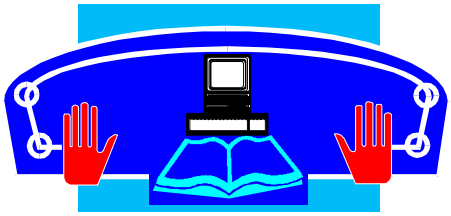

Sectoral Overview Of The Saskatchewan Fishery
Type of Study: Statistics / Economics Fisheries, Fisheries Other Provinces
Date of Report: 1986
Author: Dpa Group Inc
Catalogue Number: 3-17-2

SUMMARY

The fish resources of Saskatchewan are capable of generating a stream of benefits to society indefinitely. However, the resource must be properly conserved. Resource use and access must be properly managed.

Management of commercial, sport, and subsistence food fishery sectors in Saskatchewan has been guided largely by social considerations. Supply/harvest imbalances, allocation conflicts, and poor economic performance have characterized the fishery in recent years.

A three-phased study, of which this report forms Phase I, was launched to examine the Saskatchewan fishery. Phase I, the Sectoral Review, examines the present supply and harvest of fish, present fishery goals and regulations, and federal and provincial activities, programs, and associated expenditures. The industry profile (Phase II) quantifies the dimensions of the fishery, assesses recent economic performance, and identifies issues. Phase III presents strategies and recommendations for achieving improved economic and socioeconomic performance of the various fishery sectors.

Fishery Management Goals

In Canada's inland fisheries, both the provincial and federal governments play roles in the management and regulation of the fish resource. The federal government has legislative authority over the management of the Saskatchewan fishery. The Province of Saskatchewan, however, holds proprietary rights to the fish and waterways. Consequently, the federal government may regulate fishing seasons, quotas, size limits, and gear. The provincial government determines who can fish, what privileges are conferred, and what fees are paid. In 1930, the federal government delegated the responsibility for

administering the legislation to the province.

A recent federal Department of Fisheries and Oceans document states that the primary objective of the federal government should be to exercise its constitutional powers to ensure ' that, national fish resources make their greatest contribution to the economic and social welfare of Canadians. Secondary objectives include stability, employment generation and regional development.

The Saskatchewan Parks and Renewable Resources 'Action Plan" suggests that the overall objective of fisheries management is to have a satisfied public with access to stable, healthy fish populations. The three main goals are:

supply	to maintain and, where possible, increase the sustainable supply of economically usable fish through conservation and enhancement initiatives.
Allocation	to have satisfied user groups who have been equitably allocated sustainable supplies of fish.
Development	to increase contribution to the provincial economy through income to industry and revenue to government.

There is consistency between federal and provincial goal statements regarding the primary concern for the conservation of fish stocks. However, it appears from the goal statements that DFO is more concerned with economic efficiency considerations than is the Province. The Province is concerned primarily with distributional and equity considerations and with "satisfied" user groups.

Given the finite nature of fish resources, there are inconsistencies within each set of goal statements. For

example, one cannot increase employment *in* the fishery and increase economic efficiency in the fishery at the same time, given the present status and structure of the Saskatchewan fishery.

Furthermore, since one is allocating a finite fish resource pie among commercial, sport, and native interests, it is unlikely that one can have satisfied commercial and sport and subsistence user groups, i.e., allocating a larger slice to one group necessarily means allocating smaller shares to the other groups.

Fish Sustainable Supply and Harvests

The sustainable supply of a species is the amount that may be harvested annually from all sources and not adversely affect the population. In 1980, the sustainable supply of the four main fish species in Saskatchewan was 15.0 million kg -- 2.3, million kg walleye, 1.1. million kg lake trout, 7.4 million kg pike, and 4.1 million kg whitefish.

The majority of lake trout and pike lies in the Northern region, *whereas the* bulk of whitefish supply lies in the Central region. Walleye supply is split evenly between the Northern and Central regions. The Southern region has only 6% of the total sustainable supply.

The sustainable supply decreases over time due to loss of habitat.

Current (mid 1980s) commercial harvest levels of whitefish and lake trout are roughly 1.2 million kg and 0.4 million kg, respectively. Current walleye and pike harvests are approximately 0.8 million kg annually each.

A significant decline in whitefish harvests has occurred, with the present harvest being roughly 1/3 of harvest levels in the early 1960s. Walleye harvests have declined slightly.

Lake trout harvests are 1/2 those in the early 1960s. Pike harvest levels are comparable to those of 25 years ago.

The sport fishery harvest of pike, walleye, and lake trout was approximately 4.5 million kg in 1980 (pike 2.7 million kg, walleye 1.5 million kg, lake trout 0.3 million kg] a total exceeding the harvest of the commercial fishery. Very few whitefish are caught by anglers.

The harvest of the four main species by the subsistence fishery was 1.7 million kg in 1985 -- 0.3 million kg walleye, 0.3 million kg lake trout, 0.6 million kg pike, and 0.5 million kg whitefish.

There is a regional supply/harvest imbalance in the Saskatchewan fishery. A disproportionate share of the (commercial, sport, and subsistence) harvest is taken from the Central and Southern zones. This is especially true for pike and walleye.

At the provincial aggregate level, walleye and lake trout harvests are greater than respective sustainable supplies. There are significant surpluses of supply over harvest for pike and whitefish.

	supply	Harvest .mm '000 kg . . .	Surplus (Deficit)
Walleye	2,308	2,588	(200)
Lake Trout	1,142	1,314	(172)
Pike	7,378	4,352	3,026
Total Gamefish	10,828	8,254	2,574
Whitefish	4,128	2,521	1,607
Total	14,956	%0,77s	4,181

Aggregation to the provincial level masks important regional variations. There are significant shortfalls for walleye in the Central and *Southern* zones, for lake trout in the Northern zone, and for pike in the Central and Southern zones. Total gamefish harvest exceeds total gamefish

sustainable supply in the Central and Southern zones.

Consequently, severe supply/harvest imbalances exist in the fish resources of Saskatchewan, especially for walleye and lake trout. Given no structural change in fishery management approaches and present trends, these supply/harvest imbalances are expected to grow as fishermen continue to target on higher-valued species and as sustainable supply declines due to habitat loss.

Fishery Regulations and Allocation Mechanisms

Multiple use of lakes by commercial, sport, and subsistence food fishermen is the cornerstone of fisheries policy in Saskatchewan. The subsistence fishery has priority over the sport and commercial fisheries. However, there is no explicit allocation of total allowable harvest among the three interest groups for individual lakes or groups of lakes. Many lakes are utilized by more than one user group, often at the same time.

Lake quotas exist, but they apply only to commercial fishing operations. There are no explicit lake quotas for sport and subsistence food fisheries, and hence for total harvest on each lake.

A total of 821 lakes in Saskatchewan have commercial fishing quotas (allowable total harvests) established. Only 78 of these lakes have individual species quotas. Quota levels are based on estimates of sustainable yields. No limits are set on how much fish an individual fisherman can catch (subject, of course, to the overall lake quota) . Gill nets are the only permissible gear on most lakes.

