Bottom Trawl Explorations in Green Bay of Lake Michigan, 1963–65

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

Circular 297

UNITED STATES DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES

Bottom Trawl Explorations in Green Bay of Lake Michigan, 1963-65

By

NORMAN J. REIGLE, JR.

Circular 297

Washington, D.C.
March 1969

CONTENTS

Bottom Trawl Explorations in Green Bay of Lake Michigan, 1963-65

by

NORMAN J. REIGLE, JR., Fishery Biologist

Bureau of Commercial Fisheries
Exploratory Fishing and Gear Research Base
Ann Arbor, Mich. 48103

ABSTRACT

A bottom trawling survey was made during 11 cruises operating for 36 days over the 3-year study period. Explorations were made at all possible fishing depths and during 8 months. The 179 exploratory drags made during this study represent the first attempts by the Bureau of Commercial Fisheries to determine if bottom trawling in Green Bay is commercially feasible.

The overall catch rate was at a level that would be commercially feasible for a trawl fishery based primarily on alewife (Alosa pseudoharengus) and smelt (Osmerus mordax) and supplemented by catches of suckers (Catostomus catostomus and C. commersoni), carp (Cyprinus carpio), and yellow perch (Perca flavescens). Game fish were taken infrequently in the trawl, and trawling would not jeopardize sport fishing in Green Bay.

INTRODUCTION

The commercial fishery in Green Bay was a gill net and pound net fishery based on three primary species: common whitefish (Coregonus clupeaformis), lake herring (Leucichthys artedi), and yellow pike or walleye (Stizostedion vitreum vitreum) and five secondary species: carp, lake trout (Salvelinus namaycush), smelt, suckers, and yellow perch. Landings of the three major species have declined markedly in recent years. Of the secondary species, the lake trout almost disappreared from Lake Michigan (Eschmeyer, 1957); however restocking efforts are now underway. A limited fishery for carp, smelt, suckers, and yellow perch still exists in Green Bay. Hile, Lunger, and Buettner (1953) have summarized the fishery, and discussions of the major species in Green Bay have been presented for the whitefish by Mraz (1964), for the lake herring by Smith (1956), and for the walleye by Hile (1955) and Pycha (1961).

If commercial fishing in Green Bay is to survive, fishermen will have to turn to the efficient harvest of large volumes of low-priced industrial fish. Trawling is one way to accomplish this goal.

The aim of the study was to obtain the basic seasonal and bathymetric data necessary to establish more effective and efficient fishing methods to harvest the existing fish resources.

VESSELS, GEAR, AND METHODS

All fishing explorations during this study were made by research vessels of the Bureau of Commercial Fisheries. The research vessel Cisco was used on two cruises (12 and 30), and the research vessel Kaho on the remaining nine cruises.

All trawling was done with a 52-foot (headrope) Gulf of Mexico type fish trawl (Gordon and Brouillard, 1960). The cod end of the net had a 1-inch mesh (stretch measure) cotton liner to retain young fish and smaller species. A "white line" echo sounder was used during the trawling to observe and record fish concentrations.

Most trawl drags were 1/2-hour long although one was extended to 80 minutes, and 15 were less than one-half hour for one of the following reasons: encounters with snags, rough bottom, or stationary fishing gear (gill nets or pound nets). Most of Green Bay is suitable for bottom trawling, and snags were generally encountered close to shore (fig. 1). Gear was damaged severely on four drags and had minor damage on five drags.

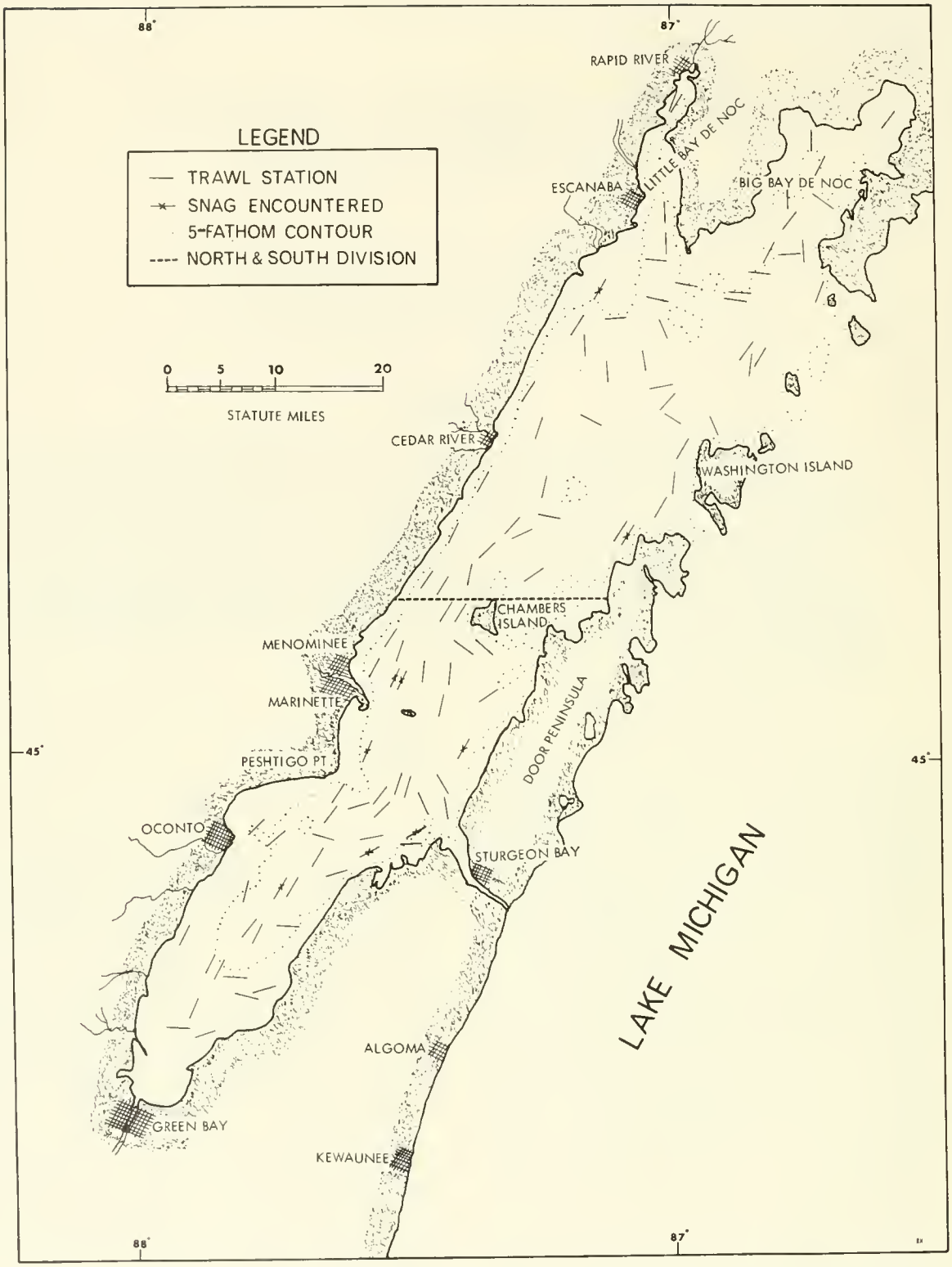

Figure 1.--Map of Green Bay showing the location of trawling stations, snags encountered, and the dividing line between northern and southern Green Bay. Some stations were visited more than once.

