ANNUAL REPORT

GREAT LAKES FISHERY COMMISSION

1971

GREAT LAKES FISHERY COMMISSION

MEMBERS — 1971

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GREAT LAKES FISHERY COMMISSION

Established by Convention between Canada and the United States for the Conservation of Great Lakes Fishery Resources.

ANNUAL REPORT

FOR THE YEAR

1971

1451 Green Road
Ann Arbor, Michigan,
U. S. A.
1973

LETTER OF TRANSMITTAL

In accordance with Article IX of the Convention on Great Lakes Fisheries, I take pleasure in submitting to the Contracting Parties an Annual Report of the activities of the Great Lakes Fishery Commission in 1971.

Respectfully,

E. W. Burridge, *Chairman*

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In Memoriam

Dr. Andrew L. Pritchard
1905-1971

Mr. Norman S. Baldwin
1920-1971

Andy Pritchard was active in the planning for the establishment of the Great Lakes Fishery Commission and became one of the original Commissioners in 1956. Norm Baldwin was appointed as the Commission's first Executive Secretary in 1957. These two men contributed immensely to the framing of the policies and procedures that made the Commission's program outstandingly successful.

Though different in their approach to their work, Andy Pritchard and Norm Baldwin complemented each other most effectively. Andy was outspoken—he talked freely and discussed matters in detail—but what he had to say merited attention. With his Irish wit, Andy also could fire barbs which delighted us all. Norm was quiet, continually alert, and superb in the evaluation of the flood of suggestions and requests, with which he was deluged. When Norm spoke he went directly to the point and framed his remarks in studied good taste.

Now both of them are gone. Vacancies can be filled, but the spice and charm of personality are lost forever. We who knew and loved Andy Pritchard and Norm Baldwin must find solace in cherished memories.

ANNUAL REPORT FOR 1971

INTRODUCTION

The need for international cooperation in the conservation of fishery resources in the Great Lakes was officially recognized as early as 1893. Since that time, several temporary boards and commissions were established by the United States and Canada to advise governments on measures to conserve the fisheries. The measures proposed, however, were mainly restrictive and failed to gain the unanimous support required for implementation. In 1940, the United States and Canada established an International Board of Inquiry for the Great Lakes Fishery which, after surveying conditions, recommended that the fishery should be investigated by an international agency which would be responsible for formulating and testing measures to improve production. Attempts to establish such a body were delayed by World War II. In 1946, a convention was drafted, but never ratified because of vigorous opposition to a provision that granted authority to a commission to regulate the fisheries. However, intensifying problems of conservation, particularly the severe depredations by the sea lamprey, led to a review and modification of early treaty drafts and finally to the ratification of the present Convention on Great Lakes Fisheries in 1955.

The Convention provided for the establishment of the Great Lakes Fishery Commission which was given the responsibilities of formulating and coordinating fishery research programs, advising governments on measures to improve the fisheries, and implementing a program to control the sea lamprey. The Commission relies on existing agencies to carry out the research it proposes and to implement the measures it recommends. Technical committees have been established on each lake to develop and coordinate local research and management while central committees advise the Commission on matters affecting the fishery as a whole. Control of the sea lamprey, a direct responsibility of the Commission, is carried out under contract with federal agencies in each country.

The rather involved committee organization for carrying out the Commission's responsibilities is largely the result of the divided jurisdiction of the Great Lakes fishery. In a very real sense the Commission is not dealing simply with two countries but with 8 states and the Province of Ontario whose sociological and economic interests are not always the same. It is essential that each jurisdiction participate at every stage of planning and the committees serve this purpose. Thus, the Commission focuses its attention on developing fish stocks for a variety of uses. In some areas the sport fishery is the primary consideration while in others it is the

commercial fishery. In many areas a judicious mixture of both uses of the resource will provide the greatest sociologic and economic benefit.

Since the entry of sea lamprey into the upper Great Lakes in the 1920's, and the tremendous population explosion by the alewives in the 1960's, the most noticeable feature of the Great Lakes fisheries is their instability and rapid change. During the last 30 years, lake trout were virtually eliminated by the sea lamprey except in Lake Superior where remnant populations remained. Stocks of whitefish were also severely damaged. Several species of large deep-water ciscoes have become virtually extinct. Lake herring and whitefish have almost vanished from Lake Erie, and herring populations in Lakes Michigan and Huron no longer contribute significantly to the commercial catch. The lake herring population in Lake Superior has declined severely. The situation with chubs is comparable. The blue pike in Lake Erie has, for all practical purposes, disappeared. Walleye populations in Lakes Michigan and Huron have declined to only an incidental part of the commercial fishery.

Despite the obvious deterioration of the resource over the past two or three decades, much cause for optimism remains. The sea lamprey control program has demonstrated its worth. Restoration efforts with lake trout, Pacific salmon, and other salmonids have been outstandingly successful to date. The establishment and expansion of the most dramatic sport fishery in the history of the Great Lakes is of tremendous importance. Environmental deterioration is not yet severe enough to preclude the recovery of stocks. The resiliency of the resource, as shown by the frequent appearance of strong year classes of most species in various parts of the basin, suggests that with wise management the present fishery resource can be enhanced and maintained for future users.

The Commission held its Annual Meeting in Toronto, Ontario, June 23-25, 1971 and its Interim Meeting in Ann Arbor, Michigan, December 1-2, 1971. The proceedings of these meetings are summarized in the report while the information presented at both are brought together in five appendices.

ANNUAL MEETING

PROCEEDINGS

The sixteenth Annual Meeting of the Great Lakes Fishery Commission was held in Toronto, Ontario on June 23-25, 1971.

The Honourable Rene Brunelle, Minister of the Ontario Department of Lands and Forests welcomed the Commission and its adivsors to Toronto and reviewed some of the fishery policies of the Department of Lands and Forests. He stressed the importance of the sea lamprey control and fishery rehabilitation programs being carried forward by the Commission and other fishery agencies on the Great Lakes.

The Commission called attention to the death of Mr. Norman S. Baldwin on March 9, 1971, and paid tribute to his outstanding contributions.

The Chairman drew attention to the many serious problems confronting those charged with responsibility for the Great Lakes fishery resource. Recent problems associated with exotic contaminants such as pesticides, PCB's, and mercury have awakened public concern over ecological deterioration in the aquatic environment. The support of an aroused and concerned public can contribute greatly to the Commission's program.

When the Commission assumed its duties in the mid-1950's, major efforts were devoted to sea lamprey control and research and lake trout restoration. It was recognized that many other problems were present, and that others would arise, but sea lamprey control and lake trout restoration had highest priority. The latter programs have become operational and in recent years the Commission has been able to devote increasing attention to other problems. Areas of concern include the drastic changes in the species composition of the entire resource base, apparent declines in the abundance of some of the most favored species, and problems associated with exotic contaminants. It has been repeatedly stressed that Commission action must be based on research findings, and that any Commission recommendations pertaining to the resource must have sound biological justification. The close cooperation of all agencies in the conduct of research to accompany management programs was therefore, essential in developing an understanding of some of these difficult problems.

Justifiably proud of the degree of lamprey control achieved by its agents, the Commission nevertheless recognizes that problem areas remain. The extension of the sea lamprey control program to Lake Ontario and the completion of the first round of treatments on Lake Huron represent significant progress. While control of the sea lamprey is essential to restoration and rehabilitation efforts, the Commission and its agents have

begun to direct increased attention to an integrated control program which might include permanent lamprey barriers and biological controls. The response of planted and residual native fish stocks to the present degree of lamprey control and the development of an outstanding recreational fishery has been most gratifying. Nevertheless, the establishment of a self-perpetuating population of lake trout had been discouragingly slow.

The continued registration of TFM for use as a lampricide was still dependent upon fulfillment of research designed to provide data on residues in water, fish, and food stuffs. The preliminary research initiated in late 1970 would, therefore, be expanded and refined in 1972, assuming that the requested funds would be made available by the two governments.

Management and research.[1] The Commission accepted each of its Lake Committee reports (Michigan, Superior, Huron, Erie, Ontario). Problems of most immediate concern included: (1) Increased lamprey activity and the apparent biological response exhibited by the residual lamprey population, (2) the slow development of self-perpetuating populations of lake trout, (3) the development of plans for increased hatchery facilities within the basin, (4) the effects of contaminants on water quality and fish, (5) the instability of fish populations and decline of some valuable species (herring, chubs, yellow perch), (6) the need for obtaining reliable catch statistics and biological data on the sport and commercial fisheries, and (7) the need to evaluate the status of the recently introduced Pacific salmon and their effects on the ecosystem.

Sea Lamprey Control and research. The Commission accepted the reports of its two agents on their sea lamprey control operations in 1971.[2] The Commission adopted a revised sea lamprey control and research budget for fiscal year 1972 calling for expenditure of $2,571,800. The revised program calls for the following activities in fiscal year 1972:

Lake Superior–Retreat 29 streams (24 in the United States and 5 in Canada). Continue, at the reduced level of recent years, surveys to assess reestablished larval populations and to detect new populations. Operate 8 assessment barriers.
Lake Michigan–Retreat 21 streams. Continue surveys to the degree funds will permit.
Lake Huron–Retreat 18 streams (9 in the United States and 9 in Canada). Construct a lamprey-proof dam on the Echo River to prevent infestation of an inland lake (Solar Lake). Continue surveys to the extent funds will permit. Operate 8 assessment barriers.
Lake Ontario–Treat 23 lamprey-producing streams on the Canadian side of the lake.
Research–Continue research into the biological response of sea lampreys to control measures--including studies on reinfestation of streams, changes in growth rates and the continuing investigation of the "known-age" population in the Big Garlic River. At Hammond Bay, continue research directed towards the development of more effective chemicals for treatment of lentic habitats, and continue the testing of chemicals for use as irritants in survey work. Continue research directed towards biological control, including inhibition of metamorphosis, chemical sterilants, non-parasitic hybrids, and pathogens. Initiate and implement research required to establish tolerance levels for TFM in water, fish, and food stuffs.

[1] General information on the status of stocks, and problems associated with management and research is presented in Appendix A.

[2] Final reports covering sea lamprey control and research in the United States and Canada in 1971 appear as Appendices C and D.

The Commission also adopted a proposed budget for sea lamprey control and research for fiscal year 1973 of $2,631,100. The proposed program covers the following activities:

Lake Superior–Treat 15 streams (9 in the United States and 6 in Canada). Intensification of the survey program including provision for development and testing of treatment methods for lentic habitats. Continue the operation of 8 assessment barriers.
Lake Michigan–Treat 12 streams and intensify survey programs and the treatment of lentic areas.
Lake Huron–Treat 16 streams (10 in Canada and 6 in the United States). Intensify survey program, and treat lentic areas. Operate 8 assessment barriers.
Lake Ontario–Treat 20-21 lamprey-producing streams on the United States side.
Research–Continue investigations of biological attributes of populations of larval sea lampreys. Expand and intensify field research to develop improved methods for surveying and treating lentic habitats. At Hammond Bay, continue and expand investigations toward the development of improved irritants and/or chemicals for treatment of deep-water habitants. Under the direction of the La Crosse Laboratory the research into the degradation and tolerance limits of TFM will be continued as required by the EPA.

Finance and Administration. The Commission approved budgets of $76,900 and $73,000 as recommended by the Finance and Administration Committee for Administration and General Research for fiscal years 1972 and 1973, respectively.

Adjournment. The 1971 Annual Meeting adjourned at 12:30 p.m. on June 25.

INTERIM MEETING

PROCEEDINGS

The Commission held its Interim Meeting in Ann Arbor, Michigan on December 1-2, 1971. Matters considered included the collection of catch statistics from the commercial and sport fisheries, contaminants and water quality in the Great Lakes, and progress of sea lamprey control and research.

Collection of catch statistics. The Great Lakes Fishery Laboratory (Bureau of Sport Fisheries and Wildlife) reported that it was cooperating with the states in the development of improved and standardized reporting of commercial catch statistics. The Commission reviewed the two methods used to obtain statistics on the sport catch–post card surveys and direct creel census. The former appears applicable where the fishery has a wide geographic distribution and the latter where the fishery is more confined. Recognizing the obvious pitfalls inherent in obtaining useful statistics on an activity so diverse as the sport fishery, the Province of Ontario volunteered to function in a coordinating role in refining a methodology for the collection of statistics on the sport catch in the Great Lakes. The need for biological data to supplement and complement the yield statistics would be emphasized.

Pesticides and other contaminants. Agencies responsible for monitoring the levels of environmental contaminants (pesticides, heavy metals, PCB's) in fish and water reported on recent observations and explained how these problems affected fisheries management. The serious consequences to the fishery of water quality deterioration in the Great Lakes were clear. The Scientific Advisory Committee was requested to draft for Commission consideration an appropriate recommendation for transmittal to appropriate agencies of both governments.

Sea lamprey control and research. Reports on the progress of sea lamprey control operations in 1971 were presented by the Commission's agents (Appendices C and D). Reports on lake trout wounding rates in Lakes Superior and Michigan, presented by the Bureau of Sport Fisheries and Wildlife, and the States of Wisconsin and Michigan indicated that lamprey abundance was somewhat higher in 1971 than in 1970.

Reports from the United States and Canadian Lamprey Barrier Dam Task Forces were submitted. The Commission accepted the recommendation calling for the development of an inventory of lamprey-producing streams categorized according to productivity, control costs, feasibility of

barriers. . .etc. The Commission also agreed that problems pertaining to funding, ownership, maintenance, and liability of lamprey barrier dams in both countries would have to be explored in depth.

