STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-81-R-6

Study No.: 230695 **Title:** Northern Lake Huron, coolwater fish community assessment.

Period Covered: October 1, 2004 to September 30, 2005

Study Objective: To collect relative abundance, growth rate, and other biological data with which to assess responses of the Les Cheneaux Islands region and the St. Marys River coolwater fish communities to exploitation, management initiatives, and changing environmental and biological conditions.

Summary: The Les Cheneaux Islands gillnet and electrofishing surveys were conducted on schedule. The mean yellow perch (see Table 1 for a complete list of all the common and scientific names of fishes mentioned in this report) gillnet catch per unit of effort (CPUE) increased by a statistically significant amount in October 2004 compared to the previous year. This increase was the first since the trend in declining perch abundance began in 2000 and occurred in all the traditional index netting locations. The increase stems mainly from increased abundance of age-1 and age-2 perch in 2004 that trace to the 2003 and 2002 year classes. It is not clear yet if these increases are due to improved perch production or lower predation rates from declining cormorant numbers or both. Total annual mortality rate of yellow perch remained relatively high at 69% in 2004 and long term trends in total annual mortality rate will be a better indicator of the effects of lower cormorant numbers. Yellow perch continue to grow fast in the Les Cheneaux Islands with amphipods and crayfish dominating the diet in 2004. Exploratory netting just outside the Les Cheneaux archipelago since 2001 collected few yellow perch indicating the declines in the fishery since 2000 were not due to movement out of the Islands region. Comparison netting between August and October survey timings since 2001 detected no appreciable difference in yellow perch CPUE suggesting that August could be a suitable alternative, however, it is concluded that October should remain the standard survey period in the future to ensure full recruitment of perch to the sampling gear and maximum sensitivity of the survey to various extractions (angler and otherwise) during the summer period.

Findings: Jobs 2, 4 and 5 were scheduled for 2004-05, and progress is reported below. Some deferred conclusions from Job 3 are also discussed.

Job 2. Title: Fish community survey of the Les Cheneaux Islands region of Lake Huron.–In 2004, the gillnet surveys collected a total of 1,684 specimens, 685 during the August survey representing 16 species and another 999 during the October survey representing 17 species. In the August portion of the 2005 survey, 1,302 specimens were collected representing 16 species. Survey differences will be discussed more directly in Job 3 of this performance report. Unless otherwise noted, this discussion pertains to the traditional October survey findings. Gillnet sampling in 2005 included the fixed-annual survey stations of Hessel Bay, Muskellunge Bay, and Government Bay. The summer exploratory set for 2005 was in Voight Bay (Figure 1).

The four-year decline in yellow perch CPUE reversed in 2004 with a statistically significant increase in the October Survey CPUE compared to 2003 (T-test; P=0.0300). This increase was evident in all sampled bays including Hessel Bay (Table 2, Figure 2). The increase in yellow

perch catch occurred mainly in ages 1 and 2 (Table 3). These ages stem from the 2003 and 2002 year classes respectively. Percid production occurred at high and often record levels in some locations around the Great Lakes in 2003. It is believed that this was due to ideal spring climate conditions that year and in some locations, declines in alewives. These factors may account for the increase in age-1 fish (2003 year class) in this survey but 2002 was not noted to also be regionally strong yet appears strong in the Les Cheneaux Islands in 2004 (Table 3, Figure 3). The increase in yellow perch abundance appears to be genuine because CPUE rose in all three sample locations throughout the Les Cheneaux Islands and because the increased CPUE was observed again in the 2005 August survey (Table 2). Clerks working the creel survey (Federal Aid Study 427) reported improved yellow perch fishing since October 2004 although analysis of those data is still pending.

Cormorants have been implicated as one factor contributing to the high mortality rate of yellow perch in the Les Cheneaux Islands (Fielder 2004). The cormorant control project implemented in 2004 by U.S. Department of Agriculture's Wildlife Services Unit in Michigan continued in 2005. It is unclear at this time if the increase in yellow perch abundance since October 2004 is a function of decreased cormorant predation or just increased perch recruitment. As expected, the yellow perch population is rebuilding from the youngest ages upward (Table 3). The higher CPUEs of age-1 and age-2 perch might reflect decreased predation losses on those age groups but could also simply reflect increased production those years. More years of data will be necessary before conclusions can be drawn over the benefits of lower cormorant numbers in the area. More direct evidence will be trends in total annual mortality rate over time. The presence of these strong year classes positions the study well to test the benefits of lower cormorant abundance by tracking the fate of these cohorts over time. The total annual mortality rate in 2004 rose slightly over 2003 and remained relatively high overall at 69% (Robson-Chapman method; Van Den Avyle and Haywood 1999; Figure 4).