Drags were made along bottom contours at depths of 4 to 20 fathoms. Efforts were made to secure as complete depth coverage as possible on each cruise. In the study of the depth distribution of fish the following depth ranges are combined to the nearest 5-fathom point in all depth analyses in this paper.

Depth range		Designated depth
Fathoms		Fathoms
3-7	=	5
8-12	=	10
13-17	=	15
18-22	=	20

For certain evaluations of distribution and the catch and in the appendix tables, Green Bay is arbitrarily divided here into northern and southern portions. The dividing line is lat. 45°12'30" N., which touches the northern tip of Chambers Island (fig. 1).

Calculations of fishing results are based on two methods: (1) catch rate, which is pounds produced per 1/2-hour effort for all drags in a particular evaluation, and (2) average catch for effective fishing effort, which is pounds per half-hour of effort for only those drags in which the particular species being evaluated was taken. Effective fishing effort has been discussed by Hile (1962).

I consider a catch to be commercially significant when its ex-vessel value is $7.50 or more per half hour. Under current conditions a significant catch would amount to 500 pounds of alewives per half hour, based on a value in between pet food and meal plant fish prices. Since the other four most abundant species taken during this study are usually caught with others, we consider the following half-hour catch rates to be commercially significant: smelt - 150 pounds, suckers - 200 pounds, carp - 200 pounds, and yellow perch - 75 pounds.

FISHING EFFORT

From 1963 through 1965, portions of 11 cruises in Lake Michigan were devoted to fishing explorations in Green Bay. The total operating time in Green Bay was 36 days--an average of over 3 days per cruise. During the study, 179 trawl drags (over 86 hours of fishing) were completed (table 1). Because exploratory fishing cruises are numbered consecutively regardless of the area of operation, cruise numbers given in this paper are not consecutive.

Table 1.--Exploratory fishing effort in Green Bay by cruise, 1963-65

Cruise No.	Dates	Days	Drags	Gear damage		Time fished
				Minor	Major	
	1963	Number	Number	Number	Number	Minutes
12	July 4-9	6	29	0	1	807
13	August 15-18	4	13	0	0	390
14	November 1-3	3	12	1	0	356
	Total	13	54	1	1	1,553
	1964					
17	May 14-15, 17-18	4	22	1	1	620
19	June 25-26	2	8	0	0	210
21	August 27-30	4	24	0	1	681
22	October 22-24	3	18	1	1	540
	Total	13	72	2	3	2,051
	1965					
24	April 25	1	7	1	0	191
26	June 25-27	3	15	0	0	450
28	August 16-17, 20-21	4	22	1	0	655
30	December 15-16	2	9	0	0	270
	Total	10	53	2	0	1,566
	Grand total	36	179	5	4	5,170

Explorations were made during 8 months as follows: April 1965; May 1964; June 1964 and 1965; July 1963; August 1963, 1964, and 1965; October 1964; November 1963; and December 1965. In 1963, 54 drags were made during three cruises; in 1964, 72 drags were made during four cruises; and in 1965, 53 drags were made during four cruises.

Depth coverage by 5-fathom intervals was complete for all four depth intervals in Green Bay for eight cruises. Cruise 14 had no drags at the 15-fathom interval, and cruises 19 and 24 had none at the 5-fathom interval.

Southern Green Bay had 102 drags (48.3 hours), and northern Green Bay had 77 drags (37.9 hours).

SPECIES COMPOSITION OF THE TRAWL CATCH

The total trawl catch was dominated by alewife (76.2 percent), smelt (10.7 percent), suckers (5.3 percent), and carp (4.9 percent). The remaining 16 species in the trawl catch were only 2.9 percent of the catch by weight (table 2). Only 1 percent of the catch had high-value species--whitefish, yellow perch, and walleye.

The species composition differed between northern and southern Green Bay, most likely owing to the larger percentage of shallow water drags in southern Green Bay. Greater amounts of warm-water species such as carp, suckers, yellow perch, and spottail shiner were taken in southern Green Bay whereas the percentages of certain cold-water species such as sculpins, common whitefish, chubs, and lake herring were higher in northern Green Bay (table 3). In northern Green Bay, alewife and smelt composed over 96 percent of the catch whereas in southern Green Bay, they composed 79 percent.

DISCUSSION BY SPECIES

Alewife

Alewives were the most abundant fish in the trawl catch; over 76 percent of the total landings were alewives. The alewife would certainly be of major importance in any trawling operation, and it is available in sufficient quantities to support a limited trawl fishery.

The abundance and wide distribution of alewives in Green Bay are shown by the occurrence of alewives in all but 13 of the 179 trawl drags. Of these 13 drags, 3 had damaged gear or malfunctioned so that no fish were taken, and the other 10 were made during cruises 17 and 24 (April and May), a period before the alewives had moved into the bay.

Alewives are an anadromous fish and have pronounced seasonal movements. The monthly catch rates and availability to bottom trawls by 5-fathom depth intervals are shown in figure 2.

Table 2.--Species compositions of 179 exploratory trawl drags in Green Bay, 1963-65

Species	Total catch		Occurrences in total drags		Catch rate per 1/2-hr. effort	Average catch for effective 1/2-hr. effort
	Pounds	Percent[1]	Number	Percent[1]	Pounds[1]	Pounds
Alewife (Alosa pseudoharengus)	42,525	76.2	166	93	246.8	264
Smelt (Osmerus mordax)	5,994	10.7	133	74	34.8	47
Suckers (Catostomus catostomus and C. commersoni)	2,931	5.3	64	36	17.0	47
Carp (Cyprinus carpio)	2,707	4.9	26	15	15.7	112
Yellow perch (Perca flavescens)	439	0.8	50	28	2.5	9
Trout-perch (Percopsis omiscomaycus)	343	0.6	58	32	2.0	6
Spottail shiner (Notropis hudsonius)	323	0.6	37	21	1.9	9
Common whitefish (Coregonus clupeaformis)	132	0.2	31	17	.8	4
Sculpins (Cottidae)	132	0.2	22	12	.8	6
Chubs (Leucichthys spp.)	103	0.2	16	9	.6	6.5
Burbot (Lota lota)	49	0.1	14	8	.3	3.5
Lake herring (Leucichthys artedi)	41	0.1	18	10	.2	2
Yellow bullhead (Ictalurus natalis)	15	T	10	6	.1	1.5
Creek chub (Semotilus atromaculatus)	13	T	2	1	.1	6.5
Ninespine stickleback (Pungitius pungitius)	10	T	6	3	T	2
Northern pike (Esox lucius)	7	T	4	2	T	2
Fresh-water sheepshead (Aplodinotus grunniens)	4	T	4	2	T	1
Lake trout (Salvelinus namaycush)	3	T	3	2	T	1
Yellowpike or walleye (Stizostedion vitreum vitreum)	2	T	1	1	T	2
Channel catfish (Ictalurus punctatus)	1	T	1	1	T	1
Total or average	55,774	99.9			323.6	324

[1] T = Trace, less than 0.5 or 0.05.

