)	(0)	(120)
Coho Salmon	0.0157	0	110	0	0	0	0	0	0	0	110
	(0.0424)	(0)	(288)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(288)
Chinook Salmon	0.0017	0	0	0	0	12	0	0	0	0	12
	(0.0037)	(0)	(0)	(0)	(0)	(12)	(0)	(0)	(0)	(0)	(12)
Total Catch	0.0523	119	110	120	2	12	0	0	6	0	366
	(0.0638)	(172)	(288)	(170)	(0)	(25)	(0)	(0)	(7)	(0)	(377)
Angler Hours		2,130	1,663	373	18	679	1,620	488	18	10	6,999
		(3,452)	(2,792)	(518)	(0)	(823)	(268)	(335)	(0)	(0)	(4,565)
Angler Trips		776	737	234	10	145	340	158	6	3	2,409
		(1,274)	(1,255)	(309)	(3)	(177)	(132)	(135)	(3)	(1)	(1,833)

Table A9. Estimated boat catches for section C from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

Species	Total C/H	ESTIMATED BOAT CATCHES									
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.1084	20	105	10	6	0	8	0	0	0	149
	(0.1450)	(16)	(177)	(19)	(7)	(0)	(19)	(0)	(0)	(0)	(180)
Brown Trout	0.0342	4	0	33	10	0	0	0	0	0	47
	(0.0446)	(5)	(0)	(54)	(9)	(0)	(0)	(0)	(0)	(0)	(55)
Chinook Salmon	0.0408	0	0	0	0	56	0	0	0	0	56
	(0.1669)	(0)	(0)	(0)	(0)	(227)	(0)	(0)	(0)	(0)	(227)
Total Catch	0.1834	24	105	43	16	56	8	0	0	0	252
	(0.2391)	(17)	(177)	(57)	(12)	(227)	(19)	(0)	(0)	(0)	(295)
Angler Hours		193	210	214	138	174	190	90	165	0	1,374
		(205)	(350)	(296)	(135)	(517)	(184)	(120)	(191)	(0)	(789)
Angler Trips		29	30	23	18	59	25	12	21	0	217
		(33)	(51)	(32)	(17)	(189)	(24)	(16)	(25)	(0)	(205)

Table A10. Estimated shore catches for section C from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED SHORE CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0203	57	35	6	16	0	0	0	0	0	114
	(0.0217)	(87)	(69)	(14)	(36)	(0)	(0)	(0)	(0)	(0)	(118)
Brown Trout	0.0215	98	0	13	11	0	0	0	0	0	122
	(0.0375)	(207)	(0)	(27)	(17)	(0)	(0)	(0)	(0)	(0)	(209)
Chinook Salmon	0.0346	0	0	0	0	0	196	0	0	0	196
	(0.0482)	(0)	(0)	(0)	(0)	(0)	(266)	(0)	(0)	(0)	(266)
Total Catch	0.0764	155	35	19	27	0	196	0	0	0	432
	(0.0673)	(225)	(69)	(30)	(40)	(0)	(266)	(0)	(0)	(0)	(358)
Angler Hours		1,640	420	248	112	217	1,710	525	720	60	5,652
		(930)	(502)	(204)	(108)	(551)	(677)	(434)	(817)	(120)	(1,674)
Angler Trips		437	226	130	39	158	466	143	196	16	1,811
		(232)	(291)	(161)	(38)	(464)	(238)	(127)	(238)	(33)	(715)

Table A11. Estimated pier catches for section C from April through December 1982, Pere Marquette River Michigan. Two standard errors are in parentheses.

	ESTIMATED PIER CATCHES									
Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Angler Hours	923 (888)	300 (288)	165 (330)	111 (160)	163 (192)	839 (870)	0 (0)	0 (0)	0 (0)	2,500 (1,342)
Angler Trips	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table A12. Estimated total catches for section C from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

Species	Total C/H	ESTIMATED TOTAL CATCHES									
		Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0374	77	140	16	22	0	8	0	0	0	263
	(0.0322)	(88)	(190)	(24)	(37)	(0)	(19)	(0)	(0)	(0)	(215)
Brown Trout	0.0241	102	0	46	21	0	0	0	0	0	169
	(0.0315)	(207)	(0)	(61)	(19)	(0)	(0)	(0)	(0)	(0)	(217)
Chinook Salmon	0.0359	0	0	0	0	56	196	0	0	0	252
	(0.0507)	(0)	(0)	(0)	(0)	(227)	(266)	(0)	(0)	(0)	(350)
Total Catch	0.0974	179	140	62	43	56	204	0	0	0	684
	(0.0710)	(225)	(190)	(66)	(42)	(227)	(267)	(0)	(0)	(0)	(465)
Angler Hours		1,833	630	462	250	391	1,900	615	885	60	7,026
		(952)	(612)	(359)	(173)	(780)	(702)	(450)	(839)	(120)	(1,861)
Angler Trips		466	256	153	57	217	491	155	217	16	2,028
		(234)	(295)	(164)	(42)	(501)	(239)	(128)	(239)	(33)	(744)

Table A13. Estimated boat catches for section B from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED BOAT CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0086	2	0	0	0	0	0	0	0	0	2
	(0.0175)	(3)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(3)
Brown Trout	0.0043	1	0	0	0	0	0	0	0	0	1
		(2)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(2)
Total Catch	0.0129	3	0	0	0	0	0	0	0	0	3
	(0.0248)	(4)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(4)
Angler Hours		22	1	60	0	0	300	0	0	0	233
		(0)	(0)	(120)	(0)	(0)	(300)	(0)	(0)	(0)	(323)
Angler Trips		3	1	8	0	0	39	0	0	0	51
		(1)	(1)	(15)	(0)	(0)	(78)	(0)	(0)	(0)	(79)

Table A14. Estimated shore catches for section B from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED SHORE CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0077	0	8	0	0	15	0	0	0	0	23
	(0.0120)	(0)	(17)	(0)	(0)	(31)	(0)	(0)	(0)	(0)	(35)
Brown Trout	0.0034	0	9	0	1	0	0	0	0	0	10
	(0.0068)	(0)	(20)	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(20)
Total Catch	0.0111	0	17	0	1	15	0	0	0	0	33
	(0.0139)	(0)	(26)	(0)	(1)	(31)	(0)	(0)	(0)	(0)	(40)
Angler Hours		1,440	300	242	12	270	720	0	0	0	2,984
		(808)	(168)	(135)	(0)	(151)	(404)	(0)	(0)	(0)	(941)
Angler Trips		469	104	161	4	70	186	0	0	0	994
		(278)	(73)	(117)	(1)	(41)	(110)	(0)	(0)	(0)	(332)

Table A15. Estimated pier catches for section B from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	ESTIMATED PIER CATCHES									
Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Angler Hours	2,100 (1,178)	1,350 (757)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3,450 (1,400)
Angler Trips	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table A16. Estimated total catches for section B from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

		ESTIMATED TOTAL CATCHES									
Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0078	2	8	0	0	15	0	0	0	0	25
	(0.0111)	(3)	(17)	(0)	(0)	(31)	(0)	(0)	(0)	(0)	(35)
Brown Trout	0.0034	1	9	0	1	0	0	0	0	0	11
	(0.0063)	(2)	(20)	(0)	(1)	(0)	(0)	(0)	(0)	(0)	(20)
Total Catch	0.0112	3	17	0	1	15	0	0	0	0	36
	(0.0132)	(4)	(26)	(0)	(1)	(31)	(0)	(0)	(0)	(0)	(41)
Angler Hours		1,462	301	302	12	270	870	0	0	0	3,217
		(808)	(168)	(181)	(0)	(151)	(503)	(0)	(0)	(0)	(995)
Angler Trips		472	105	169	4	70	225	0	0	0	1,045
		(278)	(73)	(118)	(1)	(41)	(135)	(0)	(0)	(0)	(341)