The number of commercial fishing enterprises in Saskatchewan is not limited by the provincial government, i.e., there is no formal limited entry of fishermen. However, the government has allowed local fishermen groups in Northern

Saskatchewan to set eligibility criteria for fishermen wishing to fish in the local area. Common criteria are residence in the region and previous fishing experience.

Access to the sport fishery is unrestricted (subject to the payment of the license fee). There are no overall sport fishery catch limits on a provincial, regional, and lake basis. There are daily limits for individual anglers, but no annual limits for anglers. In 1985 the daily limit was 8 fish (of designated species) plus 25 perch.

Lodge capacity guidelines were introduced by Saskatchewan Parks and Renewable Resources in 1978 in an attempt to protect both existing outfitters and the fish resource from excess capacity and undue competition for a limited resource. The capacity guidelines were also an implicit attempt to allocate the resource among outfitters. Since the guidelines were implemented as a function of the land lease, lodges located on purchased land are not under control. It is of interest that the number of lodges purchasing their lease is increasing.

The subsistence fishery has three major components: Indian, domestic, and angling. Treaty Indians may fish for food throughout the year and do not have to pay a fee for their permit. Non-treaty Indians and others purchase domestic licenses at a cost of $5 per license. Domestic licenses are issued on the basis of need according to criteria of financial hardship, geographic location, and/or possession of sled dogs. Treaty Indians may harvest fish for food by angling throughout the year.

Federal and Provincial Activities/Pro9rms

There are a variety of federal and provincial activities and programs instituted to conserve, enhance, and develop the fish resources of Saskatchewan. There are six general activity categories for government involvement: enforcement,

management, development, assessment, enhancement, and habitat protection.

Enforcement refers to activities of the operations sector and includes activities ranging from issing licenses to enforcing fishing regulations by the province, and conducting plant and fish quality inspections by DFO.

Fisheries management refers to planning and setting regulations, allocation decisions, and the consultation process with user and non-user groups.

Fish stock assessment includes biological and limnological fisheries research (and the operation of the provincial fisheries laboratory in Saskatoon).

Enhancement includes stocking and culturing fish, e.g., the operation of the provincial Fort Qu'Appelle Fish Culture Station.

Habitat protection involves monitoring and testing for deleterious substances (e.g., mercury and acid rain) to fish populations as well as the impact of major resource development such as hydroelectric dams and mines.

Development encompasses the promotion of economic benefits to man through consumptive use of the fish resource and through the infrastructure required to capture, process, and transport the fish. Main activities are: subsidies/grants, training initiatives, extension work and other programs/assistance.

The main subsidy program undertaken in the development activity is a transportation subsidy for fish caught in Saskatchewan. The program was instituted in 1975/76 and pays 90% of the cost of transporting fish from lakes where they were caught to Prince Albert. There is also a provincial

fish price support program which provides a subsidy to the price of certain species of fish, e.g., continental whitefish. Pike have received subsidies in the past.

Government Expenditures and Revenues

In 1984/85, Saskatchewan Parks and Renewable Resources spent $3.1 million excluding subsidies -- $0.9 million on the commercial fishery, $2.0 million on the sport fishery, $0.1 million on the domestic and Indian food fishery, and $0.1 million on aquiculture. An additional $0.5 million was spent on commercial fishing subsidy programs. Enforcement is the major departmental activity.

In *1984/85,* Saskatchewan Tourism and Small Business spent $0.4 million on fisheries and aquiculture.

DFO expenditures in 1984/85 are estimated at $0.7 million.

License revenues were $2.0 million in 1984/85, 99% of which was derived from angler licenses.

The overall deficit was $2.7 million -- $2.0 million provincial and $0.7 million federal. Due to the omission of several cost/expenditure categories, the figure of $2.7 million represents a lower bound. Nonetheless, it suggests the order of magnitude of the shortfall and implicit transfer of funds from federal and provincial tax payers/resource stockholders to users of the Saskatchewan fish resource.

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2.0 INTRODUCTION

Saskatchewants fish resources are found in the provinces lakes, streams, and reservoirs. Saskatchewan contains more than 94 thousand lakes, with a total surface area of 67 thousand square km. This represents about 10% of the provinces surface area.[1]

Traditionally, the main user groups of Saskatchewan's fish resources have been commercial, sport, and subsistence food fishermen. Recently, participation in other fishing sectors such as aquiculture and the brine shrimp fishery has escalated.

Present harvest levels are in the order of 10 million kg annually (all species and all fishery sectors) . Three-quarters of this total comes from walleye, lake trout, pike, and whitefish. A total of 21 species of fish are harvested by the various sectors. The bulk of the harvest comes from the *commercial* and sport fisheries. Roughly 200 lakes are fished commercially and 1,000 lakes are fished by sport fishermen. The Saskatchewan fishery is diverse in terms of the many lakes fished, the many species exploited, and the various user groups.

There is diversity not only among user groups, but also within user groups -- e.g., open water summer fisheries versus under lake ice winter fisheries; direct access versus outfitter sport fishing operations. This diversity in resource use has led to conflict between user groups. Conflicts have been exacerbated as demand for the fish resource has increased and the availability of the resource has declined.

There have been three eras of fi.sheri.es management in Saskatchewan. The first, from 1920 to 1946, was a period of open, virtually unlimited exploitation. Access and

transportation were the limiting factors. In the second era, 1947 to 1970, lake quotas were the main instrument for controlling commercial harvests. It was during this second era that recreational fishing emerged as a competing resource use. In 1970, commercial quotas for individual species began to appear. Other tools of management, particularly for the sport catch, were closed seasons and possession limits. The third era, from 1971 to the present, is characterized by habitat changes, impacts from pollution and land use, and overfishing.[2]

Saskatchewanis fish *resources* are capable of generating a stream of benefits to society indefinitely. However, the resource must be properly conserved; resource use and access must be properly managed.

The "Saskatchewan Fisheries Policy Action Plan" succinctly identifies three main policy issues for the fishery[3]:

- Supply/harvest imbalance -- growing exploitation levels versus a fixed or declining resource base: lack of demand for several species: and abundant demand for game fishing species.
- Allocation conflicts -- commercial versus sports versus subsistence; allocation conflicts within user groups.
- Development issues -- improving economic returns/ benefits from" commercial and sport fisheries; development of aquiculture and brine shrimp.

The Saskatchewan commercial fishery is characterized by low capital/labour ratios relative to other resource industries and other commercial fisheries in Canada. Capital barriers to entry to the fishery are not severe. The fishery is seen by some as a sump for absorbing unemployed labour in remote regions of the province.

Management of all fishery sectors has been guided largely by social considerations. However, as the Department of Fisheries and Oceans has observed,

> . . . Canadass fisheries resources are finite in their capacity to act as a springboard for regional growth and development and to mitigate all of the social problems associated with the immobility and inadaptability of disadvantaged persons and regions.[4]

The economic performance of various fishery sectors has been poor in most years.[5] This overall unsatisfactory situation underlies the need for this overview study of the Saskatchewan fishery.

