

**AN ANALYSIS OF FISH CONSUMPTION IN  
WINNIPEG WITH IDENTIFICATION OF  
POTENTIAL NICHE MARKETS FOR  
FRESHWATER FISH SPECIES  
NATIVE TO MANITOBA**

**by**

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**A Practicum Submitted in Partial Fulfillment  
of the Requirements of the Degree,  
Master of Natural Resources Management**

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of Manitoba in partial fulfillment of the requirements of the degree  
of**

**Master of Natural Resources Management**

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## **Abstract**

**Fisheries in crisis . . . this has been a threat often faced in recent times by inland and marine fisheries. This study assessed the nature and quantity of native and other fish species consumption by Winnipeg residents to isolate not only consumption and purchase patterns, but also factors which may influence fish consumption. Data was collected by a probability sampling of Winnipeg households using a telephone survey. A questionnaire pertained to estimates of consumption and queried attitudes about fish, sources from which fish are procured and factors which might be influential in fish purchase and consumption patterns.**

**The findings revealed annual consumption generalized to the City of Winnipeg ranged from 5.8 to 9.2 million kilograms of fish, of which 3.6 million kilograms were freshwater species. On an annual per capita basis, total consumption of fish ranged from 9 to 15 kilograms (20 to 33 pounds). Of this amount, 6 kilograms (13 pounds) were freshwater fish consumed, which is 32 times more fish than estimated for an average Canadian by published sources. Freshwater fish were consumed almost half the time and pickerel was more than three times as likely to be the species consumed than any other species of freshwater fish. Fish consumption was almost unilaterally considered by respondents to be a healthy source of protein, mainly obtained from supermarkets and subject to ethnic influences.**

**Conclusions indicated potential niche markets in ethnic and health conscious groups. The study found concurrent high utilization (consumption) of pickerel and underutilization of other native Manitoba fish species.**



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## **DEFINITION OF TERMS AND LIST OF ACRONYMS**

**For the purpose of this report the terminology used is defined as follows:**

### **Cultural, food-related and other terms**

<b>Domestic market:</b>	<b>in this report the consumers in Winnipeg, Manitoba represent the ‘domestic’ market for fish and/or fish products unless otherwise stated</b>
<b>Ethnic origin:</b>	<b>refers to the cultural group(s) to which the individual's ancestors belong</b>
<b>Foodways:</b>	<b>a pattern of food behavior which reflects the standard behavior in a culture in relation to food getting, preparation, meal patterns, suitability of items as food, attitudes, taboos, religious significance, and social meaning</b>
<b>Full cost accounting:</b>	<b>accounting for the economic, environmental, land use, human health, social and heritage costs and benefits of a particular decision to ensure there are no costs associated with that decision are left unaccounted for</b>
<b>Procurement:</b>	<b>in this report the term is used to describe the source from which fish are obtained</b>
<b>Religion:</b>	<b>refers to specific denominations or otherwise religiously defined systems of belief</b>

### **Fish-related terms**

<b>Aquaculture:</b>	<b>the farming of fish and/or marine products</b>
<b>Bycatch/bykill:</b>	<b>unmarketable fish species from commercial harvests, discarding of which may be referred to as high-grading, culling, bushing</b>
<b>Dressed fish:</b>	<b>fish which has been gutted and the head removed</b>

<b>Fish:</b>	<b>includes parts, eggs, and all stages of fish, crustaceans, shellfish and marine animals; the term ‘fish’ will be used to refer to both fish and/or fish products throughout the report</b>
<b>Freshwater drum:</b>	<b>silver bass and sunfish</b>
<b>Freshwater fish:</b>	<b>fish which dwell in freshwater habitats such as lakes and rivers</b>
<b>Groundfish:</b>	<b>fish which feed on the ocean bottom; examples are cod, ocean perch, haddock, hake</b>
<b>Marine fish:</b>	<b>fish which dwell primarily in saltwater</b>
<b>Native species:</b>	<b>species of fish existing and having originated naturally or having become naturalized in a particular region or environment, in this research project meaning in Manitoban waters</b>
<b>Pelagics:</b>	<b>fish which dwell in the ocean’s middle and upper levels, example Pacific salmon and capelin</b>
<b>Surimi:</b>	<b>imitation shellfish products made from deboned, washed and minced fish</b>

#### **Computer programming terms:**

<b>Aggregating variable:</b>	<b>a variable used to keep track of the total value of occurrences observed when the data are read by a computer program</b>
<b>SAS 6.08:</b>	<b>a programming language for statistical analysis</b>
<b>Univariate:</b>	<b>an aggregating variable in SAS programming</b>

## **ACRONYMS**

**These acronyms will be used throughout the report:**

**ADM.....Assistant Deputy Minister**

**CEDF.....Communities Economic Development Fund**

**CESO.....Canadian Executive Services Organization**

**DFO.....Department of Fisheries and Oceans**

**DNR.....Department of Natural Resources**

**EDB.....Economic Development Board**

**FAO.....Food and Agriculture Organization**

**FFI.....Fish Futures Inc**

**FFMC.....Freshwater Fish Marketing Corporation**

**IFMSC.....Intraprovincial Fish Marketing Strategy Committee**

**ISTC.....Industry, Science and Technology Canada**

**ITT.....Industry, Trade and Tourism**

**MTS.....Manitoba Telephone System**

**NIN.....National Institute of Nutrition**

**NRL.....Natural Resources Institute**

**PC.....Personal computer**

**SIL.....South Indian Lake**

**UN.....United Nations**

**U.S.A.....United States of America**

# **CHAPTER 1**

## **INTRODUCTION**

### **1.0 Introduction**

**Man often destroys that which he treasures most.**

**This research project examined the level of fish consumption, by species, by form and in total, by residents of the City of Winnipeg (referred to hereinafter simply as 'Winnipeg'). This review was impacted not only by the global and local status of fish supplies and demand, but also other factors some of which will be the focus of this research project.**

### **1.1 Preamble**

**Fish is a common property resource. Simply stated this means that until harvested the fish belongs to no one, but upon catching it belongs to the fisher. The biological consequences of the 'tragedy of the commons' have been well documented. Fish remain as the last type of food in which the commercial production format is the hunting of wild stock (Applebaum, 1978; Hjul, 1985).**

**Fisheries management approach in the past took the form of "development, exploitation, access" (Loftus, 1978), since oceans and freshwater seas and their bounty at that time seemed to be inexhaustible.**

**As the problems inherent in a common property resource became evident, the search for more effective means of managing fish resources on the principle of a**



sustainable stock basis led to the use of maximum sustainable yield (MSY) and then to optimal sustainable yield (OSY) (Martin, 1978). Three basic types of fisheries management approaches were described in Charles (1992) with objectives of:

- 1) biological yield-maximization (conservation of fish stocks),
- 2) economic value-maximization (efficiency/productivity), or
- 3) social-communal (community values).

The most recent approaches to managing the fisheries are influenced by the principle of 'sustainable development'. In Manitoba, legislation exists which requires 'full cost accounting' to be used by Manitoba governmental agencies in decision-making processes. This includes the Manitoba Department of Natural Resources (hereinafter referred to as 'MDNR'). The full cost accounting method recognizes that future generations have an interest in the manner in which fisheries are managed today and indicates a shift from a biological emphasis towards a multi-disciplinary management approach.

The recognition of all relevant costs means fisheries are treated as a 'natural capital', and takes into account all the costs of natural resource use, including environmental ones (Prugh et al., 1995). Rogers contends "the forces of demand and technology...are central to understanding the predatory relationship between economic processes and natural processes" (Rogers, 1995, p. 23) and raises questions about 'normal business' and its relation to the destruction of the natural world. Natural capital, from both renewable and non-renewable sources, is rapidly becoming the constraining factor in the economic process (Prugh et al., 1995).

In general terms, there has been an increase in fish consumption which appears to have arisen out of several sources. An entire (North American) generation has

**grown to maturity with an awareness of health, fitness and personal well-being, and the negative consequences which foods can have on these (Verge, 1985). Fish is perceived by some as a healthier protein choice, lower in fat and containing valued nutritional components. Fish has been recommended for those who wish to reduce their fat intake for health reasons, including those with heart problems, high cholesterol levels, diabetes, those at risk for stroke or heart attack, and those suffering from obesity and/or high blood pressure. Particular nutritional qualities found in rich fleshed fish and shellfish include the omega-3 polyunsaturated fatty acids, often referred to as 'omega-3s' or 'n-3s'. Omega-3s have been widely reported, in the past decade, to promote better health for humans in a considerable number of ways.**

**Fishing technologies have undergone tremendous advancements, particularly in the 1950's and 1960's. Fishing is conducted by either 'fixed' gear or 'mobile' gear methods. The term 'fixed gear' refers to practices which passively capture fish resources, such as longlining, gillnets or traps. 'Mobile gear' practices employ the active pursuit and capture of fish and include the use of 'dragger' or 'trawler' techniques (Blades, 1995).**

**Some inshore fishers still harvest in time-honored traditional ways such as with small boats (dories) using nets or traps. Inshore fishers generally fish in sight of land and return to port on a daily basis. They used to exclusively utilize fixed gear methods.**

**The introduction of steam-powered boats and other technologies led to the development of bigger crafts and 'dragger' fishing gear. As a result offshore fishing capacity was developed. Offshore fishing generally took place further from shore,**

often with greatly increased harvesting capabilities, and would be characterized by extended periods of fishing prior to a return to port.

The fleets of small crew fishing dories of the past have, over time, been replaced with fleets which often use much larger craft and gear and which also actively pursue fish stocks. The capacity of the largest vessel used to harvest fish, a 'factory-freezer trawler', is staggering relative to former harvest methods. One factory ship has the capacity to harvest 600 tonnes daily and even on an average day might process 90 tonnes not including waste (Harris, 1998).

Modern fishers now increasingly find and capture fish with mobile gear. They employ sophisticated means adapted from military technologies such as sonar, radar, electronic navigational aids, satellite positioning systems, satellite weather maps and working in concert with fish-spotting aircraft (Blades, 1995; Safina, 1998).

Overall the number of fishers, the amount of fishing gear in use, and the shift from fixed to mobile fishing gear, factors which once limited the catch, have evolved to the point where too many fishers seek too few fish.

Not surprisingly, evidence abounds that marine fisheries have been consequently overexploited. Safina (1998) speculates that 80 to 90 percent of fish in some populations are removed annually. In Alaska, just 36 hours elapsed in 1994 before 5,000 boats caught the season's limit of halibut (Smith and Symonds, 1994). "At least 60 percent of the world's 200 most valuable fish species are either overfished or fished to the limit. Eleven of the world's 15 most important fishing areas are in decline." (World Wildlife Federation, 1998).

**Commercial fisheries developed many years ago to serve a European market for fish products. The demand for fish products was one of the driving forces behind the arrival of, and settlement by, Europeans on the North American continent. Today an ever-increasing world population, growing at an increase of about 100 million annually (Safina, 1998), exerts global pressure for production of protein sources including fish and fish products. The world's population has already severely impacted global fisheries.**

**The seafood marketplace is global and demand for seafood, in some countries, far exceeds available domestic supplies. For example, in the Philippines, demand usually outstrips supplies (Barer-Stein, 1980) and the United States (U.S.) imports more than half of the seafood consumed by Americans (National Fisheries Institute, 1999c). The frozen food industry is considered by many of those in the fishing industry to be the trend of future markets.**

**As marine fisheries are fully developed and even overexploited, changes in the world markets can and will likely lead to increased accessing of alternative sources such as local freshwater fisheries markets, aquaculture and/or fish/fish product substitutes. When consumer demands are not met by conventional or traditional markets, consumers often turn to alternatives, including 'black' markets.**

**There appears to be reason for grave concern about 'mining' the resource base as suggested by past fisheries collapses and the current fisheries conditions found in much of the world (Anderson, 1998; Norris, 1998; Safina, 1998; Wood, 1998). The Food and Agriculture Organization (FAO) of the United Nations (UN) has estimated that, worldwide, between 60 and 70 percent of stocks require "urgent intervention"**

to control or reduce fishing to avoid further decline (World Wildlife Federation, 1998).

There are startling figures of wastage in global fish harvesting. The unintended catch is referred to as 'bycatch' or 'bykill'. This includes not only unwanted fish species and undersize fished species, but also marine animals and birds, including but not limited to whales, dolphins, turtles, and diving birds. Safina (1998) reports that "one of every four animals taken from the sea is unwanted" (by that fisher) and discarded overboard (Safina, 1998, p. 62). Werier (1995) reported, in an editorial, "colossal waste" (of 27 million tonnes annually) in the international commercial catch. According to the FAO, the ratio of bycatch has been estimated at 33 percent worldwide. This closely parallels the bycatch ratio of 25-30 percent calculated for Manitoba freshwater fisheries by Heuring (1993).

On the freshwater fisheries front, Canada is a 'water' country, holding 9 percent of the world's available fresh water supply (MacInnes, 1998). As such Canada and its provinces hold a favoured position in terms of freshwater fisheries potential. Canada also has been a leading nation in exports of food from water (Martin, 1978). This means that a simple comparison of relative harvests may not fully indicate the importance of Canada's potential role as a fish producer in the global economy.

As changes occur in world fish markets due to the exhaustion of marine resources, pressures will mount on alternative fish sources. It will become increasingly important to ensure that freshwater fisheries are not subjected to harvesting levels which will result in a collapse of Manitoba's freshwater fisheries, such as experienced in its sturgeon fisheries, and further that all available fish resources are

**fully utilized. The ratios between the relative size of global marine and local freshwater fish markets could change if marine fisheries continue to collapse.**

**In the mid to late 60's the western freshwater fishery in Canada was breaking down (Snell, 1989). The industry was fragmented, with insufficient capital for required investment in new facilities, thus making it difficult to meet health and sanitation standards for fish processing for export purposes (Young, personal communication, February, 1999). Additionally the fishers often bore the risks inherent in the freshwater trade, those of perishability and quality of product (Snell, 1989).**

**Several governments pressed for resolution to these problems. Led by the province of Manitoba, the ultimate recommendation was to form a Board, modeled on the Canadian Wheat Board. The sole mandate of this new Federal Crown Corporation, called the 'Freshwater Fish Marketing Corporation' (FFMC), would be to market all the fish produced by licensed fishers from the Northwest Territories, Alberta, Saskatchewan, Manitoba and North-western Ontario. Manitoba had the largest share of production at 66 percent (Snell, 1989). To accomplish their mandate the Corporation would buy, process (or arrange processing), transport and market all the fish produced by such fishers.**

**FFMC has the exclusive marketing rights for inter-provincial and export trade of freshwater fish produced in areas under its jurisdiction (FFMC, 1998) and generally controls intra-provincial trade in these products under authority of the Provinces (Young, personal communication, February, 1999).**

**At the date of the formation of FFMC around 90 percent of fish were exported to the U.S. (Young, personal communication, February, 1999). In 1998 major FFMC**

**markets, as defined by sales revenue, were 15.6 percent to Canadians and 84.4 percent to export markets, a large percentage (60.3%) going to US markets (FFMC, 1998). An increasingly larger portion of export sales are going to European markets.**

**The opinion is widely held within the Manitoba's fisheries industry that there are native Manitoban fish species that are underutilized. Dysart reported as fact that, when price does not warrant handling, the bycatch is often discarded back into the lake or on-shore (Dysart, personal communication, April, 1994). Cole, in an editorial (1999), reports that millions of pounds of low-price fish are discarded by fishermen, who refer to the practice as 'bushing'. Some fisheries personnel felt that certain influences on fish consumption patterns would be of vital interest in making decisions regarding fish marketing practices (Scaife, personal communication, April, 1994).**

**The consumption of rough fish in parts of the world is common. For example, smoked and canned turbot livers are considered a delicacy in many European countries as reported in an editorial by Werier (1995). A recent introduction by an Albertan entrepreneur of tilapia has made apparently successful inroads to local markets (Henley, personal communication, November, 1998). Aquacultured roughfish such as carp represent a large market in Asia and other parts of the world.**

**Conservation of inland fisheries, fish habitat, and export and interprovincial fish trade is Federal government responsibility. Manitoba owns fish and fish habitat as part of its crown resources and controls commercial fisheries management within its boundaries, including licensing and allocation. The province is in the process of developing a fisheries sustainable development strategy in recognition of the**

**cultural, social, economic, and environmental importance of fish resources (Manitoba Round Table for Sustainable Development, 1999b). Objectives center around policy formulation related to environmental enhancement and protection, allocation and supply of fish stocks, development and use of fish resources, planning and integrated management of fish resources, and public awareness and education about fish, habitat and management issues (Manitoba Round Table for Sustainable Development, 1999b).**

**That fish species do not exist independently of other species can be concluded from reviewing the predation patterns of various freshwater fish which consume other fish species (Scott and Crossman, 1979). In order to assist in the sustainable management of all species, an examination of demand for all harvested species from Manitoban freshwater fisheries would likely prove useful. Theoretically, the identification of specific ethnic groups or other types of groups would allow direction of niche marketing of underutilized fish towards them.**

**As part of the development of an intraprovincial fishing strategy the MDNR funded this research project to provide information on Winnipeg consumers of fish and fish products. The MDNR posed a basic question of what to do about wasted resources and queried if there were any untapped local markets. The research funded would elicit responses regarding consumption and purchase patterns of fish and fish products within Winnipeg as might reveal untapped local markets.**

**The research project focused on two main tasks, calculating consumption estimates for Winnipeg and identifying potential niche markets for underutilized native species. The knowledge gained about Winnipeg residents' consumption and potential niche markets could prove useful in the development of provincial**



**marketing strategies to increase consumption of underutilized fish species. The survey of Winnipeg residents provided the framework of this research project by gathering information to help identify and analyze Winnipegger's consumption patterns, attitudes about fish, procurement sources, and demographic information.**

## **1.2 Identification of stakeholders**

**Although the MDNR does not usually refer to itself as a stakeholder, others sometimes do. Under the Manitoba Fishery Regulations, MDNR has been effectively delegated to manage and administer the federal fisheries regulations. As such, MDNR wields authority to enforce legislation and is influential in the introduction of new fisheries-related legislation and policies.**

**The entrenchment of Aboriginal peoples' hunting, trapping and fishing rights in Canada's constitution gives them a major stake in the allocation of the province's fish resources.**

**Commercial fishers, fish wholesalers and retailers, restaurants and other related industries have vested interests in the way fish resources are managed.**

**Sport anglers and other non-consumptive users of fish resources are also stakeholders, often indirectly involving local businesses such as resort and accommodations owners, boat and fishing accessories manufacturers, boat rental businesses, bait and tackle industries, and travel, tourism and eco-tourism businesses. In addition, a multitude of special interest groups, including conservation groups, sporting associations, and fish derby participants are stakeholders.**

**As public funds are utilized in the management of fish resources the public is also a stakeholder. The use of federal funds, through the *Federal Fisheries Act* (Canada) and the regulations to that Act, may infer to some that the federal government is another stakeholder, given its accountability for expenditures relating to fish resources. A multitude of federal and provincial agencies beyond the MDNR are involved in this indirect manner, whether through laws concerning Aboriginal rights, navigable waters, conservation, and statistics to name a few.**

**Since many of the fish resources are exported other parties have a stake in the resource. Interprovincial purchasers are affected by the management of fisheries resources. International trade and export considerations mean treaties influence the transfer of fish resources between countries and thus involve international players, like politicians, lawyers, lobbyists, and organizations. The fact that Manitoba fish are exported means that even export customers may be considered as stakeholders.**

**There are other stakeholders than those affected as above. The management of fisheries can affect other peripheral businesses and activities. The utilization of fish may affect the 'bait' fishery, scientific or technological activities if fish species are required for such endeavors. Even though there may not be a clearly identifiable direct link to the utilization of fish resources, there can be indirect effects to many other individuals and as such, they are invested as stakeholders.**

**One group of the most important stakeholders currently have no way of voicing their concerns. Future generations, were they able to, would undoubtedly express their concern over the way in which today's fisheries resources are currently being managed and emphatically declare their rights as stakeholders in Manitoba's fish resources.**

### **1.3 Scope of study**

**Many issues impact Manitoban fisheries and the use of fish resources. The multi-disciplinary nature of the problem discussed herein encompasses a number of factors including: global and local impacts, multiple levels of regulatory bodies and legislation, economic forces, fish biology, biodiversity, sustainability, the environment, eco-systems, decision-making, policy, politics, marketing, food security, food safety, and social and cultural impacts and influences. Some of these factors are included in discussion, however remain out of the scope of this paper. In particular, this study does not purport to address in depth the overutilization nor the underutilization of certain fish species native to Manitoba.**

**That the issue is complex and multi-dimensional is apparent because, in spite of all the knowledge and expertise available regarding the ‘laws’ of conservation, wild stocks continue to be threatened. As Professor Thomas Henley simply states, “It is incumbent on us to do better.” (Henley, personal communication, February, 1999).**

**No ‘leaps of logic’ will be made to infer that certain relationships in fact exist, yet data may be presented which may provide opportunities for speculation on some of these areas and which may trigger interest in studying such possibilities further.**

### **1.4 Problem Statement**

**The research purpose of the study was not only to determine the general consumption of fish, but also to identify consumption of specific fish species and forms of fish by Winnipeg consumers. This may assist in the development of**

**effective marketing strategies aimed at potential niche markets for whitefish and other native Manitoba freshwater fish species characterized by underutilization.**

## **1.5 Objectives**

**The main objectives and sub-objectives were as follows:**

**Objective 1: To develop quantified estimates of fish consumption by residents of the City of Winnipeg**

**Sub-objectives:**

- 1.a. for total consumption of all fish**
- 1.b. by (selected) freshwater species**
- 1.c. by form of fish consumed**

- **Objective 2: Determine relevant factors affecting consumers' fish purchasing decisions**

**Sub-objectives:**

- 2.a. of significance**
- 2.b. and rank such factors**

- **Objective 3: Determine the source(s) of fish procurement by Winnipeg residents**

- **Objective 4: Obtain demographic information on Winnipeg consumers of fish**

- **Objective 5: Provide recommendations to MDNR related to the implications of niche markets for fish in terms of a number of factors which may arise out of the study analysis**

## **CHAPTER 2**

### **REVIEW OF RELATED LITERATURE**

#### **2.0 Introduction**

**Fish has been available in several forms. Years ago salt was used as a preservative to process the catch as dried, salted fish which was used as a staple food. This was the only form, other than fresh, made available to consumers. With the development of newer technologies, such as refrigeration and freezer, fish could be frozen or refrigerated or canned.**

**Currently, the most common forms in which fish are marketed for human consumption are 1) fresh or frozen fish, available as whole, dressed, fillets, minced, breaded or formed into surimi products, 2) canned or 3) smoked. Fish parts are also marketed such as livers, eggs (caviar), oil or other parts.**

**The consumption of seafood (finfish, shellfish and freshwater fish) is recorded by a vast variety of methods depending on the source of information. The source of seafood has in the past been provided by fishers, largely harvested from the oceans, but also taken from inland fisheries.**

**Three general types of common property fisheries existed, subsistence, recreational and commercial. An alternative commercial fishery, based on more defined and exclusive property rights, was provided by advances in development of aquaculture in the private sector (Ruggles, 1975).**

**Commercial fisheries co-exist with recreational and subsistence fisheries to provide fish to consumers. This causes difficulties in quantification since recreational and subsistence harvests are not recorded as they are in the commercial sector (Berkes, 1990). Aquaculture, not included in the global harvest data, represents another fishery from which consumable products are obtainable.**

**Some examples of the measures used to report catch are production figures for commercial catches, such as landed weight in metric tonnes, pounds, value in monetary units, whole weight, edible weight. In the recreational fisheries data on catch might be reported in weight, units (number of fish retained), or by angling effort (creel studies or return per hour).**

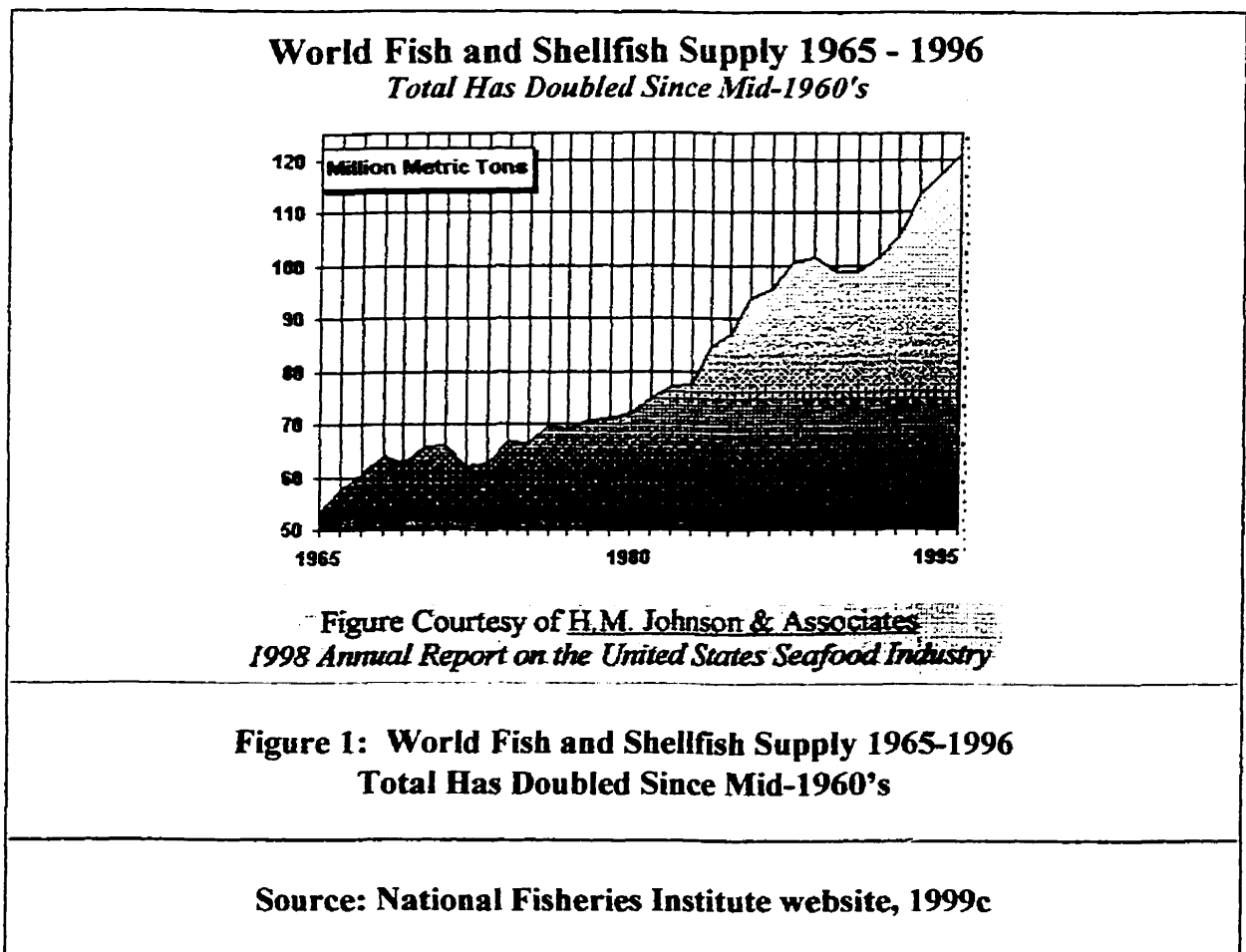
**Subsistence fisheries have been studied since the 1940's, but there are no reports in fisheries statistics nor are these fisheries monitored, assessed or regulated (Berkes, 1990). A Canadian study by Berkes (1990) reported consumption results in metric weights for all uses and also provided per capita human consumption estimates. Aquaculture production was reported by Statistics Canada as another commercial fishery, using weight as the means to report harvest.**

**To some degree consumption can be implied through production figures. Statistics are calculated with respect to per capita fish or seafood consumption by humans at the retail level, these figures differ in significant ways from commercial reporting which most often refers to 'live weight' of catch. Statistics Canada reports fish available for human consumption on average at the retail level, but does not indicate total food supplies consumed (Statistics Canada, 1998d).**

## 2.1 Production capacity and trends

Extensive data are available regarding international, national and provincial harvesting of fish products. Comparisons of harvest can be difficult because data may be reported by weight, volume, or value. Aggregate production is generally not reported in a way that allows for the identification of ultimate use as food for human consumption, since commercial landings are used for both edible and industrial purposes.

Figure 1 shows the growth in world fish and shellfish supply over the last 30 years.