Table A17. Summary of catches for all sections from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

SUMMARY OF CATCHES FOR ALL SECTIONS

Species	Total C/H	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	0.0179	493	386	85	31	35	9	25	106	0	1,170
	(0.0081)	(285)	(316)	(124)	(40)	(42)	(19)	(32)	(78)	(0)	(455)
Brown Trout	0.0074	137	94	172	30	5	46	0	0	0	484
	(0.0052)	(210)	(142)	(162)	(29)	(13)	(98)	(0)	(0)	(0)	(318)
Brook Trout	0.0001	6	0	0	0	0	0	0	0	0	6
	(0.0002)	(13)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(13)
Coho Salmon	0.0017	2	110	0	0	0	0	0	0	0	112
	(0.0044)	(5)	(288)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(288)
Chinook Salmon	0.0886	0	0	0	0	78	1,716	3,965	16	4	5,779
	(0.0435)	(0)	(0)	(0)	(0)	(229)	(1,178)	(2,220)	(25)	(11)	(2,524)
Other	0.0001	7	0	0	0	0	0	0	0	0	7
	(0.0003)	(16)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(16)
Total Catch	0.1159	645	590	257	61	118	1,771	3,990	122	4	7,558
	(0.0476)	(355)	(451)	(204)	(49)	(233)	(1,182)	(2,220)	(82)	(11)	(2,600)
Angler Hours		12,310	4,760	2,485	1,302	2,231	19,182	20,698	2,103	130	65,201
		(5,700)	(3,060)	(1,217)	(1,156)	(1,156)	(10,561)	(7,467)	(1,163)	(170)	(14,652)
Angler Trips		3,415	1,678	1,068	409	726	4,128	4,205	620	39	16,288
		(1,734)	(1,325)	(530)	(360)	(562)	(2,230)	(1,519)	(333)	(50)	(3,589)

Table A18. Anglers by county of residence (%) for all sites from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Allegan	0.85 (0.98)	2.48 (2.83)	1.18 (1.18)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.51 (0.38)
Barry	2.83 (1.77)	3.31 (3.25)	0 (0)	0 (0)	2.68 (3.05)	2.17 (1.63)	0.44 (0.88)	0 (0)	0 (0)	1.81 (0.72)
Bay	0 (0)	1.65 (2.32)	0 (0)	0 (0)	3.57 (3.51)	0.62 (0.88)	0 (0)	0 (0)	0 (0)	0.58 (0.41)
Berrien	0.57 (0.08)	0 (0)	2.35 (3.29)	0 (0)	0.89 (1.78)	0 (0)	0 (0)	0 (0)	0 (0)	0.36 (0.32)
Branch	0.85 (0.98)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.22 (0.25)
Calhoun	0 (0)	0.83 (1.65)	1.18 (2.34)	2.00 (2.80)	1.79 (2.50)	1.55 (1.38)	0 (0)	0 (0)	0 (0)	0.80 (0.48)
Cass	0 (0)	0 (0)	0 (0)	1.00 (1.99)	0 (0)	0.62 (0.88)	0 (0)	0 (0)	0 (0)	0.22 (0.25)
Charlevoix	0 (0)	0 (0)	0 (0)	0 (0)	1.79 (2.50)	0 (0)	0 (0)	0 (0)	0 (0)	0.14 (0.20)
Cheboygan	0 (0)	0 (0)	1.18 (2.34)	0 (0)	0.89 (1.78)	0 (0)	0 (0)	0 (0)	0 (0)	0.14 (0.20)

Table A18 continued (page 2).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Chipewa	0.57 (0.80)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.14 (0.20)
Clare	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0.62)	0.31 (0)	0 (0)	0.07 (0.14)
Clinton	0.85 (0.98)	0 (0)	1.18 (2.34)	0 (0)	6.25 (4.57)	1.86 (1.51)	3.51 (2.44)	0 (0)	0 (0)	1.81 (0.72)
Crawford	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.31 (0.62)	0 (0)	0 (0)	0 (0)	0.07 (0.14)
Dickenson	0 (0)	0 (0)	0 (0)	1.00 (1.99)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.07 (0.14)
Eaton	1.98 (1.48)	1.65 (2.32)	0 (0)	2.00 (2.80)	0.89 (1.78)	0.31 (0.62)	0 (0)	0 (0)	0 (0)	0.94 (0.52)
Emmet	1.42 (1.26)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.88 (1.24)	0 (0)	0 (0)	0.51 (0.38)
Genesee	2.55 (1.68)	4.96 (3.95)	2.35 (2.35)	0 (0)	0.89 (1.78)	4.66 (2.35)	6.58 (3.28)	9.62 (8.18)	0 (0)	3.83 (1.03)
Gladwin	1.70 (1.38)	0 (0)	0 (0)	0 (0)	0.89 (1.78)	1.55 (1.38)	0 (0)	0 (0)	0 (0)	0.87 (0.87)
Gratiot	1.13 (1.13)	0 (0)	0 (0)	0 (0)	1.79 (2.50)	0 (0)	0.88 (1.24)	0 (0)	0 (0)	0.58 (0.41)

Table A18 continued (page 3).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Hillsdale	0.28 (0.57)	1.65 (2.32)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.22 (0.25)
Ingham	2.55 (1.68)	11.57 (5.82)	3.53 (4.00)	2.00 (2.80)	5.36 (4.26)	5.90 (2.63)	7.46 (3.48)	7.69 (7.39)	20.00 (25.30)	5.50 (1.23)
Ionia	0.28 (0.57)	0 (0)	1.18 (2.34)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.14 (0.20)
Isabella	0.85 (0.98)	0 (0)	0 (0)	1.00 (1.99)	0 (0)	1.24 (1.23)	0.88 (1.24)	1.92 (3.81)	0 (0)	0.80 (0.48)
Jackson	2.55 (1.68)	0 (0)	0 (0)	0 (0)	17.86 (7.24)	4.97 (2.42)	3.51 (2.44)	0 (0)	0 (0)	3.83 (1.03)
Kalamazoo	2.55 (1.68)	0.83 (1.65)	2.35 (3.29)	3.00 (3.41)	1.79 (2.50)	8.07 (3.04)	4.39 (2.71)	0 (0)	20.00 (25.30)	3.98 (1.05)
Kent	19.83 (4.24)	25.62 (7.94)	17.65 (8.27)	27.00 (8.88)	8.93 (5.39)	8.39 (3.09)	4.39 (2.71)	21.15 (11.33)	20.00 (25.30)	14.68 (1.90)
Lake	0.85 (0.98)	0 (0)	1.18 (2.34)	2.00 (2.00)	0 (0)	8.07 (3.04)	1.32 (1.51)	17.31 (10.49)	0 (0)	3.18 (0.94)
Lapeer	0 (0)	0 (0)	0 (0)	0 (0)	0.89 (1.78)	0 (0)	0 (0)	0 (0)	0 (0)	0.07 (0.14)
Lenawee	0.57 (0.80)	0.83 (1.65)	0 (0)	4.00 (3.92)	0 (0)	0.62 (0.88)	0.44 (0.88)	0 (0)	0 (0)	0.72 (0.46)