The study has three phases:

- a sectoral overview
- a fishery industry profile, and
- strategies and recommendations.

The sectoral overview documents the present supply and harvests of fish, present fishery goals and regulations, and federal and provincial activities and programs. The industry profile quantifies the dimensions of the fishery for each sector, assesses recent economic performance, and identifies issues. The last phase presents strategies and recommendations for improving economic and socioeconomic performance of the various fishery sectors. The main focus of the study is the commercial, sport, and subsistence food fishery sectors.

This report presents the Phase I results. The next section of the report documents the goal statements of the provincial and federal governments for the management and performance of the Saskatchewan fishery. Section 3 assembles available information' on the sustainable supply and demand (harvest) of fish resources. Fishery regulations, allocation mechanisms for rationing the resource, and resource access for the *commercial* and sport fisheries are summarized in Section 4. The federal and provincial activities and programs affecting the fishery directly or indirectly are discussed in Section 5. In the closing section, recent government management

costs associated with these activities and programs are presented.

FOOTNOTES

1 Saskatchewan Department of Northern Saskatchewan and Department of Tourism and Renewable Resources, 'Proposed Goals and Strategies for Fisheries Management in the 1980s", January 1981, page 8.

2 Ibid.

3 Saskatchewan Parks and Renewable Resources, 'Saskatchewan Fisheries Policy Action Plan", Fisheries Branch, December 1983.

4 Department of Fisheries and Oceans, "Pacific and Freshwater Fisheries Planning Overview 1982-86", Pacific and Freshwater Fisheries, Ottawa, April 1982, page 27.

5 For an economic analysis of commercial fishing returns in 1977, see:
P.C. Thompson, The Economic Performance of the Commercial Skiff Fishery in Western Canada, Department of Fisheries and Oceans Technical Report Number 1037, Freshwater Institute, Winnipeg, December 1981.

2.0 FISHERY MANAGEMENT GOALS IN SASKATCHEWAN

For fishery performance to be assessed, a statement of goals is required. Goals serve as guidelines for setting policies and actions and provide a benchmark for assessing performance.

Before fishery management goals in Saskatchewan are documented, the dual nature of management responsibility is briefly outlined.

2.1 Management Responsibility

In Canada's inland fisheries (including Saskatchewan), both the provincial and federal governments play roles in the management and regulation of the fish resource. The federal government has legislative authority over the management of the Saskatchewan fishery. The Province of Saskatchewan, however, holds proprietary rights to the fish and waterways. Consequently, the federal government may regulate fishing seasons, quotas, size limits, and gear. The provincial government determines who can fish, what privileges are conferred, and what fees are paid.

In 1930, the federal government delegated the responsibility for administering the legislation to the province. Although the management prerogatives were delegated to the provincial government, the federal government maintains a constitutional responsibility to provide for the regulation, protection, and conservation of the Saskatchewan fishery.

Habitat protection represents part of the federal government's responsibility for the conservation and management of fish resources under the Fisheries Act[2]. The federal government can regulate and control activities that will disrupt or destroy the habitat of fish. Such activities include pollution, logging , and major resource development

projects such as hydro-electric developments and mine developments.

The provincial government is also involved in habitat protection measures though its proprietary control of lands and waterways. Consequently, in habitat protection as well as in fishery management and regulation, there is federal-provincial responsibility and cooperation. However, in contrast to the administration of federal fisheries legislation, it is understood that the habitat provisions of the Fisheries Act cannot be legally delegated to the Province of Saskatchewan.[3]

The Fisheries Act forms only part of the legislative base of the federal Department of Fisheries and Oceans (DFO). The main legislative base of DFO is the Department of Fisheries and Oceans Act and the schedule of statutes and regulations thereunder, including:

- The Fisheries Act;
- The Fisheries Development Act;
- The Fish Inspection Act;
- The Fishing and Recreational Harbours Act;
- The Fisheries and Oceans Research and Advisory Council Act;
- The Freshwater Fish Marketing Act.

These statutes charge the Minister of Fisheries and Oceans with a wide range of responsibilities involving fisheries management, development and research, hydrographic surveying and charting, and the administration of small craft harbours.

2.2 Goal Statements

Goal statements for fisheries management in Saskatchewan can be extracted from various federal and provincial documents.

2.2.1 Federal Goals

Consistent with the Departmentts legislative mandate and responsibilities, the goal of DFO was expressed in the Pacific and Freshwater Fisheries Planning Overview as: to conserve, protect, and develop Canada's marine and aquatic resources for the purpose of their rational management and sustained utilization compatible with a concern for the quality of the environment.

Later in the same document, it is stated that the primary objective of the federal government should be to exercise its constitutional powers to ensure that national fish resources make their greatest possible contribution to the economic and social welfare of Canadians.[5]

This is essentially an (economic) efficiency objective. Secondary objectives are distributional in nature and include stability, employment generation, regional development, and social aspects -- hence, social welfare considerations. The document argues that income distribution and equity considerations are important functions of the federal government. However, only by analyzing potential activities on purely economic efficiency grounds in the first instance can one ascertain the costs of serving secondary objectives.

Specifically, with respect to fish habitat management, DFO has stated the policy objective: to conserve, restore, and develop fish habitats to maintain and improve the production of Canadats fisheries resources for the benefit of present and future generations.[6]

2.2.2 Provincial Goals

Three recent provincial reports have goal statements. The "Goals and Strategies'i report[7] of 1981 states that the goal of fisheries management i.n Saskatchewan is: to maintain, protect, and enhance the fishery resources and aquatic

habitat for the sustained benefit of the people of Saskatchewan. The 'Action Plan"[8] of 1983 suggests that the overall objective of fisheries management is to have a satisfied public with access to stable, healthy fish populations. The three main goals *are:*

supply - to maintain and where possible, increase the sustainable supply of economically usable fish through conservation and enhancement initiatives.

Allocation - to have satisfied user groups who have been equitably allocated sustainable supplies of fish.

Development - to increase contribution to the provincial economy through income to industry and revenue to government.

In a 1985 discussion paper, the province lays out the following fisheries management policy objectives:

- to conserve the resource;
- to maximize the benefits of resource use (based *on* social, cultural and economic values) ;
- to promote economic stability;
- to protect social and cultural values; and
- to ease administration of policies and regulations.

2.3 Consistency and Conflicts of Goals

There is consistency between federal and provincial goal statements regarding the primary concern for the conservation of fish stocks. To be meaningful, however, concern for the raw resource must be translated into goals in *terms* of consumptive use of fish by man. It is in this aspect that the goal statements diverge somewhat.

There are conflicts within the set of goal statements for

each government. There are also conflicts between the two sets of goal statements, part of which stem from the different constituencies of the two levels of governments. Consequently, some of the differences in federal and provincial goals may be legitimate.

The federal government is concerned with the economic and social welfare of all Canadians, including non-resource users in Saskatchewan and all Canadian residents outside of Saskatchewan. The province, on the other hand, is concerned primarily with the welfare of Saskatchewan fish resource users. From the provincial goal statements, it appears that the welfare of Saskatchewan non-users of fish resources is not a major concern.

