Department of Natural Resources
Box 450
Madison, Wisconsin 53701

FISH MANAGEMENT ADMINISTRATIVE REPORT NO. 1

Management Concepts for Great Lakes Fisheries

Introduction

Several events have led to this evaluation of Wisconsin's Great Lakes management program. Sport fishing has increased drammatically with the advent of large-scale fish stocking and with sea lamprey control in the presence of abundant forage. Commercial fisheries have been beset with problems, some as a result of their own action, others due to contamination of the aquatic environment which sustains their industry. Currently fish stocks show signs of responding favorably to sea lamprey control, net regulation and changes in total fishery dynamics.

The degree to which management measures affect fishery dynamics is not always evident, however, some practices have been proven successful and deserve evaluation.

Stock Manipulation

The Great Lakes Fishery Commission, as the coordinating body for resource agencies concerned with the Great Lakes has the primary goal of reestablishing self-sustaining lake trout stocks. The void created by sea lamprey predation, with subsequent sea lamprey control, provided a fertile environment for introductions of salmonoids. Lake trout are being successfully reintroduced to fill the deep water void. Rainbow, brown, brook trout, coho and chinook salmon have been stocked with varying degrees of success to fill pelagic and near-shore voids. All have capitalized on the immense supply of alewives and/or smelt as forage.

Lake Michigan

Extrapolation of 1971 Lake Michigan creel census data provide, in theory, an estimate of the success of each species in providing a fishery (Table 1). There are many possibilities for miscalculation in interpreting these data. This is to be considered as a starting point and is intended to generate critical, constructive response.

Fish planted from 1968 through 1970 for stream trout and salmon and 1966 through 1969 for lake trout were considered as principle contributors to the sport fishery in 1971. An average annual mortality of 50 percent was assumed for both yearlings and fingerlings, with fingerlings from 1970 not assumed to contribute to the 1971 creel in significant numbers. In addition it was assumed that all species had uniform availability and equal catchability. Obviously, these assumptions are unreal, but necessary to understanding the conclusions reached.

Table 1

LAKE MICHIGAN SPORT FISHERY - 1971

Species[2]	Survival to 1971[1]	Theoretical[4] Catch Composition (%)	Actual 1971 Catch Composition (%)	1971 Harvest of Available (%)
Coho	227,400	23.1	29.4	14.9
Chinook	16,500	1.7	5.3	37.3
Rainbow	157,800	16.0	16.3	12.0
Brown	142,700	14.5	10.5	8.5
Brook	36,900	3.7	1.1	3.5
Lake[3]	403,782	41.0	37.4	10.7

1. 50% mortality/year assumed
2. 3-year classes considered '67, '68, '69; fingerlings computed separately
3. 4-year classes considered '65, '66, '67, '68
4. Assumes uniform availability and equal catchability

Coho salmon, lake trout and rainbow trout contributed to the creel in proportion to their availability in the fish stocks (actual vs. theoretical catch composition). In each instance at least 10 percent of the available stock (survival to 1971) was harvested. Estimates for coho are no doubt unrealistic since there are significant numbers of Michigan coho taken in Wisconsin waters.

Brown trout constituted a smaller portion of the creel than was to be expected, and only 8.5 percent of the fish assumed available were harvested. Factors controlling brown trout success might be heavy fungus mortality, which reduces available stocks, and well known difficulties involved in catching brown trout.

Chinook salmon constituted a greater portion of the catch than was expected, no doubt because of significant numbers of Michigan fish being caught in Wisconsin waters. Only one plant of Wisconsin chinook salmon was considered as available to the fishery.

Brook trout constituted a smaller portion of the creel than was expected. Similarly, a smaller portion of those assumed available were actually harvested (3.5%). The brook trout stocking program has been modest consisting of widespread, small scale plantings, which may have diluted the stocking effort and made it ineffective.

These observations suggest some stock manipulation is warranted. Recommendations from Lake Michigan biologists reflect these observations:

Recommendations

Brook trout quotas should be increased, accompanied by less dispersal of the planted fish to seek a greater harvest.

Brown trout quotas should be increased and some effort made to plant both yearlings and fingerlings. Fungus-related mortality remains a problem, however, the great desirability of brown trout outweighs this at present.

Doubling of present rainbow stockings is recommended based on the success of this species. Both spring and fall spawning strains are responsible for the present harvest.