Table A18 continued (page 4).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Livingston	2.27 (1.58)	0 (0)	0 (0)	0 (0)	0 (0)	0.31 (0.62)	0 (0)	0 (0)	10.00 (18.97)	0.72 (0.46)
Macomb	3.40 (1.93)	1.65 (2.32)	5.88 (5.10)	2.00 (2.80)	2.68 (3.05)	1.24 (1.23)	0 (0)	0 (0)	0 (0)	2.02 (0.76)
Manistee	0.28 (0.57)	0 (0)	0 (0)	0 (0)	6.25 (4.57)	0.62 (0.88)	4.39 (2.71)	0 (0)	10.00 (18.97)	1.52 (0.66)
Marquette	0 (0)	0 (0)	0 (0)	1.00 (1.99)	0 (0)	0 (0)	0.44 (0.88)	0 (0)	0 (0)	0.14 (0.20)
Mason	0.28 (0.57)	0.83 (1.65)	0 (0)	4.00 (3.92)	1.79 (2.50)	0.31 (0.62)	0 (0)	0 (0)	0 (0)	0.65 (0.43)
Mecosta	0.85 (0.98)	0 (0)	4.71 (4.59)	1.00 (1.99)	1.79 (2.50)	0.62 (0.88)	0.44 (0.88)	0 (0)	0 (0)	0.94 (0.52)
Midland	1.42 (1.26)	2.48 (2.83)	0 (0)	0 (0)	3.57 (3.51)	7.76 (2.98)	8.77 (3.75)	7.69 (7.39)	0 (0)	4.41 (1.10)
Monroe	1.70 (1.38)	2.48 (2.83)	0 (0)	1.00 (1.99)	0 (0)	0 (0)	0 (0)	5.77 (6.47)	0 (0)	0.94 (0.52)
Montcalm	0.85 (0.98)	0 (0)	1.18 (2.34)	0 (0)	0 (0)	0.31 (0.62)	0.88 (1.24)	0 (0)	0 (0)	0.51 (0.38)
Muskegon	5.67 (2.46)	6.61 (4.52)	11.76 (6.99)	8.00 (8.00)	1.79 (2.50)	2.80 (1.84)	0.44 (0.88)	5.77 (6.47)	0 (0)	4.41 (1.10)

Table A18 continued (page 5).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Newyago	0.28 (0.57)	0 (0)	0 (0)	1.00 (1.99)	0 (0)	0.31 (0.62)	0 (0)	0 (0)	10.00 (18.97)	0.29 (0.29)
Oakland	4.25 (2.15)	1.65 (2.32)	7.06 (5.56)	5.00 (4.36)	0.89 (1.78)	2.80 (1.84)	3.51 (2.44)	1.92 (3.81)	10.00 (18.97)	3.47 (0.98)
Oceana	0 (0)	0.83 (1.65)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.07 (0.14)
Ogemaw	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.44 (0.88)	0 (0)	0 (0)	0.07 (0.14)
Osceola	0.85 (0.98)	0 (0)	0 (0)	0 (0)	4.46 (3.90)	0.93 (1.07)	1.32 (1.51)	0 (0)	0 (0)	1.01 (0.54)
Ottawa	5.10 (2.34)	4.96 (3.95)	7.06 (5.56)	2.00 (2.80)	0.89 (1.78)	0.31 (0.62)	0.88 (1.24)	5.77 (6.47)	0 (0)	2.82 (0.89)
Saginaw	0.85 (0.98)	3.31 (3.25)	1.18 (2.34)	2.00 (2.80)	2.68 (3.05)	2.80 (1.84)	0 (0)	0 (0)	0 (0)	1.59 (0.67)
St. Clair	0.57 (0.80)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.44 (0.44)	0 (0)	0 (0)	0.22 (0.25)
Sanilac	0 (0)	0 (0)	0 (0)	1.00 (1.99)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.07 (0.14)
Shiawassee	0.57 (0.80)	0.83 (1.65)	0 (0)	0 (0)	0 (0)	1.24 (1.23)	0 (0)	0 (0)	0 (0)	0.51 (0.38)

Table A18 continued (page 6).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Van Buren	0.28 (0.57)	0.83 (1.65)	1.18 (2.34)	0 (0)	2.68 (3.05)	0.62 (0.88)	0.88 (1.24)	0 (0)	0 (0)	0.72 (0.46)
Washtenaw	3.97 (2.08)	0 (0)	0 (0)	0 (0)	1.79 (2.50)	1.55 (1.38)	1.75 (1.74)	1.92 (3.81)	0 (0)	1.88 (0.73)
Wayne	4.25 (2.15)	6.61 (4.52)	3.53 (4.00)	7.00 (5.10)	0 (0)	4.35 (2.27)	4.82 (2.84)	1.92 (3.81)	0 (0)	4.27 (1.09)
Wexford	0.57 (0.80)	0 (0)	0 (0)	0 (0)	1.79 (2.50)	2.48 (1.73)	0.88 (1.24)	0 (0)	0 (0)	1.01 (0.54)
Out-of-State	16.15 (3.92)	11.57 (5.82)	21.18 (8.86)	20.00 (8.00)	9.87 (5.62)	17.39 (4.22)	35.09 (6.32)	11.54 (8.86)	0 (0)	18.94 (2.11)

Table A19. Anglers by county of residence (%) for section F from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Allegan	0.40 (0.79)	3.57 (4.05)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.36 (0.36)
Barry	2.78 (2.07)	3.57 (4.05)	0 (0)	0 (0)	2.74 (3.82)	2.22 (1.66)	0.46 (0.91)	0 (0)	0 (0)	1.79 (0.79)
Bay	0 (0)	2.38 (3.33)	0 (0)	0 (0)	1.37 (2.72)	0.63 (0.90)	0 (0)	0 (0)	0 (0)	0.45 (0.40)
Branch	0.40 (0.79)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.09 (0.18)
Calhoun	0 (0)	0 (0)	1.92 (3.81)	2.90 (4.04)	0 (0)	1.59 (1.41)	0 (0)	0 (0)	0 (0)	0.72 (0.50)
Cass	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.63 (0.90)	0 (0)	0 (0)	0 (0)	0.18 (0.25)
Charleviox	0 (0)	0 (0)	0 (0)	0 (0)	2.74 (3.82)	0 (0)	0 (0)	0 (0)	0 (0)	0.18 (0.25)
Cheboygan	0 (0)	0 (0)	1.92 (3.81)	0 (0)	1.37 (2.72)	0 (0)	0 (0)	0 (0)	0 (0)	0.18 (0.25)
Chippewa	0.79 (1.12)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.18 (0.25)
Clare	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.32 (0.63)	0 (0)	0 (0)	0 (0)	0.09 (0.18)

Table A19 continued (page 2).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Clinton	1.19 (1.37)	0 (0)	0 (0)	0 (0)	9.59 (6.89)	1.90 (1.54)	3.65 (2.54)	0 (0)	0 (0)	2.15 (0.87)
Crawford	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.32 (0.63)	0 (0)	0 (0)	0 (0)	0.09 (0.18)
Eaton	0.79 (1.12)	2.38 (3.33)	0 (0)	1.45 (2.88)	1.37 (2.72)	0 (0)	0 (0)	0 (0)	0 (0)	0.54 (0.44)
Emmett	1.98 (1.76)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.91 (1.29)	0 (0)	0 (0)	0.63 (0.47)
Genesee	1.98 (1.76)	2.38 (3.33)	3.85 (5.33)	0 (0)	1.37 (2.72)	4.76 (2.40)	6.85 (3.41)	10.87 (9.18)	0 (0)	4.03 (1.18)
Gladwin	1.59 (1.57)	0 (0)	0 (0)	0 (0)	1.37 (2.72)	1.59 (1.41)	0 (0)	0 (0)	0 (0)	0.90 (0.56)
Gratiot	1.59 (1.57)	0 (0)	0 (0)	0 (0)	1.37 (2.72)	0 (0)	0.91 (1.29)	0 (0)	0 (0)	0.63 (0.47)
Hillsdale	0 (0)	2.38 (3.33)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.18 (0.25)
Ingham	1.98 (1.76)	13.10 (7.36)	5.77 (6.47)	2.90 (4.04)	6.85 (5.91)	6.03 (2.68)	7.76 (3.62)	4.35 (6.01)	28.57 (34.15)	5.91 (1.41)
Ionia	0.40 (0.79)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.09 (0.18)