It also appears from the goal statements that DFO is more concerned with economic efficiency considerations than is the province. The province is concerned primarily with distributional and equity considerations and with "satisfied" user groups.

Given the finite nature of fish resources, there are inconsistencies *within* each set of goal statements. For example, one cannot increase employment in the fishery and increase economic efficiency in the fishery at the same time, given the present status and structure of the Saskatchewan fishery. The *DFO* document explicitly acknowledges that one cannot maximize two conflicting fishery objectives at the same time.

Furthermore, since *one is* allocating a finite fish resource pie among commercial, sport, and subsistence food interests, it is unlikely that one can have satisfied commercial and sport and subsistence user groups, i.e., allocating a larger slice to one group necessarily means allocating smaller shares to the other groups.

Another inconsistency arises from the fact that long-term

conservation and development of fish stocks and the fishery can only occur at the expense of short-term costs to, and contraction of, the fishery, i.e., "long-term gain from short-term pain". Typically, government has a longer time horizon or payback period for fishery management measures than do present resource users. Consequently, there can be a sharp divergence between views of present resource users and government (federal and provincial) as to the efficacy of a proposed fishery management action.

The challenge of, and, in fact, the essence of, fisheries management is the resolution of conflicts. There is no shortage of conflicts in the Saskatchewan fishery.

FOOTNOTES

1 The discussion in this section is taken directly from:

Peter C. Thompson, "Institutional Constraints in Fisheries Management", Journal of the Fisheries Research Board of Canada. Vol. 31, No. 12: 1965-1981, 1974.

Department of Fisheries and Oceans, 'proposed Policy and Procedures for Fish Habitat Management", Ottawa, May 31, 1985.

2 Department of Fisheries and Oceans, Fisheries Act, As Amended, October 31, 1984.

3 Department of Fisheries and Oceans, 'proposed Policy ● 0."f op. cit.

4 Department of Fisheries and Oceans 'Pacific and Freshwater Fisheries Planning Overview 1982-1986", Pacific and Freshwater Fisheries, Department of Fisheries and Oceans, Ottawa, Ontario, April 1982 Page 1.

5 Ibid, Page 51.

6 Department of Fisheries and Oceans, "Proposed Policy ...", op. cit. Page 5.

7 Saskatchewan Department of Northern Saskatchewan and Department of Tourism and Renewable Resources, Proposed Goals and Strategies for Fisheries Management in the 1980's, January, 1981 Page 10.

8 Saskatchewan Parks and Renewable Resources, 'Executive Summary of Saskatchewan Fisheries Policy Action Plan-, **Fisheries Branch,** December **1983, Page 4.**

9 Saskatchewan Parks and Renewable Resources, **"Conservation** Options for the Commercial Users of the Fish Resource: A Discussion Paper", October **1985.** Page 3.

3.0 SASKATCHEWAN FISH RESOURCE AVAILABILITY AND EARVEST

Fish are the key resource input to fishing activity. Consequently, the availability of the fish resource in relation to the consumptive demands or harvests by the fish resource users represents the benchmark for the health of a fishery in the long-term.

In this section, existing information on sustainable supplies and harvests of fish in Saskatchewan is documented and synthesized. The discussion is directed towards walleye, pike, lake trout, and whitefish -- the most important species. Distinct inferences for the Northern, Central, and Southern management zones are drawn.

3.1 Availability (sustainable Supply)[1]

The sustainable supply of a species is the amount of fish that may be harvested annually from all lakes which contain it and not adversely affect the populations. It is derived by multiplying the areas of the lakes containing the species by the sustainable yield.

The sustainable yield is a rate of production and is stated as weight of fish per unit area of surface water. Three things are implicit in this concept: the amount *of* water (i. e. , habitat) available for a particular species; the capability of the water in the habitat to produce the species; and the productive capability of the species. The productive capability of the water is related to the type of substrate underlying the lakes. Three types of substrate are recognized (Figure 3.1): Precambrian Shield, boundary, and sedimentary.

Shield lakes are not as productive as sedimentary lakes. because they contain low concentrations of minerals which act as nutrients for organisms living in them. In general,

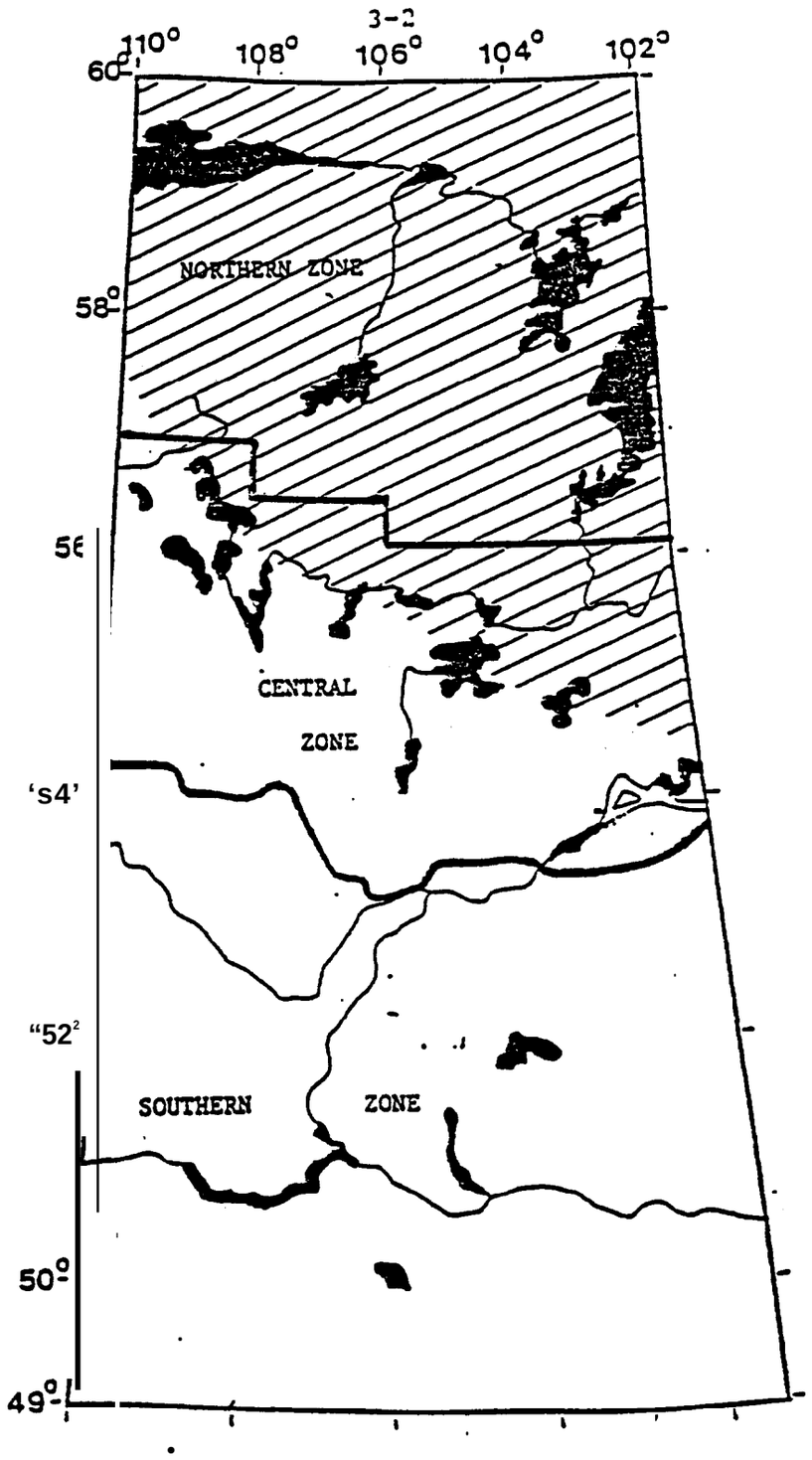


Figure 3.1 Management zones and major geological substrates of Saskatchewan. Precambrian Shield, area with diagonal lines; sedimentary area, clear.