The Commission reviewed the Sea Lamprey Control and Research Program and Budget for fiscal years 1972 and 1973. The program for fiscal year 1972 called for extension of the lamprey control program to the United States side of Lake Ontario, intensification of control and survey operations on the upper lakes, and continuation of registration-oriented research on TFM. Funds budgeted for the program were as follows:

	United States	*Canada*	*Total*
Sea Lamprey Control and Research	$1,774,550	$797,250	$2,571,800
Administration and General Research	38,450	38,450	76,900
Total	$1,813,000	$835,700	$2,648,700

The program for fiscal year 1973 called for further expansion of lamprey control and survey activities to reestablish control to an efficient level; and continuation of the research programs initiated in fiscal year 1972 which included registration-oriented lampricide research, integrated lamprey control, and biological control. Funds budgeted for the fiscal year 1973 program were as follows:

	United States	*Canada*	*Total*
Sea Lamprey Control and Research	$1,815,450	$815,650	$2,631,100
Administration and General Research	37,750	37,750	75,500
Total	$1,853,200	$853,400	$2,706,600

Symposium on Salmonid Communities in Oligotrophic Lakes

The Commission heard reports on the successful results of the international symposium on Salmonid Communities in Oligotrophic Lakes (SCOL) which was held in Geneva Park, Ontario in July, 1971. Seven lake case history papers–Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Lake Ontario, Lake Opeongo, and Lake Kootenay–would be published in the Commission's Technical Report series. Concise versions of these papers together with other lake case histories developed for SCOL will be published in a special issue of the Journal of the Fisheries Research Board of Canada.

APPENDIX A

SUMMARY OF MANAGEMENT AND RESEARCH

The general condition of the fisheries resource on the Great Lakes basin and the programs being pursued to improve and maintain this resource were described in the Annual Report for 1970. This report will stress areas of major concern, recent developments, and steps being taken to solve or alleviate some of the problems.

Water quality and contaminants

The Great Lakes Fishery Commission does not have direct responsibility for maintenance or enhancement of water quality in the Great Lakes basin. Nevertheless, the Commission recognizes the vital necessity of maintaining the highest possible water quality. Furthermore, the Commission believes that the interests of all water users, recreational, agricultural, municipal, and industrial will be served best in the long run if the welfare of the fishery resource receives high priority in the establishing of water quality standards.

In a continuing effort to encourage the establishment of water quality standards that incorporate fisheries as well as other interests, the Commission is endeavoring to develop closer liaison with those agencies and/or commissions charged with developing and enforcing state, national, and international water quality standards. With the support and encouragement of cooperating agencies, the Commission will seek to open lines of communication with such bodies as the International Joint Commission, the Environmental Protection Agency, and the various water resource and pollution commissions.

Within the past five years the problems associated with the presence of certain contaminants such as pesticides, PCB's, and heavy metals have intensified. As a result of biological multiplication, residues in fish flesh often exceed tolerance levels established by the FDA for commerce. Consequently, certain fisheries have been closed because the fish cannot be marketed. In addition, the various agencies have been obliged to mount extensive and costly monitoring programs to learn what portions of the fishery or what species may safely enter market channels, and also to get information on the distribution of the contaminants.

The problems that result from the presence of these exotic contaminants have prompted extensive discussion by the Commission and cooperating agencies; however, it is difficult for the Commission to take concrete action beyond providing responsible agencies with a clear and unequivocal position statement.

In October of 1971, the Department of Natural Resources of the State of Michigan presented a statement to the Conservation and Recreation Committee of the Michigan legislature which clearly outlined the resource management implications of PCB's and other environmental contaminants in Great Lakes fish. In essence, the statement emphasized the need for controlling the contaminants at the source, rather than the present procedure whereby fishery products are removed from market channels when residues exceed allowable levels. At its Interim Meeting in December, 1971, the Commission, with the endorsement of all agencies in attendance, strongly supported Michigan's action.

Sea Lamprey Control

Despite encouraging results to date, the lamprey control program is not without problems.

In 1970, the Commission was advised by the Department of Agriculture that the United States registration of TFM would be cancelled on December 31, 1970. The Commission at once petitioned for and received an extension. Approval hinged on the Commission's ability to support the research that would yield data to establish residue and tolerance limits for TFM in water, fish, and food or food stuffs. The possible cancellation of TFM registration made it absolutely mandatory that registration-oriented research be initiated at once. Initial research plans were developed in late 1970, and in 1971 a preliminary research program was developed and implemented primarily through the Fish Control Laboratory at La Crosse and the Hammond Bay Laboratory. Results through 1971 have been encouraging. Tests of other lampricides that may be useful in the control program are continuing, and it is assumed that when and if new chemicals are incorporated into the program they will be subject to rigorous testing before use.

Although inclusion of Lake Ontario in the sea lamprey control program in 1971 was a significant step forward, financial support has not kept pace with the expansion of the program. Consequently, the Commission and its agents have been obliged to establish priorities rather than carry out an optimally planned program. Survey and assessment efforts had to be curtailed, and some scheduled lampricide treatments had to be deferred.

At this time (1971), the lamprey control program appears to be entering a new phase in its development. The Commission and its agents believe that the effectiveness of the control program can be increased through the development of a fully integrated program that will incorporate all possible means of control. Alternative and complementary control methods under consideration include the judicious use of permanent barriers, intensification of surveys and treatments in problem areas, and biological control. The closely related programs of registration-oriented research, research into sea lamprey biology, and testing of chemicals are continuing.

Details on the lamprey control program in the United States and Canada may be found in Appendices C and D.

Rehabilitation and preservation of the fishery resource

Although serious problems remain, the lamprey control program in Lakes Superior, Michigan, and Huron has been effective, and it is expected that the benefits of the control program will be evident soon on Lake Ontario. Reudction of the sea lamprey population in the upper lakes has enabled the Commission and the various cooperating agencies to devote increasing effort to the restoration, maintenance, and preservation of the fisheries resource.

Lake trout

Since the rehabilitation program began in 1958, nearly 44 million lake trout have been planted in Lakes Superior and Michigan. Details on plantings are shown in Appendix B. The survival and growth of planted lake trout have been excellent, and a progressive increase in the abundance of the lake trout has resulted. Quantitative measurements from Lake Superior where over 30 million fish have been planted show the trend (Table 1). Biologists and commercial fishermen have reported that lake trout in Lake Superior are now as abundant as at any time within the past 40-50 years. In Lake Michigan, the planting program was initiated in 1965 and nearly 14 million lake trout have been planted to date. As in Lake Superior, abundance has risen steadily.

The primary objective of the lake trout rehabilitation program is the reestablishment of self-sustaining lake trout stocks. Since the early 1960's, planted lake trout have made up the bulk of the lake trout population in Lake Superior. In Lake Michigan, lake trout were virtually absent until 1965 when the planting program was initiated.[1] No naturally-spawned (unmarked)

Table 1. Numbers of marketable trout caught per 10,000 feet of large-mesh gillnet lifted during the spring, Lake Superior, 1962-1971.

Year	Michigan	Wisconsin	Minnesota	Ontario	Average (unweighted)
1962	39	77	43	34	48
1963	46	81	58	32	54
1964	43	11	68	56	70
1965	55	134	50	59	75
1966	75	150	22	99	87
1967	116	181	46	111	113
1968	245	–	32	76	114
1969	249	187	34	90	140
1970	354	368	78	105[1]	226
1971	505	326	39	...	290

[1]Data for Ontario omitted because of a change in conditions which affected sampling. Abundance of marketable trout was not markedly different from 1970.

[1]In Lake Huron, selected splake rather than lake trout are being used in the restoration effort. This program is in its initial phase.

juvenile lake trout appeared in samples, and mortality of large lake trout (the most productive spawners) was high.

Developments in 1971, and to a lesser extent in 1970, however, allow for guarded optimism. Samples from certain areas of Lake Superior, especially in Wisconsin waters, contain increasing numbers of naturally-produced juvenile lake trout. Also, abundance of large lake trout (potential spawners) have shown an upward trend, especially in the Michigan waters of the lake. In Lake Michigan, wild lake trout have not been observed in samples. However, the abundance of mature lake trout in sample catches has increased markedly since about 1970, and considerable spawning occurred in 1970 and 1971. Eggs taken from mature lake trout of hatchery origin in Lakes Superior and Michigan have given satisfactory results at state fish hatcheries; consequently there are no known reasons that the planted lake trout should not reproduce in Lakes Superior and Michigan. Hopefully, naturally-produced lake trout will make a substantial showing in sample catches in the near future.

Since about 1962, the commercial fishery has been closed (U.S. waters) or held to quotas sufficient only to provide adequate samples for assessment (Canadian waters). At the same time, the lake trout sport fishery, especially in U.S. waters, has grown tremendously in terms of effort and yield. Difficult and complex problems on the management, use, and allocation of this valuable lake trout resource must be faced by responsible agencies. It would be unfortunate indeed if the tremendous cooperative effort to date were to be nullified through mismanagement.

Pacific salmon and trout

To complement the lake trout restoration effort, state and provincial agencies since 1965 have been making massive plantings of other salmonids. These plantings are summarized in Appendix B.[2] The objectives of these plantings are: (1) to establish a multi-species complex in the Great Lakes basin to replace that which was severely damaged and/or disrupted through the cumulative effects of environmental change, man's activities, the sea lamprey, the alewife, the selective and exploitative commercial fishery, and probably other factors; (2) to utilize the forage base and to control alewives, especially in Lake Michigan; and (3) to encourage the development of an extensive sport fishery on the Great Lakes, especially in U.S. waters. To date, the planting program has been successful, especially in the upper lakes. Stated objectives are being met or approached. From the early 1950's to the mid 1960's, large predators (salmonids) had almost vanished from the three upper lakes; these lakes now support substantial populations of lake trout, Pacific salmon, and steelhead trout. Alewife populations seem to have leveled off and summer dieoffs have not been a serious problem since the massive one in 1967. The magnitude of the developing sport fishery is illustrated by catch and effort estimates in the Michigan waters of the three upper lakes and adjacent

[2]Appendix B does not include plantings of rainbow (steelhead) trout, brown trout, and brook trout that have been made in the Great Lakes proper and in adjacent tributary waters with ready access to the Great Lakes.

tributaries in 1971. Estimated catch of salmonids in 4.8 million angler-days was as follows: coho salmon–739,140; lake trout–457,500; chinook salmon–303,580; steelhead (rainbow) trout–576,600; and brown trout–221,880.

Although efforts to restore and maintain the fishery on the Great Lakes, through massive plantings of salmonids, have been generally successful, numerous problems remain and others will certainly arise. Kokanee have been only moderately successful. Pacific salmon have not done as well in Lake Superior as in Lakes Michigan and Huron. In Lake Erie, salmonid plantings have not yet provided a significant fishery. Existing hatcheries can provide only a certain amount of fish for planting. Thus, to obtain maximum benefit from the output of the hatcheries, managers must determine what population structure (species complex) will be best for all users. The sport fishery cannot expand indefinitely, and yet maintain its present quality. Rehabilitation efforts are just beginning in Lake Huron and have not started in Lake Ontario. In addition, the massive plantings of salmonids may exert too much pressure on the forage base. Other problems certainly exist, but the above illustrate some of those that must be faced.

Native stocks

For about 25 years, the fishery resources of the Great Lakes have been characterized by instability. Change is to be expected, but in recent years change has been accelerated by environmental deterioration, the sea lamprey, the alewife, exotic contaminants, the cumulative effects of an exploitative and selective fishery, and other factors.

Perhaps the most difficult task faced by the Commission and all cooperating agencies is the development of an effective and unified approach to the many problems that arise because of ever changing conditions. Current, accurate, and detailed information on stocks is essential, and therein lies the only hope for a rational management program.

Certain fish stocks and certain species have been decimated or have disappeared within the past few decades.[3] At this point in time it appears that some must be written off, at least for the foreseeable future (e.g., sturgeon, blue pike, and coregonids in Lake Erie). These species have been lost through a combination of circumstances. Other stocks and/or species appear to be on the road to depletion unless prompt and effective remedial action is taken. Species of most immediate concern include, herring, chubs, perch, and walleyes.

To the present time it has been extremely difficult for the various jurisdictional agencies to agree on what steps should be taken to protect, conserve, and enhance these stocks, primarily because of differences in policy. Furthermore, the various states and Ontario reserve the right to manage the resource within their territorial waters. The various lake committees provide a forum for the resolution of these difficult problems. The Commission assists with liaison between agencies and encourages the development of resource

[3]Lake Ontario does not support a viable fishery and has not for many years. Rehabilitation through lamprey control and an intensive stocking program has just been initiated, and even preliminary results are not yet at hand.

oriented management programs, based upon sound biological considerations. The Commission, however, cannot assume responsibility for resolving differences between agencies who have jurisdiction, nor can it prevent unilateral action by any agency. For the present then, it appears that compatible programs for the management and preservation of the fisheries resource must be developed through negotiation and discussion between agencies with the Commission providing coordination and documentation.

Commercial fisheries

In recent years many factors have combined to jeopardize the traditional commercial fishery on the Great Lakes, particularly in U.S. waters. The most obvious problem lies in the deterioration of the resource base. Secondly, in United States waters the recreational fishery has assumed a dominant position which tends to place the commercial fishery in an adversary position. Very probably, with the passage of time, the commercial fishery will be more closely regulated than at present. Regulations will almost certainly include restrictions on the amount of fish to be harvested (quotas) and limitations on entry into the fishery. Regulations, and the means whereby they are established, are largely the responsibility of the agencies having jurisdiction, but the Commission's lake committees provide a forum wherein regulations can be developed in concert between agencies, and also to assure that the welfare of the entire resource remains the basic consideration.