**Table 1: Global Harvest and Annual production of selected countries in five year increments**  
(in thousands of metric tonnes of live weight)

Country	Year				
	1975	1980	1985	1990	1995
<b>China</b>	<b>5252</b>	<b>5840</b>	<b>8493</b>	<b>13870</b>	<b>29240</b>
<b>Peru</b>	<b>3417</b>	<b>2710</b>	<b>4139</b>	<b>6877</b>	<b>8944</b>
<b>Chile</b>	<b>4079</b>	<b>4431</b>	<b>4987</b>	<b>5425</b>	<b>7891</b>
<b>Japan</b>	<b>10569</b>	<b>11184</b>	<b>12244</b>	<b>11266</b>	<b>7571</b>
<b>Philippines</b>	<b>1466</b>	<b>2617</b>	<b>5147</b>	<b>5394</b>	<b>7151</b>
<b>Malaysia</b>	<b>873</b>	<b>1136</b>	<b>1464</b>	<b>5123</b>	<b>6082</b>
<b>U.S.A.</b>	<b>4081</b>	<b>5220</b>	<b>6564</b>	<b>6149</b>	<b>5960</b>
<b>Russian Federation</b>	<b>10195</b>	<b>9761</b>	<b>10784</b>	<b>8053</b>	<b>4391</b>
<b>Mexico</b>	<b>2587</b>	<b>1301</b>	<b>1267</b>	<b>1469</b>	<b>1408</b>
<b>Canada</b>	<b>1155</b>	<b>1543</b>	<b>1504</b>	<b>1786</b>	<b>968</b>
<b>World catch</b>	<b>78045</b>	<b>83450</b>	<b>103012</b>	<b>114539</b>	<b>135013</b>
<b>World catch restated in millions of metric tonnes</b>	<b>78.045</b>	<b>83.45</b>	<b>103.012</b>	<b>114.539</b>	<b>135.013</b>
<b>Source: Adapted from Food and Agriculture Organization of the United Nations, FISHSTAT-PC, 1997</b>					



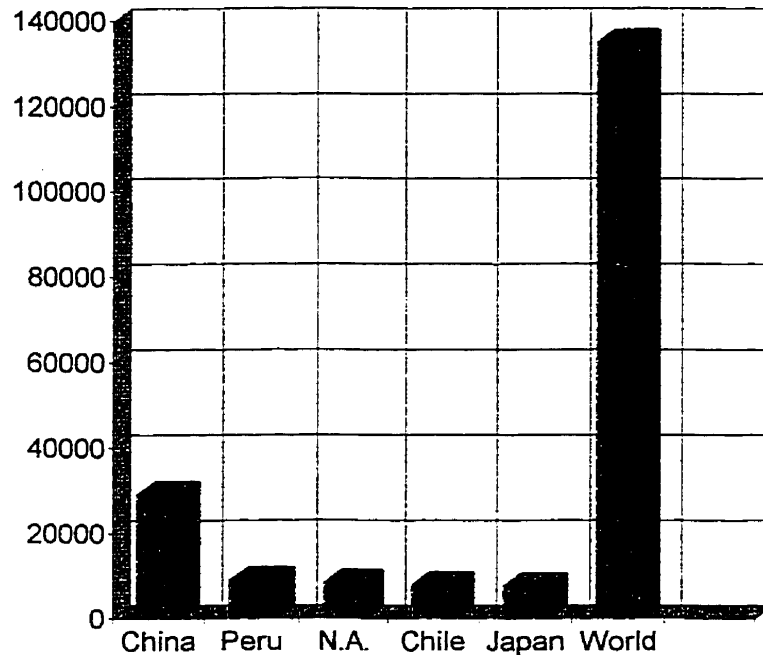
**Global commercial catches of ocean fish are highly reported, although such harvests include fish for other purposes than human consumption. Applebaum in 1978 and Safina in 1998 report that one third of world catch goes to feed livestock (usually in the form of fish meal), leaving two thirds available for human consumption and other purposes.**

**Global catches of finfish are reported as landed weight, rather than in terms of edible weight. The simple conversion often used is “edible weight = 0.70 whole weight” (Berkes, 1990). The global commercial harvests are presented in millions of metric tonnes, as adapted from the Department of Fisheries and Oceans (DFO) internet website, and are shown in Table 1 on the preceding page.**

**The ratio of North American freshwater fish production in comparison to global production and to five of the world’s major fish harvesting countries in 1995 is indicated in Figure 2. Harvest is shown in thousands of metric tonnes, live weight.**

**The relative size of the total North American fisheries can be seen to be close to the same size of certain larger fish producing countries, except Chinese fish production which far exceeds the productive capacity of any other major fishing power.**

**Canadian fisheries harvest groundfish, pelagics, salmonoids, molluscs, crustaceans and freshwater fish which are processed for human consumption or else used in auxiliary sectors which produce fish meal or fish oils. Harvests cannot be used to denote consumption for additional reasons. Imports, exports and inventories fluctuate and represent sources of fish either available, or not, for use.**

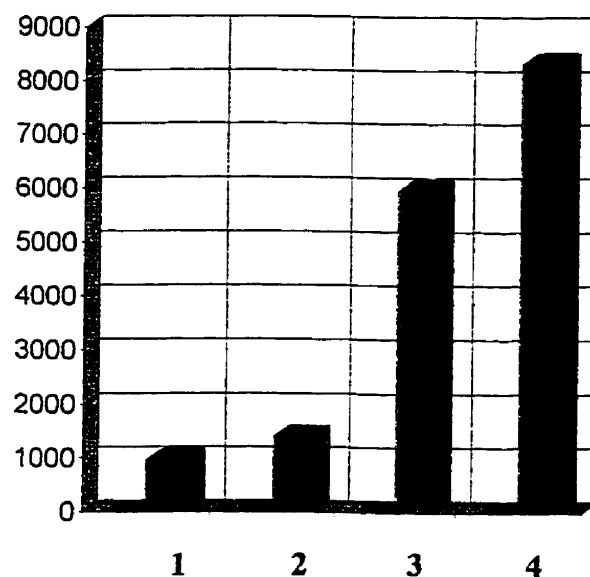


**Figure 2: North American production in relation to global and major fish harvesting countries in 1995 in thousands of metric tonnes, live weight**

**Source: Adapted from Food and Agriculture of the United Nations, FISHSTAT-PC, 1997, Department of Fisheries and Oceans Internet website, 1999e**

The relative size of each North American country's 1995 catch, in thousands of metric tonnes, is shown in Figure 3.

Historic landings (commercial) in FFMC's mandated area for selected years are summarized in Table 2 as derived from FFMC's reports of 1990-1998 landings in round weight in millions of kilograms. It was reported in 1988 that about 50 percent of total Canadian production came from FFMC (Deloitte, Haskins, Sells, 1988).



**Key: 1 Canada 2 Mexico 3 United States 4 Total North American**

**Figure 3: Production by North American countries in relation to total North American catch in 1995 in thousands of metric tonnes, live weight**

**Source: Adapted from Food and Agriculture Organization of the United Nation, FISHSTAT-PC, 1997, Department of Fisheries and Oceans Internet website, 1999e**

Manitoba's freshwater commercial catch represents only a portion of Canada's freshwater fish as shown in Table 3. A wide variation in percentage of Manitoba to Canadian catch (included in Table 3) can be observed, although Manitoba's commercial catch is, on average, about 30 percent of the total Canadian freshwater commercial catch based on live weight.

However reported provincial harvest statistic figures exclude subsistence and other uses of fish. According to Berkes (1990) the Canadian subsistence fishery was at

<b>Table 2: Historic FFMC landings of harvested species by selected years for freshwater fish (in millions of kilograms) in round weight</b>				
<b>Year</b>	<b>1990</b>	<b>1994</b>	<b>1995</b>	<b>1998</b>
<b>Whitefish</b>	<b>6.2</b>	<b>5.0</b>	<b>6.3</b>	<b>5.5</b>
<b>Pickrel</b>	<b>4.9</b>	<b>3.0</b>	<b>3.0</b>	<b>2.8</b>
<b>Sauger</b>	<b>2.7</b>	<b>1.5</b>	<b>1.7</b>	<b>1.0</b>
<b>Northern pike</b>	<b>3.3</b>	<b>2.1</b>	<b>1.9</b>	<b>2.4</b>
<b>Lake trout</b>	<b>0.7</b>	<b>2.1</b>	<b>1.9</b>	<b>2.4</b>
<b>Tullibee</b>	<b>0.1</b>	<b>0.5</b>	<b>0.5</b>	<b>0.5</b>
<b>Lake perch</b>	<b>0.5</b>	<b>0.1</b>	<b>0.4</b>	<b>0.2</b>
<b>Mullet</b>	<b>1.5</b>	<b>1.1</b>	<b>0.9</b>	<b>3.7</b>
<b>Carp</b>	<b>0.3</b>	<b>0.4</b>	<b>0.4</b>	<b>0.4</b>
<b>Other</b>	<b>0.4</b>	<b>0.1</b>	<b>0.1</b>	<b>0.2</b>
<b>Totals</b>	<b>20.7</b>	<b>14.0</b>	<b>15.2</b>	<b>16.8</b>
<b>Source: Adapted from FFMC 1997-1998 Annual Report, 1998</b>				

least 1/10 the size of the freshwater commercial fishery. The use of catch has evolved over time in Manitoba as one significant use of rough fish as sled dog food has declined with the popularization of snow machines as transportation in Canada's northern communities.

Aquaculture now produces more freshwater fish than do wild stock fisheries and overall one third of fish eaten (globally) by people are supplied by aquaculture (Safina, 1998).

<b>Table 3: Freshwater fisheries - Catches by species in Manitoba and Canada during 1989 (reported in tonnes of live weight)</b>			
<b>Species</b>	<b>Manitoba catch (as)</b>	<b>Percentage (of)</b>	<b>Canadian catch</b>
<b>Carp</b>	<b>250</b>	<b>74</b>	<b>339</b>
<b>Catfish</b>	<b>0</b>		<b>71</b>
<b>Lake trout</b>	<b>27</b>	<b>2</b>	<b>1,093</b>
<b>Perch</b>	<b>615</b>	<b>7</b>	<b>8,572</b>
<b>Pike</b>	<b>2,436</b>	<b>63</b>	<b>3,853</b>
<b>Sauger</b>	<b>2,660</b>	<b>97</b>	<b>2,730</b>
<b>Sucker</b>	<b>1,191</b>	<b>58</b>	<b>2,059</b>
<b>Tullibee</b>	<b>117</b>	<b>10</b>	<b>1,118</b>
<b>Whitefish</b>	<b>3,063</b>	<b>33</b>	<b>9,385</b>
<b>Yellow pickerel</b>	<b>4,285</b>	<b>50</b>	<b>8,491</b>
<b>Other fish</b>	<b>55</b>	<b>6</b>	<b>906</b>
<b>Total</b>	<b>14,699</b>	<b>29</b>	<b>51,201</b>
<b>Source: Adapted from Department of Fisheries and Oceans Internet website, 1999k</b>			

**Manitoba produces mostly freshwater species, whereas world production mainly relates to saltwater species. Most of Manitoba's harvest is sold through FFMC. FFMC sells 14 freshwater species, the major ones are whitefish, pickerel/sauger , northern pike, lake trout and freshwater mullet. Species sold in lesser amounts**

are lake perch, mullet, white bass, burbot, inconnu, tullibee and carp.

## **2.2 Consumption trends**

Total world requirements for fish projected for the year 2000 was estimated in 1982 by the FAO at 110 million tons (Green and Derksen, 1984). Production peaked at 135.013 million tonnes in 1995, yet consumption is known to be a product of population times per capita consumption.

Consumption trends are reported by statisticians for human consumption on a per capita basis. Total available product at the retail level is divided by the estimated population so that the average amount calculated to be available to each member of the population can be published in statistical reports and journals.

Calculated at the retail level, this means shrinkage and wastage are not accounted for in the figures determined by this method. This information can be useful to a wide variety of parties, including nutritionists, businesses, producers and natural resource managers. The basis used to calculate consumption can vary. Statistics Canada data reported in this research paper are at the retail level.

### **2.2.1 Seafood consumption by North Americans**

Seafood usually refers to edible finfish and shellfish from the sea, however the common usage of the term allows it to include fish taken from freshwater sources.

**Many North Americans believe the consumption of fish to be related to better health by virtue of their perception of fish or related products as an excellent source of high-quality protein (Ahmed,1991) and a low fat protein choice (Canadian Diabetes Association, 1989).**

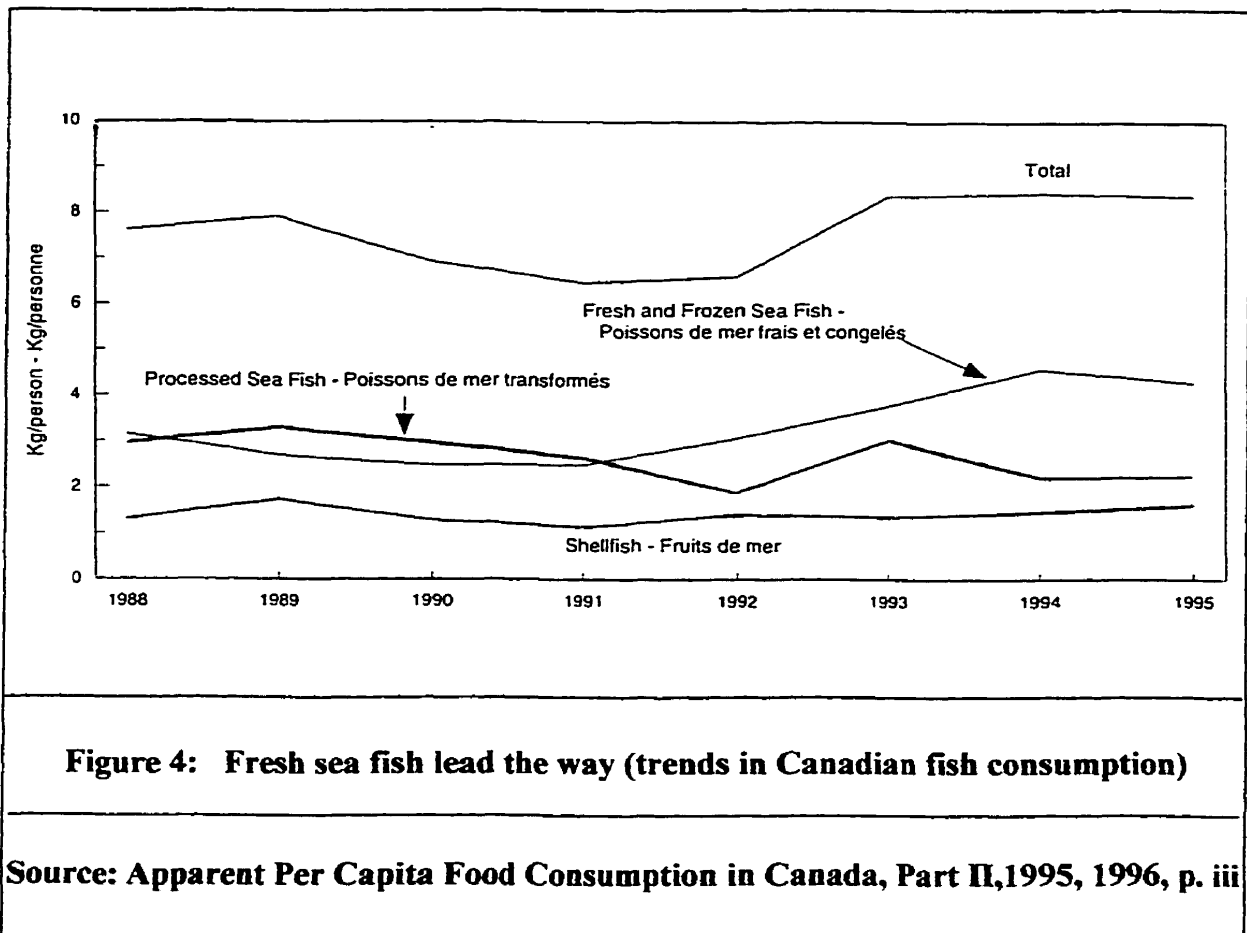
**Fish was often perceived by both Canadians and Americans as being a healthy, nutritious food (Ahmed, 1991; Statistics Canada, 1991c; Sabry, 1991). This perception may have been a major contributor to the increase in annual per capita consumption of fish by Canadians (Statistics Canada, 1996; 1997; 1998a).**

**Canadians, on average, ate an estimated 7 kilograms annually in 1989 (Statistics Canada, 1991c), 8.84 kilograms annually in 1994 (Statistics Canada, 1997) and 8.85 kilograms annually in 1996 (Statistics Canada, 1997).**

**Statistics Canada reports seafood consumption data, based on edible weight at the retail level, of fresh, frozen and processed seafish, shellfish and freshwater fish. Recent trends in Canadian consumption can be noted in Figure 4.**

**Statistics Canada (1995) reported the components of per capita total fish consumed in 1994 by Canadians of 8.44 kilograms to be 6.77 kilograms (80 %) of seafish, 1.48 kilograms (18 %) of shellfish and 190 grams ( 2%) of freshwater fish. The proportion consumed closely correlates to the Family Food Expenditure Survey data reported in a National Institute of Nutrition review in 1991 which stated fish consumption in Canada to be 84 percent finfish and the remainder shellfish (National Institute of Nutrition [NIN], 1991).**

A study by Berkes (1990) indicates that Aboriginal subsistence harvests may represent a significant Canadian fishery. The type of fish consumed would likely be freshwater fish from domestic or subsistence fishing activities.

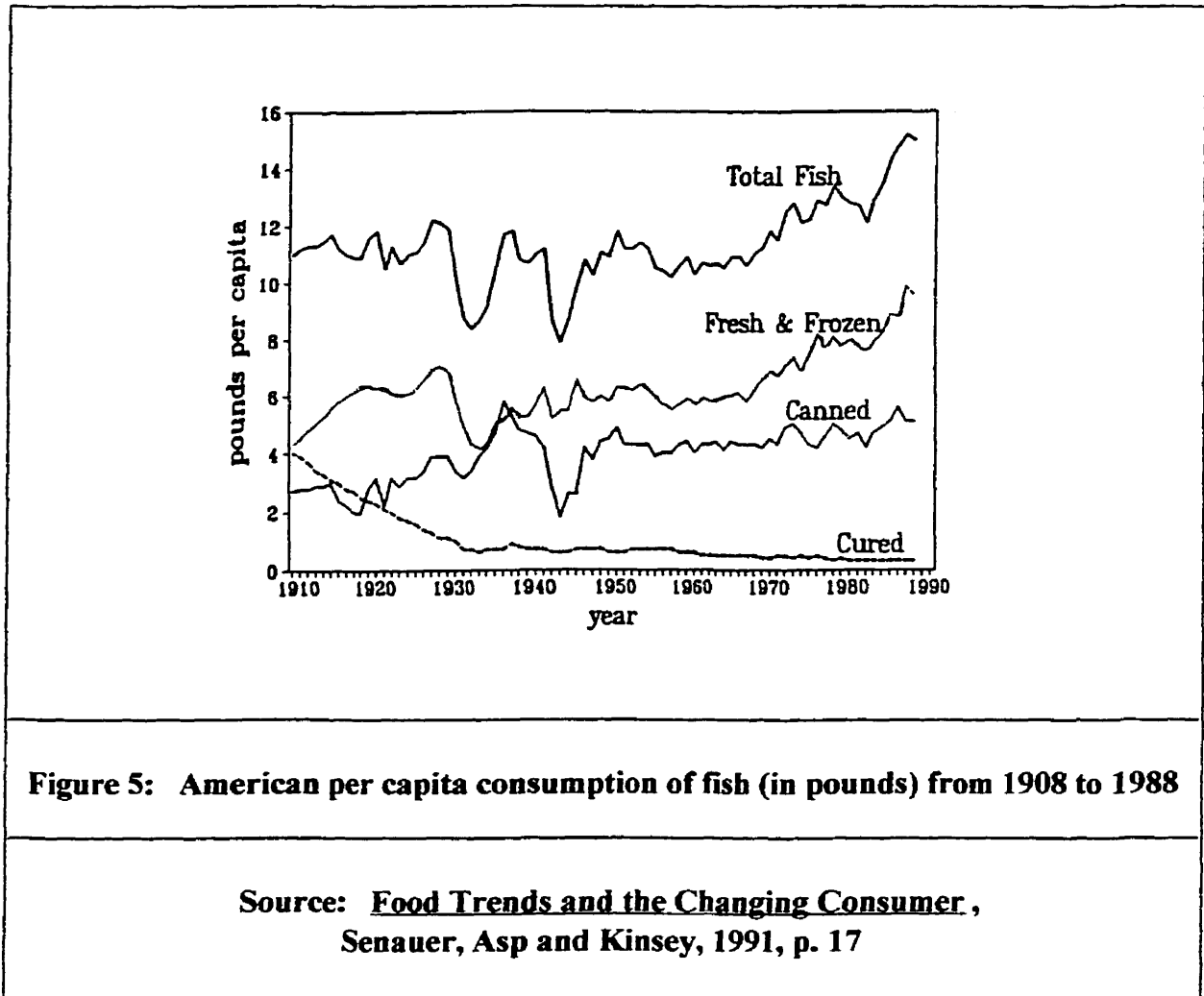


American consumption trends between 1908 and 1988 for the form of fish products consumed are evident in Figure 5. The popularity of fresh and frozen forms of fish increased, canned fish consumption increased somewhat in recent years and cured fish remained at a low per capita level (Senauer, Asp and Kinsey, 1991).

In 1991 Ahmed reported that American consumers ate in the vicinity of 10-15.9 pounds of fish per person per annum (about 7 kg.). This was more fish and shellfish



than in years prior to 1978 according to Brewster and Jacobson who reported in 1978 that Americans had been eating between 10 to 12 pounds of fish and shellfish annually for the past 65 years, excluding non-commercial game fish.



Most recently seafood consumption by Americans has been estimated at around 14.6 pounds (6.6 kg.) per year (National Fisheries Institute, 1999c). Americans consume about eight percent of total world catch from commercial fishers, aquaculture and imports (National Fisheries Institute, 1999c) and have been a major export market for FFMC production (FFMC, 1998).

**Brewster and Jacobson (1978) figures do not include the fish taken by sport or subsistence anglers, which may represent a considerable quantity of fish. Estimates of recreational and subsistence harvests were reported to have remained relatively constant at about twenty percent of the total fish and shellfish consumed in the U.S. (Ahmed, 1991; Brewster and Jacobson, 1978).**

**The amount of fish consumed by North Americans in fresh and frozen form has been increasing, as previously seen in Figures 4 and 5. The demand for canned products appears to be more constant and the consumption of cured fish product has dropped dramatically, most likely as a result of the development of refrigeration and freezer technologies (Brewster and Jacobson, 1978; Kurlansky, 1997).**

**General agreement was noted in the literature from Canadian and U.S. sources regarding the approximate level of consumption and the trend of increased consumption in seafood and fish. However there are likely many factors involved in consumers' decisions to consume particular food or food products, including fish, as Cassidy has postulated (Cassidy, 1981).**

### **2.2.2 Consumption by Manitobans**

**When the FFMC was formed in 1969 its mandate was to process the fishers catch and to market the products domestically (including Manitoba) and abroad. Often the summer fishery is more productive than the winter fishery and there are other catch fluctuations. Some of the processed catch is frozen and inventoried.**

**Fishermen can sell their fish directly to final consumers. Director's Authorizations,**

**which apply only to intraprovincial fish sales, authorize fishers to consign fish to a representative to sell fish on their behalf to final consumers. Concerns have been raised that some fishers may be selling to retailers without authorization, or may be selling fish in excess of their quota limits; such sales are illegal and are referred to as ‘bootlegging’ by local interviewed retailers.**

**Figures for FFMC sales are available for all fish sold through the Corporation including quota and unregulated fish species. According to FFMC, sales within Manitoba comprise about 1 to 1.5 percent of their total sales or approximately \$2 million annually (Intraprovincial Fish Marketing Strategy Committee, 1994).**

**Sales by fishermen directly to final consumers, under Director’s Authorizations, or under the auspices of Special Dealers Licenses issued by FFMC, are recorded by MDNR and included in commercial fishing statistics in MDNR’s annual reports.**

**Treaty Indians have a constitutionally protected right to fish for food. Non-treaty individuals may also be permitted to harvest for food, depending on need, remoteness, and harvest traditions. MDNR has no requirements for reporting on subsistence harvest of fish. Subsistence catches may be significant. Berkes, in his review of a sample of surveyed native communities (1990), reported annual per capita subsistence harvests ranging as high as 600 kilograms, noting this figure includes all purposes. The average annual per capita human consumption by Canadian native harvesters was reported as 42 kilograms of edible weight (Berkes, 1990).**

**The above information provides evidence of scattered consumption data which is**

available. However there are no published consumption data available, either total or per capita, specifically with regard to Manitobans.

### **2.2.3 Consumption by Winnipeg residents**

Until 1994, no information was available concerning either consumption or purchase patterns regarding fish and fish products specifically by Winnipeg residents. That year four concurrent local studies relating to fish were underway.

Mr. Ian Kitch, a graduate student from the University of North Dakota, conducted a study concerning sport angling in Winnipeg. MDNR also contracted for a mail survey concerning sport angling to be added into the City of Winnipeg's Leisure Guide survey of selected Winnipeg residents.

Concurrent with the study herein reported, the MDNR contracted for a similar mail survey where questions regarding consumption were also added into the City of Winnipeg's Leisure Guide mail survey. That study concluded that Winnipeggers consumed 12.6 kilograms of fish per capita in 1994 (MDNR, 1994a).

Prior to these studies an educated guess as to Winnipeg residents' consumption may have been possible by manipulating FFMC sales figures. The reliance on such calculations would likely be questionable given the number of variables involved and assumptions which would have to be made. A general statement about consumption by Winnipeg residents, according to FFMC, was that sales of freshwater fish (in dollars) in Winnipeg were relatively stable at about 70 percent of average \$1 to 1.5 million for FFMC Manitoba sales.

#### **2.2.4 Consumption of freshwater species**

**Green and Derksen (1984) recognized that increased demand for freshwater species by foreign commercial markets would be probable as world's ocean fisheries approach (or surpass) their total potential yields.**

**Seventy-nine native species of freshwater fish are identified as native to Manitoba, (this increases to 84 if introduced and established species are included). Only a handful are considered desirable for harvest and consumption (for a list of selected Manitoban fish species and their Latin names refer to Appendix 1).**

**The species most preferred in 1985 by Manitoban sport anglers were pickerel (walleye, sauger), northern pike (jackfish), perch, smallmouth bass, catfish, lake trout, whitefish, goldeye, tullibee, and burbot (Department of Fisheries and Oceans, 1985). Green and Derksen (1984) found only walleye and pike to be significant angled species, representing 94 percent of primary sport fish species (whitefish, walleye, sauger, and pike) kept by anglers.**

**The 1990 survey of sport fishing in Manitoba indicated that pickerel and northern pike were still the most popular species, followed by perch, smallmouth bass and lake trout. The survey also reported that 58 percent of all fish kept were walleye and 16 percent were northern pike (MDNR, 1994b). The Manitoba Round Table for Sustainable Development reported that, on average, pickerel accounted for 50 percent of the landed value of harvested species.**

**A summary of fish sold by fishers under Director's Authorizations through Winnipeg retailers is reproduced in Table 4, in which the pattern of various species**

sales in kilograms can be seen. Pickerel and sauger are very similar fish, belonging to the same fauna of piscivores, and the 1994 sales through Winnipeg retailers appear to be notably different from other years. FFMC sells about 136,364 kilograms of pickerel in Manitoba annually (Intraprovincial Fish Marketing Strategy Committee, 1994).

<b>Table 4: Sales (in kg) of fish through Winnipeg retailers under Director's Authorizations</b>					
<b>Year</b>	<b>Pickerel</b>	<b>Sauger</b>	<b>Whitefish</b>	<b>Other</b>	<b>Total</b>
1993	12,490	6,326	9,749	N/A	28,565
1994	19,582	16,139	563	N/A	36,283
1995	15,681	5,457	5,348	2,439	28,926
1996	14,810	20,270	1,514	4,701	41,295
1997*	8,383	1,757	980	3,629	14,748
<b>Total</b>	<b>70,947</b>	<b>49,947</b>	<b>18,154</b>	<b>10,770</b>	<b>149,817</b>
<b>* Sales as of July, 1997</b>					
<b>Adapted from: Manitoba Department of Natural Resources, Evaluation of Director's Authorizations for Fish Sales in Small Retail Outlets in Winnipeg, 1997</b>					

Commercial fishermen sometimes handle non-marketable (bycatch) fish, which are underutilized, commercially sold fish species (low grade whitefish, mullet, burbot, tullibee) by discarding on-shore (Dysart, personal communication, December 9, 1994). Consumption of such species had not been quantified due to lack of

**significant, stable markets and even cullage of underutilized species was not estimated until 1993 by Heuring. Prior to 1977 data were recorded only for marketed fish and these figures included some partially processed fish (Green and Derksen, 1984).**

**Data available for freshwater species consumption in Manitoba may be only partially inferred from FFMC sales. FFMC sales include domestic sales in terms of dollars, but are not presented so as to differentiate between species nor between Winnipeg or other Manitoban or domestic purchasers. FFMC sales figures also exclude fish sold via direct sales means allowed to fishers.**

**FFMC local domestic sales, other commercial fishers' sales, angler catches, and subsistence harvests are presumed to provide most likely sources for freshwater fish consumption by Manitobans. No data were found regarding the level of illegal sales by commercial fishers in any published source.**

**A recent editorial by Cole reported that "fish mongers in Winnipeg cannot sell fresh-caught Manitoba fish to supermarkets . . . . but can and do . . . buy pickerel from as far away as Poland to sell into supermarkets" (Cole, Winnipeg Free Press, 1999, p. A10).**

**Data are available from a survey, on the amount of reported freshwater fish catch by sport anglers from Manitoban waters (both resident and non-resident), which was co-operatively conducted by Department of Fisheries and Oceans and the MDNR (MDNR, 1994b), but the data do not differentiate between Winnipeg residents and other Manitoban residents as seen in Table 5.**

<b>Table 5: Numbers of fish caught and retained by species by anglers in Manitoba in 1990</b>			
<b>Fish Species</b>	<b>Resident</b>	<b>Nonresident</b>	<b>Total</b>
<b>Walleye</b>	<b>1,528,481</b>	<b>323,016</b>	<b>1,851,497</b>
<b>Pike</b>	<b>385,588</b>	<b>107,526</b>	<b>493,114</b>
<b>Lake trout</b>	<b>33,976</b>	<b>10,307</b>	<b>44,283</b>
<b>Smallmouth bass</b>	<b>49,582</b>	<b>6,496</b>	<b>56,078</b>
<b>Other species</b>	<b>686,412</b>	<b>47,906</b>	<b>734,318</b>
<b>Number of fish retained</b>	<b>2,684,039</b>	<b>495,251</b>	<b>3,179,290</b>
<b>Weight of fish retained (in kilograms)</b>	<b>1,993,327</b>	<b>514,742</b>	<b>2,508,069</b>
<b>Source: Adapted from Sport Fishing in Manitoba, 1990, MDNR, 1994b</b>			

The MDNR survey (1994a) concluded that annual per capita consumption of freshwater fish by Winnipeggers was 4 kilograms. Familiarity with various species of freshwater fish was reported, but not per capita consumption of each of those species.