Despite the increase in yellow perch abundance since October 2004, perch growth remains fast (Table 4) and even increased in 2004 (Figure 5). Yellow perch diet in 2004 was less diverse than 2003 and concentrated almost entirely on amphipods and crayfish (Table 5). Male yellow perch are achieving sexual maturity around 16 cm in total length and female perch at 20 cm (Table 6).

The electrofishing as an index of yellow perch recruitment was conducted in 2004 and 2005 as scheduled (Table 7). The electrofishing should be more representative of true abundances of juvenile perch than the gillnetting. Electrofishing in 2003 did detect a strong age-1 cohort (2002 year class; Table 8), consistent with the increased catch of age-2 perch in the gillnets in 2004 (Table 3). The electrofishing, however, does not indicate a strong 2003 year class at either age-0 in that year or at age-1 in 2004 (Table 8). This is in contrast to the high gillnet CPUE of yearlings in 2004. The exact utility of the electrofishing index of perch recruitment is still not clear and may require more years of data to fully characterize. Analysis of 2005 electrofishing is pending scale aging.

Part of the Les Cheneaux August gillnet survey since 2001 has been to explore the question if yellow perch may be occurring in locations immediately outside the Les Cheneaux Islands archipelago. Thus nets were set outside the islands to determine if declines in the perch fishery could stem from movement of perch or new spatial distribution. Yellow perch CPUE in these exploratory net locations since 2001 have indicated no yellow perch or a lower abundance compared to the traditional index stations within each year (Table 9). We can conclude from this that any declines in perch are not a result of movement or habitation in the vicinity immediately outside the archipelago. The exploratory netting will be discontinued starting next year.

Other species of notable abundance in the 2004 and 2005 gillnet surveys include brown bullhead, rock bass, northern pike, lake herring, sunfish species, and white sucker. Gillnet CPUE of most of these species also increased in 2004. Only alewives and menominee exhibited notable declines in gillnet CPUE since 2003.

Job 3. Title: Comparison netting of the Les Cheneaux Islands region and calculation of correction factors.–Since 2001, gillnetting has been performed in the month of August, in addition to the traditional timing of October, to explore if the survey could be rescheduled to that time period. An August venue would be more conducive to other field scheduling, but it was questioned if August may be better for assessing the abundance of yellow perch in the fish community. Significant differences in yellow perch CPUE would indicate that a transition to August and an eventual discontinuation of October would compromise the long term data series that has always been conducted in October or at least late September.

From Table 10, we see that statistically significant differences in yellow perch CPUE occurred only once in the four years; Government Bay in 2002. The mean perch CPUE has differed substantially between months within locations in some years such as Government Bay in 2001 where the October mean CPUE was 21.0 while the August CPUE was 0.0 (Table 10). Another example is Hessel Bay that differed substantially between months in 2003 and 2004. These differences were not statistically significantly different probably because of the variability that is inherent in gillnet collections and because of the relatively small sample size by station within years (two net sets each). There was no apparent pattern in differences between months within locations and years with August having the higher mean CPUE 56% of the time and October or fall 44% of the time. When compared with locations combined and over all four years, the two means were very close and not significantly different (Table 10).

From this comparison we can conclude that migrating the survey to August is a viable option if still deemed necessary. There is some concern, however, that in some years, perch production may more fully recruit to the gillnet sampling gear in the fall survey. The later survey timing may also allow for the fish community to more fully reflect the effect of the season's fishery extractions and other losses to predators which has become an important assessment element in this survey. There are also some new logistics that make the October survey timing more attractive. Therefore, with CPUEs otherwise equal, it is concluded that the Les Cheneaux Islands survey will continue in the month of October, only, in the future and will discontinue the August gillnet survey. Future improvements to the survey could include added netting effort within the archipelago (more stations) to increase sample sizes and geographic coverage, however this has to be weighed against potential effect on the overall fish community (lethal sampling) and is not recommended at this time.

Job 4. Title: Prepare performance reports.–Performance Report was prepared.

Job 5. Title: Publish report through the Fisheries Division editing and finishing process.–The final report for Job 1 from the 2002 survey is complete and available for download from; http://www.glfc.org/lakecom/lhc/SMR2002rpt.pdf. This study was amended this year to repeat Job 1 (St. Marys River survey) again in August of 2006. Separate final reports will then be prepared for the St. Marys River (Job1) and the Les Cheneaux Islands survey work (other remaining jobs) at the conclusion of this study.