Source: A.R. Murray, "Estimated Sustainable Yields and Supplies of Fish in Saskatchewan Lakes", Saskatchewan Parks and Renewable Resources, Fisheries Branch, 1985

Shield boundary lakes are intermediate in productivity.

Murray[2] has derived sustainable yields for individual Saskatchewan lakes and aggregated individual yields to form sustainable yields for each of the three management zones in Saskatchewan. Estimated yields have been calculated for four species: walleye, lake trout, pike, and whitefish. Results are summarized in Table 3.1.

Although Southern Saskatchewan waters are more productive and therefore have higher sustainable yields per unit of surface water, the bulk of the supply of Saskatchewan fish lies in the northern and central regions where the majority of Saskatchewants lakes exist.

In 1980 the sustainable supply of the aggregate of the four species was 15.o million kg -- 2.3 million kg walleye, 1.1 million kg lake trout, 7.4 million kg pike, and 4.1 million kg whitefish. Southern Saskatchewan had only 6% of the sustainable supply.

The majority of lake trout and pike lies *in* the Northern region, whereas the bulk of whitefish supply lies in the Central region. Walleye supply is split evenly between the Northern and Central regions.

The sustainable supply[3] is lower in 1980 than in 1975 due to loss of habitat.

3.2 Utilization (Harvest Levels)

The main users of the walleye, lake trout, and pike resources in Saskatchewan are the commercial, sport, and subsistence food fisheries. Whitefish is also a important species for the commercial and subsistence food fisheries. Other fishery sectors (e.g., fur farm, bait fish, etc.) do not harvest the four species under scrutiny to any large extent. '

TABLE 3.2: SUSTAINABLE SUPPLY OF MAJOR SPECIES OF FISH IN SASKATCHEWAN, 1975 AND 1980[a]

	Management Zone			
	Northern	Central	Southern	Total
	..0'000kg...			
1975				
Walleye	1,164	1,069	191	2,424
Lake Trout	770	389	23	1,182
Pike	4,515	2,729	456	7,700
Whitefish	1,510	2,538	345	4.392
Total	7,957	6,725	1,015	15,698
1980				
Walleye	1,135	1,001	172	2,308
Lake Trout	751	370	21	1,142
Pike	4,403	2,562	413	7,378
Whitefish	1,472	2,344	311	4,128
Total	7,761	6,277	917	14,956

Sources: A.R. Murray,"Estimated Sustainable Yields and Supplies of Fish in Saskatchewan LaIces", Saskatchewan Parks and Renewable Resources, Fisheries Branch.

[a] Round weight.

Annual commercial harvest data are available for the past fifty years. Sport harvest estimates are available for two years only, 1975 and 1980. An estimate of current subsistence food harvest is available for 1985. Harvest data for the minor fisheries (bait fish, aquiculture, etc.) are available, although supply estimates *are* not available.

Accordingly, the ensuing discussion is restricted primarily to analysis of commercial, sport, and subsistence food fish harvests.

3.2.1 Commercial Harvests

Long-Term Trends

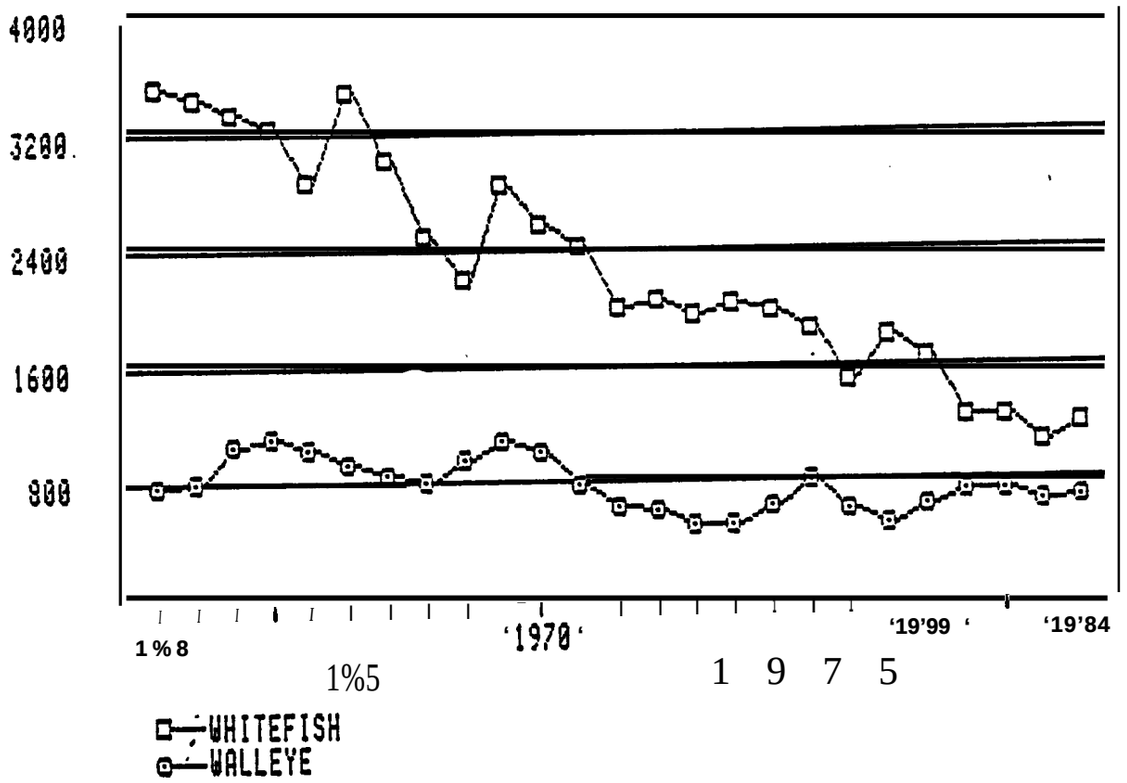
Long-term trends in provincial commercial harvest levels (landed weight)[4] are given in Figure 3.2.