Table A19 continued (page 3).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Isabella	0.79 (1.12)	0 (0)	0 (0)	1.45 (2.88)	0 (0)	1.27 (1.26)	0.91 (1.29)	2.17 (4.30)	0 (0)	0.90 (0.56)
Jackson	3.17 (2.21)	0 (0)	0 (0)	0 (0)	19.18 (9.22)	5.08 (2.47)	3.65 (2.54)	0 (0)	0 (0)	4.12 (1.19)
Kalamazoo	3.17 (2.21)	0 (0)	1.92 (3.81)	4.35 (4.91)	2.74 (3.82)	8.25 (3.10)	4.57 (2.82)	0 (0)	0 (0)	4.48 (1.24)
Kent	20.24 (5.06)	26.19 (9.59)	9.62 (8.18)	23.19 (10.16)	9.59 (6.89)	7.30 (2.93)	4.57 (2.82)	19.57 (11.70)	28.57 (34.15)	12.98 (2.01)
Lake	0.79 (1.12)	0 (0)	1.92 (3.81)	0 (0)	0 (0)	7.94 (3.05)	1.37 (1.57)	15.22 (10.59)	0 (0)	3.40 (1.08)
Lapeer	0 (0)	0 (0)	0 (0)	0 (0)	1.37 (2.72)	0 (0)	0 (0)	0 (0)	0 (0)	0.09 (0.18)
Lenawee	0.79 (1.12)	0 (0)	0 (0)	1.45 (2.88)	0 (0)	0.63 (0.90)	0.46 (0.91)	0 (0)	0 (0)	0.54 (0.44)
Livingston	3.17 (2.21)	0 (0)	0 (0)	0 (0)	0 (0)	0.32 (0.63)	0 (0)	0 (0)	14.29 (26.45)	0.90 (0.56)
Macomb	2.38 (1.92)	2.38 (3.33)	7.69 (7.39)	2.90 (4.04)	4.11 (4.65)	1.27 (1.26)	0 (0)	0 (0)	0 (0)	1.88 (0.81)
Manistee	0.40 (0.79)	0 (0)	0 (0)	0 (0)	0 (0)	0.63 (0.90)	0.46 (0.91)	0 (0)	14.29 (26.45)	0.45 (0.40)
Marquette	0 (0)	0 (0)	0 (0)	1.45 (2.88)	0 (0)	0 (0)	0.46 (0.91)	0 (0)	0 (0)	0.18 (0.25)

Table A19 continued (page 4).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Mason	0.40 (0.79)	1.19 (2.37)	0 (0)	1.45 (2.88)	2.74 (3.82)	0.32 (0.63)	0 (0)	0 (0)	0 (0)	0.54 (0.44)
Mecosta	1.19 (1.37)	0 (0)	7.69 (7.39)	1.45 (2.88)	2.74 (3.82)	0.63 (0.90)	0.46 (0.91)	0 (0)	0 (0)	1.16 (0.64)
Midland	1.19 (1.37)	3.57 (4.05)	0 (0)	0 (0)	2.74 (3.82)	7.94 (3.05)	9.13 (3.89)	8.70 (8.31)	0 (0)	5.10 (1.32)
Monroe	2.38 (1.92)	3.57 (4.05)	0 (0)	1.45 (2.88)	0 (0)	0 (0)	0 (0)	6.52 (7.28)	0 (0)	1.16 (0.64)
Montcalm	0.40 (0.79)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.91 (1.29)	0 (0)	0 (0)	0.27 (0.31)
Muskegon	5.56 (2.89)	4.76 (4.65)	13.46 (9.47)	10.14 (7.27)	1.37 (2.72)	2.86 (1.88)	0.46 (0.91)	6.52 (7.28)	0 (0)	4.12 (1.19)
Newaygo	0.40 (0.79)	0 (0)	0 (0)	1.45 (2.88)	0 (0)	0.32 (0.63)	0 (0)	0 (0)	0 (0)	0.27 (0.31)
Oakland	4.37 (2.57)	2.38 (3.33)	1.92 (3.81)	5.80 (5.63)	1.37 (2.72)	2.86 (1.88)	3.65 (2.54)	2.17 (4.30)	14.29 (26.45)	3.40 (1.08)
Ogemaw	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.46 (0.91)	0 (0)	0 (0)	0.09 (0.18)
Osecola	0.40 (0.79)	0 (0)	0 (0)	0 (0)	0 (0)	0.95 (1.09)	1.37 (1.57)	0 (0)	0 (0)	0.63 (0.47)
Ottawa	1.19 (1.37)	4.76 (4.65)	11.54 (8.86)	0 (0)	0 (0)	0.32 (0.63)	0.91 (1.29)	6.52 (7.28)	0 (0)	1.70 (0.77)

Table A19 continued (page 5).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Saginaw	1.19 (1.37)	2.38 (3.33)	1.92 (3.81)	2.90 (4.04)	4.11 (4.65)	2.86 (1.88)	0 (0)	0 (0)	0 (0)	1.79 (0.79)
St. Clair	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.46 (0.91)	0 (0)	0 (0)	0.09 (0.18)
Shiawassee	0.79 (1.12)	1.19 (2.37)	0 (0)	0 (0)	0 (0)	1.27 (1.26)	0 (0)	0 (0)	0 (0)	0.63 (0.47)
Van Buren	0 (0)	0 (0)	1.92 (3.81)	0 (0)	2.74 (3.82)	0.63 (0.90)	0.91 (1.29)	0 (0)	0 (0)	0.63 (0.47)
Washtenaw	4.37 (2.57)	0 (0)	0 (0)	0 (0)	0 (0)	1.59 (1.41)	1.83 (1.81)	2.17 (4.30)	0 (0)	1.88 (0.81)
Wayne	4.76 (2.68)	1.19 (2.37)	3.85 (5.33)	8.70 (6.78)	0 (0)	4.44 (2.32)	5.02 (2.95)	2.17 (4.30)	0 (0)	4.21 (1.20)
Wexford	0.40 (0.79)	0 (0)	0 (0)	0 (0)	2.74 (3.82)	2.54 (1.77)	0.91 (1.29)	0 (0)	0 (0)	1.16 (0.64)
Out-of-State	20.24 (5.06)	16.67 (8.13)	23.08 (11.69)	24.64 (10.37)	12.33 (7.70)	17.78 (4.31)	36.53 (6.51)	13.04 (9.93)	0 (0)	21.93 (2.48)

Table A20. Anglers by county of resisdence (%) for section A from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Barry	2.70 (3.77)	0 (0)	0 (0)	0 (0)	7.14 (13.77)	0 (0)	0 (0)	0 (0)	0 (0)	2.13 (2.43)
Bay	0 (0)	0 (0)	0 (0)	0 (0)	7.14 (13.77)	0 (0)	0 (0)	0 (0)	0 (0)	0.71 (1.41)
Berrien	0 (0)	0 (0)	12.50 (16.54)	0 (0)	7.14 (13.77)	0 (0)	0 (0)	0 (0)	0 (0)	2.13 (2.43)
Branch	2.70 (3.77)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.42 (1.99)
Calhoun	0 (0)	6.25 (12.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.71 (1.41)
Eaton	6.76 (5.84)	0 (0)	0 (0)	8.33 (15.96)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.26 (3.40)
Genesee	5.41 (5.26)	18.75 (19.52)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.96 (3.66)
Gladwin	2.70 (3.77)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.42 (1.99)
Hillsdale	1.35 (2.68)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.71 (1.41)

Table A20 continued (page 2).