Despite numerous problems facing it, the commercial fishery on the Great Lakes remains an important activity throughout the basin, and continues to furnish fish for the consumer market. The commercial catch for the years 1969, 1970, and 1971 is summarized in Tables 2, 3, and 4.

Table 2. Commercial catch (1,000's of pounds) Great Lakes, 1969-1971.

Species	1969	1970	1971
Yellow perch	35,325	25,512	19,196
Alewife	29,248	33,461	29,654
Smelt	18,840	13,126	17,131
Chubs	10,407	11,161	8,260
Carp	7,341	7,144	7,830
Lake herring	4,744	4,221	3,817
Whitefish	3,465	3,585	4,971
Sheepshead	2,504	1,060	951
White bass	2,103	1,318	1,110
Suckers	1,437	1,535	1,949
Salmon	1,144	2,243	47
Catfish	1,005	855	1,143
subtotal	117,563 (95 percent)	105,221 (94 percent)	96,059 (95 percent)
Other species	5,971[1]	6,234[1]	4,871[1]
Total	123,500	111,455	100,930

[1]Includes species sold as animal food.

Table 3. Commercial catch (1,000's of pounds) United States and Canadian waters, Great Lakes, 1969-1971.

Lake	1969	1970	1971
Superior	8,190	8,391	9,549
Michigan	47,489	53,091	44,680
Huron	5,226	4,536	5,572
St. Clair	920	87	–
Erie	59,077	41,302	37,918
Ontario	2,566	3,238	3,211
Total	123,468	110,645	100,930

Table 4. Commercial catch (1,000's of dollars) Great Lakes, 1969-1971.

Species	1969	1970	1971
Yellow perch	5,793	4,180	5,044
Alewife	322	381	305
Smelt	772	533	726
Chubs	1,821	1,957	1,676
Carp	396	385	400
Lake herring	451	402	417
Whitefish	1,895	1,960	2,431
Sheepshead	125	53	62
White bass	517	324	260
Suckers	47	51	61
Salmon	160	315	23
Catfish	412	338	420
Subtotal	12,227 (93 percent)	10,879 (93 percent)	11,825 (94 percent)
Other species	807[1]	344[1]	758[1]
Total	13,102	11,729	12,563

[1]Includes species sold as animal food.

Sport Fisheries

Reference has already been made to the magnitude and significance of the expanding recreational fishery in the Great Lakes, especially in United States waters.

The social, economic, and biological complexity of the sport fishery makes rational management extremely difficult. Several problems are of major concern. A sound statistical base for the recreational fishery (comparable to that for the commercial fishery) has not yet been developed. Second, the biological characteristics of the catch are poorly understood.

Fisheries agencies on the Great Lakes are endeavoring, with the encouragement of the Commission, to develop methods to assess the sport fishery in terms of yield, effort, and biological characteristics. It is hoped that these assessment efforts will provide a clearer understanding of the sport fishery itself, and its effects on the resource for both long and short term management.

APPENDIX B

SUMMARY OF LAKE TROUT AND SALMON PLANTINGS

Intensive annual plantings of hatchery-reared salmonids continue to be the principal method employed to rehabilitate the Great Lakes fisheries.

Lake trout have been planted annually in Lake Superior since 1958 and in Lake Michigan since 1965. The plantings have been carried out cooperatively by the Bureau of Sport Fisheries and Wildlife, the states of Michigan, Wisconsin, and Minnesota, and the Province of Ontario. Lake trout eggs are obtained from brood fish in hatcheries or from mature lake trout from inland lakes. Nearly all trout are reared to yearlings and planted during the spring and summer. In the fall of 1971, however, a modification in the stocking program was tested in Lake Michigan. Survival and growth of regular size fall fingerlings (approximately 80/pound) was compared with fingerlings whose growth had been accelerated to yearling size (about 30/pound) through diet and the use of heated rearing water. If the fall plants of accelerated growth fish proved to be successful, the U.S. Federal hatchery production could be increased substantially at a minimum cost. Tables 1 and 2 summarize annual plantings of lake trout in Lake Superior and Lake Michigan, and Tables 3 and 4 detail the 1971 plantings in Lake Superior and Lake Michigan, respectively.

Plantings of highly selected splake (brook trout–lake trout) hybrids in Lake Huron were initiated in Ontario waters in 1969 and in Michigan waters

Table 1. Plantings (in thousands) of lake trout in Lake Superior, 1958-1971.

Year	Michigan	Wisconsin	Minnesota	Ontario	Total
1958	298	184	–	505	987
1959	44	151	–	473	667
1960	393	211	–	446	1,050
1961	392	314	–	554	1,260
1962	775	493	77	508	1,853
1963	1,348	311	175	477	2,311
1964	1,196	743	220	472	2,632
1965	780	448	251	468	1,947
1966	2,218	352	259	450	3,279
1967	2,059	349	382	500	3,290
1968	2,260	239	377	500	3,376
1969	1,860	251	216	500	2,828
1970	1,944	204	226	500	2,874
1971	1,055	207	280	475	2,017
Total	16,622	4,457	2,463	6,828	30,371

Table 2. Plantings (in thousands) of lake trout in Lake Michigan, 1965-1971.

Year	Michigan	Wisconsin	Illinois	Indiana	Total
1965	1,069	205	–	–	1,274
1966	956	761	–	–	1,717
1967	1,118	1,129	90	87	2,424
1968	855	817	104	100	1,876
1969	877	884	121	119	2,001
1970	875	900	100	85	1,960
1971	1,195	945	100	103	2,343
Total	6,945	5,641	515	494	13,595

Table 3. Plantings of lake trout in Lake Superior, 1971.

Location		Numbers	Fin clip
Michigan waters			
Porcupine Mountains		205,030	right pectoral
Baraga		60,900	"
Pequaming		147,700	"
Huron Bay		101,090	"
Loma Farms		50,000	"
Laughing Whitefish Point		210,000	"
Grand Marais		60,000	"
Pendills Bay		160,000	"
Whitefish Bay		60,000	"
	subtotal	1,054,720	
Wisconsin waters			
Bayfield		205,789	dorsal-adipose
Bayfield–adult fish		870	no mark
	subtotal	206,659	
Minnesota waters			
Grand Marais		25,043	right pectoral
Little Marais		50,027	"
Split Rock		40,680	"
Two Harbors		70,068	"
Tofte		40,082	"
Palmers		54,274	"
	subtotal	280,174	
Ontario waters			
Hare Island to Swede Island		225,000	adipose-left pectoral
Haviland Bay		128,700	adipose-right ventral
Maple Island		74,300	"
Goulais Point		47,000	"
	subtotal	475,000	
	Total	2,016,553	

in 1970. These fish have been planted mostly as yearlings. Table 5 summarizes the annual plantings in Lake Huron from 1969 to 1971, and Table 6 details the plantings for the same years in United States waters and in the major geographical divisions of the Canadian waters. These plantings marked the beginning of efforts to establish a self-sustaining population of splake in Lake Huron.

Kokanee plantings have been made in Lake Huron and Lake Ontario since 1965 by the Ontario Department of Lands and Forests. Plantings have

Table 4. Plantings of lake trout in Lake Michigan, 1971.

Location		Numbers	Fin clip
Wisconsin waters			
Green Bay		221,000	left ventral
Kewaunee area		344,000	"
Two Rivers		221,000	"
Milwaukee Reef		159,000	"
	subtotal	945,000	
Michigan waters			
Escanaba		85,000	adipose-left ventral
Manistique		85,000	left ventral
Petoskey		100,000	"
Charlevoix		71,920	"
Grand Traverse Bay (East Bay)		50,025	"
Grand Traverse Bay (West Bay)		150,000	"
Frankfort		70,200	"
Pentwater		75,000	"
Montague		75,000	"
Port Sheldon		75,000	"
South Haven		75,000	"
Benton Harbor		75,000	"
	subtotal	987,145	
Grand Haven (accelerated growth fall plant)		103,500	adipose-left pectoral
Grand Haven (normal growth fall plant)		104,500	left pectoral-right ventral
	subtotal	208,000	
Indiana waters			
Bethlehem Steel Dock, Michigan City		103,400	left ventral
Illinois waters			
Chicago (North Ave. Breakwater)		100,000	left ventral
	Total	2,343,545	

Table 5. Plantings (in thousands) of splake in Lake Huron, 1969-1971.

Year	Michigan	Ontario	Total
1969	–	35	35
1970	43	247	290
1971	74	468	542
Total	117	750	867

Table 6. Plantings of splake in Lake Huron, 1969-1971.

Location		Numbers	Fin clip
1969			
Ontario waters			
Georgian Bay–Meaford		30,000	left ventral
Main basin Lake Huron–South Bay		5,410	"
	Total	35,410	
1970			
Ontario waters			
Georgian Bay–Vail Point		94,330	left pectoral-right ventral
Main basin Lake Huron–South Bay		60,811	adipose-left pectoral
Howdenvale		43,196	left pectoral-left ventral
Douglas Pt.		49,085	"
	subtotal	247,422	
Michigan waters			
Cheboygan		43,100	right ventral
	Total	290,522	
1971			
Ontario waters			
Georgian Bay–Vail Pt.		102,140	right pectoral-right ventral
Lion's Head		17,900	"
Main basin Lake Huron–Burnt Is. Bay		100,000*	left pectoral
South Bay		60,817	adipose-right pectoral
Dorcas Bay		84,290*	left pectoral
Howdenvale		103,635	right pectoral-left ventral
	subtotal	468,782	
Michigan waters			
Detour		73,550	left ventral
	Total	542,332	

*Fingerlings

consisted of eyed eggs, swim-up fry, and fingerlings, but eyed-egg plantings were discontinued in Lake Ontario after 1965 and in Lake Huron after 1966. Table 7 summarizes the annual plantings of kokanee in Lakes Huron and Ontario, and Table 8 presents in detail the 1971 plantings in these lakes.

Coho salmon have been planted annually in Lakes Superior and Michigan since 1966, and in Lakes Huron, Erie, and Ontario since 1968. Annual plantings of chinook salmon have been made in Lakes Superior and Michigan since 1967, in Lake Huron since 1968, and in Lake Ontario since 1969. Coho have been planted during the spring as yearlings and the chinook during the spring as fingerlings. Table 9 summarizes the annual coho plantings for each lake, and Table 10 the chinook plantings.

Table 7. Plantings (in thousands) of kokanee salmon in Lake Huron and Lake Ontario, 1965-1971.

Year	Eggs	Fry	Fingerlings	Total
Lake Huron				
1965	805	825	288	1,918
1966	923	644	261	1,828
1967	–	1,026	147	1,173
1968	–	185	59	244
1969	–	321	43	364
1970	–	3,400	–	3,400
1971	–	2,796	50	2,846
Total	1,728	9,197	848	11,773
Lake Ontario				
1965	323	772	2	1,097
1966	–	1,389	–	1,389
1967	–	1,412	–	1,412
1968	–	228	–	228
1969	–	334	20	354
1970	–	806	46	852
1971	–	679	50	729
Total	323	5,620	118	6,061

Table 8. Plantings of kokanee in Lake Huron and Lake Ontario, 1971.

Location	Fry	Fingerlings	Total
LAKE HURON			
Georgian Bay			
Sturgeon River	102,500	–	102,500
Balm Beach	102,500	–	102,500
Nottawasaga River	520,000	–	520,000
Sydenham River	400,000	–	400,000
Oxenden Creek	200,000	–	200,000
Colpoy Creek	200,000	–	200,000
Isthmus Bay shore	160,000	–	160,000
subtotal	1,685,000	–	1,685,000
Main Basin Lake Huron			
Elizabeth Bay shore	178,000	–	178,000
South Bay	400,000	50,000*	450,000
Saugeen River	400,000	–	400,000
subtotal	978,000	50,000	1,028,000
North Channel			
Kagawong Creek	132,700	–	132,700
TOTAL–LAKE HURON	2,795,700	50,000	2,845,700
LAKE ONTARIO			
Shelter Valley Cr.	533,712	50,000	583,712
Bay of Quinte	145,779	–	145,779
TOTAL–LAKE ONTARIO	679,491	50,000	729,491

*Left pectoral fin clip

Table 9. Plantings (in thousands) of coho salmon in the Great Lakes, 1966-1971.