Table 3.--Species composition, catch rates, and average catches for effective fishing effort in northern and southern Green Bay

Species	Southern Green Bay				Northern Green Bay			
	Species composition		Catch rate per 1/2-hr. effort	Average 1/2-hr. catch for effective effort	Species composition		Catch rate per 1/2-hr. effort	Average 1/2-hr. catch for effective effort
	Pounds	Percent[1]	Pounds	Pounds	Pounds	Percent	Pounds	Pounds
Alewife	20,252	68.6	209.6	234	22,273	84.9	294.1	302
Smelt	3,049	10.3	31.6	49	2,945	11.2	38.9	47
Suckers	2,451	8.3	25.4	50	480	1.8	6.3	37
Carp	2,622	8.9	27.1	113	85	0.3	1.1	85
Yellow perch	409	1.4	4.2	9	30	0.1	0.4	6
Trout-perch	297	1.0	2.7	7	46	0.2	0.6	3
Spottail shiners	305	1.0	3.2	10	18	0.1	0.2	4
Common whitefish	22	0.1	0.2	3	110	0.4	1.5	4
Sculpins	45	0.2	0.5	6	86	0.3	1.1	7
Chubs	0	-	-	-	103	0.4	1.4	6
Burbot	37	0.1	0.4	4	12	0.1	0.2	3
Lake herring	3	T	T	1	37	0.1	0.5	2
Others	42	0.1	0.4	([2])	15	0.1	0.2	([2])
Total or average	29,534	100.0	305.7	306	26,240	100.0	346.5	346

[1] T = Trace, less than 0.5 or 0.05. [2] Not calculated.

Figure 2.--Availability of alewives to bottom trawls in Green Bay by depth and month April - December. Figures illustrate the catch rate of alewives at 5-fathom depth intervals.

Alewives were lacking in all drags in April, and catches were light in May. By June, alewives were spawning, and the catch rate was highest at 5 fathoms and declined sharply below 15 fathoms. The best catch rate in July was obtained at 10 fathoms. During August, fish could be taken at all depths, but the largest concentrations were at 15 fathoms. In October and November, alewives were scattered at all depths, and large concentrations on the bottom were difficult to find. During December, most alewives were in the deeper waters of the bay--few were found in shallower depths. Alewives apparently move out of Green Bay into deep water in Lake Michigan in January and do not return until May.

Commercially significant catches (500 pounds or more per half hour) were made on every cruise from June through December; however, it is unlikely that alewives could be harvested on a commercial scale from Green Bay between January and May. Of the total drags made in Green Bay, 18 percent contained commercially significant quantities of alewife. A summary of catches of alewives by cruise and year is given in table 4.

Smelt

Smelt was the second most abundant species in the trawl catch--10.7 percent by weight. The smelt population appeared to be sizeable enough to constitute an important species for trawlers. Thirteen commercially significant catches (150 pounds or more) were taken on eight cruises. The overall catch rate and average catch for effective effort also indicate that smelt would be an important component in any

Table 4.--Summary of catch records of alewife in Green Bay by cruise and year, 1963-65

Year	Cruise No.	Total drags	Significant catches	Total catch	Largest 1/2-hr. catch	Catch rate per 1/2-hr effort	Average 1/2-hr. catch for effective effort
		Number	Number	Pounds	Pounds	Pounds	Pounds
1963	12	29	3	5,526	850	205	205
	13	13	3	3,225	900	248	248
	14	12	4	5,141	900	432	436
Total or average		54	10	13,892		268	269
1964	17	22	0	443	55	21	27
	19	8	4	2,209	600	316	316
	21	24	4	6,670	2,000	294	307
	22	18	2	2,170	520	121	128
Total or average		72	10	11,492		168	184
1965	24	7	0	0	0	0	0
	26	15	2	3,613	950	241	241
	28	22	12	10,970	1,100	503	503
	30	9	1	2,558	2,000	284	284
Total or average		53	15	17,141		328	374

Table 5.--Summary of catch records of smelt in Green Bay by cruise and year, 1963-65

Year	Cruise No.	Total drags	Significant catches	Total catch	Largest 1/2-hr. catch	Catch rate per 1/2-hr. effort	Average 1/2-hr. catch for effective effort
		Number	Number	Pounds	Pounds	Pounds	Pounds
1963	12	29	0	321	80	12	15
	13	13	1	464	300	36	42
	14	12	1	423	320	36	43
Total or average		54	2	1,208		23	28
1964	17	22	1	552	250	27	27
	19	8	0	64	21	9	14
	21	24	2	826	150	36	61
	22	18	1	326	190	18	25
Total or average		72	4	1,768		26	34
1965	24	7	0	113	95	18	23
	26	15	1	581	480	39	69
	28	22	5	1,516	520	70	86
	30	9	1	808	250	90	90
Total or average		53	7	3,018		58	78

commercial effort or provide a major supplement to any effort directed specifically at alewife. Smelt and alewife were taken together in 70 percent of all drags in this study. The catch records of smelt by cruise and year are summarized in table 5.

The monthly catch rates and availability of smelt to bottom trawls by depth are shown in figure 3. On the one cruise made in April, ice cover prevented extensive explorations, and no effort was made in 5 fathoms where smelt likely would be spawning. During May and June, catch rates were highest at 10 fathoms. In May, some smelt were in 5 fathoms, and few were found deeper than 15 fathoms. By June, none was caught at 5 fathoms, and the catch rate increased beyond 15 fathoms. From July through November most of the smelt were taken at 15- to 20-fathom intervals; however, a few were taken at all depths. On the December cruise, catch rates were good at all four depth intervals.

Suckers

White suckers and longnose suckers were taken in the trawl. Suckers could be an important supplement to a general fishing effort. Three trawl drags took significant quantities of suckers--the largest catch was 460 pounds. The overall catch rate was 17 pounds, and the average catch for effective effort was 47 pounds. Suckers were the third most abundant species in the total trawl catch and occurred in 36 percent of the drags. Suckers were taken at depths from 4 to 20 fathoms but were most abundant at the 5-fathom interval--only 3 pounds were taken at 20 fathoms.