Lake trout quotas must remain high. Since at least four year classes contribute to the fishery long-range stocking plans are vital to insure against substantial loss to the fishery, which is one-third dependent on this species (37.4% of 1971 catch composition).

Wisconsin harvests more coho and chinook salmon than would be expected from survival of state plants. Since our fishery presently capitalizes on Michigan plants, we have an opportunity to further test selected strains of these species from west coast stocks to enhance growth, "biteability", and other attributes.

Brook-brown hybrids have been recommended for experimental introduction. This may be the answer to brown trout fungus and disease problems and to poor brook trout returns.

Lake Superior

The Lake Superior sport fishery has not received this evaluation, however, recommendations for stock manipulation have been made.

Recommendations

Lake trout constituted over 53 percent of the catch in 1971 and over 20 percent of the available stock were presumed to be harvested. (If the assumption of 50 percent annual mortality is applied to plantings made in 1964-67 over 27 percent were harvested). A plant of 745,000 lake trout in 1964 is largely responsible for excellent Lake Superior fishing during the last four years. Subsequent plants have been only one-half as large, however, and lake trout were observed to relinquish some of their dominance in 1971, as the 1964 plant grew out of the fishery. Lake trout stocking on Lake Superior could be increased substantially in view of the high utilization of present plantings by the sport fishery, without even considering other factors influencing harvest and survival. Caution should be exercised in interpreting the data, however, since natural recruitment may be responsible for the inflated harvest of available stocks estimate.

Rainbow trout sport harvest is less than 5 percent of the available stock. Experimental planting of summer steelhead have not produced desired results.

Brown trout contribute to the creel in substantial numbers, and their stocking rate could be increased to the benefit of the fishery.

It is evident that our Lake Superior waters should be stocked more heavily with fish that could more adequately fill the mid-water and near-shore habitats. Splake have been recommended and are being reared for experimental introductions at present.

Coho salmon constituted 11 percent of the 1971 sport catch even though Wisconsin planted no coho. Their contribution to the creel could be further enhanced by modest stocking in Wisconsin waters, however, potential species interactions should be clearly identified and evaluated before initiating action.

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Atlantic salmon were planted in Lake Superior in 1972 in an effort to establish a spawning run and to develop new interest in the sport fishery. Further experimentation is warranted in view of the need to enhance the near-shore and pelagic fisheries.

Harvest Manipulation

Limited Entry

Limited entry commercial fishing has been established on Lake Superior in a departure from the historic philosophy that such fisheries should be limited simply by seasons, size limits, and limits to gear efficiency. The program is developed on the basis of wise use and conservations of fish stocks and on their perpetuation. The public has recognized the need for a departure from the traditional in this instance and has been involved, through public hearings, in the establishment of limited entry. Since the commercial fishermen who were best qualified to conduct full time fishing were benefited by this program their support was also given.

By limiting the number of fishermen and limiting the areas in which commercial fishing may be conducted, it is possible to affect control and perhaps reduction in harvest of important species, yet allow the individual fisherman to increase his efficiency.

With a limited number of highly efficient commercial fishermen as the mode of harvest it follows that the available supply of commercial species should be determined and allowable harvest quotas should be established. Initial estimates of allowable harvest have been made in conference with the U.S. Bureau of Sport Fisheries and Wildlife. These estimates should be updated quarterly based on the best available data.

We are currently capable of generating data required to make decisions on allowable harvest limits. Tables 2 and 3, are computer printouts of accumulative production of whitefish by statistical grid in 1972, and effective effort and catch per unit of effort for April 1969 through 1972. Armed with similar data, with sound biological indices of growth and survival, and with knowledge of external factors influencing catchability, i.e., weather conditions, managers could adjust quotas to sustain optimum yield.

Contract Fishing

The controlled harvest of surplus fish stocks to achieve sustained optimum yield could probably best be accomplished by contract fishing. The Lake Superior fishery is sufficiently small, in terms of harvesting units and fishing area, that it would provide an ideal pilot project.

The "ten minute" statistical grid system now employed in catch reporting provides an adequate matrix on which to establish harvest quotas and draw contracts for commercial harvest.

Contract fishing is conducted presently on Lake Superior. Smelt have been declared a detrimental fish in Section NR 20.15 (5) and contracts are issued for their harvest. For several years the Department has issued contracts to qualifying commercial fishermen for assessment fishing for lake trout.