Literature Cited:

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Schneider, J. C., P. W. Laarman, and H. Gowing. 2000. Age and growth methods and state averages. Chapter 9 in J. Schneider, editor. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Van Den Avyle, M. V., and R. S. Hayward. 1999. Dynamics of exploited fish populations. Pages 127–166 in C. C. Kohler and W. A. Hubert, editors. Inland fisheries management in North America, 2nd edition. American Fisheries Society, Bethesda, Maryland.

Prepared by: David Fielder
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Table 1.–Common and scientific names of fishes and other aquatic organisms mentioned in this report.

Common name	Scientific name
Alewife	*Alosa pseudoharengus*
Black crappie	*Pomoxis nigromaculatus*
Bloater	*Coregonus hoyi*
Bowfin	*Amia calva*
Brook trout	*Salvelinus fontinalis*
Brown bullhead	*Ictalurus nebulosus*
Brown trout	*Salmo trutta*
Burbot	*Lota lota*
Carp	*Cyprinus carpio*
Channel catfish	*Ictalurus punctatus*
Chinook salmon	*Oncorhynchus tshawytscha*
Coho salmon	*Oncorhynchus kisutch*
Freshwater drum	*Aplodinotus grunniens*
Gizzard shad	*Dorosoma cepedianum*
Lake herring	*Coregonus artedi*
Lake trout	*Salvelinus namaycush*
Lake whitefish	*Coregonus clupeaformis*
Longnose dace	*Rhinichthys cataractae*
Longnose gar	*Lepisosteus osseus*
Longnose sucker	*Catostomus catostomus*
Menominee	*Prosopium cylindraceum*
Muskellunge	*Esox masquinongy*
Northern pike	*Esox lucius*
Pink salmon	*Oncorhynchus gorbuscha*
Rainbow smelt	*Osmerus mordax*
Rainbow trout	*Oncorhynchus mykiss*
Redhorse spp.	*Moxostoma spp.*
Rock bass	*Ambloplites rupestris*
Round goby	*Neogobius melanostomus*
Sculpin	*Cottus bairdi*
Smallmouth bass	*Micropterus dolomieu*
Splake	*S. fontinalis* x *S. namaycush*
Spottail shiner	*Notropis hudsonius*
Stickleback spp.	*Pungitius* or *Gasterosteus spp.*
Sunfish spp.	*Lepomis spp.*
Trout-perch	*Percopsis omiscomaycus*
Walleye	*Sander vitreus* formally *Stizostedion vitreum*
White perch	*Morone americana*
White sucker	*Catostomus commersonii*
Yellow perch	*Perca flavescens*

Table 2.–Catch per unit of effort and total effort from traditional netting locations in the Les Cheneaux Islands, 1995 through 2005. All data are from October unless otherwise noted.

Species	1995	1996	1997	1998	1999	2000	Aug 2001	2001	Aug 2002	2002	Aug 2003	2003	Aug 2004	2004	Aug 2005
Total effort (in ft. of net)	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Net lifts	3	3	1	3	6	6	6	6	6	6	6	6	6	6	6
Alewife	0.0	1.7	0.0	1.2	0.2	1.2	0.83	0.5	14.5	12.0	9.5	29.2	2.7	5.0	0.7
Black bullhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Black crappie	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bowfin	0.0	2.3	0.3	0.0	0.0	0.2	0.3	0.2	0.0	0.2	0.2	0.0	0.2	0.0	0.3
Brown bullhead	7.2	32.8	2.5	3.2	10.7	6.3	13.7	6.8	103.5	24.5	59.5	38.2	37.5	40.5	94.2
Brown trout	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Burbot	0.0	0.3	0.0	1.0	0.0	0.3	0.3	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.0
Carp	0.0	1.3	0.2	1.0	0.3	0.0	0.0	0.2	0.2	0.2	0.0	0.2	0.0	0.0	0.0
Channel catfish	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Chinook salmon	0.0	0.7	0.2	0.2	0.2	0.3	0.2	0.0	0.5	0.7	0.0	0.5	0.2	0.2	0.0
Coho salmon	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Freshwater drum	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Gizzard shad	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0	0.0	0.3	0.7	0.0	0.0	0.5	0.2
Lake herring	1.3	1.7	0.2	0.3	9.0	0.2	8.3	1.3	4.3	2.8	1.0	8.8	0.7	4.0	0.2
Lake trout	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.8	0.0	0.0	0.0
Lake whitefish	0.0	0.3	0.8	1.0	2.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Largemouth bass	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longnose dace	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Longnose gar	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Longnose sucker	0.0	0.3	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.3
Menominee	0.0	1.0	0.0	0.0	0.0	0.0	0.5	0.8	0.5	1.2	0.3	1.5	2.5	1.3	0.2
Muskellunge	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Northern pike	9.2	15.5	10.0	15.3	16.7	8.2	0.8	4.7	1.8	8.5	1.5	8.3	3.0	4.2	3.3

Table 2.–Continued.