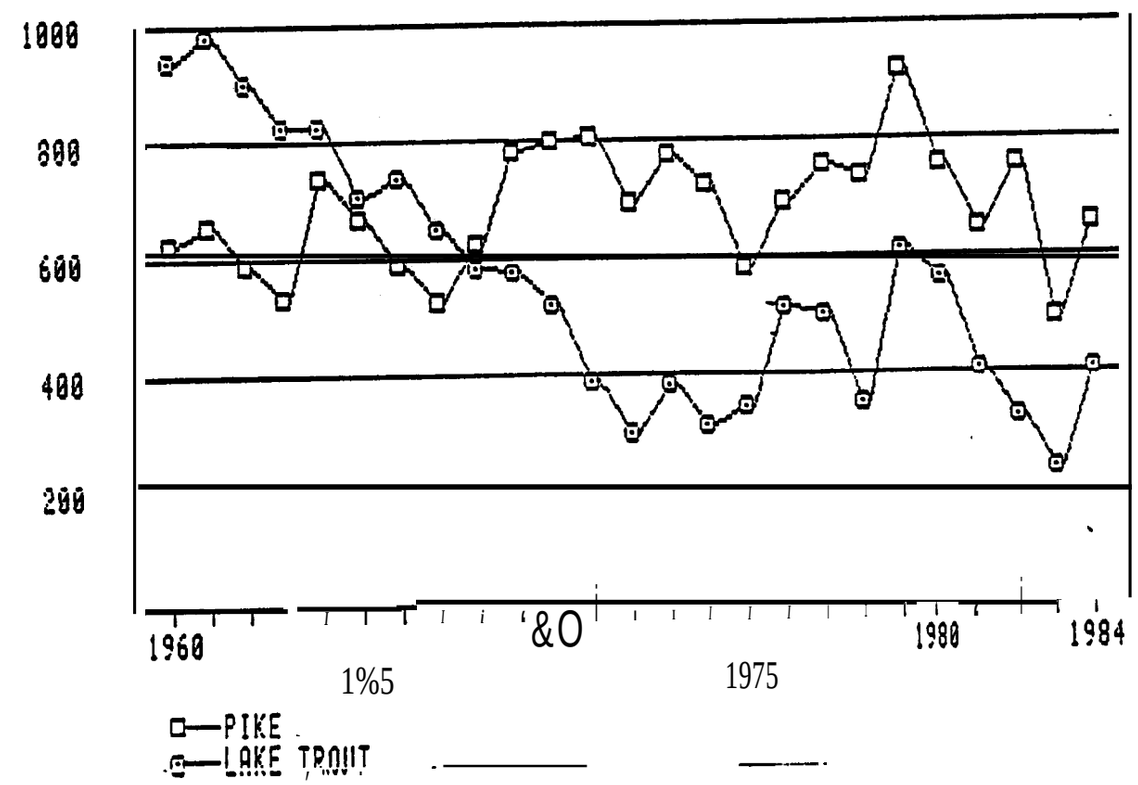
A significant decline in whitefish harvests has occurred with the present harvest being roughly 1/3 of harvest levels in the early 1960s. Walleye harvests have declined slightly. Lake trout harvests are 1/2 of those in the early 1960s. Pike harvest levels *are* comparable to those of 25 years ago.

Trends within each of the three management zones generally are the same as those at the provincial level.[5] Harvest levels by management zone are given in the supporting tables of Appendix A.

The decrease in whitefish harvests may reflect biological factors (e.g., decreased fish population levels) as well as economic factors. Commercial fishermen do not 'target' on whitefish as much as they did in the past. Price increases for walleye, lake trout, and pike over the past 25 years have been greater than for whitefish. The presence of cysts of the tapeworm, Triaenophorus crassus, in the flesh of whitefish from some lakes (so called 'cutter' whitefish) makes the product unacceptable to the market place unless the

FIGURE 3.2: COMMERCIAL CATCHES IN SASKATCHEWAN , OF MAJOR SPECIES, LANDED WEIGHT ('000 kg)





product undergoes additional processing, which depresses the price for cutter whitefish. The pest is impossible to eradicate. The majority of lakes of the Northern and Central Managements Zones are classified as "cutter" lakes.

Choice of Commercial Harvest Data

Annual commercial harvest data are available from two sources -- Saskatchewan Parks and Renewable Resources (Appendix A) and Canada Department of Fisheries and Oceans through the FFMC weighbill system (Appendix B). Each set of data has advantages and disadvantages.

Provincial data include estimates of direct sales to Saskatchewan residents as well as transactions between fishermen and the FFMC. The FFMC waybill system includes only the latter. Direct sales are roughly 10% of total sales. The provincial data are available back to the *early* 1920s, whereas the FFMC data series commences in 1973.

The provincial data are reported in landed weight. The FFMC data are reported in landed and round equivalent (live) weight form.

Over the past 12 years, FFMC harvest data in landed weight are 95% of Saskatchewan Parks and Renewable Resources harvest data for walleye, pike, and lake trout. However, FFMC whitefish harvest data are 85% of the comparable provincial harvest data.

Differences exist between the provincial and FFMC data with respect to harvest levels, number of fishermen, and number of lakes fished.

One is interested in comparing commercial harvest levels to sustainable supply and to sport and subsistence harvest. levels. The latter estimates are on a live weight basis. It is critical that all supply and harvest data be presented on

a comparable weight basis.

Consequently, the FFMC data are used to determine the average conversion factors from landed to round weight. These conversion factors are applied to the provincial landed weight harvest data to estimate total commercial harvests (including direct sales) on a live weight basis. That is, provincial data are used in comparing supply and harvest levels. FFMC waybill data, however, are used in phase II to assess the economic performance of the commercial fishery.[6]

Current Harvest Levels

Commercial (and sport) harvests of walleye, lake trout, pike, and whitefish in live weight units are reported in Tables 3.2 and 3.3 for 1975 and 1980 -- the same years for which sustainable supply estimates were presented (Table 3.1).

Current (mid 1980s) harvest levels of whitefish and lake trout are roughly 1.2 million *kg* and 0.4 million *kg* respectively, and are lower than those reported in 1980. Current walleye and pike harvests of 0.8 million kg are roughly the same as those in 1980.

The bulk of commercial walleye, lake trout, pike, and whitefish harvests come from the Central Management Zone. Over 90% of lake trout harvest comes from the Northern Zone.

The major reason for the decline in aggregate harvest levels is that fishing effort as measured by number of deliveries to the FFMC has declined by 1/3 over the past 10 years (see Table B.11, Appendix B).[7] This decline reflects fewer fishermen making deliveries rather than fewer deliveries per fisherman. The decline in commercial harvest does not reflect a decline in fish abundance.