As our knowledge of whitefish and herring stocks increases these species should be incorporated in contract fisheries. The ultimate goal would be controlled sustainable commercial production under contract on a grid basis, with seasonal quotas adjusted to correspond with status of the stocks.

Contract fishing is not envisioned for Lake Michigan for some time, largely because of the number of commercial fishermen involved and our lack of sufficient data on which to base quotas.

Commercial fisheries traditionally harvested lake trout. The average annual harvest from Lake Michigan in the period from 1940 through 1947 was 2,370,000 pounds. During this period production from Lake Superior averaged 599,000 pounds. Such harvests may or may not have been sustainable. The sport fishery's precedence over commercial fisheries in this era dictates that such commercial harvests by traditional netting methods will never again be achieved.

Commercial Trolling

Presently perhaps one-third the annual harvest of lake trout might come from commercial charter trollers (licensed guides). Trolling for lake trout is generally specific in that other species are seldom caught. This represents a form of harvest which is presently commercial in nature and could provide a method for future commercial harvest of lake trout. Limited commercial lake trout harvest will be warranted when significant natural reproduction is evidenced, when naturally produced lake trout begin to constitute a dominant portion of the total stock, or when there is conclusive proof that a surplus exists over what is needed to sustain the sport fishery and to reestablish self-sustaining native stocks.

Because of the similarity between commercial charter trolling and public-sector sport trolling, in that both provide recreational fishing, this method of commercializing on lake trout seems acceptable.

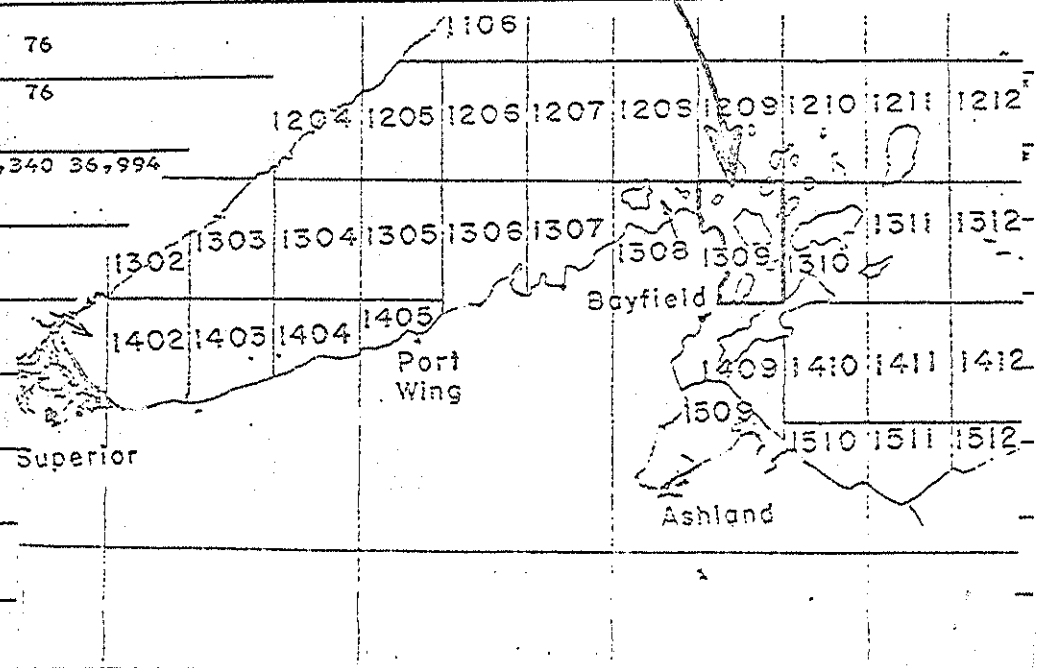
Rigid controls are necessary. Commercial charter trollers may be licensed to fish selected areas, may have daily limits regardless of the number of chartering parties aboard, and would be required to report their catches, detailed in a manner acceptable to the Department.

Entrapping Gear

Interspecific relationships between lake trout, whitefish, and stream trout (seasonally) make continued commercial use of large mesh gill nets impractical. These nets are size selective but not species selective, and kill fish to a degree which varies with length of time set and weather conditions. Gill nets have been the principle cause of sport-commercial fishery conflict on the Great Lakes since interest in the Great Lakes for sport fishing was first apparent.