Similarly, Statistics Canada report freshwater fish consumption for all Canadians, including Winnipeg residents, however at a much lower per capita level of 190 grams in 1994 (Statistics Canada, 1996). These average figures are calculated for all



**Canadians and about 23 percent of Canada's population lives in coastal communities (Department of Fisheries and Oceans, 1999h).**

### **2.3 Factors affecting consumption**

**Demographic changes, increased lifestyle pace and changing attitudes of North Americans regarding nutrition are some factors dictating changes in eating habits and producing more discriminating consumers (Barkema, 1994). Several kinds of properties may affect the motivation to consume certain food products.**

#### **2.3.1 Product characteristics**

**Numerous characteristics of foods can be associated with the manner and form in which they are produced, marketed, purchased, and consumed. Such characteristics include production methods and standards, presentation, perishability, palatability, size, variety, availability, consistency of supply, quality, safety, table qualities and nutritional value (Caswell, Roberts and Jordan Lin, 1994; Darrah, 1967; Gruber, 1968; Henderson and Handy, 1994).**

#### **2.3.2 Sensory properties of fish**

**The primary sensory characteristics of fish are taste, odor, texture and appearance, and the presence of bones. These are 'table qualities' which can affect the desirability of consuming fish or certain species of fish.**

### **2.3.3 Economic properties of fish**

**According to mainstream economics, there are economic factors of price, elasticity of demand and substitution effects. Fish are said to be ‘supply driven’ and subject to the economic laws of supply and demand.**

**Significant governmental subsidies, harvest regulations, political agendas, and natural environmental cycles may affect the price, availability and thus the ultimate consumption of fish products (Harris, 1998; Kurlansky, 1997; Palmer and Sinclair, 1997; Rogers, 1995). Direct or indirect economic influences on the price or supply of fish can affect the demand for fish as noted above.**

**Where there are few historical data on prices, available supplies or market demand, a reliable generation of supply and demand functions is not possible (Deloitte, Haskins and Sells, 1988). In their 1984 report on the past, present and projected demand for Manitoban fish, Green and Derksen projected demand to the year 2000 based on a series of stated assumptions.**

**It is noted that fish statistics are often combined in a manner in which little detail is available regarding specific species, although there is a large quantity of data with respect to ‘fish’ in general.**

**The way natural resources are being viewed has been changing. If the full costs of utilizing a resource are not included in the price, then a ‘negative externality’ results and the resource is consequently overused (Manitoba Round Table for Sustainable Development, 1999a). The need for better valuation of natural resources has been recognized in provincial legislation. Under the Sustainable**

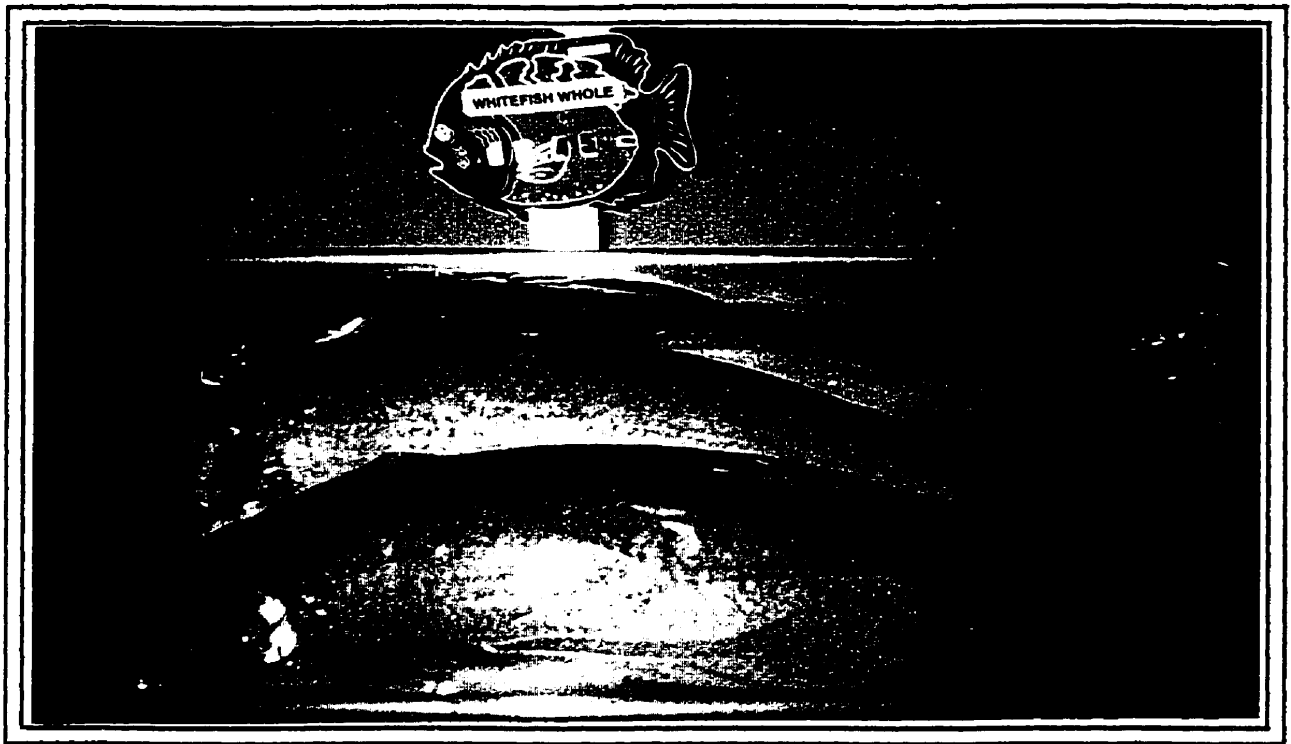
**Development Act (Section 270), the first guideline for sustainable development is “efficient use of resources”, which includes employing full cost accounting to provide better information to decision-makers (Scaife, personal communication, March, 1999).**

#### **2.3.4 Marketing characteristics of fish**

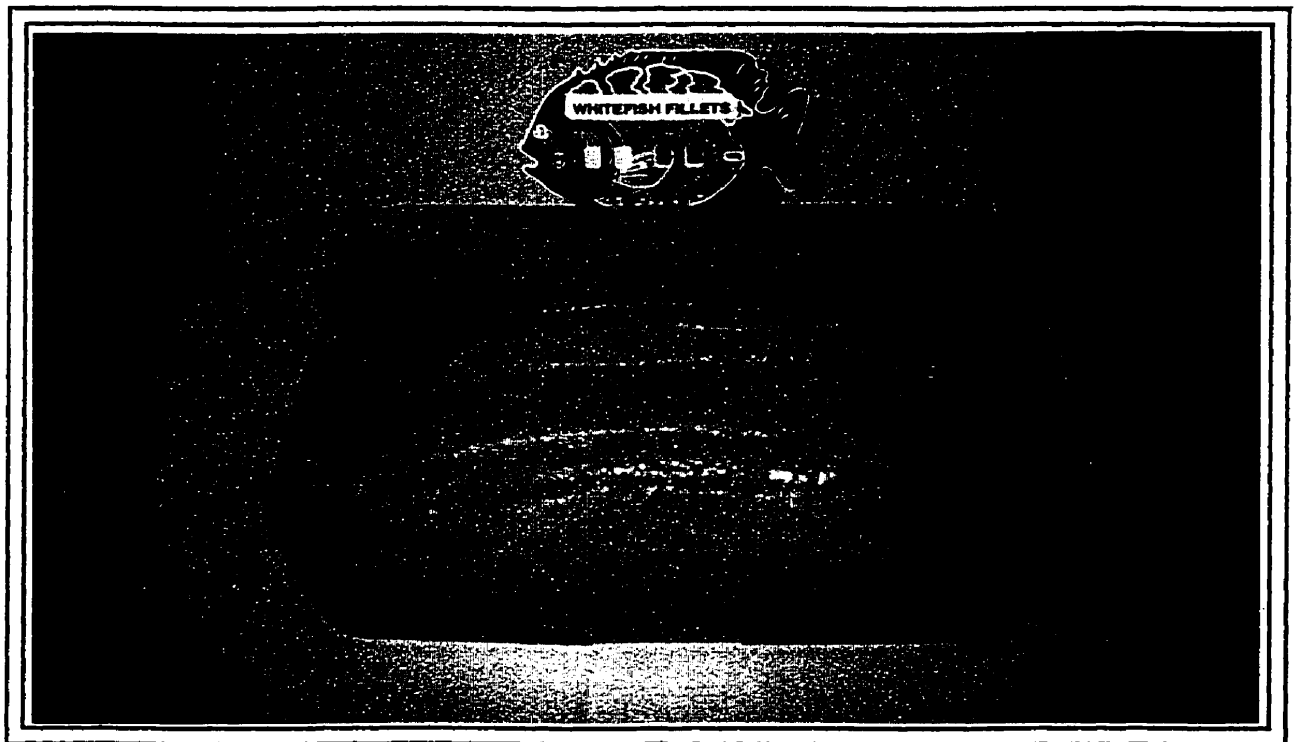
**The discipline of marketing is devoted to the premise that one can influence purchasing decisions. Consumer influences are complex and therefore most often elude simple analysis. Knowledge is often discovered by individuals and service may or may not be secondary to price and/or supply (Stickney, 1986). The impact of information on the consumer market cannot be underestimated; a case in point was the effectiveness of a boycotting campaign of tuna products which were not produced in a manner which was ‘dolphin friendly’.**

**Some general marketing characteristics which also apply to fish include product presentation , packaging, convenience, service, customizing, product form, safety, regulations, labelling and new products. From a marketing point of view seafood marketing, when coupled with low catch rates, will tend to be channelled into high-priced markets, the ‘white table-cloth’ restaurants (Harris, 1997).**

**Visual appeal to a potential consumer and the degree to which the fish are already processed, which is closely related to the convenience of any product, can vary. This can be illustrated when comparing different presentations of the same whitefish species (see Photograph 1 of scaled whitefish and Photograph 2 of whitefish fillets).**



**Photo 1: Scaled whitefish, Gimli Fish Company, Winnipeg**



**Photo 2: Whitefish fillets, Gimli Fish Company, Winnipeg**

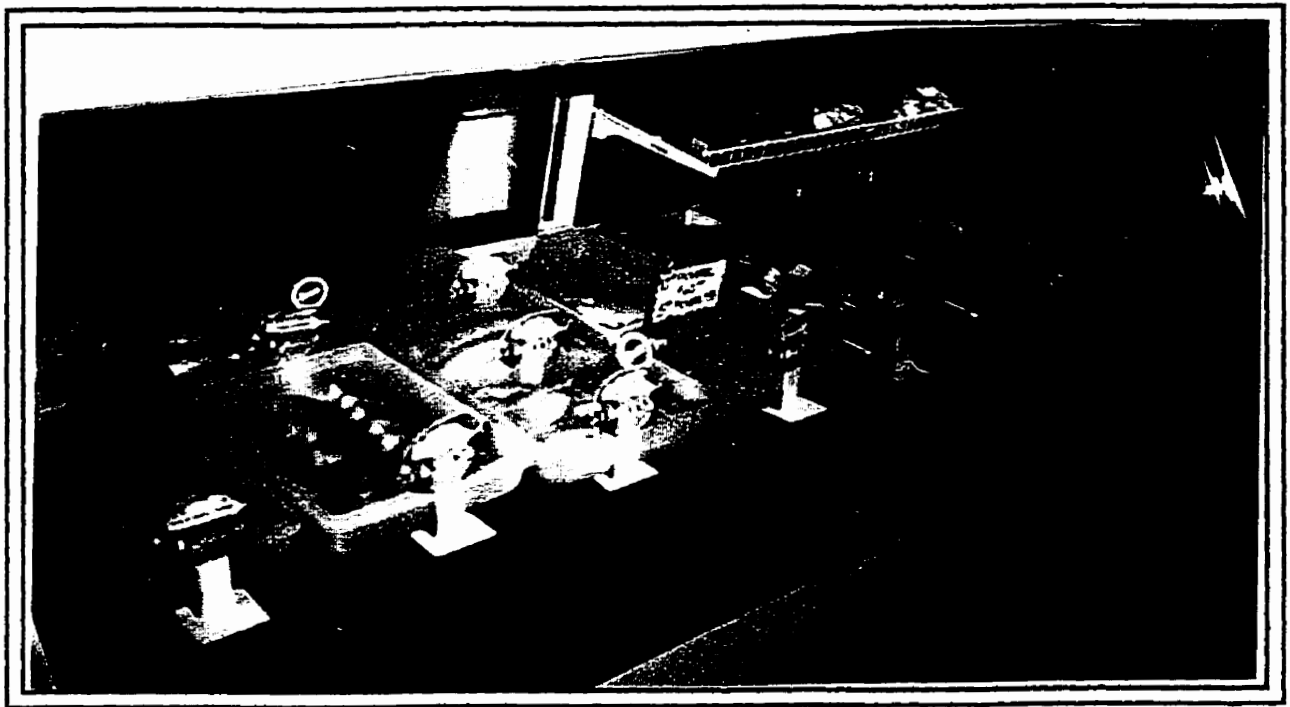
**Depending on the degree to which fish are processed at the time of purchase, they can appeal to consumers with different purchase motivations. The ‘standard’ presentation of whitefish was for many years as a whole ‘dressed’ fish, which would be quite familiar to some customers (Young, personal communication, December 3, 1998). Yet this presentation may not appeal to today’s meal preparers.**

**Retailers display products available for sale in a manner designed to meet the retailer’s business objectives, usually assumed to be to maximize profits. Some examples of seafood displays/products are provided in Photograph 3 of a local retail seafood display and Photograph 4 of Dim Sum grocery store products.**

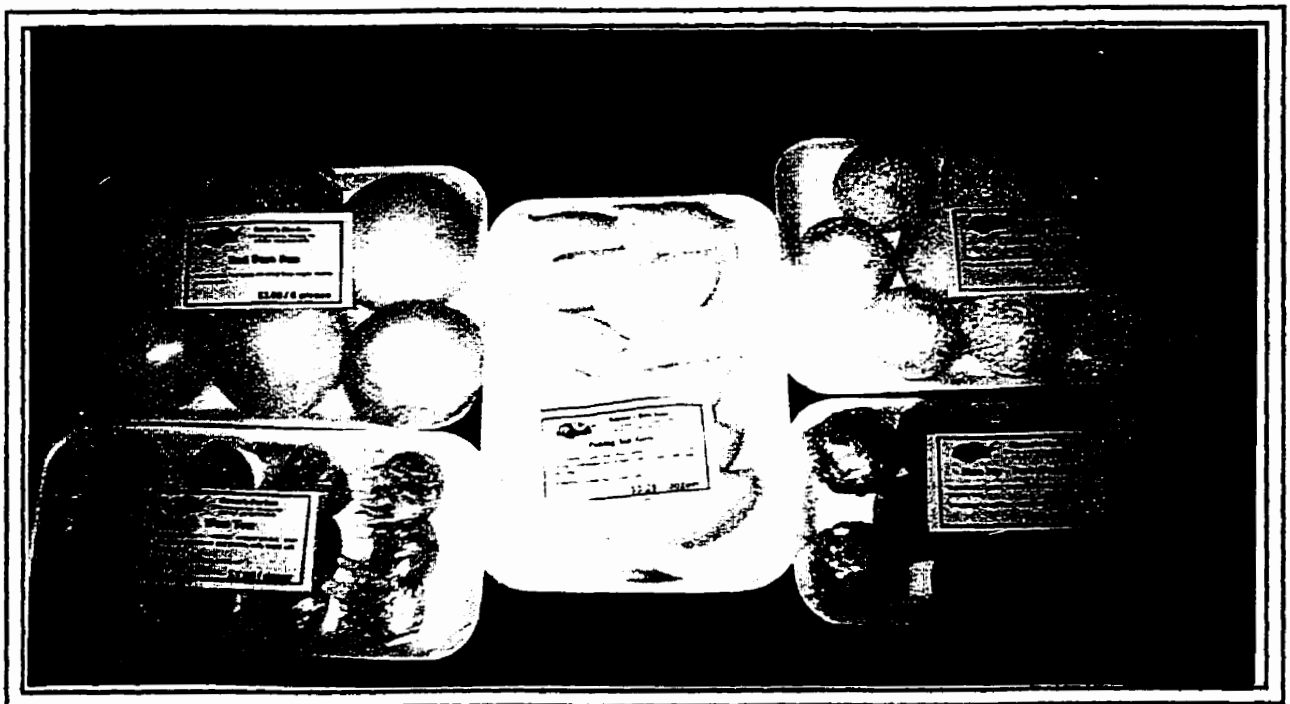
**Traditional marketing efforts use a wide variety of advertising techniques on various media. Common forms may include advertisement on television, radio, billboard, printed publications (magazines, newspapers, flyers among a few). Other forms might include websites on the Internet, logo marketing of wearing apparel, and retailers may use unique or unusual methods of advertising such as a ‘talking’ beverage can.**

**However, a study done by Deloitte, Haskins and Sells (1988) indicated that surveyed restaurateurs, wholesalers and distributors, located in major Canadian cities, had no idea from where their purchases of freshwater fish originated.**

**Although product presentation and other aspects are important aspects of fish marketing, the limited scope of this research paper dictates that only a general discussion of marketing is appropriate.**



**Photo 3: Retail seafood display, Gimli Fish Co., Winnipeg**



**Photo 4: Dim Sum product sample, Keefer's Dim Sum, Winnipeg**

### **2.3.5 Marketing of fish within Manitoba**

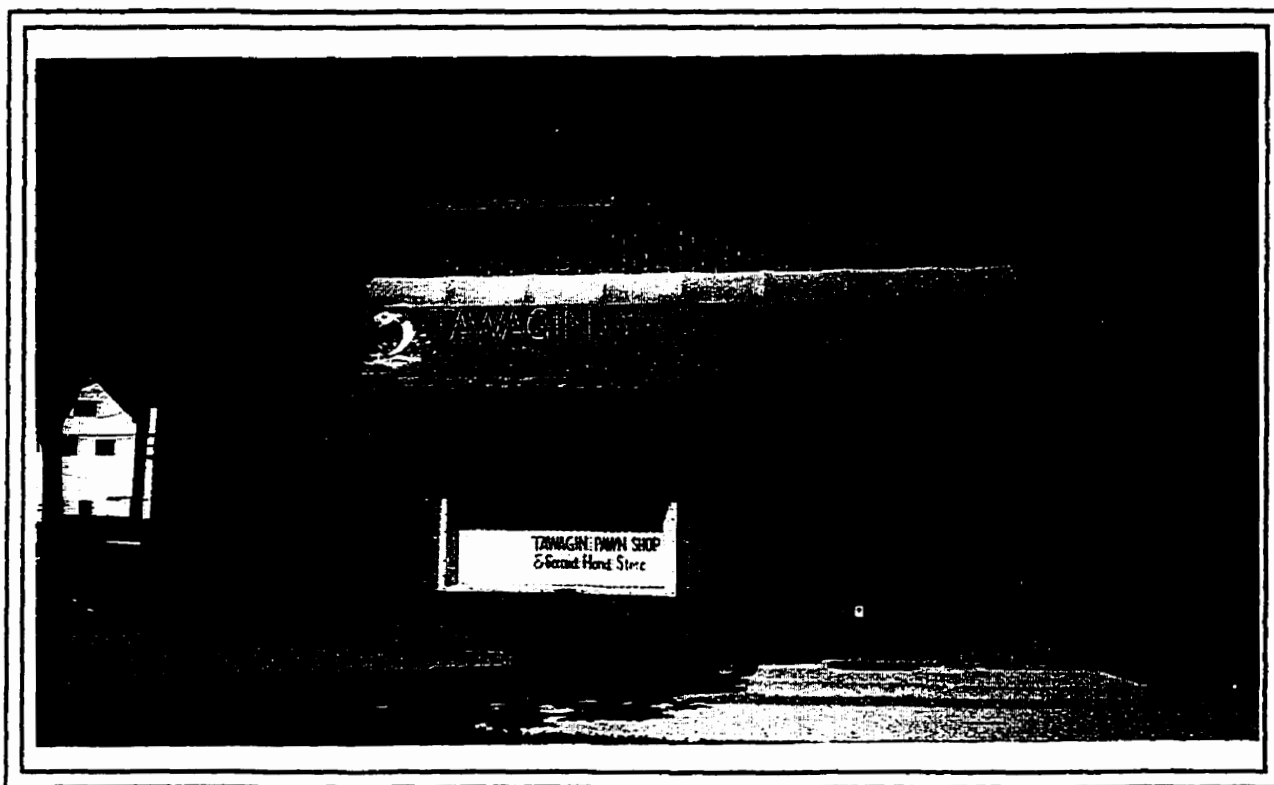
**Consumers can get ocean and freshwater fish from different sources. Fresh, frozen or processed Manitoban fish may be wholesaled or retailed to local businesses and restaurants and may also be exported to foreign markets.**

**Local retailers often carry a product line of seafood, for example supermarkets or general grocery stores (see Photograph 5 of local general grocery store, previous page). Some retailers specialize in retail seafood (see Photograph 6 of local specialty fish store).**

**In Manitoba, fishers and/or retailers sometimes sell out of the back of refrigerated trucks parked on the side of major access highways to/from Winnipeg (see Photograph 7 of roadside truck vendor's sign). These trucks appear to be targetting travelers either on their way to or returning from weekend excursions, usually concurrent with the cottaging season.**

**Interest has been shown, by some Manitoba entrepreneurs, in retailing 'truckload' sales of fish from parking lots of retail grocery stores. This practice is more popular in rural areas when the grocery store does not carry an extensive seafood product line and yet receives spin-off business (Hay, personal communication, April, 1994).**

**The Province of Manitoba regulates a large portion of the commercial production of Manitoban freshwater fish through a system of fish 'quotas' allocated to fishers. The largest portion of commercially harvested fish are sold to the FFMC. The**



**Photo 5: Local Winnipeg general grocery store**

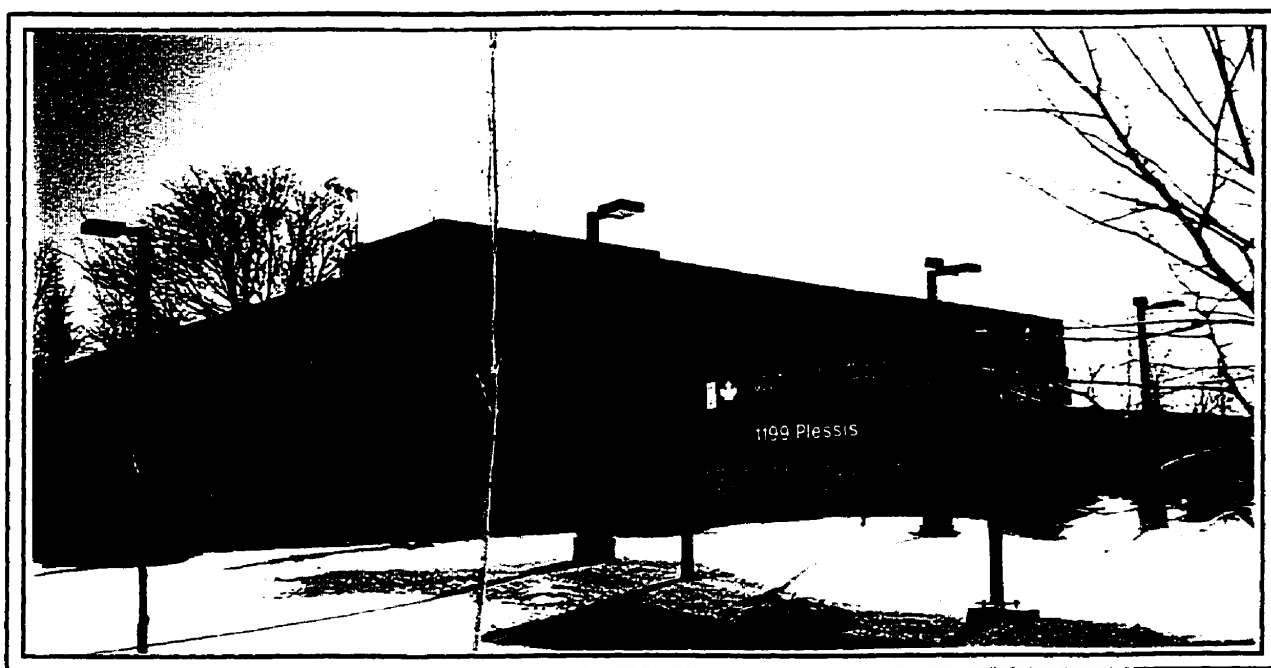


**Photo 6: Local Winnipeg specialty fish store**





**Photo 7:**      **Roadside truck vendor sign, near Dugald, Manitoba**



**Photo 8:**      **FFMC Winnipeg facility**

**FFMC processes the Manitoba commercial catch in its Winnipeg facility (see Photograph 8 of FFMC facility) and sells both to local and export markets, although the domestic (and local) market is small relative to export markets.**

**If fishers do not sell their fish to final consumers, other legal options are to sell**

- 1. to FFMC as the ‘single order desk’,**
- 2. with Special Dealer’s License issued by FFMC (specifying what and where they can sell) or**
- 3. intraprovincially with special permission called a ‘Director’s Authorization’.**

**In some cases, representatives can be a small retailer (Scaife, personal communication, June, 1994).**

### **2.3.6 Marketing boards**

**The producers of particular products sometimes pool resources to form a marketing board to promote their product on a provincial or national level. Some familiar examples may be Manitoba Egg Producers or Manitoba Milk Producers. Or perhaps only slogans, like ‘Pick Pork’, or advertising, like the television commercial extolling the virtues of ostrich meat, would elicit recognition.**

**The marketing programs of these boards can be rather sophisticated and extensive. For example, according to Brenda Bazylewski (personal communication, February, 1999) the Manitoba Egg Producers have in place a six-part marketing program (Appendix 2) to which significant dollars are committed on an ongoing basis.**

**The egg producers have not only a provincial marketing board, but also a national marketing board, the Canadian Egg Marketing Association (CEMA). CEMA differs from FFMC in that they also have the authority to regulate production. This is an important distinction as it has ramifications in the marketplace. National advertising programs are developed at CEMA, some of the results include the development of ad campaigns and slogans like ‘Get Cracking’ and ‘Eggs. Grade “A” Goodness.’ (Bazylewski, personal communication, February, 1999).**

**FFMC is essentially a cooperative marketing board for 14 freshwater fish species which are commercially harvested in three provinces, part of another and the Northwest Territories. Having the exclusive rights to market fish produced in the above-noted region, expenditures on advertising and promotion are made by FFMC to promote fish products. The resources allocated to advertising and promotion were around the \$200,000 range for both 1997 and 1998, representing less than 0.5 percent of annual sales of \$43 million; total selling and administrative costs were reported as 5 percent compared to annual sales (FFMC, 1998).**

**If general consumption of fish were promoted, the benefits of advertising would be realized by any party selling fish. The MDNR, although not responsible for marketing, expends funds on various program development and promotional activities which encourage fish consumption (Wall, personal communication, 1999).**

**In the U.S. aquacultured catfish are heavily promoted by The Catfish Institute. One of The Catfish Institute’s paid advertisements from a magazine is shown in Appendix 3. Other than fish marketing efforts noted by way of two billboards and printed ‘sales flyer’ types of materials, fish does not appear to be heavily promoted in Winnipeg by traditional marketing methods.**

### **2.3.7 Recent developments in promotion of fish use within Manitoba**

**The MDNR recognized the underutilization of certain Manitoba fish species as problematic. The four studies in 1994 related to fish consumption and sport angling were conducted at the initiation of MDNR. As a result of the information gleaned from these studies, Ms. Scaife (personal communication, December, 1998) stated that MDNR had put into motion a series of events designed to increase the utilization of fish resources in the non-commercial sector.**

**Mr. Carl Wall, MDNR's Angling Program Manager, described the 'Urban Angler Program' as a partnership between provincial and municipal governments, local businesses and certain organizations who have an interest in urban angling (Wall, personal communication, February, 1999). First conceptualized in the early 90's, the program's objectives center largely around promoting angling as a recreational opportunity within Winnipeg and promoting the use of underutilized fish resources within Winnipeg.**

**Various partnership projects have been initiated; in 1995 the first 'Winnipeg Fish Festival' and in 1996 the first 'Learn to Fish Program' are among several which are now annual events. Another MDNR incentive was the development of brochures on angling in Winnipeg, such as 'Get Hooked on Fishing in Winnipeg' (Appendix 4). These promotional materials provided information on fishing spots, fishing techniques and spotlighted recipes for underutilized fish species.**

**Future events may include special events for the year 2000 and other projects or programs which may be developed by partnership members.**

### **2.3.8 Current trends in desirability of fish product**

**The popularity of fish species has not been constant over time for all species. Cod, the flagship product of global fisheries, has been considered a staple food throughout much of the world for a very long time. “On the world market, cod is the prize” (Kurlansky, 1997, p. 41).**

**Other species have experienced extreme changes in their desirability. For example, sturgeon were once spurned by fishermen as a “worthless nuisance that destroyed gear set for valuable fish” (Scott and Crossman, 1979, p. 88). Reportedly long ago sturgeon were not eaten by Aboriginals but fed to their dogs (MacDonell, 1997). Sturgeon were later commercially exploited to the verge of extinction because they “commanded a higher price per pound than any other freshwater commercial fish” (Scott and Crossman, 1979, p. 88).**

**Walleyes, one of FFMC’s current premier products, were not considered as important as lake whitefish in the first few decades of the commercial harvest (Heuring, 1993). Walleyes were originally considered a ‘rough fish’, culled or kept for domestic use by fishers (Gislason, Macmillan, and Craven, 1982). FFMC had advertised walleye heavily in the seventies to achieve a change in market acceptance of this species (Scaife, personal communication, February 22, 1999).**

**Goldeyes were once taken only incidentally to gillnet catches of other species. The goldeye fish was never popular as a fresh fish. Their primary use as dog food did not change until 1912 when the market increased rapidly for a smoked version (Scott and Crossman, 1979). Smoked goldeye became a Canadian delicacy which could**

**command a premium price. A commercial fishery developed in the pursuit of this species, although this product has been consumed mostly by a regional market.**

**Despite palatable and nutritious white, flaky flesh, the burbot was “almost universally regarded as a coarse fish by management agencies and fishermen alike” (Scott and Crossman, 1979, p. 644). Specific efforts to promote public acceptance had not been particularly successful up to 1979, other than a European market for smoked and canned burbot livers (Scott and Crossman, 1979). Burbot was said to be enjoyed by lake fishers in Alaska, the Great Lakes, New England and Scandinavia (Kurlansky, 1997).**

**Lack of familiarity may be a problem in the consumption of certain species as speculated in the City of Winnipeg Fish Consumption Survey (MDNR, 1994a).**

## **2.4 Potential consumer influences**

**Certain factors, external to the product package, are thought to be influential in whether a consumer will purchase a given product. Such influences might include cultural factors which are instilled through traditions. The cultural influence has been considered as a strong, but not the only, influence on consumer purchase and consumption of seafood.**

### **2.4.1 Ethnicity**

**Many ethnic groups have a coastal origin (for example Caribbean, Filipino,**

Japanese), and have been accustomed to obtaining fish and other foods from the sea. One might speculate, as does Thelma Barer-Stein (1980) in her book aptly titled “You Eat What You Are”, that the use of ocean products becomes culturally instilled in such people with the passage of time, greatly influencing behavior even though they may not still live in the proximity of the sea. She notes fish are a ‘staple’ for certain ethnic groups and her account of the food traditions of various ethnic communities provides a comprehensive and detailed examination of the food patterns of various cultures.