Carp

Carp was the fourth most abundant species in total pounds landed in the trawl catch. Carp occurred in 26 drags and composed 4.9 percent of the total catch. Only five catches, however, exceeded 100 pounds, and these accounted for 86 percent of the carp catch. All five of these catches were made south of Peshtigo Point at depths from 5 to 15 fathoms. Three catches of 200, 600, and 1,300 pounds were commercially significant. In northern Green Bay, carp occurred in only one trawl drag, which caught 85 pounds of carp at 6 fathoms in Big Bay De Noc. Carp were taken in 4 to 15 fathoms; however, 95 percent of the total poundage was caught in less than 12 fathoms. Ninety-five percent of the carp poundage was taken during cruises 21 and 22 (August and October 1964).

Yellow Perch

Fifty trawl drags had yellow perch, but the average catch for effective effort was only 9 pounds. Only two catches were over 50 pounds (55 and 70). Thus, it is unlikely that yellow perch would be a major species for trawlers. This fish would be only an incidental supplement to other production efforts.

Perch were taken at depths from 4 to 20 fathoms; most were caught at the 5-fathom interval. The several large catches made at 11 and 12 fathoms in December and April indicated a seasonal movement into deeper water during the winter.

Miscellaneous Species

Three of the miscellaneous species, trout-perch (Percopsis omiscomaycus), spottail shiner (Notropis hudsonius), and whitefish composed 1.4 percent of the total landings and are listed separately in the appendix tables. The remaining 12 species--sculpins (Cottidae), chubs (Leucichthys spp.), burbot (Lota lota), lake herring, yellow bullhead (Ictalurus natalis), creek chub (Semotilus atromaculatus), ninespine stickleback (Pungitius pungitius), northern pike (Esox lucius), fresh-water sheepshead (Aplodinotus grunniens), lake trout, walleye, and channel catfish (Ictalurus punctatus)--composed only 0.7 percent of the total catch and are grouped together in the appendix tables. None of these miscellaneous species now has potential commercial importance to bottom trawling.

Figure 3.--Availability of smelt to bottom trawls in Green Bay by depth and month April - December. Figures illustrate the catch rate of smelt at 5-fathom depth intervals.

The trout-perch is an important forage fish that was abundant in Green Bay. It occurred in 32 percent of the drags, and its overall catch rate was 2 pounds per drag. One large catch of 100 pounds was made at 8 fathoms off Sturgeon Bay. Trout-perch occurred at depths from 4 to 20 fathoms.

Spottail shiner is another forage fish that was caught in nearly a quarter of all trawl drags. It has no commercial importance except as a bait minnow. Spottail shiners were most abundant at the 5-fathom interval, and 97 percent were taken in 12 fathoms or less. The largest catch was 130 pounds in a 20-minute drag at 7 fathoms south of Oconto, Wis.

Whitefish were taken in 32 catches but never in commercial quantities. The largest catch was only 12 pounds, and the average catch for effective effort was only 4 pounds. Seventy-one percent of the whitefish landing was taken at the 10-fathom interval.

Sculpins composed a small portion of the trawl catch, and over half the sculpin catches were a pound or less. The largest landing of sculpins was only 30 pounds. Sculpins were taken at depths from 11 to 20 fathoms; 95 percent of the catch were taken at the 15- and 20-fathom intervals.

Chubs, an important species to bottom trawling in Lake Michigan, appeared very infrequently in Green Bay trawl catches. They were taken in only 16 drags at an average catch for effective effort of 6-1/2 pounds. The catches ranged from one individual to 25 pounds per drag. Chubs were taken by bottom trawling only in northern Green Bay and only during late June through August. Chubs were taken at depths from 7 to 20 fathoms, although 57 percent were taken at the 20-fathom interval.

The remaining species taken in trawls generally occurred as individuals or in very small amounts. Burbot were taken in 14 drags in various areas of Green Bay at depths from 4 to 17 fathoms. The largest catch of burbot was 13 pounds. Lake herring were found also throughout the bay but were more common in the northern half. The largest catch of lake herring was only 4 pounds, but most of the catches contained only one lake herring. Bullheads were in 10 trawl catches in amounts ranging from one bullhead to 5 pounds. Bullheads were taken only in southern Green Bay at depths from 5 to 15 fathoms. Two drags made at 15 and 8 fathoms off Sturgeon Bay, Wis., had 3 and 10 pounds of creek chubs. Sticklebacks occurred in six drags, primarily in northern Green Bay at depths from 5 to 17 fathoms. Eight northern pike were captured in four drags during cruise 30 at depths from 11 to 13 fathoms. Fresh-water sheepshead were taken in four drags in the southern portion at depths from 5 to 15 fathoms. Five recently planted lake trout from 7.2 to 10.4 inches long were caught in northern Green Bay in 1965. One walleye was taken in 4 fathoms in the extreme southern portion of the bay. One channel catfish was taken in 8 fathoms off Sturgeon Bay. Eight adult sea lampreys were captured during the summer of 1963 at depths from 6 to 16 fathoms (table 6).

Table 6.--Catches of adult sea lampreys in exploratory trawl drags in Green Bay, 1963-65

Drag No.	Date	Location	Depth	Sea lampreys
			Fathoms	Number
359...	July 8, 1963	Off Cedar River, Mich.	9	1
360...	July 8, 1963	Off Cedar River, Mich.	8	1
361...	July 8, 1963	Little Bay De Noc	4	1
362...	July 9, 1963	Little Bay De Noc	8	1
364...	July 9, 1963	Big Bay De Noc	6	1
396...	August 15, 1963	Off Sturgeon Bay, Wis.	10	1
401...	August 16, 1963	Off Marinette, Wis.	16	1
405...	August 16, 1963	Off Marinette, Wis.	12	1

Four of the above miscellaneous species, northern pike, lake trout, walleye, and channel catfish, are also important game fish. These four species were taken in only nine drags and are not available to effective commercial harvesting with the bottom trawl.

CONCLUSIONS

Bottom trawling in Green Bay is feasible on a commercial scale. Much of Green Bay has suitable trawling bottom--gear was damaged only on 5 percent of all drags. The composition of the total trawl catch by weight was 76.2 percent alewife, 10.7 percent smelt, 5.3 percent suckers, 4.9 percent carp, 0.8 percent yellow perch, and 2.1 percent other species. Commercial quantities of alewives were taken on every cruise between June and December. Alewives move out of the relatively shallow waters of Green Bay in January and do not return until May. Smelt were available in sufficient quantities to harvest commercially with the bottom trawl. Suckers and carp were taken

occasionally in commercially significant amounts and, along with the higher value yellow perch, would supplement fishing based on alewife and smelt. Because very few game fish were taken, trawling would not interfere with sport fishing in Green Bay.

LITERATURE CITED

ESCHMEYER, PAUL H.
1957. The near extinction of lake trout in Lake Michigan. Trans. Amer. Fish Soc. 85: 102-119.