SPECIES	GRID		TOTAL	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
46 RAINBOW TROUT	1409	NUMBER	2			2									
46 RAINBOW TROUT	TOTAL		2*			2									
60 SMELT, HUMAN FOOD	1306	POUNDS	5,270	625	3,165	1,075	405								
60 SMELT, HUMAN FOOD	1307	POUNDS	9,019		827	4,753	3,439								
60 SMELT, HUMAN FOOD	1308	POUNDS	1,978		1,239	739									
60 SMELT, HUMAN FOOD	1309	POUNDS	4,977	1,045	81	933	2,918								
60 SMELT, HUMAN FOOD	1310	POUNDS	1,941	51			1,890								
60 SMELT, HUMAN FOOD	1409	POUNDS	37,233	5,889	11,895	9,987	9,462								
60 SMELT, HUMAN FOOD	1410	POUNDS	2,155		265	1,348	542								
60 SMELT, HUMAN FOOD	1509	POUNDS	3,068	1,838	753	477									
60 SMELT, HUMAN FOOD	TOTAL		65,641*	9,448	18,225	19,312	18,656								
64 SUCKERS	1409	POUNDS	35	9	17	4	5								
64 SUCKERS	TOTAL		35*	9	17	4	5								
70 WHTEFSH, COMM -LEGAL	1209	POUNDS	1,392		1,012	380									
70 WHTEFSH, COMM -LEGAL	1210	POUNDS	1,316		557	759									
70 WHTEFSH, COMM -LEGAL	1211	POUNDS	347		347										
70 WHTEFSH, COMM -LEGAL	1308	POUNDS	2,218	602	494	575	547								
70 WHTEFSH, COMM -LEGAL	1309	POUNDS	12,138	2,873	4,547	2,736	1,982								
70 WHTEFSH, COMM -LEGAL	1310	POUNDS	2,939		1,249	1,300	390								
70 WHTEFSH, COMM -LEGAL	1409	POUNDS	28,133	4,545	11,045	7,968	4,575								
70 WHTEFSH, COMM -LEGAL	TOTAL		48,483*	8,020	19,251	13,718	7,494								
70 WHTEFSH, COMM -UNDER	1210	NUMBER	1		1										
70 WHTEFSH, COMM -UNDER	1309	NUMBER	3		1		2								
70 WHTEFSH, COMM -UNDER	TOTAL		4*		2		2								
71 WHITEFISH, MENOMINEE	1409	POUNDS	209	44	89	76									
71 WHITEFISH, MENOMINEE	TOTAL		209*	44	89	76									
FINAL TOTAL			170,343*	26,544	48,465	56,340	36,994								

Table 2
Whitefish production by grid
Accumulated for 1972



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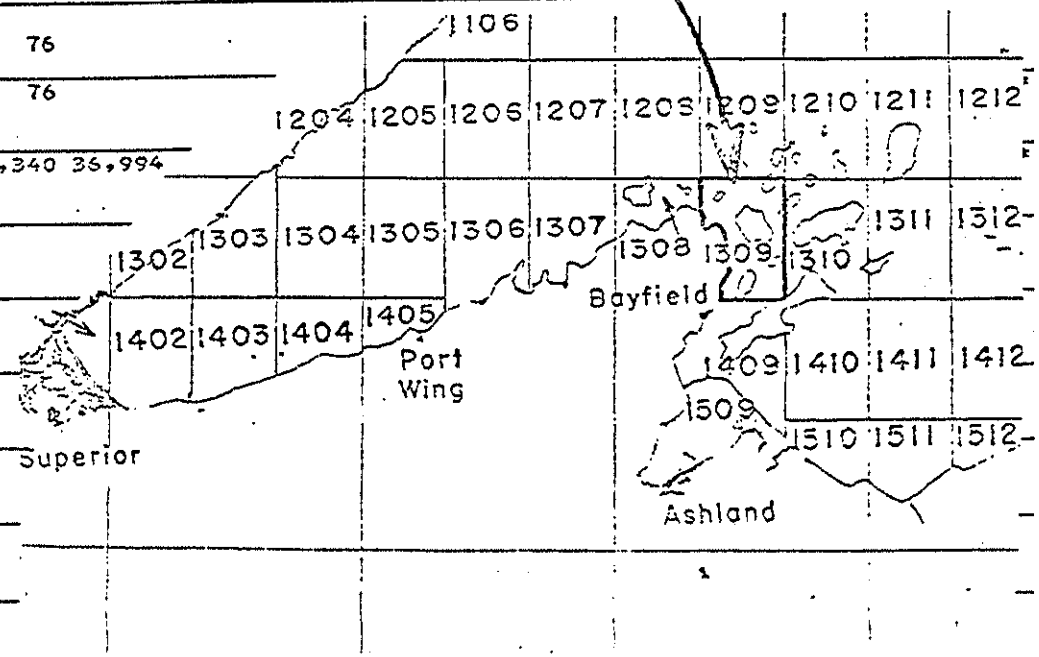