Location	1966	1967	1968	1969	1970	1971
Lake Michigan						
Michigan waters						
St. Joseph River				100	100	199
Kalamazoo River				100	100	100
Grand River				100	200	200
Muskegon River			220	11	202	200
Pere Marquette River			98	100		
Big Sable River					200	150
Big Sable Point						150
Little Manistee River		433	148	700	550	92
Manistee River			74	100	100	251
Bear Creek	395	750				
Portage Lake						200
Point Betsie						72
Platte River	265	503	308	1,092	778	390
Brewery Creek			101	100	200	100
Porter Creek			50	50	75	51
Bear River			52	300	277	
Black River					50	
Manistique River				50	50	25
Thompson Creek		46	25	27	73	56
Whitefish River			100	162	75	75
Hay Meadow Creek					25	
Big Cedar River				62	50	100
Menominee River					50	
subtotal	660	1,732	1,176	3,054	3,155	2,411
Wisconsin waters						
Little River				40	50	40
Ahnapee River			25	45	57	40
Kewaunee River				40	50	43
Two Rivers					25	25
Manitowoc River				46	50	40
Sheboygan River				46	58	40
Oak Creek					50	39
subtotal			25	217	340	267
Indiana waters						
Little Calumet River					10	32
Trail Creek					38	36
subtotal					48	68
Illinois waters						
Chicago						3
Waukegan						1
Great Lakes Naval Station				9		
subtotal				9		4
Total	660	1,732	1,201	3,280	3,543	2,750

Table 9. (continued)

Location	1966	1967	1968	1969	1970	1971
Lake Huron						
Michigan waters						
Carp River			50	100	100	50
Hammond Bay						50
Thunder Bay River			100	150	100	100
AuSable River			75	217	236	225
Tawas River			177	200	60	150
Cass River						250
Port Hope						50
Diamond Creek					25	
Elk Creek					25	50
Lakeport Creek					25	50
Total			402	667	571	975
Lake Superior						
Michigan waters						
Sucker River			40	50	50	50
Anna River			175	226	150	
Cherry Creek			25			
Dead River					75	122
Big Huron River	192	467				
Falls River			60	50	82	80
Sturgeon River				75	100	
Ontonogan River			50	75		
Presque Isle River			32	50	50	25
Black River						125
subtotal	192	467	382	526	507	402
Minnesota waters						
French River				110	63	125
Beaver River					23	43
Grand Portage Creek					25	20
subtotal				110	111	188
Ontario waters						
Jackpine River				11	31	27
Gravel River				9		
subtotal				20	31	27
Total	192	467	382	656	649	617

Table 9. (continued)

Location	1966	1967	1968	1969	1970	1971
Lake Erie						
Ohio waters						
Cold Creek						1
Huron River				28	95	101
Chagrin River			30	31	40	
Conneaut River				28	74	20
Kelly Island					10	
South Bass Island				5	35	
subtotal			30	92	254	122
Pennsylvania waters						
Elk Creek			7		32	22
Grimshaw Run			15	19	10	13
Trout Run			34	30	43	
Walnut (Bear) Creek				21	25	27
Godfrey Run			20	60	75	75
Presque Isle Bay						3
Six Mile Creek				2	8	7
Orchard Beach Creek				2	4	5
Unnamed Creek			10			
subtotal			86	134	197	152
New York waters						
Eighteen Mile Creek					24	26
Big Sister Creek						14
Delaware Creek						7
Cattaraugus Creek			5	10	30	8
Dunkirk Harbor					20	20
Chautauqua Creek						20
subtotal			5	10	74	95
Total			121	236	525	369
Lake Ontario						
New York waters						
Salmon R. (Pulaski Pond)			40		248	122
Oak Orchard Creek				20		
Little Salmon River				89		
Sterling Creek					46	
subtotal			40	109	294	122
Ontario waters						
Humber River				20	25	25
Credit River				90	100	112
Bronte Creek				20	20	23
subtotal				130	145	160
Total			40	239	439	282

Table 10. Plantings (in thousands) of chinook salmon in the Great Lakes, 1967-1971.

Location	1967	1968	1969	1970	1971
Lake Michigan					
Michigan waters					
St. Joseph River					200
Grand River				466	503
Muskegon River	211	365	352	500	402
Big Sable River				100	100
Little Manistee River	591	322	300	309	302
Manistee River					203
Platte River					54
Bear River				200	
Menominee River				100	101
subtotal	802	687	652	1,675	1,865
Wisconsin waters					
Strawberry Creek			66	119	130
Ahnapee River					10
Kewaunee River					50
Little Manitowoc River					64
Sheboygan River					10
subtotal			66	119	264
Illinois waters					
Chicago				10	7
Waukegan					1
subtotal				10	8
Indiana waters					
East Chicago (Jeorse Park)					20
Black Ditch					50
Little Calumet River				50	40
Trail Creek				50	50
Michigan City Yacht Club					20
subtotal				100	180
Total	802	687	718	1,904	2,317
Lake Superior					
Michigan waters					
Anna River			50		
Cherry Creek		50			
Dead River				50	50
Big Huron River	33				
Falls River					101
Sturgeon River				100	101
Total	33	50	50	150	252

Table 10. (continued)

Location	1967	1968	1969	1970	1971
Lake Huron					
Michigan waters					
Hammond Bay (Nagle Creek)					132
Ocqueoc River		200	200		
Thunder Bay River		74	45	140	154
Harrisville (Mill Creek)			5		201
AuSable River			5	503	205
Cass River					202
Total		274	255	643	894
Lake Erie					
Ohio waters					
Huron River				65	
Chagrin River				65	147
Conneaut Creek					33
Kelley Island				20	
subtotal				150	180
Pennsylvania waters					
Elk Creek					29
Trout Run					81
Walnut (Bear) Creek					19
subtotal					129
Total				150	309
Lake Ontario					
New York waters					
Little Salmon River			70		
Salmon River				141	149
subtotal			70	141	149
Ontario waters					
Ganaraska River					89
subtotal					89
Total			70	141	238

APPENDIX C

LAMPREY CONTROL IN THE UNITED STATES

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The number of lampreys captured in assessment barriers on Lake Superior increased markedly in 1971, despite a reduction in the number of such barriers from 16 to 8. Not only was the final count of 9,613 adult sea lampreys taken at the eight barriers more than double the number taken at these same barriers in 1970, but it was 69% more than the total taken at all 16 barriers in that year. The average size of the lampreys was slightly larger than in 1970, and the number of males in the catch fell from 35.2% to 30.6%.

Chemical control continued on the three upper Great Lakes with the treatment of 48 streams (total flow, 6,181 cfs). However, nine streams scheduled for treatment were not treated. Two of these, the Menominee and Cheboygan Rivers, have never been treated; the Menominee River is a major producer of sea lampreys.

Surveys and chemical treatments

Lake Superior surveys. High water levels delayed the survey of most Lake Superior tributaries until early June. Thereafter, 16 streams were examined to verify previously established upper limits of lamprey distribution and recheck the status of tributaries. Although little effort was directed towards assessing the size of larval populations, it was observed that the numbers of ammocetes in the Sucker, Ontonagon, and Bad Rivers were relatively large; all three streams were subsequently treated. The absence of sea lampreys in three streams (Seven Mile and Boston-Lily Creeks and Elm River) and the very small numbers present in two others (Slate and Ravine Rivers) indicated that treatments could be postponed until significant populations develop.

Sea lampreys were found in 18 of 30 previously treated streams surveyed to determine whether lampreys had become reestablished. Moderate numbers of larvae (in relation to the size of the streams) were found in the Two Hearted, Little Two Hearted, Gratiot, and Brule Rivers and Furnace Creek. Oxbow ponds on the lower Two Hearted River contained no ammocetes.

The resurvey of 25 streams in which no ammocetes have been found indicated no change in their status.

The Bad River has been examined for sea lamprey spawning since 1964. A total of 51 nests were found in 1971 compared with 44 in 1970. In previous years, the number has varied from a high of 189 in 1964 to a low of 38 in 1966.

Lake Superior chemical treatments. Operations on Lake Superior began with the treatment of the Salmon Trout River (Marquette County) on June 23, and finished with the treatment of Mud Lake Outlet on November 2. The late start was the result of priorities given certain Lake Michigan tributaries which can best be treated at flows that occur in May and early June. During June-November, 18 streams with a total flow of 3,305 cfs were treated (Table 1). Six remain to be treated before July 1, 1972, to complete the fiscal year 1972 schedule. Of these, the East Sleeping River will produce transformed lampreys in the fall of 1972 if it is not treated; however, two streams contain so few ammocetes that treatment can safely be postponed.

The Cranberry River, originally scheduled for treatment in late summer 1970 (fiscal year 1971) and which is known to have produced transformed lampreys in 1970 and 1971, still has not been treated. Stream water levels were too low during most of the 1970 and 1971 field seasons, and priority

Table 1. Details on the application of lampricides to tributaries of Lake Superior in 1971.

Stream	Date	Discharge at mouth (cfs)	Concentration of TFM (ppm)		Larvicide used	
			Minimum effective	Maximum allowable	TFM (pounds)	Bayer 73 (pounds)
Salmon Trout River	June 23	68	1.5	6.0	550	–
Iron River	June 29	105	1.5	3.5	836	–
Harlow Creek	July 2	10	1.5	3.5	22	9.0
Potato River	July 8	6	3.5	8.0	242	–
Ontonagon River	July 22	1,200	2.0	5.0	12,716	4.5
Little Beaver Lake	July 28	–	–	–	–	12.5
Sullivans Creek	Aug. 2	5	3.0	7.0	44	–
Sucker River	Aug. 4	100	2.5	5.0	961	72.0
Miners River	Aug. 18	19	5.0	10.0	240	–
Tahquamenon River	Sept. 10	500	1.5	6.0	4,752	90.0
Galloway Creek	Sept. 12	4	3.0	7.0	110	–
Rock River	Sept. 21	45	4.5	11.0	792	2.0
Bad River	Oct. 8	620	1.5	6.0	9,174	12.0
Poplar River	Oct. 22	50	1.5	3.5	770	–
Amnicon River	Oct. 27	300	1.0	2.5	1,276	5.0
Nemadji River	Oct. 27	250	0.5	1.5	638	–
Traverse River	Nov. 1	20	2.0	4.5	638	–
Mud Lake Outlet	Nov. 2	3	1.0	2.5	110	–
Total	–	3,305	–	–	33,871	207.0

was given to the major lamprey producing streams during periods when water levels were optimum for treatment.

The 18 treated streams include 6 scheduled for treatment in fiscal year 1971. Five of these, the Traverse, Potato, Amnicon, and Nemadji Rivers and Mud Lake Outlet, contained transforming lampreys when treated and undoubtedly contributed significantly to lake-dwelling populations in 1970.

The Nemadji River treatment was nearly washed out by sudden heavy rains. The minimum lethal concentration of TFM, determined by instant bioassay before treatment, was not maintained long enough to ensure a complete kill. However, the dilution by rain changed the water chemistry sufficiently to lower the minimum lethal concentration from 1.0 ppm to 0.5 ppm, and concentrations between 0.5 and 1.2 ppm were maintained for 6 hours. At the prevailing water temperatures (55-58° F) and chemistry, the application should have been effective. Posttreatment survey in spring 1972 will determine whether it was successful.

The delta of Bismark Creek in Harlow Lake was treated again in July as part of a continuing study to test the orientation of lake-dwelling ammocetes to stream mouths or deltas. The experiment began in July 1970, when 476 marked sea lamprey ammocetes were released near the middle of Harlow Lake. Twenty-six of the marked animals were recovered from the delta in the July 1971 treatment.

Heavy rains washed out the early July treatment of the Ontonagon River. Re-treatment was completed later in the month, but the total costs in time and chemical were high. Because collecting conditions were poor during the treatment, the small numbers of larvae taken were probably not indicative of the size of the ammocete population present.

The Bad River was also treated at water levels that were higher than usual. Light daily rains kept river waters muddy and, again, collections during treatment were probably not indicative of the number of ammocetes present. Ammocetes were collected throughout the system, however, and five transforming sea lamprey larvae were found. Survey crews had treated oxbow ponds not connected to the river at water levels at which treatments are made with powdered and granular Bayer 73.

The Tahquamenon River was treated with a TFM-Bayer mixture. To ensure that toxicity of the mixture remained at desired levels (a loss of toxicity had occurred in the Ford River in May—see Lake Michigan treatment section), the block of treated water was checked daily by a bioassay. No appreciable loss of toxicity was noted, possibly partly because the stream was treated under cloudy skies that limited detoxification by sunlight. Many sea lamprey ammocetes and four transforming larvae were collected.

The large number of transforming sea lampreys found during reestablishment surveys made the treatment of the Traverse River mandatory. Although stream water levels were too low for effective treatment at the time the work was done, many ammocetes were killed. The expected large numbers of transformed lampreys were not seen; many may have left the river before the treatment.

The dam at the mouth of the Rock River has been repaired and may be a barrier to spawning adults. The river was treated in 1971, possibly for the last time. A large ammocete population was present.

Re-treatment of the Potato River was necessary to eliminate the large numbers of ammocetes that survived the treatment during low water in 1970. Although the stream was again treated at lower than optimum water levels, many large ammocetes were killed.

The lower portion of the Sucker River was treated with TFM and 10.5 acres of East Bay were sprayed with Bayer 73 granules. The river population was sparse and consisted of small ammocetes, but many large ammocetes were collected in the bay.

The other treatments in 1971 were routine and involved only small-to moderate-sized ammocete populations. No significant fish kills occurred.

Lake Michigan surveys. The runoff from the unusually heavy snowfall of the 1970-71 winter, combined with frequent spring rains, delayed the start of surveys on most Lake Michigan streams until mid-May. Because of the time lost, not all of the scheduled assessment surveys were completed.

Surveys were conducted on 31 tributaries scheduled for chemical treatment in 1971 and 1972. Relatively large numbers of ammocetes were evident in five streams—the Betsie, Manistee, Little Manistee, Pere Marquette, and Ford Rivers. Populations in the remaining 26 streams appeared to be moderate to small.

An additional 35 streams were checked to assess populations that have developed since treatment in the period 1963-71. Populations of reestablished ammocetes were large in 5 (Jordan, Platte, White, Muskegon, and Whitefish Rivers), moderate to low in 15, and apparently lacking in 15.

Sea lamprey ammocetes were found for the first time in the Paw Paw River, a major tributary of the St. Joseph River, and in the Manistique River above the dam at Manistique. One young-of-the-year larva (31 mm long) was collected from the Paw Paw River and 11 (34-75 mm long) from the Manistique River. The dam on the Manistique had previously been considered a barrier to adults, but 11 of a total of 8,516 ammocetes collected at 118 stations above the dam were sea lampreys. The infestation was spread along approximately 70 miles of the main stream.