Species	1995	1996	1997	1998	1999	2000	Aug 2001	2001	Aug 2002	2002	Aug 2003	2003	Aug 2004	2004	Aug 2005
Pink salmon	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Rainbow smelt	0.0	0.3	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.3
Rainbow trout	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Redhorse spp.	2.2	0.7	1.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Rock bass	12.8	15.7	10.5	8.2	44.3	11.0	14.3	11.7	15.5	21.5	40.0	3.2	13.5	15.3	15.0
Smallmouth bass	0.2	0.0	0.0	0.3	0.7	0.7	2.2	0.7	1.0	1.0	3.3	0.2	0.2	0.2	4.8
Splake	2.5	1.2	2.3	2.0	0.7	0.2	0.0	0.0	0.0	0.3	0.0	0.5	0.7	0.0	0.0
Spottail shiner	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sunfish spp.	0.0	0.3	0.2	0.0	0.2	3.0	0.3	2.8	0.0	0.0	0.7	0.0	0.2	2.0	3.8
Walleye	0.2	1.0	0.7	1.7	0.5	0.7	0.0	0.2	0.2	0.0	0.2	0.5	0.5	0.3	0.5
White perch	0.0	1.0	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0
White sucker	6.2	9.8	5.2	2.3	13.5	8.3	10.2	8.7	3.5	32.5	34.3	14.0	22.0	27.8	24.2
Yellow perch	41.8	20.2	15.3	36.2	21.2	73.5	52.5	45.8	28.2	28.5	45.5	14.7	22.2	64.5	60.7

Table 3.–Yellow perch catch per unit effort (CPUE) by age from the Les Cheneaux Islands 1998–2004 based on October gillnet catch.

Age	1997	1998	1999	2000	2001	2002	2003	2004
0	–	–	–	–	0.33	0.17	–	–
1	–	0.67	1.30	1.50	20.50	17.00	0.67	40.17
2	1.50	7.67	8.67	28.00	3.83	4.83	3.17	21.00
3	1.83	13.50	7.50	29.67	11.67	5.50	9.33	2.50
4	5.67	5.33	1.50	8.83	6.67	0.67	0.83	0.33
5	2.50	2.67	0.17	3.67	2.17	0.17	–	0.17
6	2.50	2.17	0.83	0.83	0.17	–	–	–
7	1.33	1.33	0.83	0.17	–	–	–	–
8	0.17	1.33	–	0.17	–	–	–	–
9	0.17	0.5	–	0.17	–	–	–	–
10	–	0.33	0.17	–	–	–	–	–
11	–	0.17	–	–	–	–	–	–
Number aged	94	213	126	438	272	170	84	385
Total CPUE	15.67	35.5	21.00	73.00	45.33	28.30	14.17	64.17
Mean age	4.52	3.75	2.88	2.87	2.24	1.65	2.74	1.43

Table 4.–Mean length-at-age (in mm) for yellow perch from Les Cheneaux Islands, 2004 October collection with the state average (Schneider et al. 2000) for comparison.

Age	Mean Length	Number	State average
0	–	–	–
1	152	241	133
2	206	126	165
3	277	15	191
4	–	–	216
5	–	–	240
6	–	–	262
7	–	–	282
8	–	–	295
9	–	–	307

Table 5.–Incidence of void stomachs and percent-abundance of food items found in stomachs of yellow perch in Les Cheneaux Islands region, 2003–2004 (August and October data combined).

Parameter	2002 % Composition	2003 % Composition	2004 % Composition
Void	67	60	30
Non-void	33	40	70
Food item			
Amphipods	–	3.2	58.3
Crayfish	92.7	69.1	39.3
Dipterans	0.4	–	–
Alewives	0.4	0.8	–
Sculpins	–	1.2	–
Sticklebacks	4.5	2.8	–
Mayflies	–	9.7	–
Smelt	–	0.8	–
Johnny darter	–	1.2	–
Zebra mussel	–	0.4	–
Largemouth bass	–	0.4	–
Others	2.0	8.1	2.4
Total	100.0	100.0	100.0

Table 6.–Percentage of yellow perch that were scored as sexually mature in the Les Cheneaux Islands region, 2004 (Aug. & Oct. combined) by length increment.