Catch per unit effort (delivery), an indicator of abundance,

TABLE 3.2: COMMERCIAL AND SPORT HARVEST OF MAJOR SPECIES OF FISH IN SASKATCHEWAN, 1975[a]

	Management Zone			
	Northern	Central	Southern	Total
	...'000kg...			
Commercial				
Walleye	43	599	1	643
Lake Trout	389	25	-	414
Pike	83	695	3	781
Whitefish	590	1,673	192	2,455
Subtotal	1,105	2,992	196	4,293
Sport				
Walleye	52	960	361	1,373
Lake Trout	181	140	13	334
Pike	210	1,869	1,013	3,092
Whitefish				
Subtotal	443	2,969	1,387	4,799
Commercial Plus sport				
Walleye	95	1,559	362	2,016
Lake Trout	570	165	13	748
Pike	293	2,564	1,016	3,873
Whitefish	590	1,673	92	2,455
Total	1,548	5,961	1,583	9,092

[a] Round weight

Sources: National angler survey data (Appendix A) plus commercial harvests in landed weight from Saskatchewan Parks and Renewable Resources (Appendix A) converted to a round equivalent weight basis. Conversion factors were calculated by dividing FFMC landed weight into FFMC round equivalent weight (Appendix B).

TABLE *3.3:* COMMERCIAL AND SPORT **HARVESTS** OF MAJOR SPECIES OF **FISH** IN SASKATCHEWAN, 1980[a]

	Management Zone			
	Northern	**Central**	Southern	Total
		...'000kg...		
commercial				
Walleye	64	728	2	794
Lake Trout	637	49		686
Pike	108	911	6	1,025
Whitefish	**495**	**1,253**	**275**	**2,023**
Subtotal	1,304	2,941	283	4,528
Sport				
Walleye	58	1,075	405	1,538
Lake Trout	**154**	120	11	285
Pike	183	1,627	882	2,692
Whitefish	—	—	—	—
subtotal	395	2,822	*1,298*	*4,515*
Commercial Plus Sport				
Walleye	122	1,803	407	2,332
Lake Trout	791	169	11	971
Pike	291	2,538	888	3,717
Whitefish	**495**	**1 252**	**275**	**2,023**
Total	1,699	5,763	1,581	**9,043**

[a] Round weight

Sources: National angler survey data **(Appendix** A) plus commercial harvests in landed **weight** from **Saskatchewan** Parks and Renewable Resources **(Appendix** A) **converted to** a round **equivalent** weight **basis. Conversion factors** were **calculated** by **dividing** FFMC landed **weight into** FFMC round **equivalent weight (Appendix** B) .

has remained relatively stable and even increased for some species (see Appendix C). This increase, however, could be due to fishermen targeting the most valuable species, increases in gear efficiency, or increases in the "size" (number of nets lifted) of operations.

A delivery is only a crude indicator of fishing effort, but is the best available measure.

3.2.2 Recreational (SpOrt) Harvests[8]

The harvest of pike, walleye, and lake trout by anglers was approximately 4.5 million kg in 1980, a total exceeding that for the commercial fishery (Table 3.3). Pike represents 2.7 million kg or 60% of the total sport harvest, and walleye represents 1.5 million kg or 1/3 of the total. *Few* whitefish are caught by sport fishermen.

AS with the commercial fishery, approximately 60% of the total sport catch occurs in the central zone.

The sport harvest figures include harvests of fishermen 16 years of age and older. The figures *do* not include harvests of individuals under 16 years of age, i.e., those who do not require a license.

3.2.3 Subsistence Food Fish Harvests

The subsistence food fish harvest for the year 1985 is estimated as:

	Management Zone			
	Northern	Central	Southern	Total
		.*.'000 kg...		
Walleye	6	154	96	256
Lake Trout	313	29	1	343
Pike	138	297	200	635
Whitefish	137	210	151	498
Other Species	16	72	29	"117
Total	609	763	477	1,849

.0. continued

Source: A.R. *Murray* and J.W. Clouthier, Involvement of People of Indian Ancestry in Saskatchewan Fisheries, Saskatchewan Parks and Renewable Resources, Fisheries Branch, Regina, 1986. Table 1.

The estimated harvest of walleye, lake trout, pike, and whitefish in 1985 was 1.7 million kg. The major species harvested were pike and whitefish. Approximately 40% of the harvest came from the Central Zone.

3.2.4 Other Fisheries

There *are a* number of other minor fisheries in Saskatchewan - the bait fishery, the fur farm fishery, fish farming or aquiculture, and the brine shrimp fishery.

The bait fishery was initiated in the early 1970s to supply bait needs af anglers. In 1984/85, 15 thousand kg of shiners (emerald and spottail) were harvested.

The fur farm fishery has fluctuated with the fur market. Present production of roughly 50 thousand kg is less than 5% of production 20 years ago. This reflects the collapse of fur (mink) farming in western Canada. The main species harvested are burbot, suckers, ciscoes, and pike.

Fish farming is practiced by hobbyists and commercial enterprises. Rainbow trout fingerlings are stocked in dugouts, sloughs, and small lakes in the spring and harvested in the fall before freeze-up. The bulk of the 75-100 thousand kg annual production comes from hobbyists.

The brine shrimp fishery harvests brine shrimp, a small crustacean from saline waters. Brine shrimp are sold as fish food for tropical aquariums. Current annual production is roughly 20 thousand kg, all of which comes from Chaplin Lake.

3.3 Supply/Harvest Balance

One can assess supply/harvest balances from at least two perspectives:

- the distribution of sustainable supply and harvest among regions, and
- the levels of supply and harvest within regions.

Analysis is restricted to whitefish, walleye, lake trout, and pike.

3.3.1 Relative Distribution of Supply and Harvest[9]

Walleye is most abundant in the Northern Zone (49% of supply) and least abundant in the Southern Zone. However, only 5% of the catch comes from the north. Note that the sustainable supply of walleye in the "very large" lakes of the Northern Management Zone may be an overestimate.[10]

Two-thirds of the lake trout sustainable supply and 82% of the harvest comes from the Northern Zone. The Southern Zone has minimal lake trout supplies.

Sixty percent of the pike supply comes from the Northern Zone, and only 5% comes from the Southern Zone. However, only 9% of the pike harvest *occurs* in the Northern Zone; 23% of the harvest occurs in the South.

The distributions of whitefish supply and harvest are the most balanced of the four species considered. Approximately, 60% of supply and harvest occurs in the Central Zone.

The above suggests that there is a regional supply/harvest imbalance in the Saskatchewan fishery. A disproportionate share of the harvest is taken from Central and Southern Zones. This is especially true for pike and walleye. "

TABLE 3.4: LEVELS OF SUBSTAINABLE SUPPLY AND HARVESTS, [a] 1980

	Management Zone			
	Northern	Central	Southern	Total
	.99 '000kg...			
Walleye				
supply	1,135	1,001	172	2,308
Harvest	128	1,957	503	2,588
Surplus (Deficit)	1,007	(956)	(331)	(280)
Lake Trout				
supply	751	370	21	1,142
Harvest	1,104	198	12	1,314
Surplus (Deficit)	(353)	172	9	(172)
Pike				
supply	4,403	2,562	413	7,378
Harvest	429	2,835	1,088	4,352
Surplus **(Deficit)**	3,974	(273)	(675)	3,026
whitefish				
supply	1,472	2,344	311	4,128
Harvest	632	1,463	426	2,521
Surplus **(Deficit)**	840	881	(115)	1,607
Total				
supply	7,761	6,277	917	14,956
Harvest	2,293	6,453	2,029	10,775
Surplus **(Deficit)**	5,468	(176)	(1,112)	4,181

[1] Round equivalent **(live)** weight. 1980 **harvests** of the commercial and sport **fisheries** plus the 1985 harvest of the subsistence food fishery.