Surveys of 86 streams in which larval sea lampreys have never been found still yielded none. Many of the streams are small and intermittent and have little or no potential for production of sea lampreys.

Posttreatment surveys of five streams in Wisconsin and Upper Michigan showed that large numbers of ammocetes had survived treatments in two—the Ford and Cedar Rivers. Ammocetes that survived in both streams were in oxbow ponds and high-water channels not reached by the chemical at water levels prevailing during the treatments. Additionally, in the Ford River the toxicity of the TFM-Bayer mixture was lost in the lower one-third of the river. The ponds and channels on the Ford River were re-treated, but time did not permit a return to the lower Ford or the Cedar before the end of the field season. In two other streams—Hibbards Creek and certain

problem areas of the Whitefish River—much small numbers of ammocetes had survived treatment. None were found in the Bark River.

Age and growth data were collected in five Lower Michigan tributaries in which growth rates of ammocetes (and therefore the potential for early metamorphosis) were high (Table 2). Populations in two of these streams, the Betsie and Little Manistee Rivers, comprised four age groups (0-III) and both streams yielded small numbers of metamorphosing sea lampreys during midsummer treatments. The transformation of ammocetes at age III indicates the need for a re-treatment interval of 3 years for streams in which the larval growth rate is fast.

A total of 363 adults and 950 nests were counted in 16 of 28 Lower Michigan streams surveyed for evidence of spawning activity. Of 206 adults captured, 94 (46%) were males. Their average length and weight were 44 cm and 208 g. Particularly interesting was the discovery of spawning adults on September 2, in the Carp Lake River below the site of the inclined-plane trap.

Lake Michigan chemical treatments. The treatment season began 2 weeks earlier than usual with the treatment in April of four Wisconsin tributaries of Lake Michigan. The low stream water levels during the extremely dry summer that followed made treatment more difficult and raised bioassay minimums above normal. A total of 24 streams, with a combined flow of 2,078 cfs, were treated (Table 3).

After treatment of the Little Manistee River, TFM was found in a private well. A report to the Ludington Biological Station on August 3 stated that water from a shallow, hand-driven well approximately 5 feet from

Table 2. Mean length (mm) and length increment of age groups of sea lamprey ammocetes collected in the spring and fall from five tributaries of Lake Michigan, 1971. [Numbers of ammocetes measured are shown in parentheses.]

	Age group							
	0		I			II		III
Stream	Fall	Spring	Fall	Increment	Spring	Fall	Increment	Spring
Betsie River[1]	–	37	–	–	68	–	–	101
	(0)	(90)	(0)		(110)	(0)		(191)
Manistee River	43	48	88	40	91	123	32	–
	(228)	(53)	(299)		(31)	(94)		(0)
White Manistee	–	31	–	–	67	–		102
River[2]	(0)	(20)	(0)		(64)	(0)		(198)
White River	46	54	84	30	–	–	–	–
	(93)	(91)	(191)		(0)	(0)		(0)
Muskegon River	38	61	87	26	–	–	–	–
	(243)	(68)	(215)		(0)	(0)		(0)

[1]No fall sample; stream was treated with TFM on August 6, 1971.

[2]No fall sample; stream was treated with TFM on July 26, 1971.

Table 3. Details on the application of lampricides to tributaries of Lake Michigan in 1971.

Stream	Date	Discharge at mouth (cf)	Concentration of TFM (ppm) Minimum effective	Concentration of TFM (ppm) Maximum allowable	Larvicide used TFM (pounds)	Larvicide used Bayer 73 (pounds)
Three Mile Creek	April 20	8	6.0	13.0	220	–
Door County #23	April 21	5	6.0	12.0	88	–
Hibbards Creek	April 22	50	7.0	17.0	1,034	–
Bark River	April 29	110	3.0	14.0	1,672	–
Sunny Brook Creek	May 1	20	1.5	3.5	88	–
Days River	May 4	115	2.5	6.0	1,210	–
Cedar River	May 13	314	3.5	12.0	4,994	–
Carp Lake River	May 18	200	3.0	10.0	1,160	–
Ford River	May 30	380	1.5	6.0	6,732	56.0
Whitefish River	June 10	375	2.5	6.0	8,470	5.0
Hock Creek	June 23	5	–	–	–	5.0
Squaw Creek	June 24	12	4.0	10.0	180	–
Little Manistee River	July 26	190	4.0	9.0	4,202	–
Betsie River	Aug. 6	180	7.0	8.0	3,916	–
Good Harbor Creek	Aug. 8	19	6.0	15.0	726	–
Ford River (ponds)	Aug. 10	–	–	–	–	55.0
Elk River	Sept. 9	–	–	–	–	107.5
Horton Creek	Sept. 11	15	10.0	22.0	396	82.5
Porter Creek	Sept. 14	7	10.0	22.0	198	30.0
Loeb Creek	Sept. 30	2	8.0	16.0	110	–
Gulliver Lake Outlet	Oct. 22	8	4.0	11.0	132	–
Bulldog Creek	Oct. 22	21	3.0	9.0	264	–
Deadhorse Creek	Oct. 23	4	5.5	14.0	110	–
Rock River	Oct. 24	13	6.5	6.5	264	–
Hog Island Creek	Oct. 25	25	6.0	12.0	968	–
Total	–	2,078	–	–	37,134	341.0

the river's edge was yellow and tasted of iodine. The chemical (TFM) had passed this point during treatment 4.5 days earlier. Analysis of kitchen tap water on August 3, showed 0.7 ppm TFM present. Daily analysis thereafter showed that the concentration was halved each day until August 9 when none was detectable.

Treatment of six northern Green Bay tributaries had been postponed from 1970 to 1971 because of low water levels. Five were treated in May and early June; the sixth (Rapid River) could not be treated because of low water. All six contributed to the adult populations in 1970; the Rapid River contributed in 1971 as well.

Because the TFM-0.8 Bayluscide mixture used in the Ford River in May lost toxicity, many sea lamprey ammocetes in the lower one-third of the system were unaffected by the treatment. The loss of toxicity was attributed to detoxification of Bayluscide by sunlight, but may also have been due in part to diurnal changes in pH of the water. Re-treatment,

planned for the fall 1971, was prohibited by extremely low stream water levels.

Door County No. 23 Creek was the only initial treatment in the 1971 field season. It is a small creek, recently found to contain a small ammocete population confined to within 2,000 feet of the mouth.

The estuary of the Elk Lake Outlet was treated again with Bayer 73 granules. A total of 11 acres were treated, but significant numbers of sea lampreys were found only in the same area (1 acre) that produced larvae during the 1970 treatment.

Reestablished ammocete populations were large in the Cedar, Carp Lake, Ford, Whitefish, Little Manistee, and Betsie Rivers, and moderate to small in all others. In some areas of the Ford and Cedar Rivers, ammocetes seemed to be as abundant as they were at the time of the initial treatment. Many adult sea lampreys were seen in the Cedar River.

Two tributaries of the Whitefish River, Deer and Werner Creeks, were treated successfully for the first time. Both tributaries contain many beaver dams and flow through a relatively inaccessible area. In a previous treatment at low water levels, the chemical was diluted below toxic concentrations in beaver ponds. The higher water in 1971, however, carried the chemical through the entire area at concentrations lethal to sea lampreys.

Large numbers of spawning white suckers and longnose suckers were killed in Hibbards Creek during treatment. Personnel from the Bureau and the Wisconsin Department of Natural Resources cooperated in a clean-up effort that required 12 man-days. No other significant fish kills occurred.

Lake Huron surveys. Two Lake Huron tributaries, Pine and Saginaw Rivers, were surveyed in preparation for scheduled chemical treatments. The Pine River, Iosco County, contained a large sea lamprey population. Discrete populations were found in two tributaries of the large and complex Saginaw River system; 5 stations on Bluff Creek and the Chippewa River produced 17 sea lampreys (21-120 mm long).

Twenty-four additional streams were examined for sea lamprey ammocetes reestablished since treatment. Large numbers were present in the Pine (Mackinac County), Devils, and Rifle Rivers; the Rifle yielded an average of 73 ammocetes per hour of collecting. Populations were moderate to small in 12 streams, including Silver Creek (Iosco County), which was classified as a highly productive stream before its initial treatment in May 1969. Ammocetes reestablished since treatment were not detected in the Pigeon and Sturgeon Rivers (treated in May 1971) and in seven small Upper Michigan streams.

Age and growth data for sea lamprey larvae in the Rifle River indicate the capacity of this population for early metamorphosis and the need for re-treatment of this stream on a 3-year cycle. The mean lengths of the three age groups collected in October were 37 mm (0 group), 77 mm (I group), and 120 mm (II group).

Four small Lower Michigan streams, treated in September 1970 under adverse weather conditions, were surveyed to check the success of treatment.

Two of these, Grace and Mulligan Creeks, produced 27 and 311 residual sea lampreys, respectively. Smaller numbers of residual larvae were also taken from Trout Creek and the Carp River in Upper Michigan.

Nine of 14 streams surveyed visually in the thumb area of Michigan in July were dry or stagnant. Their flow consists principally of surface runoff.

Eleven streams were surveyed for spawning adults and nests; 54 adults and 136 nests were counted in eight streams. Twenty-nine adults (15 males and 14 females) captured in the Devils and East Au Gres Rivers had an average length of 38 cm and an average weight of 128 g.

Lake Huron chemical treatments. A total of six Lake Huron tributaries with a combined flow of 798 cfs were treated (Table 4)—five for the second time and one (Myers Creek) for the first time. Treatments of the Saginaw River and Rock Falls and Mill Creeks were postponed because few ammocetes were present; however, later survey information on the Saginaw River indicated that ammocetes were more abundant than determined by the first survey and that early treatment is needed.

All sea lamprey producing tributaries in the Cheboygan River system were treated during the year. Sea lamprey larvae were abundant in the Pigeon and Sturgeon Rivers, but relatively scarce in the remaining three tributaries. Plans to treat the Cheboygan River proper below the paper mill dam had to be cancelled because of poor bioassay results and large numbers of migrant fish. This short section of river was rescheduled for treatment in 1972.

The Sturgeon River treatment included, for the first time, the stream and raceways above the dam at the Wolverine Trout Rearing Station. The several million trout in these raceways precluded treatment in 1966, but the fish stocking schedule of the Michigan Department of Natural Resources was adjusted in 1971 to empty the rearing station in early May and provide the opportunity to treat. Stop logs in the rearing station dam have been removed each year in July to allow brown trout easy access to the upper river. Unfortunately, sea lampreys also gained access and the population of larvae

Table 4. Details on the application of lampricides to tributaries of Lake Huron in 1971.

Stream	Date	Discharge at mouth (cfs)	Concentration of TFM (ppm)		TFM used (pounds)
			Minimum effective	Maximum allowable	
Sturgeon River	May 2	408	5.0	11.0	8,448
Pigeon River	May 13	194	6.0	16.0	5,352
Pine River	Aug. 21	108	11.0	16.0	4,620
Maple River	Sept. 22	80	10.0	15.0	2,640
Laperell Creek	Sept. 23	4	10.0	20.0	88
Meyers Creek	Sept. 23	4	9.0	18.0	88
Total	–	798	–	–	21,236

had increased to a level where treatment was mandatory. It is to be hoped that the dam will now be maintained year-round so that treatment above the dam will not be necessary.

During the treatment of the Pine River (Alcona County), many brook trout were killed in upper Backus Creek. Chemical was applied in this area for an extended period to treat several large beaver ponds that contained many larval and newly transformed sea lampreys. Larval sea lampreys were extremely numerous in the entire system, but particularly in Backus and McGillis Creeks.

Surveys of estuarine areas in the upper Great Lakes. The estuaries of 11 streams tributary to Lakes Michigan and Huron were sampled for the presence of larval sea lampreys by using Bayer 73 granules. Four estuaries produced ammocetes; however, three of these (Bear, Elk, and Sturgeon Rivers) had yielded sea lampreys in previous surveys. Two larvae (33 and 108 mm long) were captured about 300 yards off the mouth of Carp Lake River.

Studies of adult sea lampreys

Migrant sea lampreys in Lake Superior. The assessment barrier network included, until 1971, a network of 16 assessment barriers on streams tributary to Lake Superior to sample spawning migrants to measure changes in abundance and biological characteristics of sea lampreys. In 1966-70, 78 to 91% of the lampreys captured have come from the barriers in eight rivers: the Betsy, Two Hearted, Sucker, Chocolay, Iron, Silver, Brule, and Amnicon. These eight streams should supply adequate biological data for the types of analyses presently used. In the interest of economy and with the belief that these eight barriers will supply the necessary biological data, the Great Lakes Fishery Commission directed that only eight barriers be operated.

The final count of 9,613 adult sea lampreys captured at the eight index barriers in 1971 was more than double the number captured in the same eight barriers in 1970; it was equal to 25% of the precontrol (1958-61) average, and the third highest count since 1961 (Table 5). The barriers were operated from April 13 to July 13. The lamprey spawning run began the week of April 18, and 42% of the season's total were captured during the 15-day period from May 26 to June 9.

Barriers in the Brule and Amnicon Rivers, in western Lake Superior, captured 63% of the total and those in the two major producers in the eastern end, the Two Hearted and Iron Rivers, captured 27%. These four barriers captured 90% of the run, and their total (8,631) exceeded the catch at the 16 barriers in 1970. The number captured in 1971 increased 23% at weirs east of the Keweenaw Peninsula and 220% at those west of the Peninsula.