	Males		Females	
Length (cm)	Total No.	% Mature	Total No.	% Mature
13	10	60.0	5	20.0
14	61	70.5	38	7.9
15	65	76.9	62	16.1
16	13	100.0	34	32.4
17	12	91.7	22	77.3
18	15	86.7	18	83.3
19	8	100.0	13	92.3
20	12	91.7	13	100.0
21	6	100.0	17	100.0
22	2	100.0	18	100.0
23	2	100.0	19	100.0
24	5	100.0	11	100.0
25	–	–	11	100.0
26	–	–	5	100.0
27	–	–	3	100.0
28	–	–	6	100.0
29	–	–	3	100.0
30	–	–	2	100.0
31	–	–	1	100.0

Table 7.–Sample location and effort (in seconds of generator time) yellow perch electrofishing recruitment index in the Les Cheneaux Islands, August 2001–2005.

Location	Year				
	2001	2002	2003	2004	2005
Hessel Bay	1,018	1,800	1,800	1,800	1,800
Muskellunge Bay	1,800	1,800	1,800	1,800	1,800
Government Bay	1,800	1,800	1,800	1,800	1,800
Cedarville Bay	1,800	1,800	1,800	1,800	1,800
Moscoe Channel	1,000	1,800	1,800	1,800	1,800
Mackinac Bay	–	1,800	–	–	–

Table 8.–Catch per unit of effort of yellow perch by age from electrofishing in the Les Cheneaux Islands 2001–2004. One unit of effort equals 30 minutes of generator time. Data for 2005 are pending aging analysis.

	Year and Age							
	2001				2002			
Location	Age-0	Age-1	Age-2	Age-3	Age-0	Age-1	Age-2	Age-3
Hessel	4.0	3.0	6.0	3.0	0.0	2.0	0.0	0.0
Muskellunge	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Government	15.0	11.0	4.0	0.0	0.0	0.0	0.0	0.0
Cedarville	15.0	17.0	6.0	1.0	0.0	3.0	0.0	0.0
Moscoe	74.0	14.0	4.0	0.0	79.0	10.0	0.0	0.0
Mackinac	–	–	–	–	0.0	1.0	0.0	0.0
Mean	21.6	9.0	4.0	0.8	15.8	3.2	0.0	0.0
	2003				2004			
Hessel	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
Muskellunge	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0
Government	1.0	16.0	70.0	1.0	0.0	0.0	0.0	0.0
Cedarville	0.0	5.0	11.0	1.0	0.0	0.0	1.0	3.0
Moscoe	1.0	97.0	11.0	1.0	0.0	1.0	15.0	1.0
Mackinac	–	–	–	–	–	–	–	–
Mean	0.4	23.6	18.4	0.6	0.0	0.2	4.6	1.0

Table 9.–Comparison of yellow perch gillnet catch-per-unit-of-effort (CPUE) between exploratory net set locations and mean of traditional index stations in the Les Cheneaux Islands, August 2001–2005. Two standard errors of the mean in parentheses.

Year	Exploratory net location	Exploratory net mean CPUE	Traditional index location mean CPUE
2001	Middle Entrance	0.0 (0.0)	52.5 (65.2)
2002	Bear Island	0.0 (0.0)	28.2 (35.6)
2003	St. Martins Bay	0.0 (0.0)	45.5 (41.9)
2004	Moscoe Channel	5.5 (11.0)	22.2 (35.4)
2005	Voight Bay	0.0 (0.0)	60.7 (25.3)

Table 10.–Comparison of mean catch per unit effort of yellow perch in gillnets in the Les Cheneaux Islands for 2001–2004. Comparisons are within year between fall (F) sets made in October and summer (S) sets made in August, comparisons by specific sampling location and locations combined. Also tested are years and locations combined. Tests were Independent-samples T-test. Significance was determined at P<0.05.