County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
Ingham	2.70 (3.77)	12.50 (16.54)	0 (0)	0 (0)	7.14 (13.77)	0 (0)	0 (0)	33.33 (38.49)	0 (0)	4.96 (3.66)
Jackson	1.35 (2.68)	0 (0)	0 (0)	0 (0)	28.57 (24.15)	0 (0)	0 (0)	0 (0)	0 (0)	3.55 (3.11)
Kalamazoo	1.35 (2.68)	0 (0)	6.25 (12.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	66.67 (54.43)	2.84 (2.80)
Kent	17.57 (8.85)	18.75 (19.52)	25.00 (21.65)	16.67 (21.52)	14.29 (18.70)	0 (0)	0 (0)	33.33 (38.49)	0 (0)	18.44 (6.35)
Lake	1.35 (2.68)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	33.33 (38.49)	0 (0)	2.13 (2.43)
Lenawee	0 (0)	6.25 (12.10)	0 (0)	25.00 (25.00)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2.84 (2.80)
Macomb	6.76 (5.84)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.55 (3.11)
Mason	0 (0)	0 (0)	0 (0)	25.00 (25.00)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2.13 (2.43)
Midland	2.70 (3.77)	0 (0)	0 (0)	0 (0)	14.29 (18.70)	0 (0)	0 (0)	0 (0)	0 (0)	2.84 (2.80)
Muskegon	5.41 (5.26)	12.50 (16.54)	6.25 (12.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.96 (3.66)

Table A 20 continued (page 3).

County	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Newaygo	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	33.33 (54.43)	0.70 (1.41)
Oakland	5.41 (5.26)	0 (0)	12.50 (16.54)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.26 (3.40)
Osecola	2.70 (3.77)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.42 (1.99)
Ottawa	13.51 (7.95)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	7.09 (4.32)
Saginaw	0 (0)	6.25 (12.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.71 (1.41)
St. Clair	2.70 (3.77)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.42 (1.99)
Sanilac	0 (0)	0 (0)	0 (0)	8.33 (15.96)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.71 (1.41)
Van Buren	0 (0)	0 (0)	0 (0)	0 (0)	7.14 (13.77)	0 (0)	0 (0)	0 (0)	0 (0)	0.71 (1.41)
Washtenaw	4.05 (4.59)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2.13 (2.43)
Wayne	1.35 (2.68)	18.75 (19.52)	6.25 (12.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.55 (3.11)

Table A20 continued (page 4).

County	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Wexford	1.35 (2.68)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.71 (1.41)
Out-of-State	8.11 (6.35)	0 (0)	31.25 (23.18)	16.67 (21.52)	7.14 (13.77)	0 (0)	0 (0)	0 (0)	0 (0)	9.93 (5.04)

Table A21. Anglers by county of residence (%) for section C from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Bay	0 (0)	0 (0)	0 (0)	0 (0)	9.52 (12.81)	0 (0)	0 (0)	0 (0)	0 (0)	2.30 (3.21)
Berrien	11.76 (15.63)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2.30 (3.21)
Calhoun	0 (0)	0 (0)	0 (0)	0 (0)	9.52 (12.81)	0 (0)	0 (0)	0 (0)	0 (0)	2.30 (3.21)
Dickenson	0 (0)	0 (0)	0 (0)	6.67 (12.88)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.15 (2.29)
Eaton	5.88 (11.41)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.15 (2.29)
Ingham	11.76 (15.63)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2.30 (3.21)
Ionia	0 (0)	0 (0)	7.14 (13.77)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.15 (2.29)
Isabella	5.88 (11.41)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.15 (2.29)
Jackson	0 (0)	0 (0)	0 (0)	0 (0)	0.52 (12.81)	0 (0)	0 (0)	0 (0)	0 (0)	2.30 (3.21)

Table A21 continued (page 2).

County	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Kent	5.88 (11.41)	30.77 (25.56)	42.86 (26.45)	46.67 (25.76)	4.76 (9.29)	57.14 (37.41)	0 (0)	0 (0)	0 (0)	26.44 (9.46)
Lake	0 (0)	0 (0)	0 (0)	13.33 (17.55)	0 (0)	14.29 (26.45)	0 (0)	0 (0)	0 (0)	3.45 (3.91)
Macomb	5.88 (11.41)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.15 (2.29)
Manistee	0 (0)	0 (0)	0 (0)	0 (0)	33.33 (20.57)	0 (0)	0 (0)	0 (0)	0 (0)	8.05 (5.83)
Montcalm	11.76 (15.63)	0 (0)	7.14 (13.77)	0 (0)	0 (0)	14.29 (26.45)	0 (0)	0 (0)	0 (0)	4.60 (4.49)
Muskegon	11.76 (15.63)	15.38 (20.01)	14.29 (18.70)	6.67 (12.88)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	8.05 (5.83)
Oakland	0 (0)	0 (0)	21.43 (21.93)	6.67 (12.88)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.60 (4.49)
Oceana	0 (0)	7.69 (14.78)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.15 (1.15)
Osceola	0 (0)	0 (0)	0 (0)	0 (0)	23.81 (18.59)	0 (0)	0 (0)	0 (0)	0 (0)	5.75 (4.99)
Ottawa	29.41 (22.10)	15.38 (20.01)	0 (0)	13.33 (17.55)	4.76 (9.29)	0 (0)	0 (0)	0 (0)	0 (0)	11.49 (11.49)

Table A21 continued (page 3).

	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Saginaw	0 (0)	7.69 (14.78)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.15 (2.29)
Van Buren	5.88 (11.41)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.15 (2.29)
Wayne	0 (0)	23.08 (23.37)	0 (0)	6.67 (12.88)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.60 (4.49)
Out-of-State	0 (0)	0 (0)	7.14 (13.77)	0 (0)	4.76 (9.29)	0 (0)	0 (0)	0 (0)	0 (0)	2.30 (3.21)

Table A22. Anglers by county of residence (%) for section B from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE									
County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Allegan	20.00 (25.30)	0 (0)	33.33 (54.43)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10.34 (11.31)
Barry	10.00 (18.97)	12.50 (23.39)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6.90 (9.41)
Cass	0 (0)	0 (0)	0 (0)	25.00 (43.30)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Clinton	0 (0)	0 (0)	33.33 (54.43)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Genesee	0 (0)	12.50 (23.39)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Gratiot	0 (0)	0 (0)	0 (0)	0 (0)	25.00 (43.30)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Ingham	0 (0)	12.50 (23.39)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Kalamazoo	0 (0)	12.50 (23.39)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Kent	50.00 (31.62)	25.00 (30.62)	0 (0)	50.00 (50.00)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	31.03 (17.18)

Table A22 continued (page 2).

PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE										
County	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Macomb	0 (0)	0 (0)	33.33 (54.43)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Manistee	0 (0)	0 (0)	0 (0)	0 (0)	25.00 (43.30)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Van Buren	0 (0)	12.50 (23.39)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)
Washtenaw	0 (0)	0 (0)	0 (0)	0 (0)	50.00 (50.00)	0 (0)	0 (0)	0 (0)	0 (0)	6.90 (9.41)
Wayne	20.00 (25.30)	12.50 (23.39)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	10.34 (11.31)
Out-of-State	0 (0)	0 (0)	0 (0)	25.00 (43.30)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.45 (6.78)

Table A23. Bait types used (%) in all sections from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