The average length and weight of sea lampreys caught at the Lake Superior barriers increased from 43.1 cm and 176 g in 1970 to 44.9 cm and

Table 5. Number of adult sea lampreys taken at electric barriers operated in eight tributaries of Lake Superior through July 13, 1961-1971.

Stream	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971
Betsy River	1,366	316	444	272	187	65	57	78	120	87	104
Two Hearted River	7,498	1,757	2,447	1,425	1,265	878	796	2,132	1,104	1,132	1,035
Sucker River	3,209	474	698	386	532	223	166	658	494	337	485
Chocolay River	4,201	423	358	445	563	260	65	122	142	291	53
Iron River	2,430	1,161	110	178	283	491	643	82	556	713	1,518
Silver River	5,052	267	760	593	847	1,010	339	1,032	1,147	321	340
Brule River	22,478	2,026	3,418	6,718	6,163	226	364	2,657	3,374	167	1,754
Amnicon River	4,741	879	131	232	700	938	200	148	1,576	1,733	4,324
Total	50,975	7,303	8,366	10,249	10,540	4,091	2,630	6,909	8,513	4,781	9,613
Percentage of the 1958-61 mean	132	19	22	27	27	11	7	18	22	12	25

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Percentage of the 1958-61 mean	132	19	22	27	27	11	7	18	22	12	25

190 g in 1971. The number of males in the catch decreased from 35.2% in 1970 to 30.6% in 1971.

Wounding or scarring of large rainbow trout taken at the barriers increased from 2.1% in 1970 to 2.6% in 1971. The total number of rainbow trout captured was approximately the same in the 2 years in the eight barriers operated.

The number of white suckers captured at the barriers remained near the average for previous years, whereas the catch of longnose suckers was the lowest since 1966.

The Ocqueoc River weir on Lake Huron captured 2,997 adult sea lampreys.

Parasitic sea lampreys. Feeding-phase sea lampreys were again purchased from commercial fishermen operating in Lakes Superior, Michigan and Huron. The study was expanded during the fall of 1971 to include Lakes Erie and Ontario, but no lampreys have been received from these lakes to date. Since the inception of the project in 1969, 863 lampreys have been collected from Lake Superior, 1,427 from Lake Michigan, and 269 from Lake Huron. Examination of the lampreys for length, weight, sex, and maturity has been completed for 1,847 specimens–471 from Lake Superior, 1,207 from Lake Michigan, and 169 from Lake Huron.

Data from the lampreys are being placed on punch cards and computer programs are being developed to facilitate analysis of the collections.

Reestablishment of larvae in treated streams

Ammocetes of the 1971 year class were collected in 31 of 62 Lake Superior streams examined this year. The removal of electrical weirs from eight Lake Superior tirbutaries in 1971 has had a noticeable effect on the reestablished populations. Ammocetes were recovered for the first time since 1962 in Miners River above Miners Lake, and the number recovered per hour increased markedly in the Huron, Sturgeon, and Middle Rivers; a similar increase is expected in the Firesteel River, where high water and new beaver dams prevented sampling. Sea lamprey ammocetes have been absent from the Firesteel River since 1963. Collections from the Rock River contained fewer ammocetes than in 1968-70; collections from Furnace Creek and the Misery River have not been analyzed.

Residual larvae were collected at index stations in six tributary streams of Lake Superior during 1971. A large population of transforming sea lampreys (85 in 6,000 square feet) was recovered in the estuary of the Traverse River. Three of the streams (Potato, Bad, and Traverse Rivers) were subsequently re-treated. Residual larvae remain in the Little Two Hearted, Sand, and Little Garlic Rivers.

Large numbers of age-group I (1970 year class) sea lamprey ammocetes survived the August 20, 1970, treatment of the Sturgeon River (Lake Superior) in the area immediately below Prickett Dam. Collections totaled 115 age-group I ammocetes in this area and only 1 in seven stations below

it. Untreated water seeping through the dam is the likely cause of this survival.

In posttreatment surveys of two Lake Michigan Streams, residual larvae were recovered at three of eight stations on the Ford River and two of five stations on the Cedar River.

Age and growth of larvae in Big Garlic River

The known-age sea lampreys established in the Big Garlic River in 1960 are in their 12th year of life. Some have transformed in each of 7 consecutive years, and many larvae remain in the stream. Their longevity is thus about twice that reported by previous investigators. Because of their longevity, sea lampreys from populations in offshore and lake waters relatively unaccessible to chemical treatment could contribute parasitic lampreys to the Great Lakes for many years.

The downstream trap captured 841 recently metamorphosed lampreys in the fall of 1971 compared with 648 during the same period in 1970. Their mean length was 148 mm (range, 118-182 mm), compared with 144 mm (range, 116-179 mm) in 1970.

A total of 357 age-XI larvae collected in October 1971 to determine annual growth had a mean length of 127 mm (range, 85-170 mm), an increase of 6 mm since October 1970.

Movement of ammocetes to the downstream trap decreased to 3,759 in the 1970-71 migration period after a peak catch of 13,244 in 1968-69, a decrease of 72% in 2 years. During the six migration seasons (largely fall and spring), the following numbers of larval and transformed sea lampreys have been taken:

Period	Larval	Transformed
1965-66	7,684	4
1966-67	7,931	46
1967-68	10,728	229
1968-69	13,244	398
1969-70	6,075	358
1970-71	3,759	659

Although adult sea lampreys bypassed the downstream trap in 1967, the adults and their progeny were confined to the lower fifth of the study area by natural falls. In 1971, the length distributions of the 1960 and 1967 year classes overlapped for the first time. Since the animals are therefore of little use for further study, the area will be treated with larvicides in 1972 to eradicate all sea lampreys. The original objectives of the study will be met with the ammocetes remaining in the upper river.

In 1968, 41% of the fall (September-December) total of recently transformed lampreys migrated to the downstream trap during a 12-hour period following a drop in water temperature (below 45° F) and a

subsequent rise in water level. The same major movement occurred in the following 3 years (40% in 1969, 47% in 1970, and 41% in 1971). Since the first transformed lamprey was caught (1965), less than 10% of the migration of young adults has occurred in the spring.

APPENDIX D

LAMPREY CONTROL IN CANADA

J. J. Tibbles and B. G. H. Johnson

Fisheries and Marine Service
Resource Management Branch
Environment Canada

This report summarizes activities during the period April 1, 1971 to March 31, 1972 in compliance with a Memorandum of Agreement between Canada's Department of the Environment and the Great Lakes Fishery Commission. The Department acts as agent for the Commission in carrying out sea lamprey control on the Canadian side of the Great Lakes. The sea lamprey control program is the responsibility of the Department's Sea Lamprey Control Centre located at Sault Ste. Marie, Ontario.

Electrical Barrier Operations

In 1971 only seven electrical assessment barriers were operated on tributaries on the Canadian side of Lake Huron: one on the North Channel, three in Georgian Bay, and three in the main basin of Lake Huron. The total catch was 2,043 sea lamprey in 1971, an increase of 28 per cent over the 1970 catch in the same barriers, but a decrease of 65 per cent from the average catch of the four previous years (see Table I).

The lack of uniformity observed among the three subdivisions of Lake Huron, in the trends of sea lamprey captures year by year, can usually be attributed to the scheduling of lampricide treatments. These treatments have been carried out, to a large extent, within a single subdivision of the lake in a given year, and reduced lamprey catches have characteristically occurred in the succeeding year or years. This was the case in Georgian Bay following the 1968 treatments and in the main basin following the 1969 treatments.

In spite of these irregularities in numbers of sea lamprey, an overall downward trend has been evident since 1968. This reduction in numbers of lamprey collected at the electrical barriers together with the reduction in lamprey wounds and scars as reported by the commercial fishermen reflects a decrease in the abundance of sea lamprey in Lake Huron.

Stream Surveys

Surveys in Lake Superior were conducted on 83 tributaries during 1971. As a result of 52 routine surveys, small numbers of sea lamprey were found in three new streams—the Big Squaw, Neebing, and Pine Rivers—and these were added to the 1972 treatment schedule. Re-established populations of sea lamprey were found in 13 of the 20 streams surveyed. Special surveys were conducted in five areas, two of which—a part of St. Marys River adjoining the International Rapids, and part of the mouth of Nipigon River—contained sea lamprey. Pretreatment surveys were carried out on six streams subsequently treated with lampricide in 1971.

In the Lake Huron drainage 60 streams were surveyed during 1971. In the course of 36 routine surveys, three streams were found with sea lamprey for the first time—Blind River, Pretty River, and Bothwell's Creek. Re-established populations of sea lamprey were found in twelve streams during 15 surveys of previously treated watersheds. Two special surveys were carried out in the estuaries of known sea lamprey streams, and when both yielded positive results, granular Bayer 73 was applied to destroy the larvae. Pretreatment surveys were carried out on seven streams prior to lampricide treatments in 1971.

In the Lake Ontario drainage, 23 known sea lamprey streams were re-surveyed to verify the extent of lamprey distribution for the purpose of subsequent lampricide treatments. Six other streams were surveyed with negative results.

Table 1. Numbers of sea lampreys taken at Canadian Lake Huron assessment barriers from 1967 to 1971.

Streams	Count for the Season					Operating dates 1971
	1967	1968	1969	1970	1971	
North Channel Area						
Kaskawong	82	239	478	482	271	Apr. 26-July 15
Totals	82	239	478	482	271	
Georgian Bay Area						
Still	1,839	6,154	1,621	558	960	May 5-July 15
Naiscoot-Harris	1,635	1,336	785	173	446	May 6-July 15
Mad	333	413	42	8	15	May 12-June 30
Totals	3,807	7,903	2,448	739	1,421	
Lake Huron Area						
Manitou	637	597	144	3	12	May 19-July 15
Blue Jay	957	1,807	1,130	236	332	May 19-July 15
Bayfield	789	191	582	128	7	Apr. 18-June 30
Totals	2,383	2,595	1,856	367	351	
Grand Totals	6,272	10,737	4,782	1,588	2,043	

Lampricide Treatments

On Lake Superior seven streams were treated, including the five originally deferred owing to the expected demands for lampricide in Lake Ontario. These were the Stillwater, Cypress, Otter Cove, Batchawana, and White Rivers. In addition, the Sand and Agawa Rivers were treated. Details of these seven treatments are shown in Table II.

Several near-shore areas in Batchawana Bay, in the east end of Lake Superior, amounting to 2.2 acres in aggregate, were treated with granular Bayer 73, as the concluding part of a four-year assessment of the lake dwelling population of sea lamprey ammocoetes in this large bay. As in the past, it was observed that the ammocoetes were concentrated near the mouths of the three main sea lamprey producing rivers that flow into the bay and are normally restricted to depths generally less than fifteen feet.

In Lake Huron nine tributaries were treated with lampricide as shown in Table III. Two of these, the Saugeen and Blind Rivers, were treated for the first time. Treatment of the Spanish River, initially scheduled for 1971, was postponed when no large ammocoetes were found. Granular Bayer 73 was applied to sections of four of the rivers treated with TFM or to their estuaries, and also to areas off the mouths of three other rivers, the Still, the Root and the unnamed stream H-1054.

Sea lamprey control was extended to Lake Ontario in 1971 when all 23 known sea lamprey producing streams on the Canadian side were treated with lampricide, as shown in Table IV. Many of these streams end in large swampy estuaries before entering the lake, which caused difficulty in achieving adequate coverage by the toxicant. In most cases however it was found that ammocoete distribution was restricted in these marshes. In spite of the hardness of the stream water in contrast to that normally found in the upper Great Lakes, less lampricide was used than anticipated, resulting in a savings that permitted the treatment of several Lake Superior streams.

Sea Lamprey from Commercial Fishermen

During 1971, 668 adult, parasitic-phase sea lamprey caught by commercial fishermen were received and examined. Of these, 22 were from Lake Superior, 85 from the North Channel, 284 from Lake Huron proper, 14 from Lake Erie and 263 from Lake Ontario. As in previous years, the offshore catches of sea lamprey in commercial fishing gear were characterized by a predominance of females and a size selection by size of gear and species of prey—larger lamprey being associated with larger mesh nets and larger fish.

Sea Lamprey from Humber River, Lake Ontario

The individual who has collected sea lamprey under contract since 1968 from the Humber River in Toronto, captured 2,450 specimens during the spawning run in April, May, and June, 1971. This represents only an

Table II. Summary of streams treated with lampricide on the Canadian side of Lake Superior, 1971.

Name	Date-1971	Flow (cfs)	TFM lbs. active ingredient	Bayer 73 lbs. active ingredient	Granular Bayer 73 lbs.	Sea lamprey abundance	Approx. stream miles treated
Stillwater	Aug. 8-10	3	47	–	–	Scarce	2.6
Cypress	Aug. 10-11	26	220	–	76	Moderate	3.2
Otter Cove	Aug. 12	3	41	–	–	Nil	0.3
Batchawana	Aug. 31-Sept. 3	201	1,530	28	557	Moderate	9.6
Agawa	Sept. 10-12	130	723	14	13	Moderate	11.6
Sand	Sept. 13	80	3	–	150	Scarce	–
White	Sept. 25-26	303	3,595	70	–	Scarce	1.4
Totals		746	6,159	112	796		28.7

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Sand	Sept. 13	80	3	–	150	Scarce	–
White	Sept. 25-26	303	3,595	70	–	Scarce	1.4
Totals		746	6,159	112	796		28.7

Table III. Summary of streams treated with lampricide and Bayer 73 on the Canadian side of Lake Huron, 1971.