Kurlansky, in his biography about cod (1997), indicated there are strong preferences by certain ethnic groups, even for fish belonging to the same order of gadiformes, of which cod is a member. Six kinds of gadiform, the Atlantic cod, haddock, whiting, hake and the Pacific cod are commercially harvested. British want cod, not whiting or pollock and Spain’s people, who had the highest per capita consumption of any Western country in 1997, prefer to eat hake (Kurlansky, 1997).

Winnipeg is well-known for its rich cultural heritage. The 1991 census results give evidence of this richness and diversity. The population characteristics display cultural diversity in the identification of major home languages of English, French, Tagalog (Filipino), Chinese, German, Polish, Portuguese, Ukrainian, and Spanish (Statistics Canada, 1993c).

By single ethnic origin Statistics Canada (1993c) identifies seven major ethnic origins in Winnipeg as being British, French, Ukrainian, German, Filipino, Aboriginal, Polish and Other. Statistics Canada (1993a) identifies British, Eastern European (including Russian and Ukrainian), Western European (including

**German), French, Filipino, Aboriginal, Jewish, Chinese, and Caribbean as ethnic origins within Winnipeg's population.**

**Ms. Karen Olson, a major local commercial retailer, advised there is often an identifiable ethnic background in consumers who purchase fish. The major ethnic categories she identifies are 1) Jewish, 2) Mennonite, 3) Russian, 4) eastern European, 5) Filipino, 6) Chinese, 7) Caribbean and 8) white Anglo-Saxon Protestant (Olson, personal communication, April 12, 1994).**

**Variations in the consumption patterns of different ethnic groups have been reported in many studies. Ms. Barer-Stein provides a comprehensive examination of ethnic food traditions proving her point that “food is much more than a tool of survival” (Barer-Stein, 1980). Our individual cultural inheritance deeply affects not only what we eat, but also how food is prepared, served, and even eaten, according to Ms. Barer-Stein (1980). Relative to whites, ethnic minorities consumed more pork, fish, poultry and eggs in the U.S. (Kinsey, 1994).**

**These varied ethnic and religious origins could be a major factor in the purchase and consumption of fish and fish products by Winnipeg residents if consumption patterns differ from other provinces and cities because of the strong ethnic and religious components of Winnipeg's population.**

**Local fish retailer Karen Olson provided the most detailed accounting of ethnic fish purchasing patterns when interviewed. She identified ethnic major fish consumers as Jewish, eastern European, Chinese, Filipino, Russian and Caribbean. Further she was able to identify the species or qualities of fish preferences based on these ethnic backgrounds (Olson, personal communication, November, 1994).**



Jewish consumers comprised of 'new' and 'older' consumers; Ms. Olson said more affluent customers purchased pickerel and whitefish, less affluent opted for mullet or carp. Carp was, by far, the most preferred fish by eastern Europeans, with lesser purchases of whitefish and northern pike. Chinese bought whole pickerel and whole white bass, going for 'high end' quality and avoiding coarse fish. Chinese customers also preferred the freshest fish possible and declined to purchase of fish with fins or heads removed. Filipinos preferred white and silver bass, mullet, and whitefish, provided they were in whole form. Carp, mullet, whitefish and fish eggs were the main choices by Russians, with price being the overriding criterion for purchase decisions. Caribbeans (West Indies) preferred mullet and silver bass, price again being the overriding criterion and noting purchases are often made in large quantities. Ethnic consumers all preferred whole fish, except Jewish customers. All ethnic groups were price conscious and willing to prepare their own fish (Olson, personal communication, November, 1994).

In a follow-up interview in March, 1999 Ms. Olson indicated current trends to be towards more processed fish, often scaled and cleaned. In addition to previous consumption patterns by individual ethnic consumers, she now sells whole rough fish, cleaned and chunked, to ethnic customers who prepare it stewed, fried or steamed. She sees a potential market for whole fish to be value-added (Olson, personal communication, March, 1999).

A regionality within Manitoba may also be involved in fish consumption patterns (Hay, personal communication, April 12, 1994). Green and Derksen (1984) reported various northern Manitoban communities' annual per capita consumption of fish to range between 12 and 46 kilograms. A report by Berkes (1990) collected data as reported from several sources regarding consumption by native Canadian

**communities. Berkes indicates that annual subsistence per capita consumption ranged considerably, from 6 kilograms to 600 kilograms, between the native Canadian communities for which he collated data. Goldeye are reportedly consumed mainly by a regional market (Scott and Crossman, 1979).**

#### **2.4.2 Seasonality**

**The availability of fish from fresh waters of Manitoba is variable, according to the season. During summer months supplies of fish are more easily accessed, whereas the formation of ice reduces, to a certain extent, the harvesting of fresh fish during the winter.**

**However an extensive commercial winter fishery exists in Manitoba, where fish are sought with gillnets set under the ice. Combined with transportation costs, the effects of a cold climate result in high costs of operating northern commercial winter fisheries (Deloitte, Haskins and Sells, 1988). Freshwater fish, as a Manitoban product and from an economic perspective, are more easily harvested in summer months.**

**Seasonality of fish taken by recreational (sport) anglers can be observed as anglers fish off the shore or in boats (see Photographs 9 and 10 of anglers) or other water vessels in summer. 'Ice-fishing' through holes cut in the ice commences when the waters have frozen over (see Photograph series 11 of 'ice fishers' and 'ice fishing shacks').**



**Photo 9: Angler, Winnipeg (photo courtesy of MDNR)**

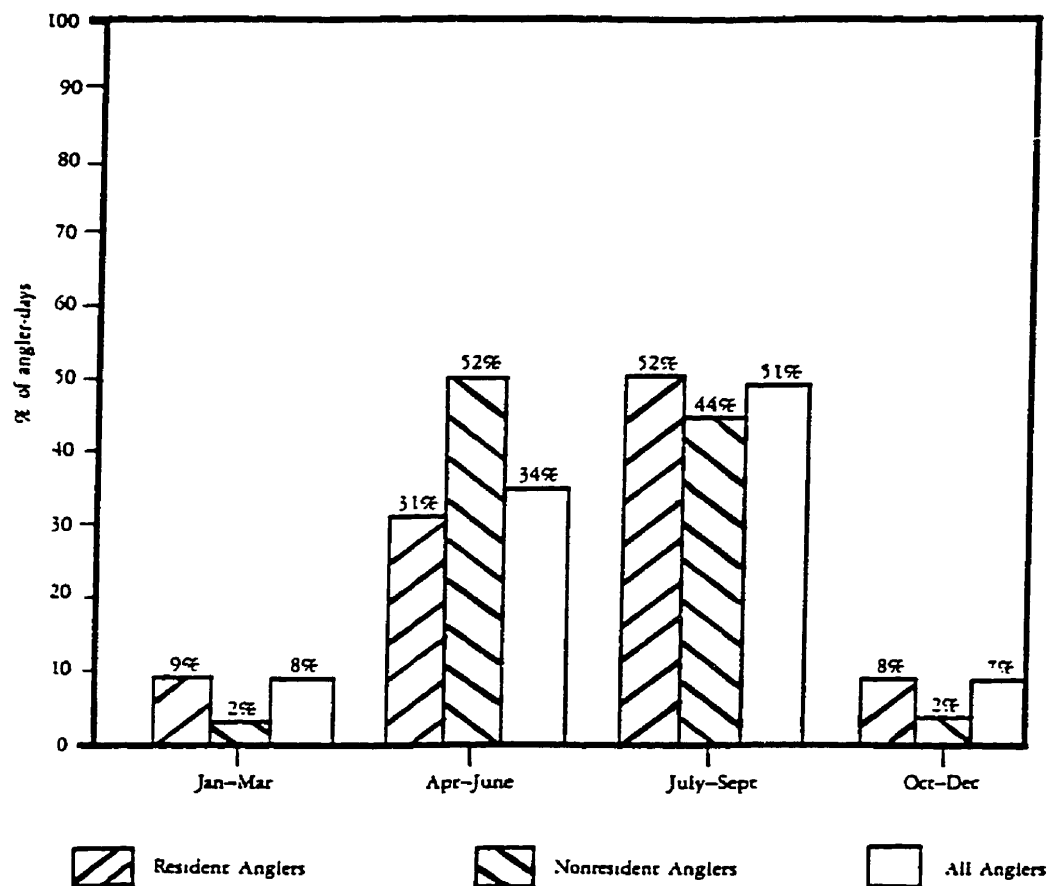


**Photo 10: 'Master angler' (photo courtesy of MDNR)**



Photo series 11: 'Ice fishers' and 'Ice fishing shacks' on the Red River, January 1999

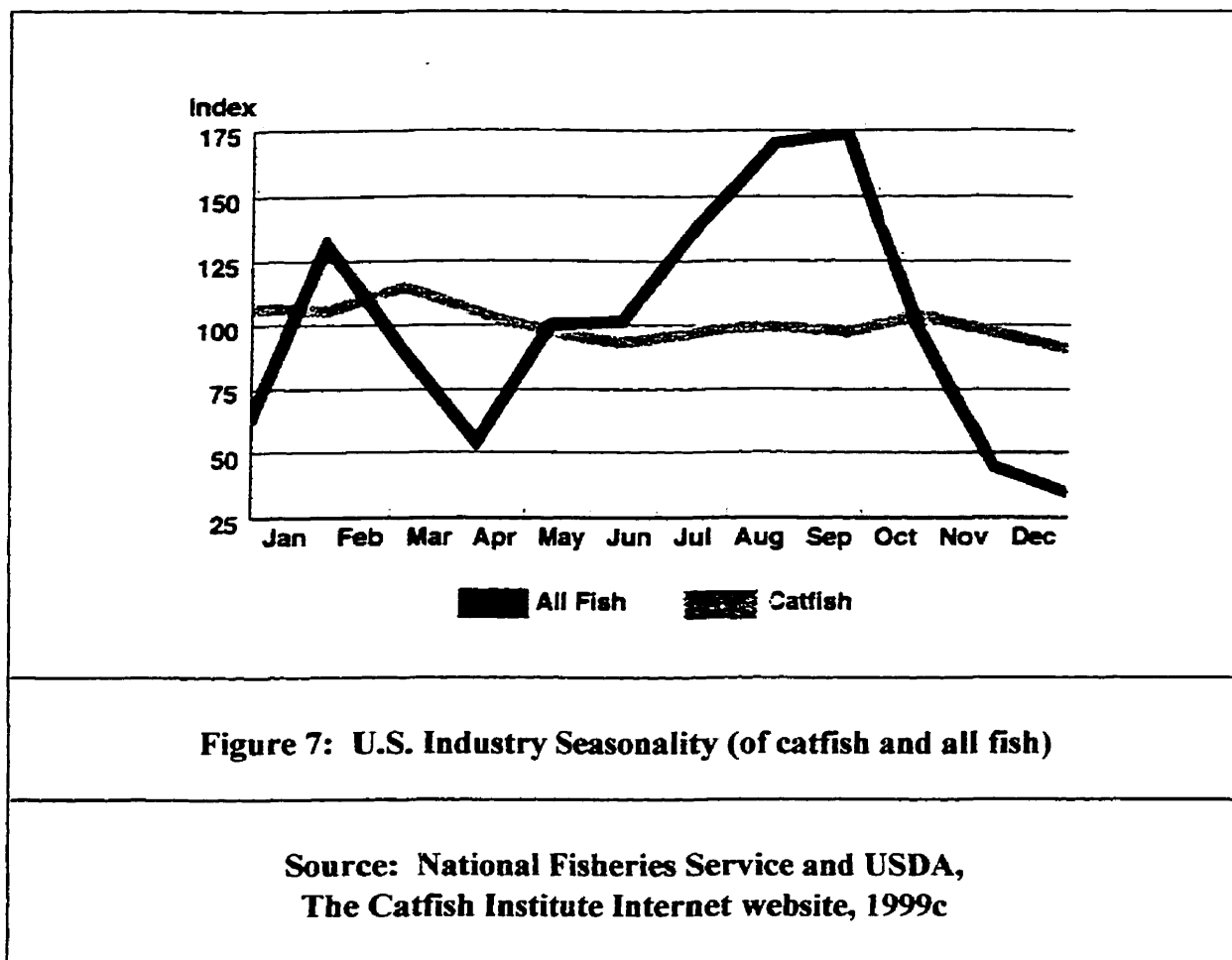
Reported catches during the 1985 fishing season varied greatly with respect to time of year as seen in Figure 6. In the 1990 sport fishing survey the seasonality of fishing was presented in a different manner, based on 'days fished' and differentiating between 'open water fishing' and 'ice fishing'. For annual combined resident and non-resident anglers, the ratios of open water fishing and ice fishing were 87 percent open water fishing and 13 percent ice fishing (MDNR, 1994b).



**Figure 6: Angling effort by season in Manitoba in 1985**

**Source: Sport Fishing in Manitoba, 1985, 1988**

A comparison of the seasonality of catfish and all fish consumption by American consumers is conveyed in Figure 7. The consumption of all fish can be seen to fluctuate while catfish consumption remains relatively constant over the year.



#### 2.4.3 Dietary considerations

Various organizations, such as the Heart and Stroke Foundation of Manitoba, Canadian Cancer Society and Canadian Diabetes Association, have been active in promoting the use of fish as a healthy food choice (Canadian Diabetes Association,

1989). The cholesterol content is lower than for red meats and other concerns regarding red meat consumption abound, such as the presence of carcinogens, steroids or antibiotics. Howard Lyman became world renowned after his appearance on a television talk show. The expertise which he has shared on 'Mad Cow' disease and 'Downer Cow Syndrome' may spur such concerns to new heights.

Fish is thought to be a better animal food choice for heart and stroke patients. Fish is promoted as a choice which is high in nutrients and, particularly when substituted for red meat, may lead to generally improved health. Fish is rich in phosphorus, magnesium, iron, zinc, and selenium and naturally low in sodium (NIN, 1991). Recent 'positive user-image' has been associated with fish consumption (Sabry, 1991; Verge, 1985).

The National Fisheries Institute promotes eating of rich-fleshed fish in order to gain a variety of health benefits. These benefits often relate to the Omega-3 polyunsaturated fatty acids found in certain fish and shellfish (National Fisheries Institute, 1999a) and not occurring in significant amounts in other foods (NIN, 1991). The extensive potential benefits of regularly eating rich-fleshed fish, according to Dr. Nettleton, are summarized in Appendix 5.

#### **2.4.4 Religious considerations**

According to Statistics Canada seven major Canadian religious groups are; 1) Catholic, 2) Protestant, 3) Eastern Orthodox, 4) Jewish, 5) Eastern Non-Christian, 6) Para-religious group and 7) No Religious Affiliation (Statistics Canada, 1993d). With the exception of the Jewish religion, Statistics Canada further sub-classifies

**these religious groups into sub-groups. Winnipeggers are reported to be about 33.4 percent Catholic and nearly 43 percent Protestants (Statistics Canada, 1993c).**

**Religious traditions can affect the consumption of fish. The Roman Catholic edict not to eat meat on Wednesdays, Fridays, or both, meant about 166 days out of the year required a substitute for meat in meals for those following that religious prescription. Fish was an allowable and common substitute. Even though this edict was suspended many years ago, some Roman Catholics and high Anglicans still honour the tradition, either out of belief or habit.**

**The orthodox and some conservative Jewish communities have religious prescriptions regarding the consumption of animal foods. The rules of Kashruth govern not only the kind of meat, seafood or dairy products which may be consumed, but also the manner in which they are to be prepared. The only fish which may be eaten in traditional Jewish homes are those fish which have fins and scales. This means no shellfish or other types of sea products are permissible (Barer-Stein, 1980). According to Ms. Barer-Stein, fish must be used in the preparation of the traditional Jewish/Israeli Sabbath Eve dinner and are most often tuna and carp (Barer-Stein, 1980).**

**Most Protestant faiths impose few dietary restrictions applicable to the consumption of food for religious reasons.**

**In Winnipeg, gefilte is a seasonally prepared Jewish dish made from whitefish and pickerel (Cantor, personal communication, November, 1994).**



#### **2.4.5 Angler influences**

**Whether an individual is a sport angler may represent an influence on fish consumption. Sport fishing may represent a strictly recreational opportunity or an effort to obtain fish for consumption or a combination of both.**

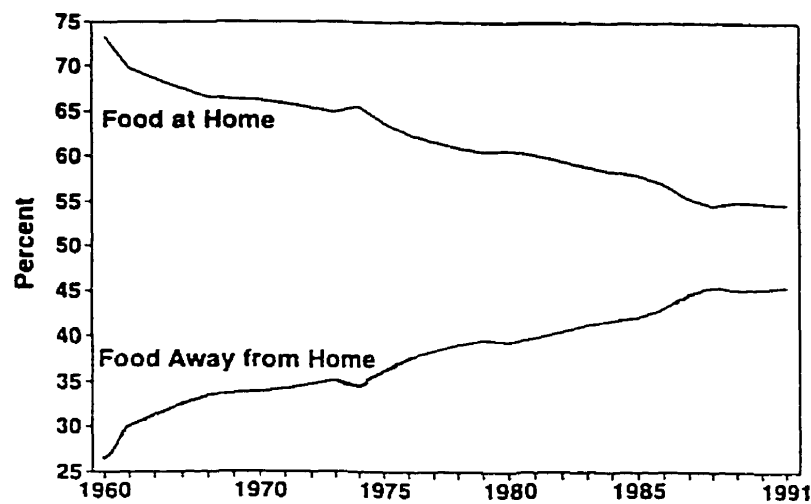
**There are statistics produced on the numbers of licensed anglers and the results of their fishing efforts. Manitoba had 120,599 active anglers in 1995 according to the Department of Fisheries and Oceans 1995 Survey of Recreational Fishing in Canada (Department of Fisheries and Oceans, 1999g). A crude estimate of the portion of Manitobans who sport fish would be roughly 19 percent, assuming no major fluctuation in angler participation between 1994 and 1995.**

**There are also non-residents anglers who travel to Manitoba to fish, virtually all such anglers arriving from the mid-west states of Minnesota and North Dakota (Green and Derksen, 1984). The species of fish retained by resident and non-resident anglers tends to vary (Department of Fisheries and Oceans, 1999h) and Americans are believed to favor northern pike as well as walleyed pickerel (Scaife, personal communication, March, 1999).**

#### **2.4.6 Where meals are taken**

**There has been a change in trend with respect to where meals are being taken. In more developed countries leisure time is a treasured commodity and consumers are willing to pay premiums for products which save time. One of the means by which potential leisure time can be increased is by the use of 'convenience' foods,**

those which are partially or fully prepared for meals. Individually quick frozen products, or IQFs as they are referred to in the industry, are a major selling feature for American aquacultured catfish (The Catfish Institute, 1999b). Another aspect of convenience may entail the partaking of food in retail establishments such as a restaurant or 'fast food outlet'.



**Figure 8: Percent of U.S. Food Expenditure, Home and Away, 1960-1991**

**Source: Food and Agricultural Markets: The Quiet Revolution, 1994, p. 23**

In the U.S. a major shift occurred between 1960 and 1990. As seen in Figure 8, the trend is for an increasing portion of meals to be taken 'away from home'. This trend means the food and meal preparation has moved further away from the consumer (Kinsey, 1994).

## **2.5 Alternatives to wild fish stocks**

**As fish resources are consumed, in part, to meet dietary needs for protein, the purchase and consumption of fish competes with alternative protein sources. Additionally there are alternatives to the harvests of wild fish stocks. The relative value in pursuing such alternatives will reflect the changing nature of wild fish stocks and the effects of population growth on the earth's ability to produce and maintain viable renewable fish resources. Prugh et al. (1995) state that**

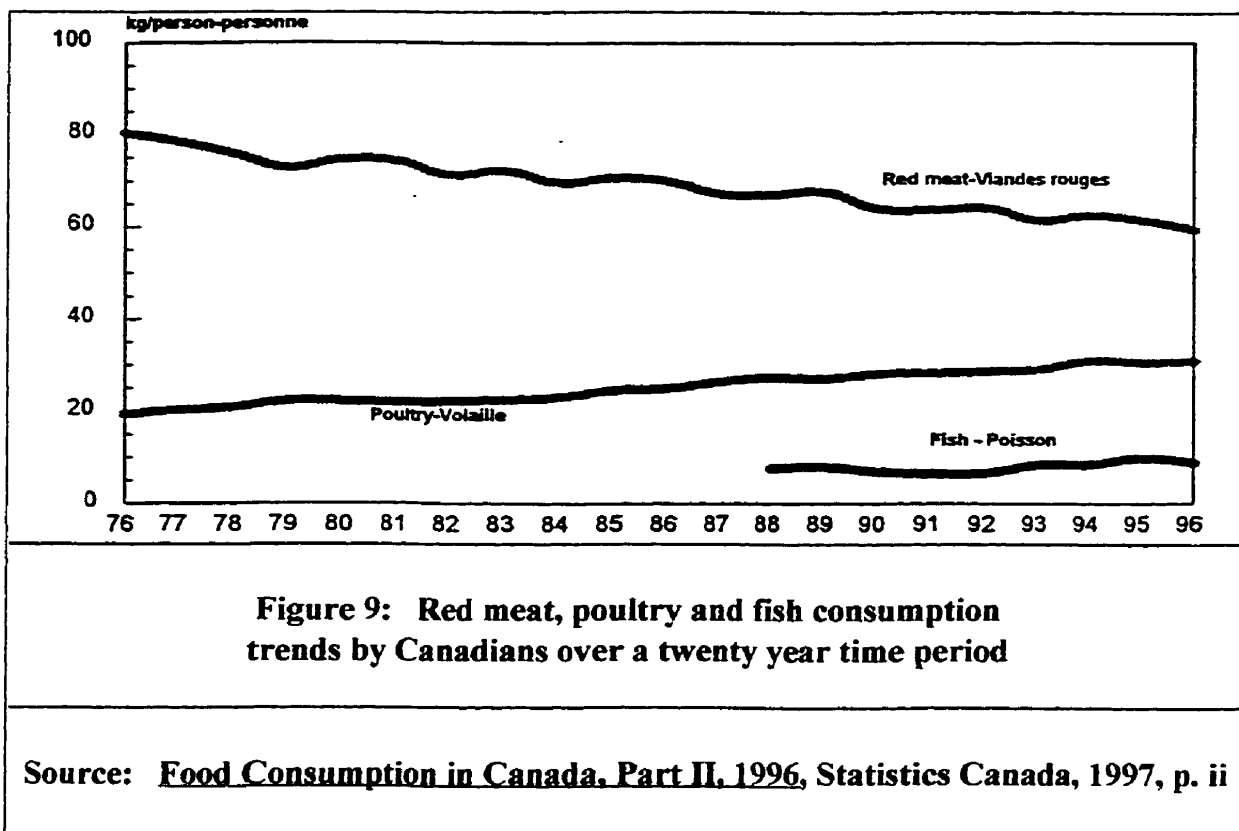
**“Impact = Population x Affluence x Technology”.**

### **2.5.1 Alternative dietary protein sources**

**Worldwide farmed protein is derived from many sources, ‘red meats’, (beef, pork, mutton, veal or any mammal meat or meat product), ‘white meats’ (poultry, fish), eggs and milk, legumes, nuts and related products, like soya beans or peanut butter, which provide protein. Dairy products are often altered into forms such as cheese, yogurt and other dairy products which contain, and are used as, dietary sources of protein. Although not considered a ‘mainstream’ source, some cultures even use the protein found in grubs and insects.**

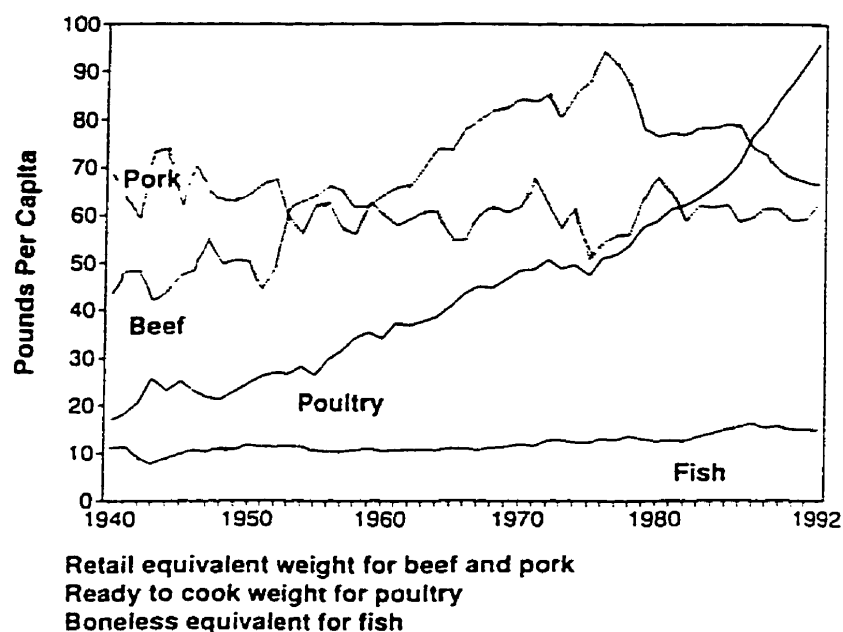
**For many years the major protein sources for Canadians and Americans, inferred from the reporting of apparent consumption data, were beef, pork, lamb and offal derived from these. A downward trend in reported red meat consumption by Canadians continued (Statistics Canada, 1995; 1998) and as shown in Figure 9.**

Initially fish was not reported in Canadian publications as a separate category for consumption figures.



In the last couple of decades poultry became an increasingly important protein component in North America, poultry consumption exceeding beef consumption in 1991 as reported by Statistics Canada (1994), and ultimately surpassing the ‘red’ meats in per capita consumption in the U.S. as seen in Figure 10.

‘New’ protein substitutes on Manitoba’s market include emu and ostrich meat, a lean red meat being actively promoted in television advertising. Wild boar, bison and ‘beefalo’ (a cross between beef cattle and buffalo) are now domesticated to provide meat for human consumption. Surimi products are shaped from (pollock) fish meal to resemble seafood products such as lobster and crab.