Bait Used	PERCENTAGE OF BAIT TYPES USED BY ANGLERS									
	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Artificial and Natural	14.71 (3.66)	3.88 (3.40)	4.44 (4.34)	1.85 (2.59)	0 (0)	0.90 (1.04)	0 (0)	0 (0)	10.00 (18.97)	4.78 (1.12)
Flies	52.67 (5.16)	62.79 (8.51)	63.33 (10.16)	68.52 (8.94)	78.95 (7.64)	95.48 (2.28)	100.00 (0)	90.57 (8.03)	90.00 (18.97)	76.97 (2.20)
Spawn	11.76 (3.33)	3.88 (3.40)	0 (0)	0 (0)	4.39 (3.84)	1.20 (1.20)	0 (0)	1.89 (3.74)	0 (0)	4.03 (1.03)
Spoons	1.60 (1.30)	0 (0)	0 (0)	0 (0)	5.26 (4.18)	0.60 (0.85)	0 (0)	0 (0)	0 (0)	0.96 (0.51)
Fly and Wiggler	8.82 (2.93)	4.65 (3.71)	6.67 (5.26)	0.93 (1.84)	0 (0)	0.30 (0.60)	0 (0)	0 (0)	0 (0)	3.21 (0.92)
Lures	1.87 (1.40)	1.55 (2.18)	0 (0)	0.93 (1.84)	0 (0)	0.60 (0.85)	0 (0)	0 (0)	0 (0)	0.82 (0.47)
Worms	6.42 (2.53)	17.05 (6.62)	13.33 (7.17)	23.15 (8.12)	7.02 (4.78)	0.90 (1.04)	0 (0)	0 (0)	0 (0)	6.43 (1.28)
Spinners	2.14 (1.50)	6.20 (4.25)	12.22 (6.91)	4.63 (4.04)	3.51 (3.45)	0 (0)	0 (0)	7.55 (7.26)	0 (0)	2.73 (0.85)
Wigglers	0 (0)	0 (0)	0 (0)	0 (0)	0.88 (1.75)	0 (0)	0 (0)	0 (0)	0 (0)	0.07 (0.14)

Table A24. Bait types used (%) in section F from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF BAIT TYPES USED									
Bait Used	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Artificial and Natural	13.53 (4.19)	3.37 (3.83)	3.51 (4.87)	0 (0)	0 (0)	0.93 (1.07)	0 (0)	0 (0)	0 (0)	3.72 (1.10)
Flies	70.68 (5.58)	84.27 (7.72)	85.96 (9.20)	94.67 (5.19)	100.00 (0)	96.90 (1.93)	100.00 (0)	100.00 (0)	100.00 (0)	90.36 (1.72)
Spawn	1.88 (1.67)	0 (0)	0 (0)	0 (0)	0 (0)	0.93 (1.07)	0 (0)	0 (0)	0 (0)	0.68 (0.48)
Fly and Wiggler	11.63 (3.93)	5.62 (4.88)	8.77 (7.49)	1.33 (2.65)	0 (0)	0.31 (0.62)	0 (0)	0 (0)	0 (0)	3.63 (1.09)
Lures	2.26 (1.82)	2.25 (3.14)	0 (0)	1.33 (2.65)	0 (0)	0.62 (0.87)	0 (0)	0 (0)	0 (0)	0.93 (0.56)
Worms	0 (0)	4.49 (4.39)	0 (0)	2.67 (3.72)	0 (0)	0.31 (0.62)	0 (0)	0 (0)	0 (0)	0.59 (0.45)
Spinners	0 (0)	0 (0)	1.75 (3.48)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.08 (0.17)

Table A25. Bait types used (%) in section A from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE BAIT TYPES USED									
Bait Used	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Artificial and Natural	17.57 (8.85)	6.25 (12.10)	0 (0)	7.69 (14.78)	0 (0)	0 (0)	0 (0)	0 (0)	33.33 (54.43)	11.27 (5.31)
Flies	5.41 (5.26)	6.25 (12.10)	12.50 (16.54)	0 (0)	64.29 (25.61)	0 (0)	0 (0)	16.67 (30.43)	66.67 (54.43)	13.38 (5.71)
Spawn	33.78 (11.00)	6.25 (12.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16.67 (30.43)	0 (0)	19.01 (6.59)
Spoons	8.11 (6.35)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.23 (3.38)
Fly and Wiggler	2.70 (3.77)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.41 (1.98)
Lures	1.35 (2.68)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.70 (1.40)
Worms	22.97 (9.78)	50.00 (25.00)	31.25 (23.18)	76.92 (23.37)	21.43 (21.93)	0 (0)	0 (0)	0 (0)	0 (0)	30.28 (7.71)
Spinners	8.11 (6.35)	31.25 (23.18)	56.25 (24.80)	15.38 (20.01)	14.29 (18.70)	0 (0)	0 (0)	66.67 (38.49)	0 (0)	19.72 (6.68)

Table A26. Bait types used (%) in section C from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF BAIT TYPES USED									
Bait Used	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Artificial and Natural	16.67 (15.21)	0 (0)	0 (0)	6.25 (12.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5.05 (4.40)
Flies	20.83 (16.58)	20.00 (20.56)	35.71 (25.61)	6.25 (12.10)	23.81 (18.59)	44.44 (33.13)	0 (0)	0 (0)	0 (0)	23.23 (8.49)
Spawn	33.33 (19.24)	20.00 (20.66)	0 (0)	0 (0)	23.81 (18.59)	11.11 (20.95)	0 (0)	0 (0)	0 (0)	17.17 (7.58)
Spoons	0 (0)	0 (0)	0 (0)	0 (0)	28.57 (19.72)	22.22 (27.72)	0 (0)	0 (0)	0 (0)	8.08 (5.48)
Fly and Wiggler	0 (0)	0 (0)	7.14 (13.77)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.01 (2.01)
Worms	20.83 (16.58)	46.67 (25.76)	50.00 (26.73)	68.75 (23.18)	14.29 (15.27)	22.22 (27.72)	0 (0)	0 (0)	0 (0)	35.35 (9.61)
Spinners	8.33 (11.28)	13.33 (17.55)	7.14 (13.77)	18.75 (19.52)	4.76 (9.29)	0 (0)	0 (0)	0 (0)	0 (0)	9.09 (5.78)
Wigglers	0 (0)	0 (0)	0 (0)	0 (0)	4.76 (9.29)	0 (0)	0 (0)	0 (0)	0 (0)	1.01 (2.01)

Table A27. Bait types used (%) in section B from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF BAIT TYPES USED									
Bait Used	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Artificial and Natural	20.00 (25.30)	11.11 (20.95)	66.67 (54.43)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	16.67 (13.61)
Flies	0 (0)	22.22 (27.72)	33.33 (54.43)	50.00 (50.00)	25.00 (43.30)	0 (0)	0 (0)	0 (0)	0 (0)	20.00 (14.61)
Spawn	60.00 (30.98)	11.11 (20.95)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	23.33 (15.44)
Fly and Wiggler	0 (0)	11.11 (20.95)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	3.33 (6.55)
Worms	20.00 (25.30)	33.33 (31.43)	0 (0)	50.00 (50.00)	50.00 (50.00)	0 (0)	0 (0)	0 (0)	0 (0)	30.00 (16.73)
Spinners	0 (0)	11.11 (20.95)	0 (0)	0 (0)	25.00 (43.30)	0 (0)	0 (0)	0 (0)	0 (0)	6.67 (6.67)

Table A28. Species sought by anglers (%) in all sections from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF SPECIES SOUGHT									
Species Sought	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	98.13 (1.40)	89.15 (5.48)	67.42 (9.94)	0.93 (1.84)	4.39 (3.84)	1.51 (1.34)	7.57 (3.34)	94.34 (6.35)	100.00 (0)	43.33 (2.59)
Brown Trout	1.60 (1.30)	9.30 (5.11)	10.11 (6.39)	9.26 (5.58)	11.40 (5.95)	1.51 (1.34)	0.80 (1.12)	0 (0)	0 (0)	3.90 (1.01)
Chinook Salmon	0 (0)	0 (0)	0 (0)	0 (0)	4.39 (3.84)	23.19 (4.63)	15.54 (1.12)	0 (0)	0 (0)	8.28 (1.18)
Trout	0 (0)	0 (0)	19.10 (8.33)	89.81 (5.82)	35.09 (8.94)	6.02 (2.61)	0.40 (0.80)	0 (0)	0 (0)	11.98 (1.70)
Salmon	0 (0)	0 (0)	0 (0)	0 (0)	38.60 (9.12)	65.66 (5.21)	73.31 (5.58)	5.66 (6.35)	0 (0)	30.73 (2.41)
Salmon and Trout	0 (0)	1.55 (2.18)	3.37 (3.83)	0 (0)	6.14 (4.50)	2.11 (1.58)	2.39 (1.93)	0 (0)	0 (0)	1.71 (0.68)
Other	0.27 (0.53)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.07 (0.14)