SPECIES GEAR TYPE		1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980
02 2 INCH GILL NETS	CPE	4.24			3.13								
64 SUCKERS	EFF EFFORT	24.5			1.6								
03 4 INCH GILL NETS	CPE	2.37											
64 SUCKERS	EFF EFFORT	60.0											
06 POUND NETS	CPE	65.45	106.79	79.81									
64 SUCKERS	EFF EFFORT	11.0	42.0	26.0									
64 SUCKERS	PDS	7,531*	966*	4,485*	2,075*	5*	*	*	*	*	*	*	*
03 4 INCH GILL NETS	CPE	17.91	15.24	39.69	26.12								
70 WHTEFSH, COMM -LEGAL	EFF EFFORT	446.9	63.7	179.3	286.9								
70 WHTEFSH, COMM	PDS	23,587*	8,005*	971*	7,117*	7,494*	*	*	*	*	*	*	*
03 4 INCH GILL NETS	CPE	.43		.38	.20								
70 WHTEFSH, COMM -UNDER	EFF EFFORT	71.4		5.3	9.8								
70 WHTEFSH, COMM	CTH	35*	31*	*	2*	2*	*	*	*	*	*	*	*
01 1 INCH GILL NETS	CPE		6.00	3.64									
71 WHITEFISH, MENOMINEE	EFF EFFORT		.5	1.1									
02 2 INCH GILL NETS	CPE			263.24									
71 WHITEFISH, MENOMINEE	EFF EFFORT			3.4									
71 WHITEFISH, MENOMINEE	PDS	902*	*	3*	899*	*	*	*	*	*	*	*	*
03 4 INCH GILL NETS	CPE	.00											
72	EFF EFFORT	10.0											
72	PDS	*	*	*	*	*	*	*	*	*	*	*	*
FINAL TOTAL		1005,900*	139,251*	511,897*	317,758*	36,994*	*	*	*	*	*	*	*

Table 3

Whitefish catch per unit of effort (cpe)
Effective effort (1,000's of feet of gill net)
April 1969-1972

Chapter 25.08 (8) (b) of the Wisconsin Administrative Code allows for an incidental catch of illegal fish (trout spp., etc.) not to exceed 10% of the total catch by weight. Many historical whitefish grounds are now inhabited by stocked lake trout to the extent that the "ten percent law" is exceeded regularly.

Long-range management of commercial fisheries should, therefore, consider the use of entrapping gear exclusively in areas where the incidental catch of game fish would be significant. Contract commercial fisheries, wherein fishing areas and fishing gear are specified, could eliminate large-mesh gill nets in areas of conflict.

Summary

Wisconsin has title to 6,439,700 acres of the Great Lakes and 820 miles of their shoreline. There is little doubt that they are our greatest aquatic resources. Sport fishing interest in Lake Michigan alone doubled and redoubled in 1970 and 1971 (in terms of angler trips) and shows signs of a similar increase in 1972. With nearly 50 percent of our state population within 30 miles of these lakes it is fitting that management effort acknowledge their value. Enhancing the Great Lakes fishery is especially critical at present, when recreational pressures on inland waters are mounting beyond the capacity of the lakes and streams to sustain these activities without harming the resource.

Recommendations for stock manipulation have generally envisioned increases in stocking quotas. However, in some instances hybrids and strains new to these waters are recommended. The search for the most desirable traits in those species presently stocked should continue.

Recommendations relative to harvest manipulation envision elaboration of the limited entry concept and contract fishing, both now utilized in managing the fishery.

The elimination of large-mesh gill netting in favor of entrapping gear in sensitive areas has to a limited extent been used and is further recommended.

The utilization of trolling as a commercial means of fish harvest is new to the Great Lakes, however, it has been successfully incorporated in west coast management programs and is worthy of our consideration.

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