**Figure 10: U.S. per Capita Beef, Pork, Poultry, and Fish Consumption, 1940-1992**

**Source: Food and Agricultural Markets: The Quiet Revolution, 1994, p. 21**

### **2.5.2 Alternatives to wild fish stocks**

**By all accounts, the demand for fish will remain; it is only a question of how demand will be met by alternative sources if conventional ones fail to supply the markets' demands.**

**'New' developments in providing more secure sources of fish are fish stocking programs, ponds prepared on privately-owned land (Anderson, personal**



**Photo 12:**                    **'U-Catch' farmed fish sign**



**Photo 13:**                    **Private enterprise sign**

communication, March, 1998), and ‘fish farms’ (see Photograph 12 of ‘U-Catch’ farm sign and Photograph 13 of privatized sport fishing signage). One example of an advertisement for private fishing in one state in the U.S. is shown in Appendix 6.

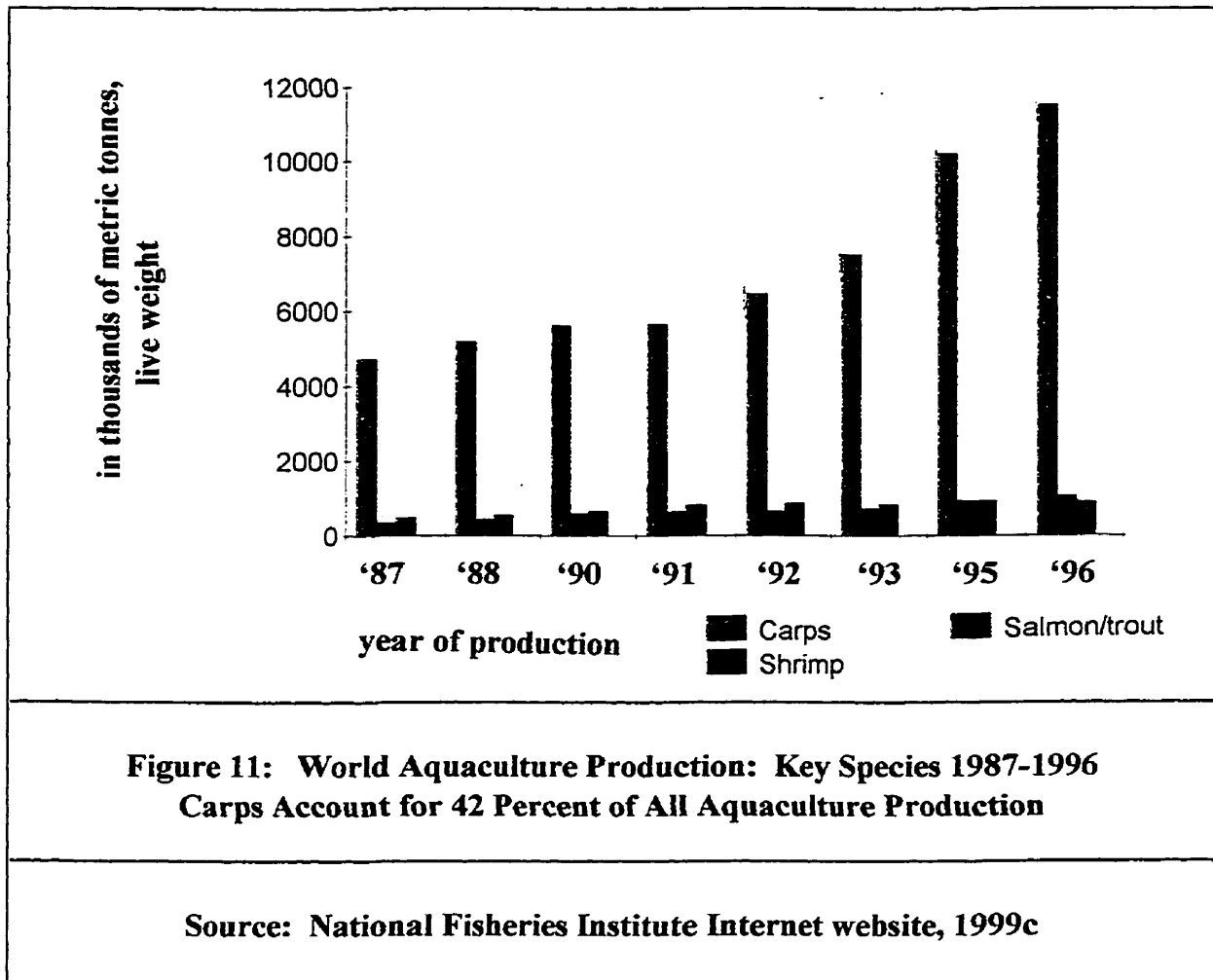
‘New’ products are being introduced to compete with fish on the basis of its valued nutritional component, omega-3s. The poultry industry has targetted a health conscious market by producing ‘designer’ eggs which contain the coveted omega-3s (Ferrier et al., 1995; Holub, 1994; Sim and Cherian, 1994; Stearns, Petry, Holstun and Zetocha, 1994; Van Elswyk, 1997). This was accomplished after research showed that feeding flaxseed to poultry could ‘enrich’ eggs (Scheidler, Cuppett and Froning, 1994; Van Elswyk, 1997). The same basic flaxseed feed supplement is used to produce poultry meat similarly enriched (Chanmugam et al., 1991).

Once this process is well established, one might suppose the technology could be transferable to other animal protein tissues should the consumer be willing to pay any required premium for meat enhanced with omega-3s.

### **2.5.3 Aquaculture**

MacKay stated in 1975 that world population increases would place a strain on conventional agriculture and fisheries such that (it is unlikely that) they would be unable to supply the required food. One alternative is the ‘farming’ of fish in confinement. These captive fish represent an entirely different fishery based on the requirement of capital, expertise, technology, and unlike conventional fisheries, and perhaps most importantly establishes exclusive property rights to the unharvested fish (MacKay, 1975; Ruggles, 1975).

Worldwide, the key species for aquacultured species are shown in Figure 11 as carps, salmon/trout, and shrimp (in thousands of metric tonnes, live weight).



The growth of Canada's aquaculture industry during the past decade shows large increases in production (Figure 12), although still insignificant relative to world production. Looking at the figures for 1996, world production was approaching 12, 000 thousand metric tonnes while Canada was still producing less than 90 thousand metric tonnes. The major finfish and shellfish species produced by Canadian aquaculture were salmon, mussels, oysters and trout. Manitoba aquaculture production is so minor that, in preliminary 1997 Canadian statistics,



Manitoba's production is combined with char and other finfish production at 78 out of Canadian production of 87,211 metric tonnes (Department of Fisheries and Oceans, 1999a).

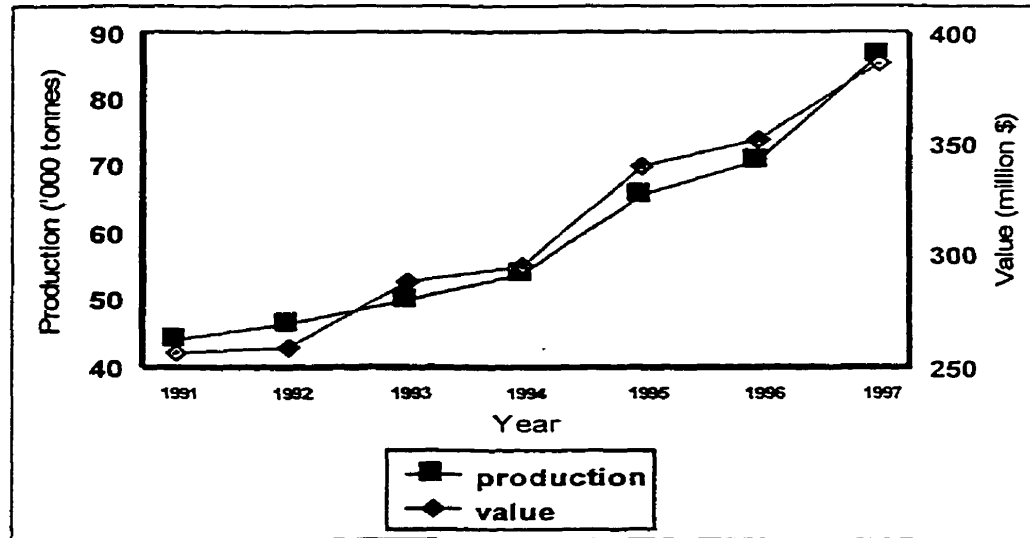


Figure 12 : Canadian Aquaculture Production and Value

Source: Livestock Statistics, Statistics Canada, 1997, p. 6

The process of raising fish in confinement raises concerns, among them the presence of disease, build up of organic wastes, and genetic mixing (Lucas, 1975).

Toner (1991) poses some serious questions and discusses some possible ramifications concerning the genetic engineering of 'designer' fishes for commercial farms.

Proponents speculate that the development of 'transgenic' fish (those with genes from more than one species) might contribute to a "blue revolution" which could benefit world food security. The controversy raised by critics is that potential

benefits could be offset by biological contamination of the wild genes of the world's fisheries by interbreeding with escaped and genetically altered fish. Toner wonders

**“On a planet straining to feed 5.3 billion mouths, will designer fish help stave off starvation? Or will “Frankenstein fish” escape and upset the natural balances in aquatic ecosystems?” (Toner, 1991, p. 34 and 35)**

## **2.6 Summary of literature review**

The literature review reveals aggregate fish harvests at many levels, global, national, and provincial and from several kinds of fisheries, commercial, subsistence, recreational and aquaculture.

There are many players involved in these fisheries. Canadian and Manitoban fishers' present role in the marketplace can be seen to be small in terms of relative size, yet may become increasingly important subject to future events on the global scale. Current pressures on the fish markets and fisheries will likely continue and perhaps even escalate. Manitoban fish harvests can be seen to be subject to particular utilization patterns depending on the species of freshwater fish.

There are many options available to consumers in terms of protein food choices and many variables influencing the ultimate choice of one protein source over another. The global marketplace has a strong influence on modern consumers and is expected to increase along with population. Changes in lifestyle and socio-economic factors have been reported in the literature that will continue to alter not only the requirements of consumers for desired fish products characteristics, but also the amount of fish products consumed.

**Consumption of fish by Winnipeggers can be implied via Canadian per capita consumption surveys conducted at regular intervals by Statistics Canada, among other surveys conducted. Until 1994 the literature provided no specific information on Winnipeg resident fish consumption or purchase patterns.**

**MDNR (1994) reported Winnipeg consumption of freshwater fish at 12.6 kilograms per person. To date, no information was found regarding the amount of species-specific native Manitoban fish consumed by residents of Winnipeg, although qualitative information was available from knowledgeable retailers. The research conducted provides information to fill a gap which exists in the current literature.**

## **CHAPTER 3**

### **METHODS**

#### **3.0 Introduction**

**Many tasks comprised the overall design of the study. Dillman (1978) emphasizes that a well constructed survey can be tedious, due to the attention to detail which marks a survey of superior design. Some of the major design tasks included choosing the survey instrument, developing a questionnaire, determining minimum sample size, deriving lists of sample population, administering the survey, coding of data and computer manipulation of data.**

#### **3.1 Choice of survey instrument**

**The options for survey instrument were limited by various constraints on timing, costs, and other requirements of MDNR (the client sponsor) or other parties providing resources (refer to Appendix 7). Given that the offer and acceptance of the reciprocal agreement to conduct research occurred in June of 1994, the major constraint imposed was the necessity of completing the survey and reporting results in a final report to be submitted on December 1, 1994. For this reason mail surveys and ‘face-to-face’ survey interviews were not a viable option, due to the extended period of time which would have elapsed developing and using either of these methods.**

**‘Focus groups’ were of some interest to the client, however the basic assumption revolved around the idea that underutilized fish were being consumed by ethnic**

markets, such groups had not been specifically identified in a structured manner. Thus, any choice of ethnic group(s) would not have had a sound basis, but would represent a ‘trial and error’ approach, notwithstanding qualitative reports of ethnic consumption patterns. Other obstacles to the use of focus groups would have been excessive financial costs, timeframe difficulties, language barriers and these obstacles rendered this approach unfeasible. The use of focus groups remains an option for future investigations.

Once the decision was made to use the telephone survey method, a questionnaire was designed to elicit responses from Winnipeg residents regarding consumption of fish and fish products. From these responses generalized consumption of fish by Winnipeg residents could be possible. Queries were developed, based on client specifications, to investigate fish consumption by Winnipeg households, their attitudes about fish and sources from which fish consumers acquired their fish. These factors were then combined with demographic information to be analyzed. Supplemental information was requested by the client in the form of personal interviews to be conducted with some fish retailers. The resultant quantitative and qualitative information was intended to assist in the development of effective marketing strategies for underutilized native fish species and to support or refute study findings.

### **3.2     Telephone number list derivation**

A federally funded youth employment called ‘Youth Services Canada’ was being administered by the local non-profit organization Fish Futures Inc (FFI). These 18-24 year old youths (hereinafter referred to as ‘participants’) were available to

**assist in the study, providing they would be exposed to a variety of work training and skills and further that they would be employed for a minimum of four (4) weeks. The participants were to be trained, supervised and evaluated on their performance by the researcher. The participants were utilized in 2 phases of the study, 1. for the derivation of randomly generated telephone number lists and 2. to conduct telephone survey interviews.**

**The researcher devised a training session and support materials to teach participants to randomly select telephone numbers from the 1994 Manitoba Telephone Service (MTS) Phone Directory: White Pages. These random numbers would be used to select potential phone survey respondents. This aspect of sample selection design was intended to produce a ‘probability sampling’ of elements of the population.**

**Using published tables of random sampling numbers, a total of 9,250 random numbers were copied on columnar paper.**

**The determination of the position to indicate actual telephone numbers to be chosen was specified to recorders via ‘house rules’. Using the predetermined procedure specified in the house rules gave each telephone listing an equal chance of being selected. The randomness of the 1,721 telephone numbers generated in this manner was thus assured.**

**Explicit inclusion criteria (discussed later) meant that apparent business numbers were excluded, as the survey pertained to the domestic consumption of fish by households. The telephone number, address and name of the current resident, as**

listed in the MTS directory, was transcribed on the telephone derivation lists once a telephone listing was determined likely to be acceptable based on inclusion criteria.

### **3.3 Survey instrument design**

The survey instrument chosen was a telephone survey questionnaire. This was the format desired by the client, however, as noted, the literature (Dillman, 1978) supported this means as the most appropriate manner in which to gather the desired information considering this particular research project's requirements.

The survey consisted of two portions, one queried fish consumption, fish purchase and procurement sources (Appendix 8), the other portion queried demographic information (Appendix 9). The basic questions were replicated and modified from those prepared by the client for a mail survey, which was included with the City of Winnipeg Leisure Guide survey. The client wanted very specific information regarding the consumption patterns of Winnipeg residents as well as other types of information.

Additional questions were developed to expand the information base to be gathered and to meet more specific research objectives. A 10 minute survey length was used as a limiting guide. The design considered the principle of 'ground truthing' by asking a similar question in another form or a different way. For example, consumption totals were ground-truthed by asking general consumption recall, then querying specific species consumption and consumption by form of fish. This method would help to avoid or reduce 'second-guessing' for important questions. The asking of alternative questions also fulfilled some secondary research objectives.

### **3.4 Pretest and training surveys**

**The questionnaire was designed, pre-tested and modified in accordance with pre-test feedback.**

**Using the ‘rule of thumb’ for determining the required number of pre-test surveys, one divided by two times the square root of the population (MacPherson, personal communication, August, 1994) meant that 7.07 surveys would be a reasonable pre-test for an estimated population of 200 (calculated in Section 3.5). Eight surveys were excluded from results as pre-test surveys.**

**The researcher conducted several of the pre-test surveys in order to get first-hand feedback on the questionnaire and to be alerted to any obvious design flaws in the survey itself. Minor question ordering was changed and additional refusal reasons were added. The number of response options were reduced for queries related to form of fish consumption.**

**Trained (training discussed later in chapter) interviewers were first assigned a ‘training’ survey, one in which the respondent was arranged rather than randomly selected. Consultation with the interviewees gave insight into whether interviewers were following the specific instructions provided on the survey sheets and related forms.**

**All eight pre-test results were excluded as minor changes were made to the questionnaire. Twelve training surveys were also excluded from the reported results as they did not represent randomly selected households.**



### 3.5 Target sample size and inclusion criteria

A minimum target of useable surveys from random Winnipeg households was set as an initial goal using a 95 percent confidence interval based on the formula of

$$n = .25 \left( \frac{1.96}{E} \right)^2$$

in which E corresponds to the bound on the error of estimation (one half of the length of a 95 percent confidence interval for p) and n is the required number of households. This was based on the formula of

$$n = \hat{p} \hat{q} \left( \frac{Z_{\alpha/2}}{E} \right)^2$$

in which  $\hat{q} = 1 - \hat{p}$ . Maximizing the equation,  $\hat{p}$  was set at 0.5 to obtain a conservative estimate as the standard deviation for the population was unknown. The bound on the error of estimation was originally set at 7 % or  $E = .07$  so that solving for n, the sample size, would mean that

$$n = .25 \left( \frac{1.96}{.07} \right)^2 = 196$$

As n was calculated to be 196 the target sample size was accordingly rounded up and set at 200 households. This was determined to be a large enough population for significant statistical analysis to be performed. Inclusion criteria were developed (Appendix 10).

### **3.6    Survey population and response rate**

**A total of about 1658 contacts were initiated. The total sample size of 385 consisted of 332 survey participant households and 53 households who did not eat fish, thus exceeding the minimum targetted sample size. The inclusion of households who did not eat fish was intended to reduce potential bias when segments of the population refuse to participate (Dillman, 1978).**

**The determination of response rate can be heavily influenced by the manner in which one decides which contacts represent valid refusals (Dillman, 1978). This study reached its minimum target goal of 200 usable surveys and was then constrained only by the remaining facility time and availability of personnel.**

**At the end of the structured survey interviewing on September 6, 1994 there were 374 contacts which had been recorded on record sheets, but for which eligibility had not yet been established. These ‘abandoned’ contacts were excluded in determining response rate, as were business numbers or contacts who were otherwise ineligible to participate. Messages left on answering machines would not be received after facilities were no longer available, thus 125 additional contacts were considered as abandoned.**

**The response rate was been calculated from daily record sheet summaries and found to be 40 percent. The completion results were summarized and are presented in Appendix 11.**

### **3.6.1 Useable surveys**

**The total number of usable surveys from fish-eating respondents was 332, of which seven responded only to the consumption queries. Some respondents answered demographic information only. When only this portion of the survey was completed, the survey was eliminated from the study. Since consumption patterns, attitudes and sources of procurement could not be assessed in these surveys, the demographic information and profiles of full survey respondents would be skewed by the inclusion of those who responded to demographics only.**

**Surveys have been considered usable if the majority of the consumption portion of survey questions were answered, regardless of whether the respondent responded to the demographic queries. Seven respondents surveyed chose not to answer the demographic portion of the survey. Thus only 2 percent (7/332) of those who participated in the survey chose not to provide demographics. When combined with the never eat fish surveys the ratio of those who did not provide demographics rose to 60/385 or 16 percent.**

### **3.6.2 Self exclusions**

**Households who did not wish to participate in the survey were given an opportunity to indicate the reason for declining. Fifty-three households indicated they never eat fish. These were included in the survey sample as consuming nil amounts of fish. The inclusion of these 53/385 or 14 percent of respondents should more accurately reflect the overall consumption patterns of Winnipeg residents based on both fish-eating and nonfish-eating households.**

**The reasons given for not wanting to participate in the study are outlined in Appendix 12. The most common reason given for refusal was “Not interested”. Some respondents who refused to participate did so by simply hanging up on the interviewer during the introductory phase of the survey.**

### **3.7     Survey administration**

**The researcher devised a second training program and related written materials. This session’s purpose was to train participants to assess the eligibility of potential respondents and to conduct survey interviews by telephone.**

**The survey was administered by telephones, located in MDNR facilities, over the period of August 3, 1994 to September 6, 1994. The interviewing was mainly done by FFI participants. Interviewing was done during 17 evenings between the hours of 6:00 p.m. to 9:30 p.m. on Monday to Thursday. This approach attempted to contact potential respondents after regular working hours (assuming the majority of respondents would be employed during the hours of 9:00 a.m. to 5:00 p.m.) and after having allowed time for them to have prepared and eaten their evening meal (Dillman, 1978).**

**Near the completion of the study a message was left at 128 numbers where there was an answering machine. This provided potential respondents with a contact telephone number if they wished to participate. Three responses were received from the messages and all participated in a survey. The response rate was 3/128 or two percent for all messages left on answering machines and as the study was considered concluded the balance of contacts were considered abandoned.**

**Surveying was conducted on five Fridays from 9:00 a.m. to 4:00 p.m. when MDNR facilities (space and telephones) were available during August of 1994. It was intended that potential survey bias be reduced by also incorporating telephone contact during ‘work hours’; more critically this time frame corresponded to the availability of MDNR facilities from which the surveying was conducted.**

**Before considered as a non-response, each random phone number was attempted up to five times (Dillman, 1978). The final disposition by interviewers of each randomly selected telephone number was recorded on a survey respondent form.**

**The entire research process was supervised by the researcher. The interviewing was initially monitored by the researcher and later by a research assistant. As the assistant’s organizational skills became apparent additional duties were assigned as per Appendix 13.**

**Problems were encountered with one interviewer who had to be released due to interviewer subversion of surveys. Three surveys completed by this interviewer were excluded from reported results.**

### **3.8 Ethical considerations**

**All study participants were volunteers. The interviewers stressed the voluntary nature of the survey. The participants were advised their individual responses would remain confidential. Each survey was assigned a unique number. This number was used to identify any particular survey, thus the participants’ identities were never recorded in the data base and confidentiality was assured.**

**The surveys are securely stored at the researcher's residence. The survey was reviewed by prior committee members, Drs. Henson and MacPherson and Ms. Anderson prior to administration of the survey in August of 1994.**

**Participants were given the option of receiving survey results by contacting the researcher in the late fall of 1994. Copies of the abstract and survey 'highlights' (Appendix 14) were distributed to major participants where a direct contribution of resources was made or a definite interest was expressed in potential results. Website information might be placed at the University of Manitoba.**

### **3.9     Creation of data file**

**Using coding sheets for reference, the surveys were pre-coded by the researcher in preparation for data entry into a data file. The raw data were transcribed, with assistance, directly from pre-coded survey questionnaires onto a floppy disk using a personal computer (PC) and a fixed field format. This facilitated corrections by means of a visual inspection.**

**The data file was up-loaded into the University of Manitoba mainframe computer with assistance from University of Manitoba (computer) User Services.**

### **3.10           Programming developed**

**Question responses were assigned variable names using naming conventions which indicated the nature of the variable under examination. A codebook was developed**

by the researcher for all 113 input variables and conditionally transformed program variables. Programming materials are available for review on request at the Natural Resources Institute (NRI) office.

The statistical package utilized was a mainframe program named Statistical Analysis System 6.08 (SAS 6.08). The programming was done with technical assistance from Ms. Anderson, at that time an Economic Analyst with the Freshwater Institute, and from Ms. Armstrong, at that time of the Statistical Advisory Services at the University of Manitoba.

Eight SAS programs were written by the researcher. These were run on the mainframe to aggregate consumption information and to isolate potential variables significant in fish consumption patterns. Programs which did not produce useable results were discarded and are not reported. Useful and tested programs were incorporated as subprograms into the main program 'SASPRGM' at the author's discretion with advice from committee members or support staff.

One program identified the City of Winnipeg Community Committee and Ward Boundary Districts (hereinafter referred to as 'districts'). Households could be identified as to geographic location within Winnipeg. A map of Winnipeg indicating the district boundaries is depicted in Figure 13.

Computer programming did not produce results with some types of errors such as syntax errors. After such problems were resolved, limited sample data were entered and the manually calculated results compared with computed results to eliminate the chance of programming logic errors on the part of the programmer (also the researcher).

City of Winnipeg  
Community Committee and Ward Boundaries

Ville de Winnipeg  
Délimitation des districts et des quartiers électoraux

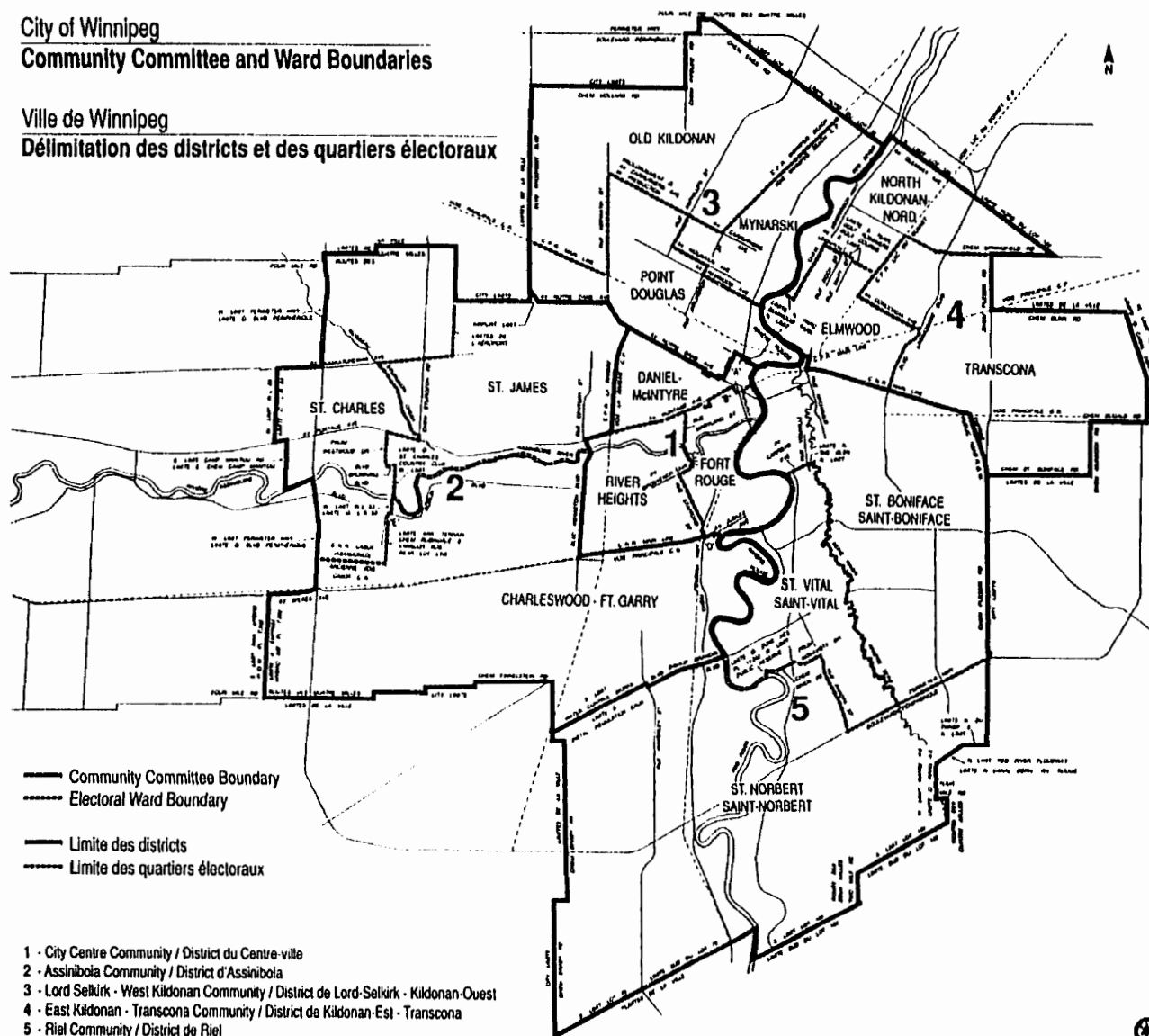


Figure 13: City of Winnipeg, Community Committee and Ward Boundaries



**Initial data and computed results were also scrutinized to detect and allow correction of technical and programming logic errors. For example, if one of the appropriate codes was not assigned by the end of the loop of the computer subroutine, a default assignment of the letter 'Z' was made to the fixed field. Thus a visual inspection of the printed data base led to data entry error corrections. As a result of clerical errors some minor data corrections were made on the uploaded data file.**

**Further verification processes were completed to ensure data accuracy. For example, two serving ranges initially showed all to be 'no response' and required correction. One result appeared improbable in that 2,190 servings were indicated in the year for one household. Rechecking the actual survey hardcopy revealed that a family of six consumed fish on a daily basis and the figure was, therefore, correct as entered and calculated.**

**Invalid data was shown as '.' by SAS if data were missing. For unanswered questions this required a revision to the SAS program in order to allow calculations to be done. On occasion, an error was encountered from an alpha character 'O' being entered rather than a zero '0' or vice versa. As the program specified either alpha or numeric variables this type of error was easily corrected by rechecking the input data, notwithstanding that the program would not produce usable output.**

**Selected cross-tabulations were chosen, in consultation with MDNR, for many of the 113 variables, however time, funding, logic and volume of data to be reported constrained the amount of cross-tabulations done.**

### **3.11            Interviews of selected fishing industry representatives**

**Personal interviews were conducted in 1994 with some local fish retailers.**

**Qualitative information from these interviews was used to support or refute survey findings.**

**In attempting to contact fish distributors it was ascertained that many of them were no longer in the business or had severely curtailed their operations with respect to fish sales. On April 21, 1994 the researcher attended an Intraprovincial Fish Marketing Strategy Committee (IFMSC) meeting (committee members are referenced in Appendix 15). Some qualitative information was gathered at this meeting as certain local retailers and wholesalers had accepted an invitation to give presentations to the committee. These informal sources were also used as a qualitative validity check on results produced by the research project.**

**The bulk of the qualitative information was presented in the previous section regarding potential ethnic influences at 2.4.1. Follow-up interviewing was limited to the retail merchant specializing in ethnic marketing and promoting underutilized fish species consumption.**

### **3.12            Potential bias**

**As the instrument chosen for the research project, the telephone survey may contain potential bias which should be considered in reviewing the results.**

**The fundamental question of whether a household might be reached was determined**

by the inclusion of a random phone number from listed households in the White Pages. Bias could have been introduced in two areas on this count. Not all households in Winnipeg are serviced by telephones, although this portion could not be determined. Secondly, only 85 percent of serviced households have their numbers published in the White Pages (Jacobsen, personal communication, February, 1999). Other deterrents to being contacted were errors in the content of the White Pages or households who moved into or out of the area prior to the time of contact.