GORDON, WILLIAM G., and KEITH BROUILLARD.
1960. Great Lakes fishermen convert gillnetters to trawling vessels. Fish Boat 5(8): 35-39.

HILE, RALPH.
1955. The walleye problem in Green Bay. Progr. Fish-Cult. 17: 44.
1962. Collection and analysis of commercial fishery statistics in the Great Lakes. Great Lakes Fish. Comm., Tech. Rep. 5, ii + 31 pp.

HILE, RALPH, GEORGE F. LUNGER, and HOWARD J. BUETTNER.
1953. Fluctuations in the fisheries of the State of Michigan waters of Green Bay. U.S. Fish Wildl. Serv., Fish. Bull. 54: 1-34.

MRAZ, DONALD.
1964. Age, growth, sex ratio, and maturity of the whitefish in central Green Bay and adjacent waters of Lake Michigan. U.S. Fish Wildl. Serv., Fish. Bull. 63: 619-634.

PYCHA, RICHARD L.
1961. Recent changes in the walleye fishery of northern Green Bay and history of the 1943 year class. Trans. Amer. Fish. Soc. 90: 475-488.

SMITH, STANFORD H.
1956. Life history of lake herring of Green Bay, Lake Michigan. U.S. Fish Wildl. Serv., Fish. Bull. 57: 87-138.

APPENDIX TABLES

The following two tables give the fishing log for 179 exploratory trawl drags in Green Bay between July 1963 and December 1965. Table entries are arranged primarily by descending depth at stations and chronologically by cruise.

Appendix table 1.--Exploratory fishing log - trawl stations in southern Green Bay

Cruise No.	Depth	Date	Drag No.	Position Lat. N.	Position Long. W.	Course	Time of doy	Fished	Limiting factor 1/	Catch: Alewife	Smelt	Suckers 2/	Carp	Yellow perch	Trout-perch	Spottail shiners	Whitefish	Others 3/	Total
	Fath.	1963						Min.		Pounds									
12	4	7- 4	343	44°39'	87°54'	NE.	1330	30	0	390	-	5	-	3	-	2	-	-	400
	5	7- 4	342	44°43'	87°49	SW.	1200	30	0	620	-	5	-	4	-	1	-	-	630
	8	7- 4	341	44°48'	87°45	SW.	1040	30	0	530	1	16	-	2	-	1	-	-	550
	8	7- 5	349	45°00'	87°35'	N.	1340	6	4	1	1	-	-	-	-	-	-	-	2
	10	7- 4	339	44°56'	87°34'	SW.	0810	30	0	45	5	-	-	-	-	-	-	-	50
	10	7- 4	340	44°52'	87°40'	SW.	0930	30	0	5	-	-	-	-	-	-	-	-	5
	14	7- 5	344	45°08'	87°29'	S.	0740	20	0	1	1	-	-	-	-	-	-	-	2
	14	7- 5	348	44°57'	87°28'	NE.	1200	30	0	75	4	-	-	-	-	-	-	1	80
	16	7- 5	346	45°05'	87°22'	SW.	0950	30	0	110	9	-	-	-	-	-	-	1	120
	17	7- 5	345	45°08'	87°25'	S.	0840	30	0	2	1	-	-	-	-	-	-	1	4
	17	7- 5	347	45°00'	87°25'	S.	1050	1	1	1	1	-	-	-	-	-	-	-	2
	18	7- 6	350	45°12'	87°25'	N.	0830	30	0	5	80	-	-	-	-	-	-	-	85
		1963																	
13	7	8-15	397	44°48'	87°46'	SW.	1340	30	0	240	1	40	5	-	-	1	-	3	290
	8	8-15	398	44°49'	87°44'	NW.	1430	30	0	10	-	-	-	-	-	1	-	-	11
	10	8-15	396	44°57'	87°36'	SW.	1140	30	0	110	3	4	3	-	-	-	-	-	120
	10	8-16	400	45°09'	87°31'	NE.	0810	30	0	500	24	-	-	-	5	-	1	-	530
	12	8-16	405	45°09'	87°23'	E.	1630	30	5	130	1	-	-	-	9	-	-	-	140
	18	8-15	399	45°03'	87°28'	N.	1650	30	0	70	8	1	-	1	-	-	-	-	80
		1963																	
14	4	11- 1	549	44°39'	87°54'	E.	1200	30	7	800	3	7	85	33	-	2	-	-	930
	5	11- 1	550	44°43'	87°50'	NE.	1320	30	7	900	-	18	-	22	-	-	-	-	940
	7	11- 1	551	44°46'	87°47'	NE.	1420	4	3	-	-	-	-	-	-	-	-	-	-
	7	11- 1	552	44°46'	87°47'	NE.	1500	20	7	1	-	55	-	13	-	130	-	1	200
	9	11- 1	553	44°49'	87°44'	NE.	1600	12	1	40	-	-	-	-	-	-	-	-	40
	10	11- 2	554	45°08'	87°30'	NE.	0920	80	0	1,400	-	-	-	-	-	-	-	-	1,400
	12	11- 3	560	45°07'	87°30'	N.	0740	30	5	100	-	-	-	-	-	-	-	-	100
	12	11- 2	559	45°09'	87°22'	E.	1550	30	0	630	10	-	-	-	-	-	-	-	640
	20	11- 2	555	45°12'	87°24'	NE.	1110	30	0	150	30	-	-	-	-	-	-	-	180
		1964																	
17	4	5-14	747	44°39'	87°51'	SW.	1110	30	0	1	10	120	-	1	2	1	-	-	135
	5	5-14	746	44°43'	87°45'	W.	1010	30	0	10	10	60	-	1	4	-	-	-	85
	6	5-14	748	44°47'	87°50'	NE.	1240	30	0	1	10	195	-	3	10	1	-	-	220
	6	5-15	752	45°09'	87°31'	NE.	0750	14	1	-	1	-	-	1	1	-	-	-	3
	7	5-14	745	44°48'	87°41'	W.	0900	30	0	1	20	2	1	1	1	-	-	-	26
	8	5-14	744	44°51'	87°33'	W.	0730	30	4	3	250	17	42	3	100	10	-	25	450
	8	5-15	753	45°10'	87°30'	NE.	0810	14	3	2	2	-	-	-	1	-	-	-	5
	9	5-14	750	44°55'	87°35'	NE.	1450	30	0	1	12	-	-	-	2	1	-	-	16
	10	5-14	749	44°52'	87°41'	NE.	1400	30	0	1	46	1	1	-	1	-	-	-	50
	11	5-17	770	45°09'	87°22'	SE.	0900	30	0	55	40	1	1	-	40	-	5	1	143
	15	5-14	751	44°57'	87°26'	SE.	1600	30	0	-	95	-	1	1	3	-	-	-	100
	15	5-17	769	45°03'	87°22'	N.	0730	30	0	-	9	-	-	1	1	-	-	1	12
		1964																	
19	10	6-25	814	44°57'	87°33'	S.	1550	30	0	570	5	5	-	-	-	-	-	-	580
	10	6-25	815	44°52'	87°41'	SW.	1700	30	0	600	-	110	-	-	-	-	-	-	710
	10	6-26	816	45°08'	87°31'	NE.	0600	30	0	400	13	-	-	-	-	-	7	-	420
	10	6-26	817	45°09'	87°23'	E.	1250	15	9	310	5	-	-	-	3	-	2	-	320
	15	6-25	813	44°56'	87°26'	N.	1440	30	0	250	20	-	-	-	-	-	-	-	270
		1964																	
21	5	8-28	923	44°43'	87°45'	S.	1100	30	5	240	-	-	200	6	15	7	-	2	470
	5	8-28	924	44°40'	87°52'	W.	1210	30	5	150	2	1	140	5	5	15	-	2	320
	7	8-28	922	44°48'	87°41'	W.	0950	30	5	120	-	11	3	15	-	1	-	-	150
	7	8-28	925	44°44'	87°50'	N.	1330	30	5	200	-	400	600	10	5	10	-	5	1,230
	8	8-28	926	44°52'	87°45'	N.	1500	6	1	80	-	4	35	1	10	10	-	-	140
	10	8-28	921	44°52'	87°33'	W.	0830	30	5	30	3	10	-	1	1	-	-	-	45
	10	8-29	930	45°09'	87°23'	E.	0910	30	0	350	1	-	6	-	2	-	1	-	360
	11	8-28	927	44°56	87°35'	NE.	1610	30	5	45	30	80	30	1	-	1	3	-	190
	14	8-29	929	45°07'	87°30'	NE.	0730	30	0	200	110	-	-	-	-	-	-	10	320
	15	8-28	920	44°56'	87°26'	NW.	1730	30	0	100	150	-	-	-	-	-	-	-	250
	18	8-28	928	45°02'	87°27'	N.	1730	30	0	100	150	-	-	-	-	-	-	-	250