Name	Date-1971	Flow (cfs)	TFM lbs. active ingredient	Bayer 73 lbs. active ingredient	Granular Bayer 73 lbs.	Sea lamprey abundance	Approx. stream miles treated
Saugeen	June 5-8	1,013	24,646	225	20	Scarce	52
Silver Lake	June 10,11	17	506	4		Abundant	3.5
Echo	June 23, 24, 28, 29) July 6, 7) Sept. 11, 12)	44	997	–	18	Moderate	31
Thessalon	July 12-18) Aug. 13-16, 19, 20)	401	3,072	–	112	Absent to Moderate	57
Mississagi	July 20-23,) Aug. 17, 18, 21)	1,550	12,247	–	33	Abundant	28.5
Serpent	July 26-29	243	362	–	20	Scarce	7
H-68	Sept. 17, 22	4	71	–	5	Scarce	1.2
Lauzon	Oct. 20	8-80	68	–	–	Scarce	0.8
Blind	Oct. 21-22	30	318	–	–	Moderate	0.1
Totals		3,310	42,287	229	208		181.1

Table IV. Summary of streams treated with lampricide on the Canadian side of Lake Ontario, 1971.

Name	Date-1971	Flow (cfs)	TFM lbs. active ingredient	Bayer 73 lbs. active ingredient	Granular Bayer 73 lbs.	Sea lamprey abundance	Approx. stream miles treated
Ancaster	Apr. 25-27	10	227	–	9	Scarce	10.0
Port Britain	Apr. 29-May 1	13	342	3	10	Moderate	5.9
Oakville	Apr. 29-May 3	130	1,864	17	71	Scarce	41.0
Gage	May 3-4	17	302	3	8	Moderate	6.0
Bronte	May 4-6	118	2,874	24	25	Abundant	19.0
Cobourg	May 6-7	63	901	9	11	Scarce	8.8
Rouge	May 9-10	27	268	3	–	Scarce	9.0
Credit	May 10-11	206	2,935	25	20	Scarce	9.5
Duffin	May 10-12	65	1,378	14	–	Moderate	14.8
Oshawa	May 28-29	23	400	4	–	Moderate	11.5
Lynde	Mune 1-4	15	607	–	–	Moderate	21.1
Bowmanville	June 7-8	48	949	10	–	Moderate	5.5
Farewell	June 10-11	4	106	–	–	Scarce	2.5
Salmon	June 12-15	150	1,360	14	–	Moderate	14.2
Butler	July 5-6	9	230	–	–	Moderate	3.5
Smithfield	July 6-7	4	151	–	–	Abundant	2.7
Mayhew	July 8-9	7	154	–	–	Scarce	1.2
Grafton	July 9-10	5	170	–	–	Abundant	4.4
Lakeport	July 11-12	9	328	–	–	Moderate	8.6
Wilmot	Oct. 18-20	22	975	–	–	Abundant	11.3
Graham	Oct. 19-22	7	522	–	–	Abundant	10.7
Shelter Valley	Oct. 24-26	34	1,026	–	–	Abundant	11.2
Salem	Oct. 26-27	7	250	–	–	Abundant	1.7
Totals		993	18,319	126	154		234.1

insignificant increase over the 1970 catch of 2,185 animals. There were 1.3 males per female in 1971, a ratio not significantly different from that observed in 1970; and the average lengths and weights were also similar to those of the previous year.

Trawling for Sea Lamprey in St. Marys River

The transient adult sea lamprey population in the St. Marys River, just downstream of the International Rapids, was again sampled by surface trawling at night during October, November, and December 1971. The average catch per hour was 1.1 animals in 1971, double the 1970 figure; but the sex ratio of 0.7 males per female and the average size were similar to those of 1970.

Construction and Modification of Lamprey Barrier Dams

Denny's Dam on the Saugeen River—a federal-provincial cost-sharing project for sea lamprey control and fish management—went into operation in the spring of 1971 and was officially opened soon after. During the spawning run, 183 sea lamprey were caught in the trap built for that purpose.

A sea lamprey control dam was constructed on the Echo River near Sault Ste. Marie. It will eliminate the difficult and costly treatment of the upper Echo watershed.

Four existing dams on Lake Ontario tributaries, two on the Salmon River and one each on Duffin and Salem Creeks, were repaired and restored to lamprey-barrier capability.

APPENDIX E

ADMINISTRATIVE REPORT FOR 1971

Meetings. The Comission held its 1971 Annual Meeting in Toronto, Ontario, June 23-25, and its Interim Meeting in Ann Arbor, December 1-2, 1971. Special meetings of the Commission were held on January 14, 1971 to consider revisions required in its sea lamprey control and research program and budget for fiscal year 1972; and on March 22 and April 5 to expedite changes in its administrative staff. Meetings of Committees during 1971 were:

Lake Erie Committee, Windsor, Ontario, March 2-3
Lake Ontario Committee, Windsor, Ontario, March 3-4
Lake Michigan Committee, Milwaukee, Wisconsin, March 9
Lake Superior Committee, Milwaukee, Wisconsin, March 10
Lake Huron Committee, Milwaukee, Wisconsin, March 11
Sea Lamprey Control and Research Committee, Ann Arbor, April 16
Scientific Advisory Committee, Ann Arbor, April 16, November 30, and Toronto, June 22
Finance and Administration Committee, Toronto, June 23, and Ann Arbor, November 30.

Officers and staff. The Commission suffered two severe losses in 1971 with the deaths of its Executive Secretary, Mr. Norman S. Baldwin on March 9, and Canadian Commissioner Andrew L. Pritchard on June 28. The dedicated service, contributions and guidance that Mr. Baldwin and Dr. Pritchard had given the Commission since its inception in 1956 will be sorely missed.

Changes in Commission members in 1971 included the appointment to the Canadian Section of Dr. C. J. Kerswill, Canadian Department of Environment to replace Dr. Pritchard; and Mr. Nathaniel P. Reed, Assistant Secretary for Fish and Wildlife and Parks in the Department of Interior was appointed to the United States Section to replace C. H. Meacham who resigned from the Commission in November, 1970.

On March 22, the Commission approved the appointment of its incumbent Assistant Executive Secretary, Mr. Robert W. Saalfeld, to the position of Executive Secretary. Mr. Leo F. Erkkila was employed for four months to assist the Commission staff. The Assistant Executive Secretary position remained vacant for the remainder of the year owing to recruiting difficulties.

Staff activities. A major responsibility of the Commission staff is to assist committees established by the Commission to obtain information and coordinate fishery programs. Considerable time was spent by the staff in planning meetings, arranging for the presentation of reports on various subjects, and preparation of minutes. Several subcommittees or work groups established to deal with special problems were assisted by the staff.

The Commission depends heavily on existing agencies in the Great Lakes for information on which to base its recommendations and to guide its sea lamprey control program. These requirements have increased in recent years and greater demands have been made on agencies, particularly for information on fish mortality caused by sea lamprey. The Commission staff has continually encouraged agencies to develop their capabilities in this area.

The Commission has encountered difficulties in obtaining funds required for effective control of sea lamprey in the Great Lakes and much of the Executive Secretary's time was spent in preparing program justifications and revising these when new budget levels were established. Considerable effort was also devoted towards promoting and expediting cooperation among fishery agencies engaged in management and research programs on the Great Lakes, and to the coordination of lake rehabilitation programs which involve intensive plantings of salmonid species by State, Federal, and Provincial agencies. Plans were prepared in cooperation with these agencies for improving hatchery brood stocks of lake trout and splake and the distribution of eggs and fry for rearing. Lake trout planting levels and locations were determined in cooperation with management and research agencies, and fin clips were assigned to evaluate experimental plantings of lake trout, coho, and chinook salmon, and rainbow and brown trout.

The Commission staff also participated in the following conferences and meetings:

Lake Erie Coho Subcommittee
Lake Superior Advisory Committee
Lake Michigan Study Group
Cryogenic Fish Marking Symposium (Seattle)
American Fisheries Society

Accounts and audit. The Commission accounts for the fiscal year ending June 30, 1971 were audited by Icerman, Johnson, and Hoffman of Ann Arbor, The firm's report is appended.

Contributions in fiscal year 1971. At its 1969 Annual Meeting, the Commission adopted a program and budget for sea lamprey control and research for fiscal year 1971 estimated to cost $2,472,400 and an administration and general research budget of $68,100. Subsequently, the program was twice revised and estimates ultimately changed to $1,960,870 for sea lamprey control and research and $70,000 for administration and general research to adjust to limited appropriations provided by the United States Government.

Requests for Funds and Contributions in Fiscal Year 1971 were as Follows:[1]

Sea Lamprey Control and Research	*United States*	*Canada*	*Total*
Commission request	$1,706,000	$766,400	$2,472,400
Appropriations	$1,353,000	$607,870	$1,960,870
Credit	(+)12,400	(+)5,573	(+)17,973
	$1,365,400	$613,443	$1,978,843
Administration and General Research			
Commission request	$ 35,000	$ 35,000	$ 70,000
Appropriations	$ 35,000	$ 35,000	$ 70,000
Credit	(+) 924	(+) 923	(+) 1,847
	$ 35,924	$ 35,923	$ 71,847

[1] All funds and disbursements in U.S. dollars.

Expenditures in fiscal year 1971. Sea lamprey control and research in fiscal year 1971 was carried out under agreements with the Canadian Department of Fisheries and Forestry ($653,800) and the U.S. Bureau of Commercial Fisheries (July 1-September 30) and the U.S. Bureau of Sport Fisheries and Wildlife (October 1-June 30) [$1,094,950].[1]

The Bureau treated 7 of the 15 tributaries of Lake Superior specified in the Agreement, was forced to postpone 7 because of unsuitable stream water levels, and treated 1 just prior to the start of the fiscal year. In addition, 4 streams that contained sea lampreys approaching the size of transformation were treated. Eight of the 16 assessment barriers were operated on Lake Superior, when a review of past records indicated that the 8 would provide as accurate an index to sea lamprey abundance as the original 16. On Lake Michigan, 12 of the 20 streams specified in the Agreement were treated, 2 had been treated just prior to the start of the fiscal year, 2 did not contain a population large enough to justify treatment, and 4 had to be postponed because water levels were unsuitable when time was available for treatment. In addition, 19 other tributaries of Lake Michigan were treated. These were streams either postponed from previous fiscal years or found to contain sea lamprey populations nearing metamorphosis. On Lake Huron, 6 of the 12 streams specified in the Agreement were treated. Three of the 12 did not require treatment because of the small size of their ammocete population, and the remaining 3 had been treated just prior to the start of the fiscal year. In addition, 8 streams were treated when surveys indicated larvae large enough to metamorphose. At the end of fiscal year 1971, the Bureau returned $53,187 in unexpended funds which was used for the purchase of lampricide.

[1] All funds and disbursements in U.S. dollars.

The Canadian Department of Fisheries and Forestry treated 9 of the 11 streams on Lake Superior specified in the Agreement. Streams not treated were the Batchawana because of the consistently high stream discharge and the White River because of washouts in the control dam. Two additional streams, the Cranberry and Stokely, were treated after sea lampreys approaching the size of transformation were discovered. Of the 14 streams scheduled for treatment on Lake Huron, three (Two Tree, Richardson's and Bar) were not treated because sea lamprey ammocetes could not be located during surveys, and the Saugeen River treatment was deferred because the lamprey barrier, "Denny's Dam" was not completed until mid-summer and bioassays during the fall were not indicative of successful treatment. In addition, a tributary to the Serpent River was treated after ammocetes were found during surveys. Electrical assessment barriers were operated on nine Lake Huron streams to follow changes in lamprey abundance. The lamprey barrier dam on the upper section of the Echo River was not constructed because of insufficient time. Following the end of fiscal year 1971, the Canadian Department of Fisheries and Forestry returned $26,710 in unexpended funds which was used for the purchase of lampricides.

The Commission purchased 96,900 pounds of lampricide (TFM) at $2.90 per pound from the North American subsidiaries of Farbewerke Hoechst Ag., Germany. The American Hoechst Corporation delivered 54,000 pounds to the U.S. Bureau of Sport Fisheries and Wildlife, and Hoechst Chemicals of Canada delivered 42,900 pounds to the Canadian Department of Fisheries and Wildlife.

The Commission also purchased 800 pounds of Bayer 73 powder ($4.65 per pound) to synergize TFM in certain treatments. The material was supplied by the Haviland Agricultural Chemical Company.

In Commission headquarters operations, expenditures for personal services and most cost components were less than budget estimates because of the reduced staff. However, Commission approved payments of $4,841 for a death benefit to the widow of the former executive secretary and $19,184 for a single premium lifetime annuity for her were covered by transferring $18,376 from the Sea Lamprey Control and Research Fund to the Administration and General Research Fund.

Program and budget for fiscal year 1972. At its 1971 Annual Meeting in June, the Commission adopted a program and budget for sea lamprey control and research of $2,536,000 for fiscal year 1972. A budget of $76,900 was approved for administration and general research. In December, the Commission was advised that continued registration and clearance of its lampricide (TFM) by the Pesticide Regulation Division of the Environmental Protection Agency hinged solely on conducting meaningful research leading to the development of data necessary for establishing residue tolerance limits in water, fish, and food or food stuffs. The estimated cost of this registration-oriented research in fiscal year 1972 was $290,000. Following several revisions owing to changes in proposed United States contributions, the Commission ultimately proceeded with the following program for sea lamprey control and research on a budget of $2,571,800:

Lake Superior—re-treat 13 streams in the United States which have larval populations approaching transformation; and routinely survey other streams to determine time for re-treatment; operate assessment barriers on 8 lamprey spawning streams.