Location	Difference	P	Means
		2001	
Muskellunge Bay	Not significant	0.22	F=115.5, S=154.5
Hessel Bay	Not significant	0.62	F=1.0, S=3.0
Government Bay	Not significant	0.28	F=21.0, S=0.0
Locations combined	Not significant	0.87	F=45.8, S=52.5
		2002	
Muskellunge Bay	Not significant	0.76	F=68.0, S=84.5
Hessel Bay	Not significant	0.50	F=1.5, S=0.0
Government Bay	Significant	0.04	F=16.0, S=0.0
Locations combined	Not significant	0.99	F=28.5, S=28.2
		2003	
Muskellunge Bay	Not significant	0.40	F=0.0, S=13.0
Hessel Bay	Not significant	0.45	F=26.0, S=93.5
Government Bay	Not significant	0.53	F=30.0, S=16.5
Locations combined	Not significant	0.19	F=14.2, S=45.5
		2004	
Muskellunge Bay	Not significant	0.91	F=55.0, S=62.0
Hessel Bay	Not significant	0.51	F=57.0, S=1.0
Government Bay	Not significant	0.29	F=81.5, S=3.5
Locations combined	Not significant	0.13	F=22.2, S=64.5
		Years combined (2001–2004)	
Locations combined	Not significant	0.94	F=38.2, S=37.1

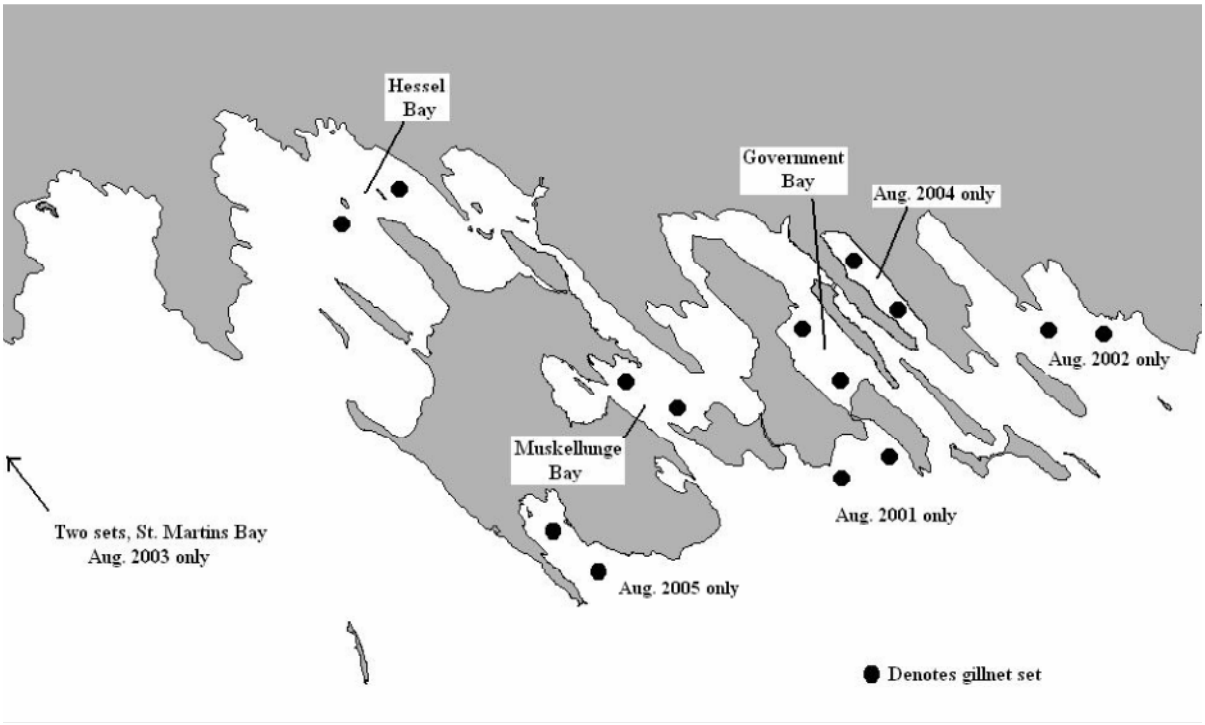

Figure 1.–Gillnet locations in the Les Cheneaux Islands region, set in 2001 through 2005.