Source: Tables 3.1 and 3.3 and Section 3.2.3.

3.3.2 supply and Harvest Levels

In Table 3.4 sustainable supply levels are compared with harvest levels for 1980. At the provincial aggregate level, walleye and lake trout harvests are greater that their respective sustainable supplies. There are significant surpluses of supply over harvest for pike and whitefish.

Aggregation to the provincial level masks important regional variations. There are significant shortfalls for walleye in the Central and Southern Zones, for lake trout in the Northern Zone, and for pike in the Central and Southern Zones.

Walleye, lake trout, and pike are gamefish. Total gamefish harvest exceeds total gamefish sustainable supply in the Central and Southern Zones.

Consequently, severe supply/harvest imbalances exist in the fish resources of Saskatchewan. They *are* especially acute for walleye and lake trout. Given no structural change in fishery management approaches and present trends, these supply/harvest imbalances *are* expected to grow in the future as fishermen continue to target on higher-valued species and as sustainable supply declines due to habitat loss.

FOOTNOTES

1 The first two paragraphs of this section are taken almost verbatum from A.R. Murray, "Estimated Sustainable Yields and Supplies of Fish in Saskatchewan Lakes", Saskatchewan Parks and Renewable Resources, Fisheries Branch, Regina, 1985.

2 A.R. Murray, op. cit.

3 It was assumed the annual loss rate was 0.5% for lakes in Northern Saskatchewan and 2% for lakes in Southern Saskatchewan. (Murray, op. cit).

4 Tables 11 through 14, Appendix A.

5 Whitefish catch in Southern Zone increased in the late 1970s due to the opening of a fishery in Lake Diefenbaker.

6 Advantages to the FFMC data are:

- landed values by region *are* available
- deliveries as a measure of fishing effort are available
- whitefish by grade (export, continental- and cutter) are available
- income distribution data are available.

Consequently, the FFMC data are much more useful for economic analysis of the Saskatchewan commercial fishery.

7 Saskatchewan Parks and Renewable Resources annual reports also indicate a decline in fishing effort over historic levels.

8 Data are taken from the 1975 and 1980 surveys of sport fishing.

K. Brickley and R.P. Johnson, Survey of Sport Fishing in Saskatchewan in 1975, Saskatchewan Tourism and Renewable Resources, June 1978.

A.R. Murray, K.W. Brickley, R.P. Johnson and A.L.W. Tuomi, 1980 Survey of Sport Fishing in Saskatchewan, Saskatchewan Parks and Renewable Resources, 1984.

9 Distributions are calculated from information in Tables 3.1 and 3.3.

10 A.R. Murray, "Estimated Sustainable Supply...", op. cit., p. 15.

4.0 FISHERY REGULATIONS AND ALLOCATION MECHANISMS

Fishery regulations represent the mechanism by which policies and actions concerning desired fishermen behaviour are implemented. The behaviour of fishermen may be altered by imposing physical constraints *on* harvesting or by changing revenue-cost relationships of fishing operations. Each may be applied to inputs (capital and labour) *or* output (catch). [1]

Constraints on harvest include a global or lake quota or individual fishermen quotas. Such quotas may exist for each individual species or for some species aggregate. Size restrictions (minimum and maximum) may exist. Some sport fisheries may be managed as "catch and release", i.e., fishermen are not allowed to keep the catch.

Regulations on inputs can be classified into three main categories:

- number of fishing units (fishermen, yards of gillnet);
- catching power of each fishing unit per" unit time (type of gear, mesh size, barbless hooks) ;
- time and area of fishing (closed seasons, closed areas, days fished).

Resource (access) pricing can take the form of a lump sum annual licence fee, a fee per unit of fishing effort (day fished or standard unit of gear), *or a* resource royalty.

Following are descriptions of the regulatory regimes within the commercial, sport, and subsistence food fishery sectors. First, allocation processes are described.

4.1 Allocation Mechanisms

Allocation essentially refers to:

- the distribution of harvest among various fishery sectors (commercial, sport, subsistence) ;

- who has the right to fish within each sector; and
- the allocation of each sector's total harvest among participants.

Multiple use of Saskatchewan lakes by commercial, sport, and subsistence food fishermen is the cornerstone of fisheries policy in Saskatchewan. There is not an explicit allocation of total allowable harvest among the three interest groups for individual lakes or groups of lakes. Many lakes are utilized by more than one user group, often at the same time.

The domestic use of fish by Treaty Indians and residents in remote northern locations has first priority for the use of the fish resources of Saskatchewan, i.e., the subsistence fishery has priority *over the* commercial and sport fisheries. However, no explicit allocation of harvest exists among commercial, sport, and subsistence fisheries.

Lake quotas exist, but they apply only to commercial fishing operations. *There* are no explicit lake quotas for sport and subsistence food fisheries, and hence for total harvest on each lake.

Under an open access system of management, economic returns from the fishery are dissipated as more and more fishermen enter the fishery and compete for the harvest at higher than required cost. For a developed fishery to generate substantial economic "wealth" or "benefits", it isnecessary to ration access to and harvest of the fish resource. The rationing device may be adminsitrative fiat or a price system in which resource use is priced based on competitive market conditions. The Province of Saskatchewan has chosen to follow neither of these avenueS.

4.2 Commercial Fishing Regulations[2]

A total of 821 lakes in Saskatchewan have commercial fishing quotas (allowable total harvests) established= only 78 Of

these lakes have individual species quotas. Quota levels are based on estimates of sustainable yields.[3] No limits are set on how much fish an individual fisherman can catch (subject, of course, to the overall lake quota).

There are no explicit size restrictions on catch. However, the FFMC may only accept fish above a certain minimum size for certain species.

The number of commercial fishermen enterprises in Saskatchewan is not limited by the provincial government, i.e., there is no formal limited entry of fishermen. However, the government has allowed local fishermen groups in Northern Saskatchewan to set eligibility criteria for fishermen wishing to fish in the local area. Common criteria are residence in the region and previous fishing experience. De facto, there is some rationing of fishing opportunities, but this allocation is promulgated by local fishermen and not the provincial government.

Gill nets are the only permissible commercial gear on most lakes. In some southern lakes, trap and pound nets are allowed for rough fish harvests. There *are* gillnet minimum mesh size regulations for each lake, the most common of which are 5 inch or 5 1/2 inch mesh extended measure. Smaller mesh nets are permitted in some lakes to meet special local circumstances.

There are closed seasons for each lake. Commercial fishing in Northern Saskatchewan currently can commence when lakes become free of ice.

Fishermen require a separate licence for each lake fished. Gillnet licence fees are $10 for each 1,000 metres or potiion thereof of gill net for each lake. Trap net and pound net licence fees are $20 per net. Hired men do not require a licence, i.e., only the operator requires a licence.