See footnotes at end of table

Appendix table 1.--Exploratory fishing log - trawl stations in southern Green Bay--Continued

Cruise No.	Depth	Date	Drag No.	Position Lat. N.	Position Long. W.	Course	Time of day	Fished	Limiting factor 1/	Catch: Alewife	Smelt	Suckers 2/	Carp	Yellow perch	Trout-perch	Spottail shiners	Whitefish	Others 3/	Total
	Fath.	1964						Min.		Pounds									
22	4	10-22	1044	44°39'	87°51'	W.	1200	30	0	22	10	20	1	2	2	2	-	1	60
	5	10-22	1043	44°43'	87°46'	NE.	1110	30	0	80	15	38	1	5	5	5	-	1	150
	7	10-22	1042	44°47'	87°41'	W.	1000	30	3	120	8	8	20	1	5	5	-	3	170
	9	10-22	1045	44°49'	87°44'	NE.	1410	30	0	50	45	5	-	1	5	14	-	-	120
	10	10-22	1041	44°52'	87°33'	W.	0830	30	0	1	-	10	1,300	4	1	1	-	3	1,320
	10	10-23	1049	45°08'	87°20'	W.	0940	30	0	150	-	-	-	-	-	-	-	-	150
	11	10-22	1047	44°55'	87°35'	NE.	1600	30	0	40	3	10	1	4	2	3	-	7	70
	12	10-22	1046	44°52'	87°41'	E.	1500	30	0	65	8	50	-	5	6	6	-	-	140
	15	10-22	1040	44°56'	87°26'	NW.	0720	30	0	1	1	24	100	2	5	5	-	2	140
	15	10-24	1054	45°07'	87°30'	NE.	0710	30	0	35	20	2	1	-	1	-	-	21	80
	18	10-23	1048	45°02'	87°27'	N.	0810	30	0	6	3	1	-	1	-	-	-	7	18
	20	10-23	1050	45°12'	87°24'	NE.	1040	30	0	200	-	-	-	-	-	-	-	-	200
		1965																	
24	10	4-25	1115	44°52'	87°33'	W.	0830	11	3	-	6	1	-	-	5	3	-	-	15
	10	4-25	1117	44°55'	87°35'	N.	1020	30	0	-	-	3	-	-	2	2	-	-	7
	10	4-25	1119	45°09'	87°31'	N.	1300	30	0	-	-	1	-	-	-	-	-	-	1
	12	4-25	1116	44°52'	87°39'	W.	0910	30	0	-	95	5	-	55	25	30	2	8	220
	15	4-25	1114	44°56'	87°25'	NW.	0700	30	0	-	2	-	-	1	-	-	-	1	4
	15	4-25	1120	45°12'	87°23'	SW.	1420	30	0	-	7	-	-	-	3	1	-	-	11
	20	4-25	1118	45°02'	87°27'	N.	1140	30	0	-	3	-	-	-	1	1	-	-	5
		1965																	
26	5	6-27	1150	44°45'	87°49'	SW.	1120	30	0	630	-	9	-	1	-	-	-	-	640
	5	6-27	1151	44°39'	87°54'	SW.	1230	30	0	950	-	-	-	-	-	-	-	-	950
	5	6-27	1152	44°42'	87°48'	E.	1340	30	0	440	-	-	-	-	-	-	-	-	440
	5	6-27	1153	44°47'	87°44'	E.	1450	30	0	110	-	-	-	-	-	-	-	-	110
	10	6-26	1145	45°09'	87°24'	E.	1420	30	0	320	9	-	-	-	-	-	-	1	330
	10	6-27	1149	44°50'	87°42'	SW.	0930	30	0	110	10	-	-	-	-	-	-	-	120
	10	6-27	1154	44°52'	87°35'	E.	1610	30	0	230	-	-	-	-	-	-	-	-	230
	12	6-27	1148	44°57'	87°36'	SW.	0810	30	0	320	480	-	-	-	-	-	-	-	800
	15	6-26	1147	45°07'	87°30'	N.	1710	30	0	150	-	-	-	-	-	-	-	-	150
	20	6-26	1144	45°09'	87°22'	SW.	1330	30	0	5	70	-	-	-	-	-	-	-	75
	20	6-26	1146	45°04'	87°27'	S.	1540	30	0	15	5	-	-	-	-	-	-	-	20
		1965																	
28	4	8-16	1197	44°39'	87°52'	S.	1440	25	9	500	-	70	-	10	-	-	-	2	582
	5	8-16	1196	44°43'	87°45'	W.	1330	30	0	800	-	180	-	20	-	-	-	-	1,000
	6	8-16	1194	44°47'	87°50'	NW.	1130	30	0	10	-	20	-	1	-	-	-	-	31
	7	8-16	1195	44°47'	87°43'	E.	1230	30	0	530	-	150	-	10	-	-	-	-	690
	10	8-16	1192	44°52'	87°33'	W.	0740	30	0	230	-	10	-	-	-	-	-	-	240
	10	8-16	1193	44°53'	87°39'	W.	0830	30	0	1,000	-	30	-	-	-	-	-	-	1,030
	10	8-17	1198	44°57'	87°33'	SW.	0740	30	0	420	520	-	-	20	-	-	-	-	960
	10	8-17	1201	45°08'	87°20'	NW.	1200	30	0	1,000	-	460	-	-	-	-	-	-	1,460
	13	8-17	1203	45°09'	87°29'	W.	1410	30	3	830	20	70	4	-	-	-	1	-	925
	15	8-17	1199	44°56'	87°25'	NW.	0910	30	0	90	4	-	-	1	-	-	-	-	95
	17	8-17	1200	45°02'	87°26'	N.	1020	30	0	40	25	-	-	-	-	-	-	2	67
	20	8-17	1202	45°12'	87°24'	NE.	1250	30	0	20	240	-	-	-	-	-	-	-	260
		1965																	
30	6	12-15	1256	44°46'	87°47'	NE.	1310	30	0	1	100	10	-	70	1	20	-	-	202
	11	12-15	1254	44°57'	87°34'	SW.	1000	30	0	5	8	20	-	45	2	10	-	6	96
	11	12-15	1255	44°53'	87°39'	W.	1120	30	0	10	60	10	-	15	1	1	-	-	97
	12	12-16	1257	45°12'	87°29'	NE.	0800	30	0	40	250	-	-	1	-	-	-	7	298
	15	12-15	1253	44°56'	87°26'	NW.	0830	30	0	30	20	10	1	5	5	3	-	2	76