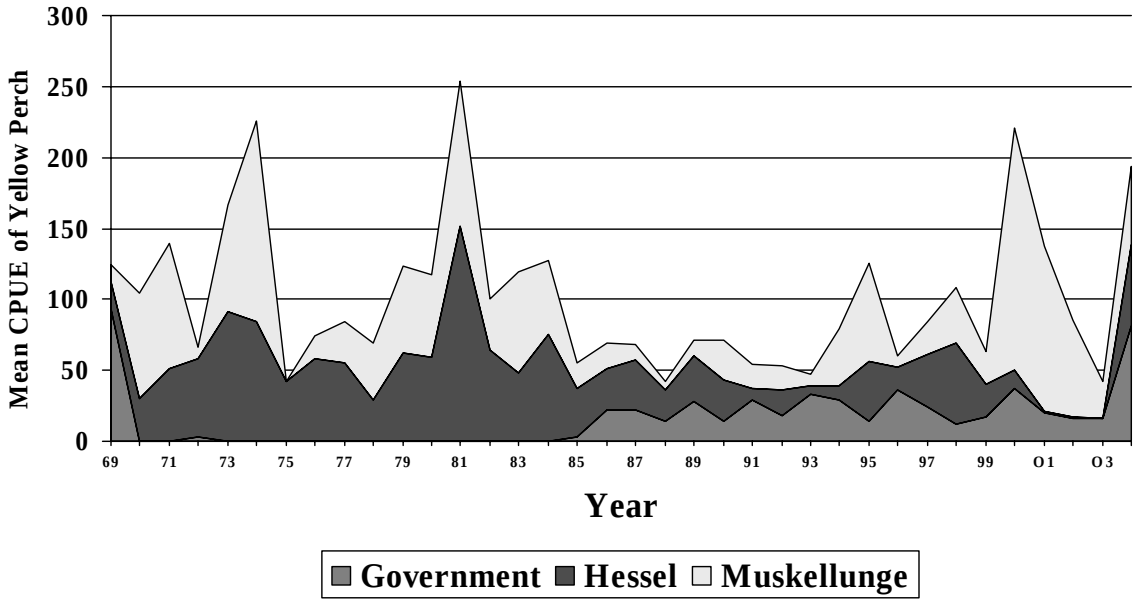

Figure 2.–Mean catch per unit of effort (CPUE) in gillnets of yellow perch in the Les Cheneaux Islands by sampling station 1969–2004 (October data only). Government Bay was not sampled 1970–1984. Muskellunge Bay was not sampled in 1975.

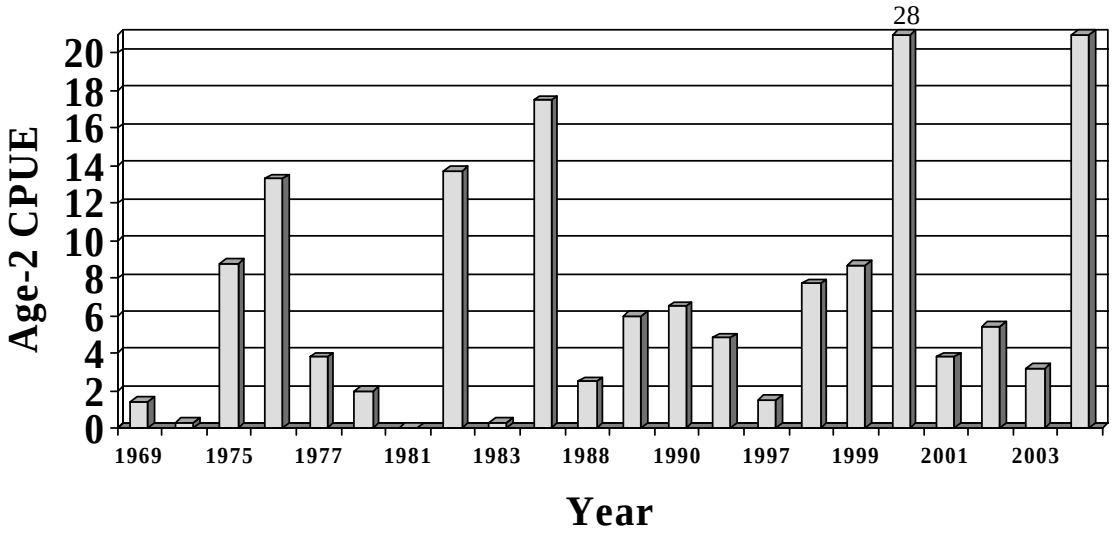

Figure 3.–Catch per unit effort (CPUE) of age-2 yellow perch in gillnets as an indicator of recruitment in the Les Cheneaux Islands 1969 through 2003. All data if from October.