Table A29. Species sought by anglers (%) in section F from April through December 1982, Pere Maruqette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF SPECIES SOUGHT									
Species Sought	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	98.88 (1.29)	92.13 (5.71)	69.64 (12.29)	1.33 (2.65)	5.33 (5.19)	1.55 (1.37)	7.85 (3.46)	93.62 (7.13)	100.00 (0)	39.37 (2.84)
Brown Trout	1.12 (1.29)	7.87 (5.71)	14.29 (9.35)	6.67 (5.76)	17.67 (8.17)	1.55 (1.37)	0.83 (1.16)	0 (0)	0 (0)	3.47 (1.07)
Chinook Salmon	0 (0)	0 (0)	0 (0)	0 (0)	6.67 (5.76)	23.84 (4.74)	16.12 (4.73)	0 (0)	0 (0)	10.24 (1.76)
Trout	0 (0)	0 (0)	16.07 (9.82)	92.00 (6.27)	38.67 (11.25)	6.19 (2.68)	0.41 (0.82)	0 (0)	0 (0)	10.84 (1.81)
Salmon	0 (0)	0 (0)	0 (0)	0 (0)	32.00 (10.77)	65.63 (5.29	72.31 (5.75)	6.38 (7.13)	0 (0)	35.06 (2.78)
Salmon and Trout	0	0	0	0	2.67	1.24	2.48	0	0	1.02

Table A30. Species sought by anglers (%) in section A from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF SPECIES SOUGHT									
Species Sought	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	97.30 (3.77)	93.75 (12.10)	56.25 (24.80)	0 (0)	0 (0)	0 (0)	0 (0)	100.00 (0)	100.00 (0)	73.94 (7.37)
Brown Trout	1.35 (2.68)	6.25 (12.10)	0 (0)	7.69 (14.78)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2.11 (2.11)
Trout	0 (0)	0 (0)	31.25 (23.18)	92.31 (14.78)	28.57 (24.15)	0 (0)	0 (0)	0 (0)	0 (0)	14.79 (5.96)
Salmon	0 (0)	0 (0)	0 (0)	0 (0)	71.43 (24.15)	0 (0)	0 (0)	0 (0)	0 (0)	7.04 (4.29)
Salmon and Trout	0 (0)	0 (0)	12.50 (16.54)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.41 (1.98)
Other	1.35 (2.68)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.70 (1.40)

Table A31. Species sought by anglers (%) in section C from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF SPECIES SOUGHT									
Species Sought	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	91.67 (11.28)	80.00 (20.66)	64.29 (25.61)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	43.43 (9.96)
Brown Trout	8.33 (11.28)	20.00 (20.66)	7.14 (13.77)	25.00 (21.65)	4.76 (9.29)	0 (0)	0 (0)	0 (0)	0 (0)	11.11 (6.32)
Trout	0 (0)	0 (0)	21.43 (21.93)	75.00 (21.65)	23.81 (18.59)	0 (0)	0 (0)	0 (0)	0 (0)	20.20 (8.07)
Salmon	0 (0)	0 (0)	0 (0)	0 (0)	47.62 (21.80)	66.67 (31.43)	0 (0)	0 (0)	0 (0)	16.16 (7.40)
Salmon and Trout	0 (0)	0 (0)	7.14 (13.77)	0 (0)	23.81 (18.59)	33.33 (31.43)	0 (0)	0 (0)	0 (0)	9.09 (5.78)

Table A32. Species sought by anglers (%) in section B from April through December 1982, Pere Marquette River, Michigan. Two standard errors are in parentheses.

	PERCENTAGE OF SPECIES SOUGHT									
Species Sought	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Season
Rainbow Trout	100.00 (0)	66.67 (31.43)	100.00 (0)	0 (0)	25.00 (43.30)	0 (0)	0 (0)	0 (0)	0 (0)	66.67 (17.21)
Brown Trout	0 (0)	11.11 (20.95)	0 (0)	0 (0)	25.00 (43.30)	0 (0)	0 (0)	0 (0)	0 (0)	6.67 (9.11)
Trout	0 (0)	0 (0)	0 (0)	100.00 (0)	50.00 (50.00)	0 (0)	0 (0)	0 (0)	0 (0)	20.00 (14.61)
Trout and Salmon	0 (0)	22.22 (27.22)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	6.67 (9.11)

Table A33. Estimated boat catches for section F from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

ESTIMATED BOAT CATCHES					
Species	Total C/H	Jan	Feb	Mar	Season
Angler Hours		0 (0)	0 (0)	124 (195)	124 (195)
Angler Trips		0 (0)	0 (0)	34 (53)	34 (53)

Table A34. Estimated shore catches for section F from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in Parenthesis.

ESTIMATED SHORE CATCHES					
Species	Total C/H	Jan	Feb	Mar	Season
Rainbow Trout	0.0582 (0.0452)	23 (43)	67 (13)	375 (325)	465 (328)
Angler Hours		459 (642)	783 (155)	6,778 (2,515)	7,988 (2,600)
Angler Trips		103 (155)	163 (37)	2,036 (867)	2,302 (882)

Table A35. Estimated total catch for section F from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

ESTIMATED TOTAL CATCH					
Species	Total C/H	Jan	Feb	Mar	Season
Rainbow Trout	0.0559 (0.0431)	23 (43)	67 (13)	375 (325)	465 (328)
Angler Hours		459 (642)	783 (155)	7,077 (2,520)	8,319 (2,605)
Angler Trips		103 (155)	163 (37)	2,113 (866)	2,387 (883)

Table A36. Estimated shore catches for section C from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

ESTIMATED SHORE CATCHES					
Species	Total C/H	Jan	Feb	Mar	Season
Rainbow Trout	0.0303 (0.0739)	0 (0)	24 (57)	0 (0)	24 (57)
Brown Trout	0.0303 (0.0739)	0 (0)	24 (57)	0 (0)	24 (57)
Total Catch	0.0606 (0.1077)	0 (0)	48 (81)	0 (0)	48 (81)
Angler Hours		28 (168)	336 (359)	428 (195)	792 (442)
Angler Trips		9 (53)	103 (140)	114 (54)	226 (159)

Table A37. Estimated shore catches for section C from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

		ESTIMATED SHORE CATCHES *			
Species	Total C/H	Jan	Feb	Mar	Season
Rainbow Trout	0.0303	0	24	0	24
	(0.0739)	(0)	(57)	(0)	(57)
Brown Trout	0.0303	0	24	0	24
	(0.0739)	(0)	(57)	(0)	(57)
Total Catch	0.0606	0	48	0	48
	(0.1077)	(0)	(81)	(0)	(81)
Angler Hours		28	336	428	792
		(168)	(359)	(195)	(442)
Angler Trips		9	103	114	226
		(53)	(140)	(54)	(159)

* No boat angler estimates possible.

Table A38. Anglers by county of residence (%) for sections F, A and C (separate estimates for section A and estimates for section B were not possible). Two standard errors are in parenthesis.

PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE				
County	Jan	Feb	Mar	Season
Clinton	0 (0)	0 (0)	1.09 (2.72)	0.55 (1.10)
Eaton	0 (0)	0 (0)	1.09 (10.25)	0.55 (1.10)
Genesee	7.89 (8.75)	5.88 (6.59)	1.09 (5.33)	7.18 (3.84)
Gladwin	0 (0)	0 (0)	1.09 (2.72)	0.55 (1.10)
Gratiot	0 (0)	0 (0)	1.09 (2.72)	0.55 (1.10)
Ingham	2.63 (5.19)	11.76 (9.02)	1.09 (2.72)	4.42 (3.06)
Jackson	0 (0)	3.92 (5.44)	0 (0)	1.10 (1.56)
Kalamazoo	0 (0)	1.96 (3.88)	0 (0)	1.10 (1.10)
Kent	23.68 (13.79)	27.45 (12.50)	20.65 (9.68)	23.20 (6.28)
Lake	0 (0)	7.84 (7.53)	1.09 (5.33)	4.42 (3.06)
Livingston	0 (0)	0 (0)	1.09 (2.72)	0.55 (1.10)
Macomb	2.63 (5.19)	0 (0)	0 (0)	0.55 (1.10)
Manistee	5.26 (7.24)	0 (0)	0 (0)	1.10 (1.55)

Table A38 continued (page 2).

PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE				
County	Jan	Feb	Mar	Season
Mason	0 (0) (0)	0	2.17 (3.82)	1.10 (1.55)
Mescota	5.26 (7.24)	0 (0)	5.43 (5.91)	3.87 (2.87)
Midland	0 (0)	5.88 (6.59)	4.35 (11.55)	4.42 (3.06)
Muskegon	0 (0)	9.80 (8.33)	4.35 (5.33)	4.97 (3.23)
Newaygo	0 (0)	0 (0)	2.17 (3.82)	1.10 (1.55)
Oakland	2.63 (5.19)	7.84 (7.53)	7.61 (17.55)	6.63 (3.70)
Oscoda	2.63 (5.19)	0 (0)	0 (0)	0.55 (1.10)
Ottawa	31.58 (15.08)	7.84 (7.53)	7.61 (6.98)	12.71 (4.95)
Saginaw	2.63 (5.19)	3.92 (5.44)	7.61 (6.89)	5.52 (3.40)
Shiawasee	5.26 (7.24)	0 (0)	0 (0)	1.10 (1.55)
Washtenaw	0 (0)	1.96 (3.88)	0 (0)	0.55 (1.10)
Wayne	7.89 (8.75)	3.92 (5.44)	2.17 (5.82)	3.87 (2.87)
Out-of-State	0 (0)	0 (0)	15.22 (23.18)	7.73 (3.97)

Table A39. Bait types used by anglers (%) for sections F, A and C from January through March 1983, Pere Marquettte River, Michigan. Two standard errors are in parenthesis.

	PERCENTAGE OF BAIT TYPES USED			
Bait Used	Jan	Feb	Mar	Season
Flies	63.16 (15.65)	83.33 (10.84)	81.52 (13.82)	78.26 (6.08)
Spawn	31.58 (15.08)	16.67 (10.14)	13.04 (8.78)	17.93 (5.66)
Worms	0 (0)	0 (0)	3.26 (10.49)	1.63 (1.87)
Spinners	0 (0)	0 (0)	3.02 (3.87)	1.09 (1.53)
Wigglers	5.26 (7.24)	0 (0)	0 (0)	1.09 (1.53)

Table A40. Species sought by anglers (%) in sections F, A and C from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

	PERCENTAGE OF ANGLERS BY SPECIES SOUGHT			
Species	Jan	Feb	Mar	Season
Rainbow Trout	100.00 (0)	100.00 (0)	98.91 (9.75)	99.46 (1.08)
Atlantic Salmon	0 (0)	0 (0)	1.09 (9.75)	0.54 (1.08)

Table A 41. Anglers by county of residence for section F from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE				
County	Jan	Feb	Mar	Season
Clinton	0 (0)	0 (0)	1.41 (3.54)	0.72 (1.43)
Eaton	0 (0)	0 (0)	1.41 (12.88)	0.72 (1.43)
Genesee	13.04 (14.04)	6.67 (7.44)	9.86 (21.78)	9.35 (4.94)
Gladwin	0 (0)	0 (0)	1.41 (3.54)	0.72 (1.43)
Gratiot	0 (0)	0 (0)	1.41 (3.54)	0.72 (1.43)
Ingham	0 (0)	13.33 (10.13)	1.41 (3.54)	5.04 (3.71)
Jackson	0 (0)	4.44 (6.14)	0 (0)	1.44 (2.02)
Kalamazoo	0 (0)	2.22 (4.39)	0 (0)	0.72 (1.43)
Kent	21.74 (17.20)	28.89 (13.51)	16.90 (10.97)	21.58 (6.98)
Lake	0 (0)	2.22 (4.39)	9.86 (6.88)	3.60 (3.16)
Livingston	0 (0)	0 (0)	1.41 (3.54)	0.72 (1.43)
Macomb	4.35 (8.50)	0 (0)	0 (0)	0.72 (1.43)
Manistee	8.70 (11.75)	0 (0)	0 (0)	1.44 (2.02)
Mason	0 (0)	0 (0)	1.41 (3.54)	0.72 (1.43)

Table A41 continued (page 2).

PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE				
County	Jan	Feb	Mar	Season
Mecosta	0 (0)	0 (0)	2.82 (4.96)	1.44 (2.02)
Midland	0 (0)	6.67 (7.44)	7.04 (14.60)	5.76 (3.95)
Muskegeon	0 (0)	8.89 (8.48)	2.82 (4.96)	4.32 (3.45)
Newaygo	0 (0)	0 (0)	1.41 (3.54)	0.72 (1.43)
Oakland	4.35 (8.05)	8.89 (8.48)	7.04 (21.24)	7.19 (4.38)
Ottawa	39.13 (20.35)	6.67 (7.44)	7.04 (6.88)	11.51 (5.41)
Saginaw	4.35 (8.50)	4.44 (6.14)	9.86 (8.48)	7.19 (4.38)
Shiawassee	4.35 (8.50)	0 (0)	0 (0)	0.72 (1.43)
Washtenaw	0 (0)	2.22 (4.39)	0 (0)	0.72 (1.43)
Wayne	0 (0)	4.44 (6.14)	1.41 (3.54)	2.16 (2.47)
Out-of-State	0 (0)	0 (0)	19.72 (27.23)	10.07 (5.11)

Table A42. Bait types used by anglers (%) in section F from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

	PERCENTAGE OF BAIT TYPES USED			
Bait Used	Jan	Feb	Mar	Season
Flies	95.65 (8.50)	97.83 (4.30)	100.00 (0)	98.57 (2.01)
Spawn	4.35 (8.50)	2.17 (4.30)	0 (0)	1.43 (2.01)

Table A43. Species sought by anglers (%) in section F from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

	PERCENTAGE OF SPECIES SOUGHT			
Species sought	Jan	Feb	Mar	Season
Rainbow trout	100.00 (0)	100.00 (0)	100.00 (0)	100.00 (0)

Table A44. Anglers by county of residence (%) for section C from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

PERCENTAGE OF ANGLERS BY COUNTY OF RESIDENCE				
County	Jan	Feb	Mar	Season
Kalamazoo	0 (0)	0 (0)	14.29 (43.30)	6.67 (12.88)
Kent	50.00 (40.82)	50.00 (70.71)	71.43 (69.55)	60.00 (25.30)
Ottawa	50.00 (40.82)	50.00 (70.71)	14.25 (54.43)	33.33 (24.32)

Table A45. Bait types used by anglers (%) in section C from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

PERCENTAGE OF BAIT TYPES USED				
Bait Used	Jan	Feb	Mar	Season
Flies	16.67 (30.43)	0 (0)	42.86 (43.30)	26.67 (22.84)
Spawn	66.67 (38.49)	100.00 (0)	14.29 (54.43)	46.67 (20.66)
Worms	0 (0)	0 (0)	42.86 (69.45)	20.00 (20.66)
Wigglers	16.67 (30.43)	0 (0)	0 (0)	6.67 (12.88)

Table A46. Species sought by anglers in section C from January through March 1983, Pere Marquette River, Michigan. Two standard errors are in parenthesis.

	PERCENTAGE OF SPECIES SOUGHT			
Species Sought	Jan	Feb	Mar	Season
Rainbow Trout	100.00 (0)	100.00 (0)	85.71 (43.30)	93.33 (12.88)
Atlantic Salmon	0	0	14.29	6.67