1/ 0 - clear drag, 1 - snag encountered (no gear damage), 2 - gear malfunction, 3 - minor gear damage, 4 - major gear damage (including loss of net), 5 - wind over 20 m.p.h., 6 - strong current, 7 - adverse weather conditions (including ice, fog, high seas), 8 - rough bottom, 9 - set fishing gear in area.

2/ Include longnose and white suckers.

3/ Include sculpins, chubs, burbot, lake herring, bullhead, creek chub, stickleback, northern pike, freshwater sheepshead, lake trout, yellow pike, and channel catfish.

Appendix table 2.--Exploratory fishing log - trawl stations in northern Green Bay

Cruise No.	Depth	Date	Drag No.	Position Lat. N.	Position Long. W.	Course	Time of day	Fished	Limiting factor 1/	Catch: Alewife	Smelt	Suckers 2/	Carp	Yellow perch	Trout-perch	Spottail shiners	Whitefish	Others 3/	Total
	Fath.	1963						Min.		Pounds									
12	3	7- 9	367	45°52'	86°35'	SE.	1640	30	0	280	9	-	-	-	-	1	-	-	290
	4	7- 8	361	45°45'	87°01'	S.	1920	30	0	160	-	-	-	-	-	-	10	-	170
	6	7- 9	364	45°39'	86°50'	E.	1250	30	0	130	9	-	-	-	-	-	1	-	140
	6	7- 9	366	45°43'	86°44'	E.	1440	30	0	130	1	-	-	-	5	-	4	-	140
	7	7- 9	363	45°36'	86°53'	E.	1150	30	0	95	2	-	-	-	-	-	-	3	100
	8	7- 9	362	45°41'	87°01'	S.	0950	30	0	850	-	-	-	-	-	-	10	-	860
	8	7- 8	360	45°34'	87°13'	SW.	1640	30	5	460	1	-	-	-	-	-	8	1	470
	8	7- 8	354	45°32'	86°53'	E.	0900	30	0	1	1	-	-	-	-	-	-	-	2
	9	7- 8	359	45°33'	87°13'	S.	1530	30	5	370	5	-	-	-	-	-	5	-	380
	10	7- 6	353	45°25'	87°18'	NE.	1250	30	0	480	9	-	-	-	-	-	-	1	490
	10	7- 9	365	45°41'	86°47'	NE.	1340	30	0	300	10	-	-	-	-	-	-	-	310
	12	7- 8	358	45°31'	87°09'	S.	1410	30	0	270	19	-	-	-	-	-	-	1	290
	13	7- 8	356	45°28'	87°03'	NE.	1150	30	8	20	2	-	-	-	-	-	1	4	27
	16	7- 8	357	45°30'	87°04'	N.	1250	30	0	10	20	-	-	-	-	-	-	4	34
	17	7- 8	355	45°25'	87°01'	W.	1050	30	0	100	45	-	-	-	-	-	-	5	150
	17	7- 6	352	45°19'	87°16'	N.	1120	30	0	55	5	-	-	-	-	-	-	-	60
	18	7- 6	351	45°16'	87°20'	NE.	0950	30	0	30	80	-	-	-	-	-	-	-	110
		1963																	
13	7	8-18	408	45°36'	86°53'	E.	1110	30	0	290	5	-	-	5	-	-	-	-	300
	11	8-18	406	45°33'	87°11'	SW.	0810	30	0	600	17	-	-	-	-	-	3	-	620
	11	8-18	407	45°31'	86°56'	NE.	1010	30	0	890	4	-	-	-	1	-	1	4	900
	14	8-16	402	45°23'	87°18'	N.	1050	30	0	170	50	-	-	-	-	-	3	7	230
	16	8-16	401	45°15'	87°25'	NE.	0920	30	0	20	300	-	-	-	1	-	3	6	330
	17	8-16	403	45°26'	87°11'	E.	1250	30	0	100	16	-	-	-	-	-	4	-	120
	20	8-16	404	45°17'	87°15'	SW.	1440	30	0	95	35	-	-	-	-	-	-	-	130
		1963																	
14	12	11- 2	558	45°16'	87°24'	SW.	1440	30	0	480	20	-	-	-	-	-	-	-	500
	19	11- 2	557	45°16'	87°19'	NE.	1330	30	5	160	40	-	-	-	-	-	-	-	200
	20	11- 2	556	45°13'	87°23'	N.	1150	30	5	480	320	-	-	-	-	-	-	-	800
		1964																	
17	5	5-18	774	45°40'	86°44'	S.	0830	30	0	12	1	-	-	3	-	-	-	1	17
	8	5-17	772	45°34'	87°10'	E.	1320	30	0	20	2	-	-	-	1	-	-	1	24
	10	5-18	775	45°42'	86°46'	S.	0940	30	0	55	6	-	-	-	2	-	-	2	65
	11	5-15	754	45°15'	87°24'	NE.	0900	30	0	35	10	-	-	-	5	-	-	-	50
	12	5-17	771	45°38'	87°15'	NE.	1210	22	1	43	2	-	-	-	1	-	-	-	46
	13	5-15	755	45°20'	87°20'	NE.	1010	30	0	50	5	-	-	-	5	-	-	-	60
	13	5-15	756	45°20'	87°11'	W.	1150	30	0	40	9	-	-	-	-	-	-	1	50
	15	5-17	773	45°31'	86°52'	NE.	1300	30	0	33	5	-	-	-	1	-	-	-	39
	17	5-15	758	45°16'	87°06'	N.	1430	30	0	40	15	-	-	-	3	-	-	2	60
	19	5-15	757	45°20'	87°02'	N.	1310	30	0	40	2	-	-	-	2	-	-	2	46
		1964																	
19	10	6-26	818	45°19'	87°11'	E.	1450	30	0	27	21	-	-	-	-	-	-	17	65
	15	6-26	819	45°16'	87°06'	NE.	1550	15	8	40	-	-	-	-	-	-	-	2	42
	20	6-26	820	45°20'	87°02'	N.	1650	30	0	12	-	-	-	-	-	-	-	2	14
		1964																	
21	6	8-30	938	45°49'	86°44'	S.	0910	30	0	10	-	100	85	-	-	5	-	-	200
	7	8-29	937	45°34'	87°10'	E.	1740	30	0	200	10	30	-	-	-	-	-	-	240
	10	8-30	940	45°34'	86°51'	SW.	1150	30	7	100	-	-	-	-	-	-	-	-	100
	11	8-30	939	45°42'	86°46'	S.	1030	30	2	-	-	-	-	-	-	-	-	-	-
	11	8-29	936	45°28'	87°16'	NE.	1630	15	4	300	20	-	-	-	-	-	-	-	320
	12	8-30	941	45°33'	86°52'	SW.	1300	30	1	300	-	-	-	-	-	-	3	2	305
	13	8-29	934	45°21'	87°21'	NE.	1350	30	0	800	100	8	-	-	2	-	-	-	910
	14	8-29	933	45°20'	87°11'	E.	1210	30	0	2,000	-	-	-	-	-	-	1	-	2,001
	18	8-29	935	45°26'	87°12'	E.	1520	30	0	700	100	-	-	-	-	-	-	10	810
	20	8-27	918	45°20'	87°03'	NE.	1520	30	0	95	-	-	-	-	-	-	1	24	120
	20	8-27	919	45°17'	87°06'	N.	1640	30	0	150	100	-	-	-	-	-	2	8	260
	20	8-29	931	45°16'	87°19'	N.	1000	30	0	200	95	1	-	1	-	-	2	1	300
	20	8-29	932	45°16'	87°19'	E.	1100	30	0	200	100	-	-	-	-	-	-	5	305
		1964																	
22	10	10-24	1056	45°34'	87°10'	E.	1100	30	0	50	5	-	-	-	-	-	-	-	55
	12	10-23	1052	45°20'	87°11'	S.	1250	30	0	520	8	-	-	-	-	-	2	-	530
	12	10-24	1057	45°32'	86°54'	S.	1240	30	7	500	-	-	-	-	-	-	10	-	510
	13	10-24	1055	45°20'	87°20'	NE.	0900	30	0	200	190	300	-	-	-	-	10	-	700
	15	10-23	1053	45°18'	87°04'	S.	1350	30	4	-	-	-	-	-	-	-	-	-	-
	20	10-23	1051	45°16'	87°19'	NE.	1140	30	0	130	10	-	-	-	-	-	-	-	140