The survey was based on respondent recall rather than on direct observation. Reported consumption may have varied from actual consumption either by reason of faulty memory or any motivation to either overreport or underreport consumption.

The survey was conducted during a summer month and actual fish consumption may have been higher during the recall period because of the availability of fresh fish. This possibility was considered in the questioning of whether fish consumption varies.

Interviewing was conducted in the English language thus excluding potential respondents who were unable or unwilling to communicate in this language. A significant portion of ethnic communities may have been excluded in this manner in homes where English is not spoken as a second language. This may be the most serious potential for survey bias given widely-held industry beliefs that fish consumption is higher than average in ethnic portions of the population.

Surveying was done by telephone. This use of this instrument was not considered to introduce any significant bias in terms of reaching the population. The effect of the line being busy or not answered is not likely to have introduced any appreciable

**bias. Some bias may relate to the non-response where answering machines were encountered if these households have consumption patterns which differ from the rest of the populace.**

**The total reliance on non-visual cues and responses was a limit imposed by the use of the telephone as the survey instrument (Dillman, 1978). Respondents may not have heard a question clearly. With no visual cues, the interviewer had less chance of identifying a respondent's confusion unless the person relayed, by a hesitation or a question, that a problem had occurred in the communication. Dillman (1978) also reported that a respondent is hesitant to indicate such confusion.**

**Potential bias may have been introduced if the respondents were confused by the names used for species of fish. Scott and Crossman (1979) indicate that fish are often called by a variety of names. Common names sometimes are even used for more than one fish, for example, both smallmouth and largemouth bass may be called black bass. The survey did query the consumption of white bass and silver bass. Many fish use the terms 'pike' and/or 'perch' and/or 'trout'. Colors are often used in the common naming of fish. The names of fishes surveyed was already referenced at Appendix 1, but may warrant another review to illustrate the potential for confusion in fish naming conventions.**

**The most significant potential bias was in who agreed or did not agree to be surveyed. It was more likely that people who do not eat fish would decline to participate and therefore introduce a bias. The direction of the bias would be towards an overreporting of fish consumption in surveyed respondents.**

### **3.13 Description of research project**

**This research project was non-experimental, descriptive and ex post facto survey research. Causal relationships between variables cannot be identified nor inferred. This research project did not isolate a dependent variable, nor control or manipulate an independent variable. Survey research, by its nature, is based on ‘recall’ of participants rather than on observed behaviour. This method can only produce results which indicate there may be a correlation between variables.**

## **CHAPTER 4**

### **RESULTS, ANALYSIS AND DISCUSSION**

#### **4.0 Introduction**

**This research project was a ‘slice in time’ survey involving both quantitative and qualitative data collected from Winnipeg merchants and household residents. The study had been determined to be descriptive in nature based on its design. Data gathered included levels of fish consumption, sources of procurement, attitudes towards the consumption of fish and sample demographic information.**

**Once results were compiled it was apparent that ‘data scarcity’ in underutilized species consumption would preclude meaningful statistical analysis. Although some statistical analysis was performed, there are severe limitations on the results of the analyses.**

**In this chapter, Sections 4.1 to 4.3 present the survey results along with brief explanations and references to question numbers. The main points brought to light during merchant and other related interviews are discussed in Section 4.4.**

**After compilation of results, the data were analyzed by the use of computer programs to attempt to determine if other significant information could be ascertained. An analysis of compiled data and the results of additional computer manipulation of data are presented in Section 4.5. This section also discusses the manipulated data results and indicates where relevant research objectives are met. Implications of this research relative to current literature and body of knowledge are discussed along with a summary of the main findings of this research.**

**Section 4.6 presents a discussion of some of the implications to natural resource management of fish resources arising out of the research project findings.**

**The research project found the survey population to be reasonably representative of Winnipeg in many areas such as religious background, ethnic identification, age, income, and household composition. However the use of an English language telephone survey may have excluded high consumers of underutilized fish species even though many households reported speaking more than one language in the home.**

**The high proportion of respondents who fish for their own consumption may have introduced bias. Active anglers were been roughly estimated as representing 19 percent of Manitobans in 1994, while 43 percent of surveyed respondents indicated they fish. This means that about twice as many anglers, as would have been expected to be encountered in a truly random fashion, participated in the survey. For this reason the author concluded that fish consumption may be overreported. Even though the main meal preparer was surveyed, the survey may have included respondents who eat more fish than a typical Winnipegger.**

**The potential design bias inherent in the survey reduces the reliance one may put on these results. This bias would tend to reflect an overparticipation by fish eating respondents and an underparticipation by ethnic residents who do not speak English. However qualitative information from those involved in the fishing industry does support many of the findings of the research project and thus may mitigate some of the potential bias. The reader bears the ultimate responsibility of assessing the relative merit of these findings for their own purposes.**

The survey population was not considered by the author to be truly representative of Winnipeg's population in terms of the portion of respondents who participated in the survey. As such, an estimate of Winnipeg's consumption would not be an accurate reporting of the findings. However, consumption is generalized to Winnipeg; that is consumption is reported 'as if' survey results were typical of Winnipeg respondents. This was also consistent with the client's request that estimates of consumption be calculated for Winnipeg. The resultant projections are therefore included in the presentation of results and relevant calculations are noted as being 'generalized to Winnipeg'.

#### **4.1 An overview of general survey results**

Canadian per capita consumption as reported by Statistics Canada surveys combine coastal and inland province respondents. As previously seen in the literature about 23 percent of Canada's population live in coastal areas. There is potential for a skewing of these average consumption figures if one accepts the assertion that coastal residents would likely have eaten more fish than their inland counterparts due to proximity to commercial fishers. One might expect inland province residents to consume less fish than an average Canadian if this speculation were found to be true.

Based on calculations from reported consumption the study results indicate that in 1994, instead of less fish, surveyed Winnipeggers consumed considerably more fish and fish products than were indicated for an average Canadian in published literature according to Statistics Canada.



**Different means of measuring and calculating home consumption of fish were possible from survey data collected. Consumption queries were based on servings of fish meals, therefore the results all refer to ‘edible weight’ and ‘at the household level’ unless otherwise indicated. Results are reported more fully discussed later in this report. The rational of using a 200 gram serving size for calculations is presented in Appendix 16. This serving size also gave MDNR (the client) a means of readily comparing results of this research project to its mail survey results.**

#### **4.2     Presentation of survey sample results**

**In this section the results are presented with a brief description. Identifiable factors relevant in fish consumption, based on responses to demographic questions and analysis of consumption patterns, start as computer generated data illustrated in Appendix 17 . The SAS program provided statistical results and those relating to species specific fish are summarized in Table 6. These figures provide the basis for several calculations required to meet research objectives for consumption of specific species of fish, ocean fish, and shellfish.**

**The gross compilations of demographic responses are presented as results, in the order they are asked as questions in the survey interview, in the tables on the following pages. Given the ease with which one may identify these results the question numbers are not referenced for demographic results.**

**Responses from 332 households who participated in the survey are reported. Of these, seven respondents did not answer demographic queries. Demographics were coded for inclusion as an ‘unknown’ response for these surveys. Ten out of 332**

surveyed households indicated they did not eat fish. Surveyed respondents sometimes indicated they did not eat freshwater fish and often indicated zero consumption of underutilized species.

**Table 6: \* Fish variable (univariate), N, mean, standard deviation, and sum calculated for servings of freshwater species, ocean and shellfish**

<b>Fish variable</b>	<b>N</b>	<b>Mean</b>	<b>Standard deviation</b>	<b>Sum</b>
<b>Pickereel</b>	<b>328</b>	<b>35.29</b>	<b>36.89</b>	<b>11,574</b>
<b>Pike</b>	<b>317</b>	<b>6.99</b>	<b>19.74</b>	<b>2,214</b>
<b>Lake trout</b>	<b>320</b>	<b>8.74</b>	<b>20.34</b>	<b>2,796</b>
<b>Catfish</b>	<b>315</b>	<b>2.29</b>	<b>11.34</b>	<b>720</b>
<b>Whitefish</b>	<b>319</b>	<b>10.89</b>	<b>25.53</b>	<b>3,474</b>
<b>Goldeye</b>	<b>323</b>	<b>7.19</b>	<b>17.76</b>	<b>2,322</b>
<b>Mullet</b>	<b>322</b>	<b>0.54</b>	<b>4.67</b>	<b>174</b>
<b>Drum</b>	<b>323</b>	<b>1.76</b>	<b>9.46</b>	<b>570</b>
<b>White bass</b>	<b>322</b>	<b>2.37</b>	<b>12.14</b>	<b>762</b>
<b>Perch</b>	<b>325</b>	<b>4.45</b>	<b>13.48</b>	<b>1,446</b>
<b>Sturgeon</b>	<b>322</b>	<b>0.80</b>	<b>5.70</b>	<b>258</b>
<b>Tullibee</b>	<b>321</b>	<b>2.06</b>	<b>11.75</b>	<b>660</b>
<b>Carp</b>	<b>322</b>	<b>0.65</b>	<b>5.20</b>	<b>210</b>
<b>Ocean fish</b>	<b>330</b>	<b>59.45</b>	<b>39.71</b>	<b>19,620</b>
<b>Shellfish</b>	<b>329</b>	<b>26.61</b>	<b>34.27</b>	<b>8,754</b>
<p><b>Where:</b>     <b>N</b>     is the number of responding households for each species of fish                   <b>mean</b> is the average number of servings of each species of fish                   <b>sum</b>    is the total number of servings of each species of fish                   * calculated by 'SASPRGM' for each fish species variable listed</p>				

The gender profile of respondents is shown in Table 7 below.

<b>Table 7: Gender of respondents</b>		
<b>Gender</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>Female</b>	<b>212</b>	<b>64</b>
<b>Male</b>	<b>108</b>	<b>32</b>
<b>No response</b>	<b>12</b>	<b>4</b>
<b>Total</b>	<b>332</b>	<b>100</b>

English was the single language spoken in the home in the majority of households surveyed while 16 percent indicated more than one language was spoken (Table 8).

<b>Table 8: First language spoken in the home</b>		
<b>Languages spoken</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>English</b>	<b>273</b>	<b>82</b>
<b>Multiple</b>	<b>52</b>	<b>16</b>
<b>Other (not answered)</b>	<b>7</b>	<b>2</b>
<b>Total</b>	<b>332</b>	<b>100</b>

**More than half the respondents were between the ages of 25 and 45; all responses are presented in Table 9.**

<b>Table 9: Age range of respondents</b>		
<b>Age range</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>&lt; 18</b>	<b>12</b>	<b>4</b>
<b>18-24</b>	<b>32</b>	<b>10</b>
<b>25-34</b>	<b>83</b>	<b>25</b>
<b>35-44</b>	<b>85</b>	<b>26</b>
<b>45-54</b>	<b>42</b>	<b>13</b>
<b>55-64</b>	<b>34</b>	<b>10</b>
<b>65+</b>	<b>37</b>	<b>11</b>
<b>unknown</b>	<b>7</b>	<b>2</b>
<b>Total</b>	<b>332</b>	<b>100</b>

The educational level attained was most often university (39%) or high school (30%), followed by technical school or college (22%) as seen in Table 10 which summarizes the level attained by respondents.

<b>Table 10: Level of education attained</b>		
<b>Educational level</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>Less than high school</b>	<b>21</b>	<b>6</b>
<b>High school</b>	<b>100</b>	<b>30</b>
<b>Technical school or college</b>	<b>72</b>	<b>22</b>
<b>University</b>	<b>129</b>	<b>39</b>
<b>Unknown</b>	<b>10</b>	<b>3</b>
<b>Total</b>	<b>332</b>	<b>100</b>

The household composition was usually a couple with children (47%) or without children (19%) and 15 percent of the time the household consisted of a single adult (Table 11).

Table 11: Household composition of respondents		
Household composition	Number (#)	Percent (%)
Couple with children	155	47
Couple with no children	64	19
Single parent	20	6
Single adult	49	15
More than 1 unrelated	15	5
Other	29	9
Total	332	100

Most respondents did not indicate they were immigrants and results are shown in Table 12. Those 15 percent who did immigrate came from 25 different countries, with representation in all seven of the major and in three of the minor ethnic groups delineated in Statistics Canada publications.

<b>Table 12: Landed immigrant</b>		
<b>Landed immigrant</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>Yes</b>	<b>51</b>	<b>15</b>
<b>No</b>	<b>262</b>	<b>79</b>
<b>Unknown/no answer</b>	<b>19</b>	<b>6</b>
<b>Total</b>	<b>332</b>	<b>100</b>

An ethnic background was declared by a large portion of respondents in Table 13:

<b>Table 13: Ethnic origin declared</b>		
<b>Declared</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>Yes</b>	<b>314</b>	<b>95</b>
<b>No/unknown</b>	<b>18</b>	<b>5</b>
<b>Total</b>	<b>332</b>	<b>100</b>

These ethnic origins were widely dispersed among many ethnic backgrounds and often multi-ethnic backgrounds were declared. However most often reported ethnic backgrounds were determined via computer analysis and the eight most frequently identified ethnicities are summarized in Table 14.

<b>Table 14: Single ethnic origins declared by survey respondents (selected; not equal 100%)</b>		
<b>Ethnic origin</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>English</b>	<b>26</b>	<b>8</b>
<b>Aboriginal</b>	<b>21</b>	<b>6</b>
<b>French</b>	<b>10</b>	<b>3</b>
<b>German</b>	<b>14</b>	<b>4</b>
<b>Filipino</b>	<b>5</b>	<b>2</b>
<b>Ukrainian</b>	<b>19</b>	<b>6</b>
<b>Jewish</b>	<b>6</b>	<b>2</b>
<b>Canadian</b>	<b>37</b>	<b>11</b>
<b># is number of respondents out of 332 survey population</b> <b>% is percentage of single ethnic origin to sample of 332</b>		



The major religions reported by respondents were 39 percent Protestant, 36 percent Catholic and 2 percent Jewish as per Table 15 below.

<b>Table 15: Religious affiliation of respondents</b>		
<b>Religion</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>Catholic</b>	<b>119</b>	<b>36</b>
<b>Protestant</b>	<b>128</b>	<b>39</b>
<b>Jewish</b>	<b>6</b>	<b>2</b>
<b>Unknown or other</b>	<b>79</b>	<b>24</b>
<b>Total</b>	<b>332</b>	<b>100</b>

Aboriginal background was declared by 6 percent while 81 percent of respondents were not of Aboriginal descent (Table 16).

<b>Table 16: Aboriginal origin</b>		
<b>Aboriginal background</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>Yes</b>	<b>21</b>	<b>6</b>
<b>No</b>	<b>268</b>	<b>81</b>
<b>Unknown</b>	<b>43</b>	<b>13</b>
<b>Total</b>	<b>332</b>	<b>100</b>

Profiles were constructed by other SAS programming for respondents on a district basis and are shown in Table 17. These districts were determined on the basis of the postal code from question 13 or the street address given in question 14, in which case the postal code was recorded after the termination of the interview by reference to a postal code publication by Canada Postal Corporation.

<b>Table 17: City of Winnipeg Community and Ward Boundary District of Respondents</b>		
<b>District</b>	<b>Number (#)</b>	<b>Percent (%)</b>
1	70	21
2	49	15
3	38	11
4	43	13
5	70	21
unknown	62	19
<b>Total</b>	<b>332</b>	<b>100</b>

**Income levels reported were distributed in all income brackets specified in the questionnaire. The responses ranged from 5 to 16 percent of respondents (Table 18). The largest portion of respondents, 18 percent, did not indicate their income range.**

<b>Table 18: Income range of respondents</b>		
<b>Income range in \$</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>&lt; 10,000</b>	<b>15</b>	<b>5</b>
<b>10,000-19,999</b>	<b>25</b>	<b>8</b>
<b>20,000-29,999</b>	<b>46</b>	<b>14</b>
<b>30,000-39,999</b>	<b>49</b>	<b>15</b>
<b>40,000-49,999</b>	<b>35</b>	<b>11</b>
<b>50,000-59,999</b>	<b>26</b>	<b>8</b>
<b>60,000-69,999</b>	<b>53</b>	<b>16</b>
<b>&gt; 70,000</b>	<b>24</b>	<b>7</b>
<b>unknown/ not answered</b>	<b>59</b>	<b>18</b>
<b>Total</b>	<b>332</b>	<b>100</b>

**This concludes the presentation of the demographic question results.**

### **4.3     Results from survey responses**

**This section discusses the way the results were obtained. Calculations are presented along with relevant assumptions and conversions where applicable.**

**The reporting of results is based on a total survey sample size of 385 which consisted of 332 households who participated in the survey and 53 households who do not eat fish and for whom consumption was set at nil servings for all forms and species. The 322 households who responded to demographic queries indicated those households to consist of 651 adults and 352 children.**

**Consumption was recorded by several questions in the survey instrument. The values of the aggregating variables for freshwater species, ocean fish and shellfish were already summarized in Table 6 in Section 4.2. All estimates are based on the assumption of an average serving size of 200 grams when conversions are made from servings to kilograms of fish (calculation rationale already presented in Appendix 16). The conversion of kilograms to pounds, for presentation purposes, was applied at 2.205 pounds per kilogram and “M”, in the notes for calculation, is used as an abbreviation for million.**

**Three major estimates of consumption by surveyed households were required by the primary objective of the study. Certain components of the calculations may be taken from an appendix or table previously referenced in order to simplify the presentation.**

**In questions six and ten, the recalled consumption patterns of any kind of fish over the previous month had been recorded. From this information the frequency of**

consumption was multiplied by the number of servings reported by each household to arrive at the total servings per the survey.

#### **4.3.1 First calculation of consumption**

The general recall of fish consumption queries (questions 1.a. and 1.b.) were intended as a transition into the survey, as Dillman (1978) suggests might be beneficial. The generality of the question should have convinced respondents that they knew enough to state their opinion. Dillman (1978) states this is important since if the first few questions are answered, then the respondent is unlikely to terminate the interview. The question also served the function of internal validation for other consumption queries.

Total annual consumption based on this measure was reported by both fish-eating households and households who did not eat fish. These figures were aggregated from respondents' replies to the questions which were simply stated as “ about how often do you eat fish ? ” and “ how many servings ? ” A first calculation based on general recall is presented for fish consumed both ‘at home’ and ‘total including meals taken away from home’ fish consumed.

The first calculation of total consumption is shown in Table 19. This calculation is required under sub-objective 1.a. and is based on *total* reported general recall of fish servings consumed in Winnipeg households. As determined in Table 19 the generalized estimate of total fish consumption in Winnipeg was 5.8 million kilograms or 9 kilograms per capita (5,766,261 kg. / 634,397 approximate population).

In all calculations the conversion of results from surveyed households to generalize to Winnipeg households was determined applying the ratio of 656.974. This ratio was total occupied private dwellings in Winnipeg (264,490 dwellings-11,555 unoccupied dwellings per Statistics Canada, 1992) divided by sample size of 385.

Two other calculations were required to fulfill the primary estimate of consumption

<b>Table 19: First calculation of total annual consumption by residents of Winnipeg for all fish</b>	
(1) Servings of meals 'at home'	41,345
(2) Servings of meals 'away from home'	2,541
	<hr/>
<b>Total fish servings consumed</b>	<b>43,886</b>
	<hr/> <hr/>
(3) Conversion to kilograms	8,777
	<hr/> <hr/>
(4) Generalized to the City of Winnipeg (in kilograms)	5,766,261
	<hr/> <hr/>
(5) Per capita kilograms of fish consumed	9
	<hr/> <hr/>
(1) from Table 6 'TOTHOME1' (2) from Table 6 'TOTAWAY1' (3) using 200 gram serving size (4) using 656.974 to convert from surveyed to Winnipeg households (5) 5.8 M / population of 634,397 and rounded to nearest kilogram	

objectives, they are presented next. These calculations for three sub-objectives produced varied consumption figures. The significance of these differences will be discussed later in this chapter.

#### **4.3.2 Second calculation of consumption**

The specific consumption estimates by type of fish consumed are believed to be more accurate as they are based on defined ranges of servings over a one month period as worded in questions two, six and ten. Recall of total fish consumption over a period determined at the discretion of the respondent, which may have been over the period of up to one year if that is how the respondent recalled their consumption, was considered more vague as for establishing consumption levels (MacPherson, personal communication, 1994). The detailed level of question wording was supported by literature review (Dillman, 1978).

Table 20 depicts the calculation of fish consumption, by surveyed Winnipeg residents recalling 'at home' consumption of freshwater, ocean and shellfish species, in ranges of servings per month (queried in question 6). Fish meals consumed 'away from home' were queried in question 10 using the same range of serving question format. The combined meals taken at home and away from home result in the second calculation of total consumption as shown in Table 21. Sub-objective 1.b. is fulfilled through this determination of consumption by *species*, as well as providing part of a second measure of *total* estimated consumption for sub-objective 1.a.

The total annual servings of each freshwater species (presented in Table 22) were computer summed to determine total freshwater species consumption. Then similarly determined servings by recall of other types of fish (ocean fish and

shellfish) were added to estimate consumption by species 'at home'. The values used for ocean fish 'OCEAN' and shellfish 'SHELL' were available from univariates results found in Table 6. As seen in Table 20 'at home' consumption was calculated at a total of 55,554 servings. This converts to 11,111 kilograms of annual 'at home' consumption which generalized to Winnipeg was 7.3 million kilograms of fish species (freshwater, ocean and shellfish) consumed at home. Surveyed Winnipeg residents consumed 29 kg per household or 12 kilograms per capita by this measure.

<b>Table 20: Calculation of 'at home' consumption by Winnipeg residents based on recall of freshwater, ocean and shellfish species</b>			
	<b>Servings per annum</b>	<b>Kilograms per annum</b>	
<b>Freshwater species *</b>	<b>27,180</b>	<b>5,436</b>	
<b>Ocean fish *</b>	<b>19,620</b>	<b>3,924</b>	
<b>Shellfish *</b>	<b>8,754</b>	<b>1,751</b>	
<b>Total 'at home' fish and shellfish consumption reported by respondents</b>	<b>55,554</b>	<b>11,111</b>	
<b>Generalized to Winnipeg (in kilograms)</b>		<b>7,299,594</b>	
<b>Per capita kilograms of fish consumed (1)</b>		<b>12</b>	
<b>* servings per annum were generated from 'SASPRGM'</b> <b>(1) 7.3 M / population of 634,397 and rounded to the nearest kilogram</b>			



**Table 21: Second calculation of total fish consumption based on recall of  
'at home' and 'away from home' servings of fish species**

	<b>Servings per annum</b>	<b>Kilograms per annum</b>	<b>Total consumption</b>
<b>Freshwater species</b>	<b>27,180</b>	<b>5,436</b>	
<b>Ocean fish</b>	<b>19,620</b>	<b>3,924</b>	
<b>Shellfish</b>	<b>8,754</b>	<b>1,751</b>	
<b>Total 'at home'</b>	<b>55,554</b>	<b>11,111</b>	
<b>Fish 'burgers'</b>	<b>2,370</b>	<b>474</b>	
<b>Fish'n'chips</b>	<b>5,484</b>	<b>1,097</b>	
<b>As main meal</b>	<b>6,858</b>	<b>1,372</b>	
<b>Total 'away from home'</b>	<b>14,712</b>	<b>2,942</b>	
<b>Total servings 'at home ' and 'away from home' reported by respondents</b>			<b>70,266</b>
<b>Total kilograms consumed (converted from servings)</b>			<b>14,053</b>
<b>Generalized to Winnipeg (in kilograms)</b>			<b>9,232,399</b>
<b>Per capita kilograms of fish consumed (1)</b>			<b>15</b>
<b>(1) 9.2 M / population of 634,397 and rounded to the nearest kilogram</b>			

**The second calculation of total fish consumption based on servings is shown in Table 21 and includes servings taken both ‘at home’ and ‘away from home’.**

**The figures used in these calculations were aggregated by an author written computer program named ‘SASPRGM’. The aggregations were computer calculated on a survey by survey basis using either a frequency of servings or else using average servings depending on the question format.**

#### **4.3.3 Freshwater fish consumption**

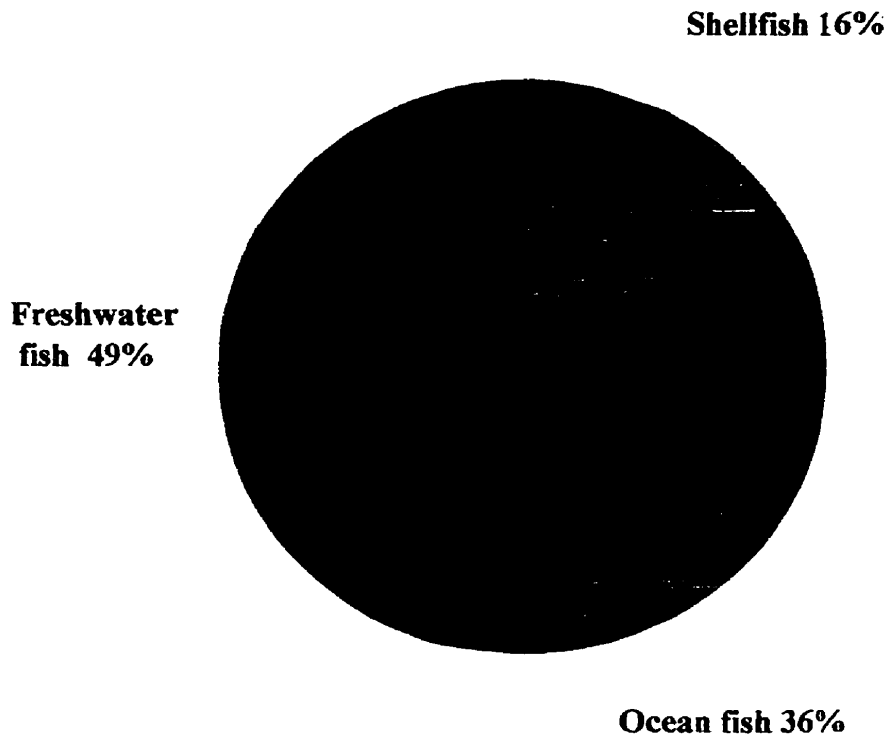
**Freshwater species were aggregated separately, then combined with ocean and shellfish figures to estimate consumption. However, detailed consumption information was gathered regarding each freshwater species (Table 22) and provides the unique feature of this research project. The calculation of freshwater *species* servings and consumption fulfills the research requirements of sub-objective 1.b. The total freshwater fish species consumption generalized to Winnipeg was 3.6 million kilograms and a per capita consumption rate of 6 kilograms. The results vary considerably from those reported by Statistics Canada of 190 grams per capita of freshwater fish. Surveyed Winnipeg residents ate 32 times more freshwater fish than an average Canadian.**

**To graphically illustrate the magnitude of freshwater fish consumption, a pie graph comparison of the ratio of freshwater, ocean and shellfish consumed is shown in graph form (Figure 14) as reported by respondents.**

**Table 22: Calculation of estimated annual consumption by  
Winnipeg residents of (selected) freshwater fish species**

<b>Species</b>	<b>Number of servings</b>
<b>Pickerei</b>	<b>11,574</b>
<b>Whitefish</b>	<b>3,474</b>
<b>Lake trout</b>	<b>2,796</b>
<b>Goldeye</b>	<b>2,322</b>
<b>Northern pike</b>	<b>2,214</b>
<b>Yellow perch</b>	<b>1,446</b>
<b>White bass</b>	<b>762</b>
<b>Catfish</b>	<b>720</b>
<b>Tullibee</b>	<b>660</b>
<b>Freshwater drum</b>	<b>570</b>
<b>Sturgeon</b>	<b>258</b>
<b>Carp</b>	<b>210</b>
<b>Mullet</b>	<b>174</b>
	<hr/>
<b>(1) Total freshwater fish servings</b>	<b>27,180</b>
	<hr/>
<b>(2) Converted to kilograms</b>	<b>5,436</b>
	<hr/>
<b>(3) Generalized to the City of Winnipeg (in kilograms)</b>	<b>3,571,289</b>
	<hr/>
<b>(4) Per capita in kilograms</b>	<b>6</b>
	<hr/>

- (1) from Table 6 list of univariates**
- (2) using 200 gram serving size**
- (3) using 656.974 to convert from surveyed to Winnipeg households**
- (4) 3.6 M / population of 634,397 and rounded to the nearest kilogram**



**Figure 14: Graph illustrating relative portion of types of fish consumed 'at home' by Winnipeg surveyed residents**

#### **4.3.4 Form of fish consumption queries results**

**The client specified consumption queries to be included with respect to the form of fish consumed. Possible forms were fillets, whole, dressed, boneless and breaded when purchased as fresh or frozen. Fish form could also be smoked, canned, or other (minced, pickled, raw). Responses were recorded corresponding to whether**

these forms were eaten 'Never', 'Rarely', 'Sometimes' or 'Often'.