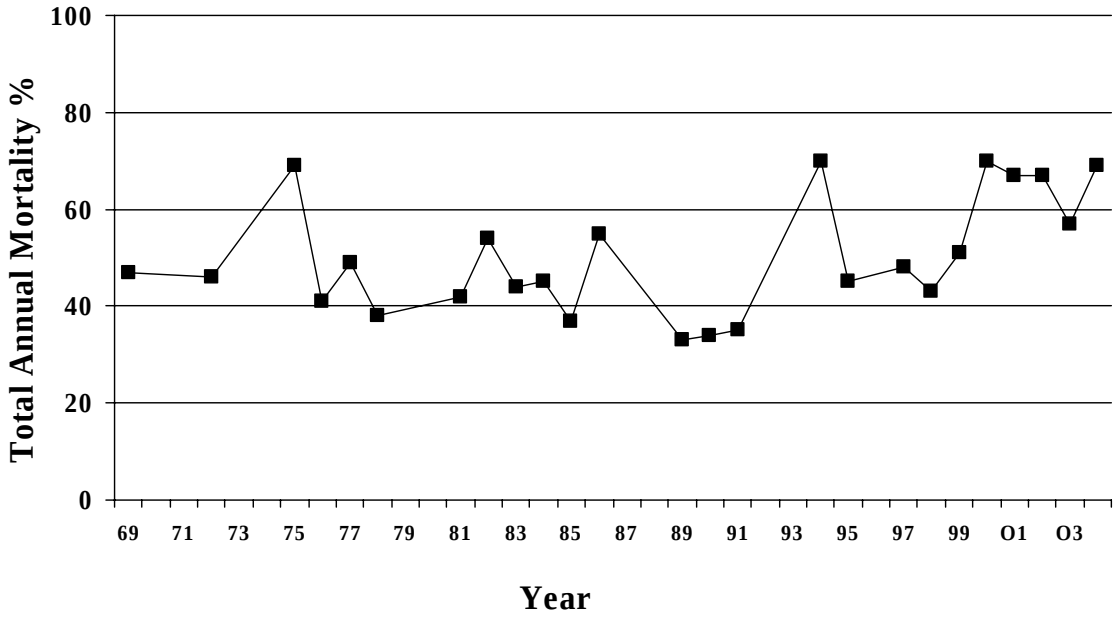

Figure 4.–Total annual mortality of yellow perch in the Les Cheneaux Islands from 1969 through 2004 gillnet catches. Calculated with Robson-Chapman Method.

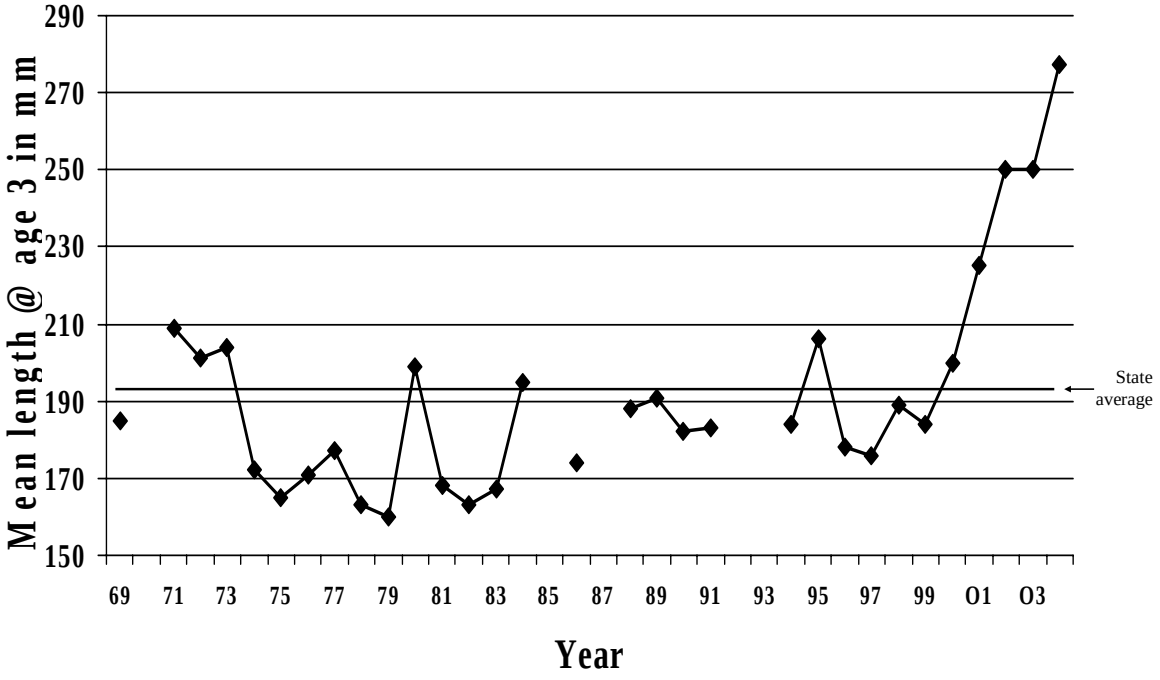

Figure 5.–Mean length at age-3 for yellow perch (sexes combined) for 1969–2004 from the Les Cheneaux Islands October gillnet catch. Michigan state average length at age-3 indicated for reference.