See footnotes at end of table.

Appendix table 2.--Exploratory fishing log - trawl stations in northern Green Bay--Continued

Cruise No.	Depth	Date	Drag No.	Position Lat. N.	Position Long. W.	Course	Time of day	Fished	Limiting factor 1/	Catch: Alewife	Smelt	Suckers 2/	Carp	Yellow perch	Trout-perch	Spottail shiners	Whitefish	Others 3/	Total
	Fath.	1965						Min.		Pounds									
26	15	6-26	1141	45°15'	87°24'	NE.	0810	30	0	8	2	-	-	-	-	-	-	-	10
	15	6-26	1142	45°28'	87°15'	NE.	1000	30	0	60	5	-	-	-	-	-	-	-	65
	15	6-26	1143	45°20'	87°09'	W.	1140	30	0	260	-	-	-	-	-	-	-	10	270
	20	6-25	1140	45°21'	87°01'	SW.	1620	30	0	5	-	-	-	-	-	-	-	-	5
		1965																	
28	5	8-21	1219	45°53'	86°58'	S.	0740	30	2	600	15	15	-	20	10	10	-	-	670
	6	8-21	1223	45°45'	86°44'	S.	1520	30	0	450	5	-	-	-	-	-	-	5	460
	10	8-21	1221	45°36'	86°53'	E.	1240	30	0	500	10	-	-	-	-	-	10	-	520
	10	8-21	1222	45°40'	86°46'	N.	1400	30	0	800	3	3	-	-	1	-	2	1	810
	11	8-21	1220	45°33'	87°08'	W.	1040	30	2	600	9	4	-	-	-	-	12	5	630
	13	8-20	1216	45°20'	87°20'	NE.	1300	30	2	650	150	10	-	-	-	-	1	1	812
	15	8-20	1214	45°20'	87°09'	W.	1040	30	0	1,100	75	-	-	-	-	-	-	-	1,175
	17	8-20	1215	45°17'	87°17'	NE.	1200	30	0	250	150	3	-	-	-	-	-	2	405
	17	8-20	1217	45°25'	87°12'	E.	1420	30	0	250	150	-	-	1	-	-	-	9	410
	20	8-20	1218	45°20'	87°02'	NE.	1600	30	0	300	130	-	-	-	-	-	-	20	450
		1965																	
30	12	12-16	1259	45°21'	87°20'	NE.	1030	30	7	2	120	4	-	-	1	-	-	6	133
	13	12-16	1258	45°15'	87°25'	NE.	0920	30	7	20	90	1	-	-	1	-	-	21	133
	17	12-16	1260	45°26'	87°12'	E.	1210	30	7	450	60	1	-	-	-	-	-	22	533
	19	12-16	1261	45°20'	87°02'	NE.	1400	30	7	2,000	100	-	-	-	-	-	1	31	2,132

1/ 0 - clear drag, 1 - snag encountered (no gear damage), 2 - gear malfunctian, 3 - minor gear damage, 4 - major gear damage (including loss of net), 5 - wind over 20 m.p.h., 6 - strong current, 7 - adverse weather conditions (including ice, fog, high seas), 8 - rough bottom, 9 - set fishing gear in area.

2/ Include longnose and white suckers.

3/ Include sculpins, chubs, burbot, lake herring, bullhead, creek chub, stickleback, northern pike, freshwater sheepshead, lake trout, yellow pike, and channel catfish.

MS. #1811

GP O 864-434

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF COMMERCIAL FISHERIES
WASHINGTON, D.C. 20240

OFFICIAL BUSINESS

Return this sheet to above address, if you do NOT wish to receive this material ☐, or if change of address is needed ☐ (indicate change including ZIP Code).

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF THE INTERIOR
THIRD CLASS