The final primary calculation required by sub-objective 1.c. was a determination by *form* of fish consumed. This calculation, presented in Table 23, relies on aggregated responses to questions, described above, which asked "how often do you eat fresh (frozen/ smoked/ canned/ other) forms of fish?". Questions differentiated between fresh and frozen preparation as fillets, whole, dressed, boneless and breaded consumed 'at home'.

Table 23: Calculations of estimated annual consumption by Winnipeg residents by form of fish		
	Servings	Percent (%)
(1) Fresh	4,273	33
(1) Frozen	4,383	33
(1) Smoked	1,028	8
(1) Canned	3,218	25
(1) Other	228	2
	—	—
Total servings by form of fish	13,130	101 *
	=====	
Converted to kilograms	2,626	
	=====	
(2) Generalized to City of Winnipeg (in kilograms)	1,725,214	
	=====	
(1) from univariates from Table 6		
(2) using 656.974 to convert from surveyed to Winnipeg households		
* due to rounding of percentages		

#### **4.3.5 Fish-eater attitude results**

**The number of fish eating households in the survey sample was 322 out of 385 or 84 percent. Questions were asked of 332 surveyed households (of whom 97% ate fish) regarding the taste, convenience, nutritional quality and possible barriers to fish purchasing behavior.**

**For presentation purposes, the results are rephrased from their original format. The original questions were asked from either a positive or negative perspective. This means the statements were worded in a manner such that a positive attitude was indicated by an agreement, in some cases, and by a disagreement, in other cases, with the statements read. The attitudes of survey respondents after reordering are summarized in Table 24.**

**By rearranging the results one can clearly see the extent to which a statement reflects a positive, neutral or negative attitude. For this purpose both the responses ‘Strongly agree’ and ‘Agree’ were assigned as depicting a positive attitude while negative responses were similarly combined. Respondents who did not know or did not answer were assigned a neutral attitude. Thus the number of responses to each attitude queried totals 332 and the individual number of responses to each as positive, neutral or negative are presented only as portions (percentages) of the total, without reporting the number. This was done to simplify presentation.**

**Attitudes were queried with regard to perceptions of health, price of fish, familiarity with fish, quality concerns, the effect of table qualities and the effect of some marketing aspects of fish.**

**Table 24: Attitudes towards fish indicated by respondents**

<b>Statement (rephrased)</b>	<b>Attitude stated as percentage and reported as either</b>		
	<b>Positive</b>	<b>Neutral</b>	<b>Negative</b>
<b>I like the taste of fish</b>	<b>89</b>	<b>3</b>	<b>8</b>
<b>I (do) find fish a filling meal</b>	<b>71</b>	<b>3</b>	<b>26</b>
<b>I think fish is a healthy meal</b>	<b>96</b>	<b>3</b>	<b>1</b>
<b>I (don't) worry about the quality of fish</b>	<b>38</b>	<b>5</b>	<b>57</b>
<b>I prefer fish conveniently packaged</b>	<b>56</b>	<b>8</b>	<b>36</b>
<b>I (don't) find freshwater fish too expensive to buy</b>	<b>42</b>	<b>14</b>	<b>44</b>
<b>I prefer freshwater fish</b>	<b>58</b>	<b>9</b>	<b>33</b>
<b>I (don't) find freshwater fish are too inconvenient to prepare</b>	<b>73</b>	<b>6</b>	<b>21</b>
<b>I (know) how to prepare freshwater fish</b>	<b>83</b>	<b>3</b>	<b>14</b>
<b>I (don't) find storage of freshwater fish to be a problem</b>	<b>73</b>	<b>9</b>	<b>18</b>
<b>I (am) familiar with freshwater fish</b>	<b>67</b>	<b>3</b>	<b>30</b>
<b>I eat more fish than I used to</b>	<b>36</b>	<b>2</b>	<b>62</b>
<b>I think fish is a healthy source of protein</b>	<b>92</b>	<b>6</b>	<b>3</b>
<b>I prefer fish that don't cost too much</b>	<b>56</b>	<b>6</b>	<b>38</b>
<b>I prefer the convenience of prepared fish products</b>	<b>46</b>	<b>5</b>	<b>49</b>
<b>I like to choose the size or form of fish I want</b>	<b>85</b>	<b>5</b>	<b>10</b>
<b>I like particular brands of fish product</b>	<b>43</b>	<b>6</b>	<b>51</b>
<b>I trust the quality of some brand names of fish products</b>	<b>63</b>	<b>8</b>	<b>29</b>
<b>I think that fish is a low fat meal</b>	<b>87</b>	<b>6</b>	<b>7</b>

**The general consensus that fish are perceived as a healthier, low fat choice was apparent from the positive response rate by surveyed respondents to rephrased statements like:**

<b>“I think fish is a healthy meal.”</b>	<b>96%</b>
<b>“I think fish is a healthy source of protein.”</b>	<b>92%</b>
<b>“I think that fish is a low fat meal.”</b>	<b>87%</b>

**The response rates to these three statements were three of the four most positive attitudes reported. The other most positive attitude was to the statement “I like the taste of fish” with 89 percent of respondents either agreeing or strongly agreeing with this statement.**

**Respondents were quite familiar with fish. Just over 58 percent of respondents indicated they preferred freshwater fish. Nearly 67 percent were familiar with freshwater fish. In terms of preparation of freshwater fish, a full 83 percent said they knew how to prepare them and 73 percent did not find freshwater fish too inconvenient to prepare.**

**The effect of price on consumers was found to be almost evenly divided between a positive and negative attitude. Two generally worded questions asked about preferences relating to the price of fish. Freshwater fish were reported by 44 percent as too expensive to buy, yet 42 percent did not find freshwater fish to be too expensive. A more general question asked if consumers preferred fish that do not cost too much. The response rate was 56 percent agreement and 38 percent disagreement, respectively.**



**When queried about concerns for the quality of fish, 57 percent indicated they worried about the quality of fish.**

**Respondents were asked if they liked the taste of fish and whether they found it a filling meal. These questions were both answered positively by the majority, with 71 percent finding fish a filling meal and 89 percent liking the taste of fish.**

**Some marketing aspects were queried relating to the convenience or packaging of fish products, shelf life, and brand awareness and/or loyalty.**

**The convenience of fish packaging was queried twice in slightly different questions. A fairly even split of responses was given to the question of whether respondents preferred the convenience of prepared fish products, with 46 percent agreeing to the statement and 49 percent disagreeing. To the statement “I prefer fish conveniently packaged”, 56 percent agreed while 36 percent disagreed.**

**Brand awareness and brand loyalty were queried by two questions. Those indicating they liked particular brands of fish products were 43 percent, compared to 51 percent who said they did not. Yet 63 percent reported trusting the quality of some brand names of fish products, compared to 29 percent who disagreed with that statement.**

**Shelf life was not an apparent problem as 73 percent did not find storage of freshwater fish to be a problem and only 18 percent did.**

**A large portion of respondents, 85 percent, liked to choose the size or form of their fish, while ten percent did not find this important.**

**Most respondents did not report eating more fish than they used to, only 36 percent are eating more fish. Sixty two percent are not eating more fish than they used to, noting this may reflect that respondents already represent fish eating households in 84 percent of households.**

**Responses to questions 7, 8, and 9 also attempted to assess whether other factors, which were suggested in discussions with MDNR and Dr. MacPherson (personal communication, August , 1994), affected consumers' fish purchasing decisions. These questions centered around whether the consumption of fish was variable.**

**Question 7 asked whether freshwater fish were used in the preparation of ethnic dishes and further whether such dishes held ethnic or religious or other significance. Virtually no respondents indicated the preparation of ethnic or religious dishes on survey forms. It is not known why there were no responses to this question.**

**Respondents were then asked (question 8) if fish consumption was affected by the season. If fish was eaten seasonally, then the effect of cost (price), availability, ethnic or religious reasons were queried in question 9. The results indicated that overall there was little impact on the seasonality of fish consumption based on the factors of cost or availability, according to surveyed Winnipeg respondents.**

**The results of whether consumption was variable because of cost are depicted in Table 25. The effect on availability on consumption is presented in Table 26 and immediately follows Table 25.**

<b>Table 25: Variability of consumption related to cost</b>		
<b>Consumption varied according to cost</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>Yes</b>	<b>38</b>	<b>12</b>
<b>No</b>	<b>115</b>	<b>35</b>
<b>Unknown/ no answer</b>	<b>179</b>	<b>54</b>
<b>Totals</b>	<b>332</b>	<b>101</b>

<b>Table 26: Variability of consumption related to availability</b>		
<b>Consumption varied according to availability</b>	<b>Number (#)</b>	<b>Percent (%)</b>
<b>Yes</b>	<b>89</b>	<b>27</b>
<b>No</b>	<b>66</b>	<b>20</b>
<b>Unknown/ no answer</b>	<b>177</b>	<b>53</b>
<b>Total</b>	<b>332</b>	<b>100</b>

#### **4.3.6 Sources from which fish obtained results**

The sources from which respondents obtained their fish are summarized in Table 27. The respondents were queried about the sources from which they obtained their fish. The largest portion of respondents bought fish from the supermarket or some kind of retail store. A large number of respondents also obtained fish from fishing or from friends who fished. Responses to these questions were not mutually exclusive

<b>Table 27: Sources from which respondents obtained fish Total responses expressed as percentage of 332</b>			
<b>Source used</b>	<b>Yes</b>	<b>No</b>	<b>Unknown</b>
<b>Fish for self</b>	<b>43</b>	<b>55</b>	<b>3</b>
<b>From friends who fish</b>	<b>41</b>	<b>56</b>	<b>3</b>
<b>Specialty store</b>	<b>29</b>	<b>68</b>	<b>4</b>
<b>Supermarket</b>	<b>84</b>	<b>13</b>	<b>3</b>
<b>General store</b>	<b>15</b>	<b>82</b>	<b>3</b>
<b>Fisherman (commercial)</b>	<b>25</b>	<b>71</b>	<b>4</b>
<b>Truck vendor</b>	<b>5</b>	<b>92</b>	<b>3</b>
<b>Door-to-door sales</b>	<b>2</b>	<b>95</b>	<b>3</b>

**and respondents appear to access multiple sources to obtain their fish. Truck vendors and door to door sales appear minimal.**

#### **4.4            Results from merchant interviews**

**Supplementary qualitative information was available from local merchants who were willing to be interviewed. Other sources of qualitative information came from fisheries or industry personnel. There was considerable concurrence regarding the pressure on the pickerel fishery and the distinct lack of significant markets for coarse fish. Retailers often specialized in a product line or type. For instance, Mr. John Linklater of Independent Fish Co. Ltd. dealt primarily in saltwater fish and sold a lot of frozen product and Mr. Joe Cantor of Cantor's Grocery Co Ltd. sold only pickerel.**

**Other merchants indicated they offer an alternative to mass-marketed product lines. Gimli Fish Company, South Indian Lake Fishermen's Association (SIL) and Neechi Foods Community Store orient their business strategies towards specialty markets, small-scale deliveries, and/or customizing fish into smaller, more prepared packages. Costa Brava will clean and scale fish for their customers. Gimli Fish Company cites 'Kosher Certified' in their Yellow Pages ads.**

**Many retailers indicate the difficulty in marketing certain species, although several ethnic communities have been identified as worth the effort in marketing on a seasonal or promotional basis; for example, freshwater drum and mullet are marketed to Mennonite colonies by SIL. Ms. Karen Olson provided very specific details regarding ethnic preferences for particular fish or fish qualities. For**

example Chinese are said to be influenced to purchase based on freshness as the overriding criterion, a ‘flopping’ fish is sure to be chosen over any other.

#### 4.5 Discussion and analysis

The primary objective was to quantify an estimate of fish consumption by residents of Winnipeg with three (3) sub-objectives regarding types of consumption queries. Several estimates were obtained by compiling survey data results and generalizing to Winnipeg. They are summarized as follows in Table 28.

<b>Table 28: Summary of consumption estimates obtained from survey (in millions of kilograms)</b>		
<b>Fish consumption based on</b>		<b>Generalized to Winnipeg (’000,000 kilograms)</b>
<b>General recall:</b>		
1.	At and away from home	5.8
<b>Recall of servings over the preceding month, projected to an annual consumption figure:</b>		
2.	At and away from home	9.2
3.	Freshwater, ocean and shellfish at home	7.3
4.	Species specific recall at home	3.6
5.	Form consumed at home	1.7

One major question the client wished to be addressed was whether potential niche markets exist to which marketing efforts may be directed. These marketing efforts would be for underutilized fish species. The popularity of pickerel is universally acknowledged within the fisheries industry of Manitoba. The results of the survey are conclusive as demonstrated in (previous) Table 22, in that pickerel is by far the most often consumed species reported at 43 percent of all freshwater fish consumption. These results were significant enough to restate the data as the percentage which each species represents of all freshwater fish species (Table 29).

Table 29: Annual servings of freshwater species		
Species	Number of servings	Percent (%)
pickerel	11,574	43
northern pike	2,214	8
lake trout	2,796	10
catfish	720	3
whitefish	3,474	13
goldeye	2,322	9
mullet/sucker	174	1
freshwater drum	570	2
white bass	762	3
yellow perch	1,446	5
carp	210	1
sturgeon	258	1
tullibee	660	2
	_____	_____
Total freshwater species	27,180	100
	=====	=====

In terms of annual servings by households, servings of pickerel totaled 11,574 while whitefish at 3,474 and lake trout at 2,796 were the next most frequently consumed and even lesser amounts of lake trout and goldeye. Extremely limited overall consumption patterns were reported for other freshwater fish species.

Some might speculate that this may reflect the limited retailing of underutilized species, however survey results indicate many respondents obtain their fish (Table 27) from sources other than supermarkets.

<b>Table 30: Respondents eat or do not eat freshwater species</b>		
<b>Species</b>	<b>Never eat %</b>	<b>Have eaten %</b>
<b>(stated as percentage of 332 respondents)</b>		
pickerel	42	58
northern pike	86	14
lake trout	81	19
catfish	96	4
whitefish	80	20
goldeye	83	17
mullet/sucker	99	1
freshwater drum	97	3
white bass	95	5
yellow perch	90	10
carp	97	3
sturgeon	98	2
tullibee	96	4



The survey results were quite conclusive on the point of the pressures on the pickerel fishery. The commonly held belief that 'Pickerel sells itself' is, if anything, an understatement given the ratio of pickerel (43%) to total freshwater fish eaten.

For all other freshwater species queried, respondents indicated that the vast majority of them (ranging between 77% and 98 %) do not consume any servings of those species (refer to Table 30). These survey results confirm fisheries industry opinion of underutilization of some species of native Manitoban fish.

<b>Table 31: Average annual consumption in servings by various ethnic groups declared by respondents</b>						
<b>Origin</b>	<b>* Number</b>	<b>Pickerel</b>	<b>Pike</b>	<b>Lake trout</b>	<b>Catfish</b>	<b>Whitefish</b>
<b>Canadian</b>	37	37	13	16	6	11
<b>English</b>	26	32	8	6	0	12
<b>Aboriginal</b>	21	40	12	4	0	4
<b>Ukrainian</b>	19	58	8	5	0	3
<b>German</b>	14	18	4	3	3	9
<b>French</b>	10	28	9	13	0	5
<b>Jewish</b>	6	21	0	0	0	21
<b>Filipino</b>	5	37	8	8	0	17
* relates to the numbers of households who declared this ethnicity and does not equal 100% of respondents, selected ethnic groups are presented in this table						

**Single ethnic origins were reported by some segments of surveyed respondents. Ethnic origin appears to be a significant factor in the consumption of certain species. One clear example of an ethnic influence on consumption was Ukrainian consumption of pickerel. Surveyed respondents averaged 58 servings per year. From the results of the survey the total consumption patterns can be seen to vary widely according to ethnicity (Table 31).**

**Ms. Karen Olson has identified Filipino consumers as frequent purchasers (personal communication, November 15, 1994). This observation is borne out by the reported annual consumption average of 604 servings per Filipino household. This is still much higher than the average consumption rate even after adjusting for a higher household size (one Filipino family had 6 members). This ethnic group indicated a very frequent rate of overall fish consumption.**

**Cross-tabulating ethnic information with consumption of species revealed interesting results as was seen in Table 31. Although the results are based on low sample sizes one may speculate that there are distinct patterns of preferences between ethnic groups. This variation based on ethnicity was supported in the literature and also by qualitative information supplied by knowledgeable fish retailers.**

**A local market for gefilte fish, a traditional Jewish dish, may be supported by the reported consumption of whitefish and pickerel by Jewish respondents, noting that zero consumption was reported by this ethnic group of any other fish species. Retailer Joe Cantor suggested whitefish could be used in producing a gefilte fish product for local and export sales, instead of exporting the fish which are processed**

**in New York and then imported back into Manitoba as a finished (value-added) product (Cantor, personal communication, November, 1994).**

**Exceptionally high pickerel consumption was found by respondents of Ukrainian descent. Overall consumption patterns cannot be used to infer relationships exist because samples of individual ethnic groups were too low to produce statistically sound results. However, this result may still represent a valid conclusion.**

**Ukrainians are known to consume freshwater fish as part of their cultural food heritage (Barer-Stein, 1980).**

**Positive attitudes towards fish appear to increase with both age and income levels, although these two factors likely are interconnected to some degree.**

**The single most conclusive result with respect to attitudes of fish consumers is the perception that it is a healthy source of protein (92%) and a healthy meal (96%). This may lead to the identification of potential market niches in the 'health conscious' segment of the general populace. The generally positive attitudes towards fish should be interpreted with some caution due to the potential bias of response by households who do like fish and who may have been more apt to participate in the survey.**

**It must be noted that the attitudes of respondents who never eat fish (who did not participate in the attitude queries) are not included in these responses so, in actuality, these positive attitudes towards fish consumption are suspected to be somewhat overreported. However, the reasons respondents who never eat fish probably vary and the maximum effect they could impose on any given attitude is 53/385 or 14 percent.**

**The source from which the majority of respondents obtain their fish is from the supermarket (84%) with fishing for self or getting fish from friends who fish the next most common source (43% and 41% respectively) as shown in Table 26. Specialty stores were used by 29 percent of respondents. This pattern of procurement does not lend itself well to marketing efforts unless the supermarkets will carry the underutilized species or consumers can be convinced to access other sources.**

**The fish purchased from supermarkets includes canned fish, which 74 percent of respondents purchase, ocean product and shellfish.**

**There appears to be an ethnic market for underutilized species in specialty stores, however the overriding factors are the freshness of the fish or the price, depending on the ethnic background of the purchaser (Karen Olson, personal communication, November 15, 1994).**

**Purchases from commercial fishermen were reported by 25 percent of respondents. The reported acquisitions from commercial fishermen do not support large scale direct sales, however fish distributors interviewed all expressed concern and alleged knowledge that bootlegging of fish has been problematic. The survey did not reveal any significant 'door-to-door' sales. Retailers have suggested that bootlegging activities may be directed toward larger scale operations such as fish distributors and local restaurants.**

**The results from the MDNR (1994) survey and this survey are comparable in total estimated fish consumption by Winnipeg residents and in indicating the underutilization of some species. The fish consumption surveys differed mainly in**

**that the MDNR survey queried familiarity with Manitoban species, while this study queried specific consumption of Manitoban, including underutilized, species.**

**The total freshwater fish consumption was calculated from the survey on a household basis. Converted to per capita figures after generalizing consumption to Winnipeg, 6 kilograms per capita was consumed in 1994, using edible portion. This represents a large contrast to Statistics Canada reported annual freshwater fish per capita consumption of a mere 190 grams. Statistics Canada reports are based on Canadian consumption as a whole and at the retail level (which does not account for wastage).**

#### **4.6 Implications to natural resource fisheries management**

**Freshwater fisheries such as those in Manitoba may be subjected to increasing pressures on a global scale over time if marine resources continue to be depleted. The global fisheries are fraught with common access property dilemmas and the world's population is increasing which would tend to suggest that protein shortages may occur if present trends continue. Development or exploitation of freshwater fisheries could result with significant increases in commercial (export) markets for freshwater fish (Green and Derksen, 1984), noting these fisheries are also common access properties.**

**This trend of marine stock depletion is compounded with high localized pressure on one species from local fisheries, the pickerel. At a local retailer the popularity of pickerel was evident; with pickerel and mullet both in-store 'special priced', pickerel at \$8.00 per kilogram was recently sold in competition with mullet at \$0.50**

**per kilogram. Harvesting for pickerel, or any other desired species, can result in high levels of bycatch of unwanted species which are routinely culled by disposing of dead or damaged fish stocks. Not only is the unwanted species not harvested for use, it is often intentionally destroyed by disposal on shore. Some fish resources are underutilized and also wasted.**

**FFMC acts as a fish marketing board for Manitoba fish harvesters. FFMC does not regulate production directly, yet has the ability to stimulate production of desired species by setting higher initial payments for certain species. Fishers will logically act in their own best interests by fishing the species which bring the best return on capital investment and fishing effort.**

**The ratio of FFMC export sales to domestic sales, currently about 84 percent to 16 percent as seen in the literature review, would suggest that expenditures are probably directed to foreign, rather than domestic, marketing efforts. This ratio also underscores the importance of export markets to Manitoba's commercial freshwater fish industry. However it is possible that significant local market potential may be overlooked given Winnipeg residents' apparent appetite for freshwater fish as indicated in these research project results.**

**The MDNR is responsible for commercial aspects of management of Manitoba's fisheries resources, including licensing and allocation to users. Jointly with the federal government, MDNR is required to manage provincial fish resources sustainably.**

**The dilemma ensues as these three distinctly different parties seek to achieve potentially divergent goals; the fisher to harvest in a manner that maximizes return,**

**FFMC to meet largely export market demands yet providing greater returns to fishers and MDNR to manage the commercial fisheries aspects, balancing development and use with the sustainability of the same common access property resource. One example of the recognition of the need to work cooperatively was the formation of the Intraprovincial Fish Marketing Strategy Committee.**

**Promotional activities and related expenses are usually required to generate more benefits than costs in order to be justified in the eyes of the party who is paying. Fish consumption has not been particularly promoted, with some past exceptions. Cooperative effort and understanding must continue between harvester, marketer and manager if fish resources are to be managed in a way that maintains them for future generations as well as allowing for current utilization.**

## **CHAPTER 5**

### **SUMMARY, CONCLUSIONS, RECOMMENDATIONS**

#### **5.1 Summary**

**The purpose of this research project was to analyze various aspects relating to the consumption of fish by Winnipeg residents. There was an identified need to develop quantified estimates of fish consumption by Winnipeg residents - in total for all kinds of fish, by species of freshwater fish, and by the form of fish consumed.**

**It was essential that relevant factors affecting Winnipeg consumers' fish purchasing behaviour be determined. Establishing the sources of fish procurement by these residents was necessary as well. Demographic information about Winnipeg consumers of fish was needed in order to analyze data and to provide meaningful recommendations to MDNR. This information related to the identification of niche markets for fish.**

**The research project was conducted in the summer of 1994. It included a telephone survey of randomly selected Winnipeg households. Reviewing the literature, interviewing fisheries industry people, coding and entering data into a database, and writing several computer programs all aided in the analysis of data gathered.**



## **5.2     Conclusions**

### **Consumption**

**Annual *total* fish consumption by surveyed respondents in 1994 was generalized to Winnipeg at 5.8 million kilograms for all fish, based on general recall of “*How often do you eat fish?*”.**

**Recall of servings of species of freshwater fish, ocean fish, and shellfish meals taken ‘at home’ was used to estimate consumption, generalized to Winnipeg at 7.3 million kilograms of fish. Combined with similarly recalled ‘away from home’ meals, the second measure of *total* fish consumption was generalized to Winnipeg at 9.2 million kilograms. The range of these figures, 5.8 to 9.2 million kilograms for total fish consumption, straddles MDNR survey results reported (1994a) of 7.9 million kilograms of total fish Winnipeg consumption for that year.**

**Freshwater species annual consumption, calculation of which was based on recalled servings for 13 selected *species*, was generalized to Winnipeg at 3.8 million kilograms for freshwater fish.**

**On a *per capita basis*, surveyed Winnipeg residents consumed between 9 and 15 kg of fish (between 20 and 35 lb..) based on two separate calculations of total fish consumption in 1994.**

**Of this amount 6 kilograms (13 lb.) was freshwater fish. At 43 percent of all fish consumed, surveyed Winnipeg resident freshwater fish consumption was 32 times higher than the 0.19 kilograms reported by Statistics Canada for an average Canadian, yet very similar to the 4 kilograms per capita by Winnipeg residents as**

reported by MDNR (1994a). Results are summarized in Table 32 to highlight the comparison of research projects results to other works.

Table 32: Comparison of reported results of per capita fish consumption by Winnipeg residents with other published per capita data (presented in kilograms of per capita consumption)			
Winnipeg residents *			Canadian **
	Research project	MDNR (1994a)	Statistics Canada
Total fish	9-15	12.6	8.44
Freshwater fish	6	4	0.19
* at the household level, edible portion ** at the retail level, edible weight			

Total form of fish consumption over the preceding month was queried. Those forms included were fresh, frozen, smoked, canned or other forms of fish. The research project found fish was consumed by surveyed Winnipeg residents most often in fresh (33%) or frozen form (33%), or in canned form (25%). Smoked or other forms of fish combined represented only 10 percent of form consumed.