Lake Michigan—re-treat 17 streams and continue routine surveys to determine when treatments on other lamprey-infested streams are required to prevent escapement of young lamprey to the lake.

Lake Huron—treat 15 streams (6 in the United States and 9 in Canada); continue surveys and operate 8 assessment barriers (7 in Canada and 1 in the United States) to assess changes in abundance of lamprey spawning stocks.

Research—conduct research to develop data required to re-register TFM as a lampricide: (1) investigate acute and chronic toxicity of TFM to non-target invertebrate animals, fish, and aquatic plants; (2) obtain further information on efficacy of TFM in waters of different qualities and temperatures; (3) conduct three-generation studies to detect effects of TFM on reproductive capacity of non-target vertebrates; (4) develop primary and confirmatory methods for detecting and measuring TFM residues in water, bottom soils, invertebrates and fish; (5) assess TFM residues in field samples of water, bottom soils, invertebrates, and fish; (6) identify and evaluate metabolites of TFM in fish; and (7) perform standard tests of TFM against game birds and laboratory mammals to define toxic, carcinogenic, mutagenic, teratogenic, and other effects, if any.

Develop more effective chemicals for treating deep-water larval habitats and test chemicals for an irritant to use in surveys; intensify studies of life systems in the sea lamprey to determine if other techniques might be used for control; and investigate the feasibility of biological control using such techniques as introduction of sterile males, non-parasitic hybrids, predators, parasites, and pathogens.

Study the growth and transformation of re-established lamprey populations over a wide range of conditions to determine changes occasioned by stream treatments; and study the growth, movements, and transformations of larval sea lampreys in an experimental section of the Big Garlic River.

Agreements to carry out the program were made with the U.S. Bureau of Sport Fisheries and Wildlife ($1,500,000) and the Canadian Department of Fisheries and Forestry ($668,100).[1] Orders were placed with the American Hoechst Corporation of Farbewerke Hoechst Ag., Germany for 127,300 pounds of the lampricide TFM at $3.30 per pound—the only bid received. Orders were also placed with Chemagro Corporation for 20,000 pounds of Bayer 73 granules at 70¢ per pound and with Haviland Chemical Company for 1,200 pounds of Bayer 73 powder at $6.65 per pound.

The Commission reviewed its Administration and General Research Budget for fiscal year 1972 and agreed to include within the budget of $76,900 the amount of $5,000 to purchase additional benefits for its staff so that these would be ultimately based on salaries paid during the last 4 years of service.

[1] U.S. dollars.

Requests for funds and proposed contributions in fiscal year 1972 are as follows:

Commission request	*United States*	*Canada*	*Total*
Sea Lamprey Control and Research	$1,774,550	$797,250	$2,571,800
Administration and General Research	38,450	38,450	76,900
Total	$1,813,000	$835,700	$2,648,700
Contributions (unconfirmed)			
Sea Lamprey Control and Research	$1,774,550	$797,250	$2,571,800
Administration and General Research	38,450	38,450	76,900
Total	$1,813,000	$835,700	$2,648,700

Program and Budget for fiscal year 1973. At its Annual Meeting in Toronto, the Commission adopted a program and budget for sea lamprey control and research in fiscal year 1973 estimated at $2,631,100 for intensification of the program on the Upper Great Lakes and continuation of registration-oriented research on the lampricide (TFM). A budget of $75,500 was adopted for Administration and General Research.

Reports and publications. The Commission published a brochure describing Commission organization and functions and the following technical report:

"Biology of larval sea lampreys (*Petromyzon marinus*) of the 1960 year class, isolated in the Big Garlic River, Michigan 1960-1965" by Patrick J. Manion and Alberton L. McLain., Great Lakes Fishery Commission, Technical Report 16, 35 p., 1971.

The results of investigations supported by the Commission appeared in the following publications:

"Albinism in lampreys in the upper Great Lakes" by Robert A. Braem and Everett L. King, Jr., Copeia, 1971, No. 1:176-179.

"Giant American brook lampreys, (*Lampetra lamottei*) in the upper Great Lakes" by Patrick J. Manion and Harold A. Purvis, J. Fish. Res. Bd. Canada 28:616-620.

"Sea lampreys in the Great Lakes of North America" by Bernard R. Smith, *In* "The Biology of Lampreys", Vol. 1, Academic Press, New York: 207-247.

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J. S. Burtt, C.P.A.
C. J. Morehouse, C.P.A.
D. B. Booth, Jr., C.P.A.
J. R. Suits, C.P.A.
D. L. Bredernitz, C.P.A.

OFFICES

Ann Arbor, Michigan
Howell, Michigan

September 14, 1971

Great Lakes Fishery Commission
1451 Green Road
P.O. Box 640
Ann Arbor, Michigan

We have examined the statements of assets and liabilities arising from cash transactions of the designated funds of the Great Lakes Fishery Commission as of June 30, 1971, and the related statements of receipts and expenditures for the year then ended. Our examination was made in accordance with generally accepted auditing standards, and accordingly included such tests of the accounting records and such other auditing procedures as we considered necessary in the circumstances.

In our opinion, the accompanying statements present fairly the assets and liabilities arising from cash transactions of the designated funds of the Great Lakes Fishery Commission at June 30, 1971, and the receipts collected and expenditures made by the Commission for the year then ended, on a basis consistent with that of the preceding year.

(signed)

Icerman, Johnson & Hoffman

Exhibit A

Great Lakes Fishery Commission

Statement of Assets and Liabilities

Arising from Cash Transactions

June 30, 1971

(In United States Dollars)

	Administration and General Research Fund	*Lamprey Control Operation Fund*	*Total*
Assets			
Cash in bank	$1,294	$118,234	$119,528
Accounts receivalbe (Schedule A-1)	10	94,038	94,048
Totals (Note A)	$1,304	$212,272	$213,576
Liabilities and Fund Balance			
Liabilities: (Note B)			
Accounts payable	$1,304	5,320	$ 6,624
Reserve for lampricide obligations	–0–	119,321	119,321
Fund balance	–0–	87,631	87,631
Totals	$1,304	$212,272	$213,576

Schedule A-1

Accounts Receivable

June 30, 1971

Refund from United States Bureau of Commercial Fisheries–1970	$ –0–	$ 7,851	$ 7,851
Refund from United States Bureau of Sport Fisheries and Wildlife–1971	$ –0–	53,187	53,187
Due from Canadian Government	$ –0–	26,710	26,710
Due from Canadian Government to match U.S. supplement	–0–	6,290	6,290
Refund from Sun Life Assurance Company	10	–0–	10
Totals	$ 10	$ 94,038	$ 94,048

Note A – Assets do not include program property such as land and improvements, equipment and inventories.

Note B – The Bureau of Sport Fisheries and Wildlife replaced the Bureau of Commercial Fisheries as the United States agent effective during September 1970. Final settlement of the account with the Bureau of Commercial Fisheries for the period from July through September 1970 has not been completed. It is estimated that any possible liability resulting from settlement with the Bureau of Commercial Fisheries will not be material in amount and, therefore, is not reflected in the financial statements.

Exhibit B

Great Lakes Fishery Commission

Administrative and General Research Fund

Statement of Receipts and Expenditures

Year Ended June 30, 1971

(In United States Dollars)

	Actual	*Budget*
Receipts		
Canadian Government	$35,000	$35,000
United States Government	35,000	35,000
Transfer from Lamprey Control Operation Fund	18,376	–0–
Totals	$88,376	$70,000
Accounts receivable, June 30, 1970	2,085	
Accounts receivable, June 30, 1971	(10)	
Totals	$90,451	
Expenditures		
Salaries	$47,703	$49,200
Fringe benefits	3,762	4,800
Travel	3,577	4,000
Communication	1,602	1,500
Rents and utilities	552	800
Printing and reproduction	1,424	3,000
Other contractual services	1,331	1,100
General research	4,904	4,600
Supplies	1,343	1,000
Equipment	–0–	–0–
Death benefit (Note)	4,841	–0–
Annuity (Note)	19,184	–0–
Totals	$90,223	$70,000
Accounts payable, June 30, 1971	(1,304)	
Total	$88,919	
Excess of receipts over expenditures	$ 1,532	
Cash balance, (deficit) July 1, 1970	(238)	
Cash balance, June 30, 1971	$ 1,294	

Note – On March 22, 1971 the Commission approved payment of a $4,841 death benefit to the widow of the former executive secretary. On April 15, 1971 it approved payment of $19,184 toward a single premium lifetime annuity for her.

Exihibit C

Great Lakes Fishery Commission

Lamprey Control Operation Fund

Statement of Receipts and Expenditures

Year Ended June 30, 1971

(In United States Dollars)

	Actual	*Budget*
Receipts		
Canadian Government	$ 607,870	$ 607,870
United States Government	1,353,000	1,353,000
Refund from United States Government:		
1970 fiscal year	353	–0–
1971 fiscal year	53,187	–0–
Totals	$2,014,410	$1,960,870
Accounts receivable, July 1, 1970	114,394	
Accounts receivable, June 30, 1971	(94,038)	
Total cash receipts	$2,034,766	
Expenditures		
Canadian Department of Fisheries and Forestry	$ 569,265	$ 569,265
United States Bureau of Commercial Fisheries	263,238	263,238
United States Bureau of Sport Fisheries and Wildlife (Note)	789,712	831,712
Lampricide purchases	290,736	296,655
Grants in aid for research on lampricide effectiveness	13,350	–0–
		–0–
Legal expense	75	
Transfer to Administrative and General Research Fund	18,376	–0–
Totals	$1,944,752	$1,960,870
Accounts payable and reserve for lampricide obligations:		
July 1, 1970	238,319	
June 30, 1971	(124,641)	
Total cash expenditures	$2,058,430	
Excess of cash expenditures over receipts	$ 23,664	
Cash balance, July 1, 1970	141,898	
Cash balance, June 30, 1971	$ 118,234	

Note – The final $42,000 budgeted for pay act costs was not paid, since the Bureau of Sport Fisheries and Wildlife had already received payments in excess of its requirements for the 1971 fiscal year.

DEPARTMENT OF THE ENVIRONMENT

Financial Report to Great Lakes Fishery Commission

April 1, 1970 to March 31, 1971

Canadian Funds

Administration		$128,890.72
Chemical Control, Lake Superior		162,475.17
Barriers, Lake Huron		81,774.82
Chemical Control, Lake Huron		145,003.45
Stream Surveys, Lake Superior		19,383.72
Stream Surveys, Lake Huron		18,157.76
Trawling, St. Mary's River		196.87
Final Statement		$555,882.51
Superannuation Costs (7% of $272,497.49)		19,074.82
Total Expenditure for 1970-71		$574,957.33
Canadian Contribution, 1970-71		U.S. Funds
Less Expenditure $574,957.33 @ $1.01	569,264.68 (US)	$636,580.00
Less Partial Contribution	40,605.00 (US)	$609,869.68
Balance of Contribution		$ 26,710.32

Certified Correct_____

J. Bennett
Financial Branch

BUREAU OF SPORT FISHERIES AND WILDLIFE
SEA LAMPREY CONTROL AND RESEARCH PROGRAM)

Report of Expenditures for All Activities
October 1, 1970 through June 30, 1971[1]

Activity	Funds Programmed	Salaries	Expenses	Total	Unobligated Balance
Program Costs Marquette, Michigan Ludington, Michigan Hammond Bay	$670,512	$489,088	$136,861	$625,949	$44,563
Washington, D.C.	15,000	–	15,000	15,000	–
General Administrative Expense Regional Office	104,000	64,230	31,346	95,576	8,624
Totals	$789,712	$553,318	$183,207	$736,525	$53,187

[1]No detailed accounting for first quarter July 1, 1970-September 30, 1970 available because jurisdiction was transferred to Bureau of Sport Fisheries and Wildlife on October 3, 1970 in accordance with the President's Reorganization Plan No. 4.

COMMITTEE MEMBERS - 1971

[Commissioners in Italics]

SCIENTIFIC ADVISORY COMMITTEE

CANADA	UNITED STATES
C. J. Kerswill, Chm.	*N. P. Reed*
Lionel Johnson	L. L. Smith
K. H. Loftus	S. H. Smith
H. A. Regier	D. A. Webster

SEA LAMPREY CONTROL AND RESEARCH COMMITTEE

CANADA	UNITED STATES
C. H. D. Clarke	*W. M. Lawrence*, Chm.
J. J. Tibbles	H. D. Tait

MANAGEMENT AND RESEARCH COMMITTEE

CANADA	UNITED STATES
E. W. Burridge	*Claude Ver Duin*, Chm.
G. C. Armstrong	D. C. Armbruster
M. J. Brubacher	R. E. Bass
F. P. Maher	A. D. Bradford
J. C. Weir	N. E. Fogle
	W. J. Harth
	C. N. Lloyd
	C. E. Parker
	J. A. Scott
	H. O. Swenson
	W. H. Tody
	H. J. Vondett

LAKE COMMITTEES

LAKE HURON	LAKE ONTARIO
J. A. Scott, Chm.	C. E. Parker, Chm.
M. J. Brubacher	J. C. Weir

LAKE MICHIGAN	LAKE SUPERIOR	LAKE ERIE
W. H. Tody, Chm.	G. C. Armstrong, Chm.	A. D. Bradford, Chm.
R. E. Bass	C. N. Lloyd	D. C. Armbruster
W. J. Harth	H. O. Swenson	N. E. Fogle
C. N. Lloyd	H. J. Vondett	F. P. Maher
		C. E. Parker