### **Factors affecting fish consumption**

**Relevant factors affecting Winnipeg consumers' fish purchasing behaviour were found to be present in ethnic influences, attitudes toward fish, and the geographic location within Winnipeg of the respondent's home.**

**Existence of cultural diversity in Winnipeg was found in this research project to reveal potential niche marketing opportunities. The identification of ethnic variation in consumption patterns in this research project had some limits, but also had merit by virtue of corroborating qualitative and quantitative information sources. The research project concludes that ethnic influences are apparent in the choice of freshwater fish species to be consumed.**

**Positive attitudes towards fish as a health consideration also influenced the consumption of fish. The research project found that of fish eating respondents, 96 percent thought fish was a healthy meal, 92 percent thought fish to be a healthy source of protein and 87 percent thought fish to be a low fat meal. The research project concludes that health concerns affect the level of fish consumption. This group of consumers was concluded to represent another potential niche market.**

**Consumption by freshwater fish species was found to be variable with the district in which the respondent resided. Interestingly enough, total fish consumption was not reported by surveyed respondents to vary greatly as a result of season, cost, or availability. One reason particular species of fish might not be eaten is because that species may not be available, in spite of the results which indicate total fish consumption does not vary.**

### **Source of fish procurement**

**A majority of respondents, 84 percent, indicated they purchased fish from the supermarket. The next most common source was 43 percent who fished for their own consumption and 41 percent who received fish from friends who fish. Specialty fish stores provided 29 percent of fish and commercial fishers were reported as the source of fish procurement for 25 percent of respondents.**

### **Other conclusions**

**During data analysis interesting patterns were isolated related to the consumption of particular freshwater fish species. Pickerel were found to be consumed more than three times as frequently as the next most often consumed freshwater fish. This also meant pickerel represented nearly 21 percent of total fish consumption. Generalized to Winnipeg this would represent 1.6 million kilograms of pickerel consumption in 1994.**

**Other than pickerel, freshwater species appeared to be underutilized by surveyed Winnipeg residents.**

**These research project conclusions suggest there may be implications for management and marketing of fish species, above and beyond identification of potential niche markets.**

### **5.3     Recommendations**

- 1.     MDNR should monitor fish consumption and market trends through the use of continuing research and relate these results to Manitoba fisheries resource management issues.**
- 2.     MDNR should continue to inform the public about specific fish species use and their consumption, working cooperatively with other organizations in promoting the efficient utilization of domestically produced fish.**
- 3.     Manitoba commercial fishermen associations should consider results of this research project as advice in the development of local markets for underutilized fish with potential for increased returns to fishers.**
- 4.     FFMC should consider results of this research project as advice on the importance of Winnipeg as a market, with particular opportunities for niche marketing of underutilized species.**

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**Bazylewski, Brenda; Marketing and Public Relations Coordinator, Manitoba Egg Producers, Winnipeg, Manitoba, February 3, 1999**

**Cantor, Joe; Entrepreneur, Cantor's Grocery Co. Ltd., Winnipeg, Manitoba, April and November 1994**

**Dysart, William; member of South Indian Lake Fisherman's Association, Winnipeg, Manitoba, April 21, 1994**

**Hay, Rick; member of South Indian Lake Fisherman's Association, Winnipeg, Manitoba, April 21, 1994**

**Henley, Prof. Thomas; Associate Professor, Natural Resources Institute, University of Manitoba, Winnipeg, Manitoba, November 1998, January 1999, February 1999**

**Jacobson, Elaine; Service Representative, Manitoba Telephone System, Winnipeg, Manitoba, February 2, 1999**

**MacPherson, Dr. Eric; Dean Emeritus, Faculty of Education, University of Manitoba, Winnipeg, Manitoba, August 3, 1994, September 13, 1994**

**Mallon, Jerry; Vice-President Sales, Freshwater Fish Marketing Corporation, Winnipeg, Manitoba, February 1999**

**Olson, Karen; Entrepreneur, Gimli Fish Market, Winnipeg, Manitoba, April, 1994 November 15, 1994, February 1999, March 1999**

**Scaife, Barb; Bioeconomist, Manitoba Department of Natural Resources, Fisheries Branch, April 21, 1994, June 1994, December 3, 1998, January 1999, February 1999**

**Wall, Carl; Urban Angler Program Manager, Manitoba Department of Natural Resources, Fisheries Branch, Winnipeg, Manitoba, February 1999, March 1999**

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## Appendix 1: Selected species of native Manitoba freshwater fish

Fish fauna	Latin name	Common name(s)
<b>Piscivores:</b>		
Walleye	<i>Stizostedion vitreum</i> (Mitchell)	pickerel, pike-perch
Sauger	<i>Stizostedion canadense</i>	sand pickerel
Northern pike	<i>Esox lucius</i> Linnaeus	jackfish, pike
Lake cisco	<i>Coregonus artedii</i>	tullibee
Lake trout	<i>Salvelinus namaycush</i>	salmon trout, trout
Lake whitefish	<i>Coregonus clupeaformis</i> (Mitchill)	whitefish
Goldeye	<i>Hiodon alosoides</i> (Rafinesque)	
White sucker	<i>Catostomus commersoni</i>	mullet
Freshwater drum	<i>Aplodinotus grunniens</i> Rafinesque	silver bass, sunfish, drum, sheepshead, gray bass, white perch
White bass	<i>Morone chrysops</i>	
Yellow perch	<i>Perca flavescens</i> (Mitchill)	perch
Carp	<i>Cyprinus carpio</i>	
Lake sturgeon	<i>Acipenser fulvescens</i> Rafinesque	freshwater sturgeon
Channel catfish	<i>Ictalurus punctatus</i> (Rafinesque)	catfish
Burbot	<i>Lota lota</i> (Linnaeus)	maria, freshwater cod, ling
Trout perch	<i>Percopsis omiscomaycus</i> (Walbaum)	silver chub
Smallmouth bass	<i>Micropterus dolomieu</i> Lacepede	black bass, brown bass
Largemouth bass	<i>Micropterus salmoides</i> (Lacepede)	black bass, green bass

Source: Adapted from Freshwater Fishes of Canada, Scott and Crossman, 1979

## **Appendix 2: Marketing Board Six-part Program**

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### **Egg Marketing Board Six-part Program components:**

- 1. Multi-media advertising, including a website,**
  - 2. Promotional aids, such as recipe booklets, 'ad bag' inclusions, and information booths at malls and fairs,**
  - 3. Educational development, such as school resource materials, videos and children's activity booklets,**
  - 4. Nutritional information, provided to health professionals (dietitians, doctors, home economists, aerobics teachers or anyone in a counseling role of guiding public nutrition),**
  - 5. Public relations, to foster positive attitudes about the producers, the (egg marketing) organization, and the product, including 'logo marketing' goods,**
  - 6. Research evaluation, such as participation in Omnibus surveys.**
-

## Appendix 3: Catfish advertisement

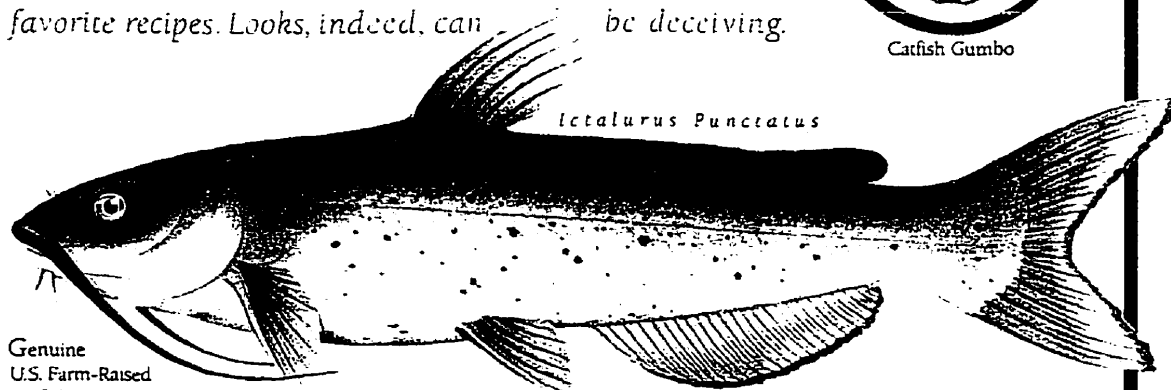
# BEAUTY

is in the

# TASTE BUDS

of the beholder.

Rarely does the *Genuine U.S. Farm-Raised Catfish* inspire such poetic words as lovely, elegant or graceful. But, beyond its rather non-exquisite exterior, lies its true beauty. A superbly delicate taste, infinitely versatile in any of your favorite recipes. Looks, indeed, can be deceiving.



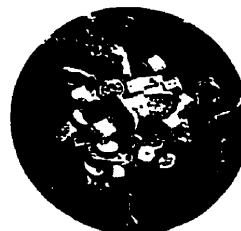
Genuine  
U.S. Farm-Raised  
Catfish. Its beauty is in the taste.

Even if you caught your own fish, it wouldn't taste better than ours. Genuine U.S. Farm-Raised Catfish are raised in only the freshest, purest well water and fed a gourmet diet of natural grains and proteins.

Only Catfish of superior quality, freshness and taste will earn this seal from The Catfish Institute.



Classic Fried Catfish



Catfish Antipasto



Catfish Gumbo

If you'd like to sample some great Catfish dishes, write for our recipe book.

NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

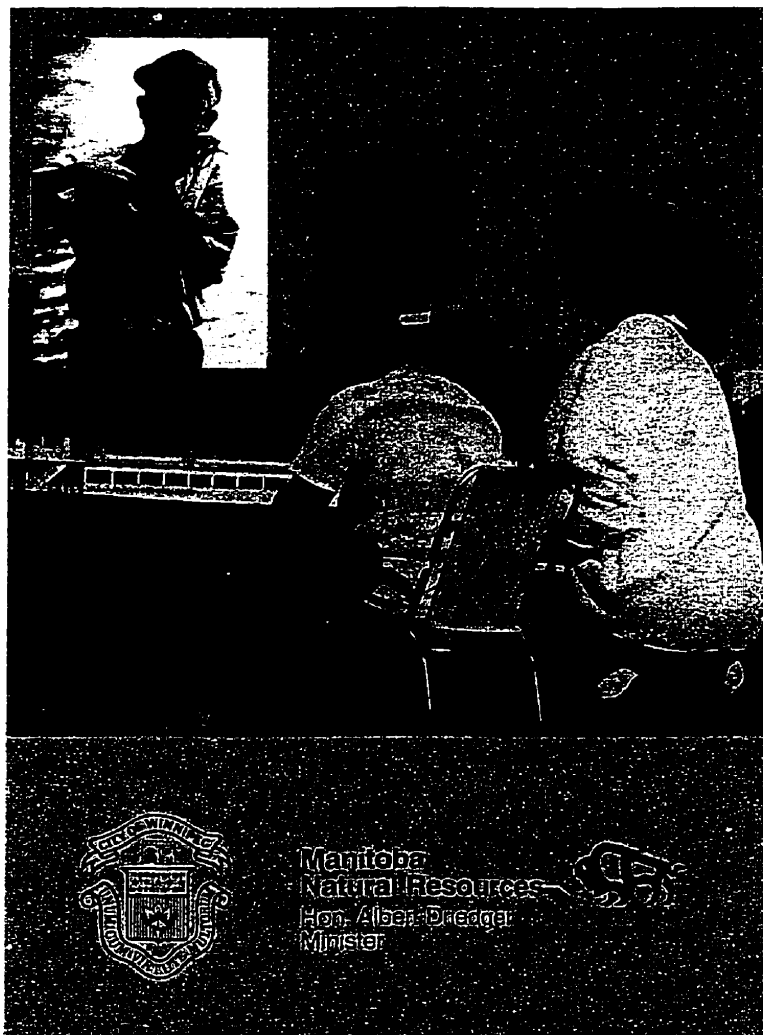
CITY \_\_\_\_\_

STATE \_\_\_\_\_

ZIP \_\_\_\_\_

Send a check or money order for \$3.00 to  
The Catfish Institute  
Box 327BHG  
Belzoni, MS 39038

# Get Hooked On FISHING IN WINNIPEG



## **Appendix 5: Omega-3 polyunsaturated fatty acids benefits**

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### **Benefits of regularly consuming rich-fleshed fish containing omega-3 polyunsaturated fatty acids**

- **less chance of developing heart disease**
- **ensures the proper development brain, nervous tissue and eyes of fetus during pregnancy**
- **may extend life, even if heart disease already present**
- **lowers blood pressure**
- **lowers risk of heart attack,  
even with current heart disease present**
- **may improve kidney function in severe diabetes**
- **may improve certain inflammatory conditions**
- **preserves healthy skin**

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**Source:        Adapted from Nettleton article, National Fisheries Institute, 1999a**

---

**LET'S GO  
FISHING!!**

*At The*

**SPEARFISH TROUT FARM**

*The Home of*  
**Black Hills Rainbow Trout®**



**Everything  
Furnished!!**

**No  
License  
Required!**

**605-642  
FISH  
(3474)**

Pool located  
3 miles from  
Downtown  
Spearfish, South  
Dakota

## **Appendix 7: Constraints on Study**

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### **Client imposed constraints**

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- **specification of research objectives**
  - **survey instrument not a mail survey**
  - **limits to funding available**
  - **restricted hours of access for telephones and office facilities**
  - **deadline for Final Report December 1, 1994**
- 

### **Constraints imposed by Fish Futures Inc**

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- **interviewing personnel available on certain conditions:**
  - **employ personnel by July 8, 1994**
  - **employment minimum of 4 weeks**
  - **exposure to aspects of fisheries**
  - **exposure to varied aspects of employment experiences**
  - **responsible for training and supervision of personnel**
  - **evaluation of personnel at end of employment**
-



## Appendix 8: Survey Questionnaire

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Survey    ☐    Pretest    ☐    Training    ☐

Phone number \_\_\_\_\_

Interviewer name \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_

( Read the questions to respondents EXACTLY AS WRITTEN. Prompts, et cetera are in parentheses for your reference. If you are unsure of how to proceed or if you encounter a problem please advise a supervisor. Thank you. )

( CONSUMPTION QUESTIONS )

1.a. About how often is fish served in your household, on the average ?

☐ .....daily

☐ .....more than once a week

☐ .....once a week

☐ .....twice a month

☐ .....once a month

☐ .....other (# times) \_\_\_\_\_ (per) \_\_\_\_\_ (timeframe)

( If they hesitate, you can prompt with questions like " Would you say you eat fish at home about once a week ? "; if a response is unclear, you can confirm it by asking a question such as " So that means you eat fish at home about twice a month ? " )

1.b. About how many servings of fish would be eaten in an average meal at your home?

---

2. How often do you buy/get fish to eat at home, in the following forms ?

	Never	Sometimes	Often
a. Fresh fish	[ ]		
		( more often than once in 6 months )	( more often than once a month )
whole (head, guts)...	[ ]	[ ]	[ ]
fillet.....	[ ]	[ ]	[ ]
dressed (gutted)....	[ ]	[ ]	[ ]
boneless.....	[ ]	[ ]	[ ]

	Never	Sometimes	Often
b. Frozen fish	[ ]		
		( more often than once in 6 months )	( more often than once a month )
whole (head, guts)...	[ ]	[ ]	[ ]
fillet.....	[ ]	[ ]	[ ]
dressed (gutted)....	[ ]	[ ]	[ ]
boneless.....	[ ]	[ ]	[ ]
breaded.....	[ ]	[ ]	[ ]

	Never	Sometimes	Often
		( more often than once in 6 months )	( more often than once a month )
c. Smoked fish.....	[ ]	[ ]	[ ]
d. Canned fish.....	[ ]	[ ]	[ ]
e. Other form.....	[ ]	[ ]	[ ]

( Record any forms of fish which are mentioned that are not listed  
example: minced )

3. When you eat fish at home, would that be by 1 person, 2 people or about how many ?

( Record answer, expect answer to perhaps be something like " 3 of 5 in the family eat fish at home" )

---

4. Is anyone in your family a vegetarian ?

No..... [ ] ( go to question 6 )

Yes..... [ ] ( go to question 5 )

5. Does that mean they don't eat fish ?

No..... [ ]

Yes..... [ ]

(If yes) How many family members don't eat fish ?

---

6. Thinking back over an average month, about how many individual servings of fish are eaten at home by members in your household ?

( Check the most appropriate box. If they ask, say that a meal for one person equals one serving. Record other answers given in margins)

	Never	1-6	7-10	1 or more
	(	servings	per	month )
a. Freshwater fish	[ ]			
Pickerel,				
Walleye or Sauger.	[ ]	[ ]	[ ]	[ ]
Pike or Jackfish....	[ ]	[ ]	[ ]	[ ]
Lake trout.....	[ ]	[ ]	[ ]	[ ]
Catfish.....	[ ]	[ ]	[ ]	[ ]
Whitefish.....	[ ]	[ ]	[ ]	[ ]

Can you think of any other varieties of freshwater fish you have eaten ?

(Pause for 1-2 seconds to let them offer a response, if none say...)

Like...

	Never (	1-6 servings	7-10 per	11 or more month )
Goldeye.....	[ ]	[ ]	[ ]	[ ]
Mullet or Sucker.....	[ ]	[ ]	[ ]	[ ]
Freshwater drum				
Silver bass or Sunfish.	[ ]	[ ]	[ ]	[ ]
White bass.....	[ ]	[ ]	[ ]	[ ]
Yellow perch.....	[ ]	[ ]	[ ]	[ ]
Carp.....	[ ]	[ ]	[ ]	[ ]
Sturgeon.....	[ ]	[ ]	[ ]	[ ]
Tullibee.....	[ ]	[ ]	[ ]	[ ]

6. b. How often do you serve ... ( still eaten at home and still how many servings per month)

	Never (	1-6 servings	7-10 per	11 or more month )
Ocean fish.....	[ ]	[ ]	[ ]	[ ]
example tuna, salmon				
cod , sole, smelts, etc				
Shellfish.....	[ ]	[ ]	[ ]	[ ]
example lobster,				
shrimp, scallops,				
clams, oysters, etc				

7. Going back to freshwater fish, do you use any in the preparation of ethnic dishes ?

No..... [ ] ( go to question 8 )

Don't know..... [ ] ( go to question 8 )

Yes..... [ ]

( If yes,... )

What kind of dishes or what dish ?

---

About how often ?

---

( It is important to record ethnic origin if mentioned, for example "Italian" or if a religious reason, example "Hanaka" )

---

Is that a favorite dish in your household or is there some other reason ? ( note mention of religious or ethnic reasons )

---

8. Does the amount of fish eaten at home by your family vary with the season ?

Yes..... [ ] ( If so, go to question 9 )  
No..... [ ] ( If so, go to question 10 )  
Don't know..... [ ] ( If so, go to question 10 )

9. If the amount of fish eaten varies according to season, is it because ... ?

	Yes	No	Don't know
The cost varies.....	[ ]	[ ]	[ ]
The availability varies...	[ ]	[ ]	[ ]
Seasonal dishes are prepared....	[ ]	[ ]	[ ]
Other reason ( record below )			
_____	[ ]	[ ]	[ ]

10. Do you eat fish prepared in restaurants ?

No..... [ ] ( prompt as below, if answer still no,  
go to purchase question section )

Yes..... [ ]

About how often ?

( Record if not match as prompted below, they may say  
"once a month", "once a week", "twice a year",  
...whatever )

---

( Perhaps prompt with ... "Do you eat ..." )

	Never	1-6	7-10	11 or more
	( servings per month )			
Fish burgers.....	[ ]	[ ]	[ ]	[ ]
Fish 'n' chips.....	[ ]	[ ]	[ ]	[ ]
Fish as a main course....	[ ]	[ ]	[ ]	[ ]

( go to PURCHASE questions per following page )



( PURCHASE QUESTIONS )

1. Now I would like to read some statements which other people have made about eating fish. For each one please tell me how much you agree or disagree. ( Check only one box per statement )

( DO not read these possible answers to the respondents ! )

( Strongly agree = SA; Agree = A;  
Disagree = D; Strongly disagree = SD;  
Don't know = DK DO NOT PROMPT, try to match their response )

	SA	A	D	SD	DK
I like the taste of fish.....	[ ]	[ ]	[ ]	[ ]	[ ]
I do not find fish a filling meal.....	[ ]	[ ]	[ ]	[ ]	[ ]
I think that fish is a healthy meal.....	[ ]	[ ]	[ ]	[ ]	[ ]
I worry about the quality of fish.....	[ ]	[ ]	[ ]	[ ]	[ ]
I prefer fish that are conveniently packaged.	[ ]	[ ]	[ ]	[ ]	[ ]
I find freshwater fish too expensive to buy..	[ ]	[ ]	[ ]	[ ]	[ ]
I prefer to eat freshwater fish.....	[ ]	[ ]	[ ]	[ ]	[ ]
I find freshwater fish are too inconvenient to prepare....	[ ]	[ ]	[ ]	[ ]	[ ]
I don't know how to prepare freshwater fish..	[ ]	[ ]	[ ]	[ ]	[ ]
I find storage of freshwater fish to be a problem.....	[ ]	[ ]	[ ]	[ ]	[ ]
I am not very familiar with freshwater fish..	[ ]	[ ]	[ ]	[ ]	[ ]

( Pause for a second while turning page... )

( PURCHASES )

1. ( continued )

And I have another set of statements, please continue to say how much you agree or disagree with the statements.

( still see how much they agree or disagree )

	SA	A	D	SD	DK
I am eating more fish than I used to.....	[ ]	[ ]	[ ]	[ ]	[ ]
I think fish is a healthy source of protein..	[ ]	[ ]	[ ]	[ ]	[ ]
I prefer fish that don't cost too much.....	[ ]	[ ]	[ ]	[ ]	[ ]
I prefer the convenience of prepared fish products.....	[ ]	[ ]	[ ]	[ ]	[ ]
I like to choose the size or form of fish I want.....	[ ]	[ ]	[ ]	[ ]	[ ]

( DO NOT let respondent name brand names;

Say we are not specifically interested in brand names )

I like particular brands of fish product.....	[ ]	[ ]	[ ]	[ ]	[ ]
I trust the quality of some brand names of fish products.....	[ ]	[ ]	[ ]	[ ]	[ ]
I think that fish is a low fat meal.....	[ ]	[ ]	[ ]	[ ]	[ ]

( go to PROCUREMENT questions per following page )

( PROCUREMENT QUESTIONS )

1. Where do you get your freshwater fish ?

( Do not read the possible responses to the respondent; just match their response to the best match )

	Never	Sometimes	Regularly
Do you sport fish for yourself.....[ ]	[ ]		[ ]
Do you get fish from friends who sport fish..[ ]	[ ]		[ ]
Do you buy fish from a specialty store.....[ ]	[ ]		[ ]
Do you buy fish from the supermarket.....[ ]	[ ]		[ ]
Do you buy fish from a general store.....[ ]	[ ]		[ ]
Do you buy fish directly from a commercial fisherman.....[ ]	[ ]		[ ]
Do you buy fish from roadside vendors/truck..[ ]	[ ]		[ ]
Do you buy fish from someone selling door to door.....[ ]	[ ]		[ ]

Other sources ?

---

( Go to DEMOGRAPHIC QUESTIONS section  
per Demographic Information form )

## Appendix 9: Demographic information survey questionnaire

---

Phone number _____	
Interviewer name _____	
Date _____	Time _____

The following questions request general information about your household. Your answers will help us understand how Winnipeggers differ. You may decide not to answer some of these questions, but please remember that your replies will be kept strictly confidential.

1. Are you ...?    Male..... [   ]  
                             Female..... [   ]

2. What is the language most often spoken in your home ?

English..... [   ]

French..... [   ]

More than one..... [   ] ( if so, enter details )

1. \_\_\_\_\_

2. \_\_\_\_\_

3. \_\_\_\_\_

Other..... [   ] (question as below)

What is the language most often spoken in  
your home? \_\_\_\_\_

3. In what age category are you ?

16-17..... [   ]

18-24..... [   ]

25-34..... [ ]  
35-44..... [ ]  
  
45-54..... [ ]  
55-64..... [ ]  
  
65 or more..... [ ]

4. What best describes your highest level of education ?

less than high school... [ ]  
high school..... [ ]  
college or  
technical school... [ ]  
university..... [ ]

*(Examples: Hertzog, Red River Community College, etc)*

5. Which of the following best describes your household ?

couple with children.... [ ] ( go to question 7 )  
couple with no children. [ ] ( go to question 8 )  
  
single parent family.... [ ] ( go to question 7 )  
single adult..... [ ] ( go to question 8 )

more than 1  
unrelated adult.... [ ] ( go to question 6 )  
other..... [ ] ( enter details below,  
including # of adults and children in the household)

\_\_\_\_\_  
\_\_\_\_\_ ( go to question 8 )

6. How many adults ? \_\_\_\_\_

7. How many children ? \_\_\_\_\_

( NOTE: For questions 8 through 12; if respondent seems annoyed in any way, assure them they are not required to answer, it's no big deal, etc . The information is simply background data for the researcher.)

8. Are you now or have you ever been a landed immigrant to Canada ?

No..... [ ] ( go to question 10 )

Yes..... [ ] ( go to question 9 )

Don't know..... [ ] ( go to question 10 )

( If respondent seems annoyed, go to question 10 )

9. ( If not Canadian by birth ) From what country did you emigrate ?

---

10. Do you mind telling me the ethnic origin of your family ?

Don't know which ethnic origin... [ ] (go to question 11)

Yes ... [ ] ( i.e. if objects to saying go to question 11 )

No ... [ ] ( i.e. doesn't mind saying, ask as below... )

( or check box below )

Which ethnic origin ?

[ ] Canadian

[ ] English

[ ] French

[ ] Ukrainian

[ ] German

[ ] Filipino

[ ] Russian

11. Do you mind telling me the religious background of your family?

Don't know what religious origin [ ] ( go to question 12)

Yes ... [ ] ( i.e. if objects to saying go to question 12 )

No .... [ ] ( i.e. if doesn't mind saying, ask as below... )

Which religious background ?

( or check box below )

[ ] Protestant

[ ] Catholic

[ ] Jewish

12. ( DO NOT ask if they have refused to answer # 10 and # 11 questions already; instead go to question 13 )

Do you mind telling me any Aboriginal descent of your family?

Don't know if of Aboriginal descent..[ ] (go to # 13)

Yes ...[ ] ( i.e. if objects go to question 13 )

No ....[ ] ( i.e. if no objection, ask as below...)

Would that be... ?

Status Indian..... [ ]

Non-status Indian..... [ ]

Metis..... [ ]

Other..... [ ]

Not Aboriginal..... [ ]

13. We are not making a mailing list, but we want to be able to sort the responses by area of the City, so we would like to get your postal code. Can you please tell me what it is ?

[R][ ][ ] [ ][ ][ ] ( go to question 15 )

Don't know.....[ ] ( go to question 14 )

14. ( If they don't know their postal code ) Would you mind telling me your street address so that I can look up your postal code ?

---

( If they object, go to question 15)

15. And the last question, what range of income best describes your annual family income ...?

Less than \$10,000..... [ ]  
> \$ 10,000 but < \$ 20,000..... [ ]  
  
> \$ 20,000 but < \$ 30,000..... [ ]  
> \$ 30,000 but < \$ 40,000..... [ ]  
  
> \$ 40,000 but < \$ 50,000..... [ ]  
> \$ 50,000 but < \$ 60,000..... [ ]  
  
> \$ 60,000..... [ ]  
Don't know..... [ ]  
  
Don't want to answer..... [ ]

Well, that's it. Thank you very much for your time and co-operation. If you have any final questions or comments I can jot them down now.

( Record comments, questions, etc here; be brief )

---

---

( NOTE: It's OK to agree to send them the results of the survey if they ask- if they do desire the results they need to send a S.A.S.E.-self addressed stamped envelope-including their full mailing address and name to:

Penny Larish  
Natural Resources Institute  
University of Manitoba  
Winnipeg, Manitoba  
R3T 2N2

Advise them the survey results will not be available until the late fall of 1994 )

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## **Appendix 10: Inclusion Criteria**

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**Inclusion criteria were as follows:**

- 1. Telephone number listed in MTS directory listing**
  - 2. Telephone number in service**
  - 3. Telephone number not a business listing, must be a residential service**
  - 4. Telephone number not listed as a 'Children's line'**
  - 5. Respondent must communicate in English**
  - 6. Respondent must be 16 or older and the meal preparer for the household**
  - 7. Respondent must volunteer to participate**
  - 8. If answering machine message in English, a message may be left inviting participation (only at later stages).**
-

## Appendix 11: Completion results of initiated telephone contacts

Completion results of survey		
<b>Ineligible contacts:</b>		
Not a valid number or not in service or ineligible to participate	54	
<b>Respondent not contacted:</b>		
• No answer/busy signal	91	
Respondent not available during interview period	3	
<b>Abandoned survey contacts (end of survey):</b>		
Interviewer inventories	374	
Messages not answered from answering machines	125	
<b>Excluded surveys:</b>		
Pre-test surveys	8	
Training surveys	12	
Demographics only surveys	7	
Interviewer contaminated	3	
Unuseable or terminated during interview	<u>11</u>	
<b><i>Total excluded contacts</i></b>		<b>970</b>
<b>Refusals:</b>		
Refusal to participate stated	428	
Interviewee hung up	<u>157</u>	
<b><i>Total refusals</i></b>		<b>585</b>
<b>Surveys completed:</b>		
Fish eaters	332	
Not eat fish	53	
<b><i>Total surveys</i></b>		<b><u>385</u></b>
<b><i>Total telephone contacts initiated</i></b>		<b><u><u>1658</u></u></b>

## **Appendix 12: Reasons for not participating in survey**

---

**Refusals, other than do not eat fish, for refusing to participant.**

**Other reasons listed on the refusal form were:**

- 1) not interested**
  - 2) not a convenient time**
  - 3) never participate in surveys**
  - 4) won't make any difference**
  - 5) takes too much time**
  - 6) too tired**
  - 7) too busy**
  - 8) don't care about fisheries**
  - 9) other (if not listed above)**
-

### **Appendix 13: Additional duties assigned**

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**Additional duties performed by Research Assistant under the guidance of the researcher included:**

- compilation of daily production records and review of both total and individual performances**
  - review of all completed questionnaires for apparent errors or omissions, illegible writing and other quality control concerns,**
  - random verification with recorded respondent that an interview had been conducted,**
  - handled interviewer queries and referred only complex matters to the researcher,**
  - monitored work breaks,**
  - monitored resource supplies, such as office supplies and questionnaires, and advised of potential problems.**
-

## **HIGHLIGHTS OF SURVEY**

### **An Analysis of Fish Consumption in Winnipeg with Identification of Potential Niche Markets for Freshwater Fish Species Native to Manitoba**

- \* Total annual fish consumption generalized to Winnipeg in 1994 was:**
  - 5.8 million kilograms based on general recall of fish eaten**
  - 9.2 million kilograms based on recall of specific fish meal patterns**
- \* Fish eaten 'at home' by Winnipeg residents was 7.3 million kilograms which translates to 29 kilograms (13 pounds) / household annually**
- \* Per capita annual consumption for total fish consumed far exceeds estimates by Statistics Canada and closely parallels a recent study by MDNR**
  - survey found 9 - 15 kg. per capita consumption for Winnipeggers**
  - MDNR reported 12.6 kg. per capita for Winnipeg residents**
  - Statistics Canada reported 8.44 kg. per capita for Canadians**
- \* An estimate of consumption of fish 'at home' has been generalized to the City of Winnipeg at 7,299,594 kilograms or 3,310,473 pounds annually**
- \* Reported consumption patterns by species emerged as highest for freshwater fish (49%) followed by ocean fish (35%) and shellfish (16%)**
- \* Consumption patterns for thirteen species of freshwater fish were queried with pickerel consumption reported at 333% higher than whitefish, the next most commonly consumed freshwater fish;**
- \* Pickerel represented 43% of all freshwater species consumed**

- \* Nominal consumption was reported for all freshwater species other than pickerel**
- \* Consumption of form of fish was reported as fresh (33%), frozen (33%) and canned (25%); fillets were the most often consumed form of both fresh and frozen fish**
- \* Preparation of ethnic or seasonal dishes was nominally reported**
- \* Fish consumption was not reported to be highly variable**
- \* Attitudes towards fish are generally positive; fish was considered almost unilaterally to be a healthy source of protein; positive attitudes increase with age and income**
- \* Fish were mainly obtained from a supermarket (84%) with sport fishing also a common source of access to fish (over 40%)**
- \* Profiles indicate ethnic influences on fish consumption patterns**
- \* Results of analysis indicate interesting possibilities but many sample sizes are too low for statistical confidence and instead suggest further study areas**

## **Appendix 15: List of IFMSC members (1994)**

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### **Intraprovincial Fish Marketing Strategy Committee and their respective affiliation**

#### **LIST OF MEMBERS OF THE INTRAPROVINCIAL FISH MARKETING STRATEGY COMMITTEE**

<b>Joe O'Connor</b>	<b>DNR, Fisheries Branch</b>
<b>Loretta Clarke</b>	<b>ADM for Northern Affairs</b>
<b>Jeff Polakoff</b>	<b>Northern Affairs</b>
<b>Gord Wakeling</b>	<b>Province of Manitoba</b>
<b>Al Charr</b>	<b>ITT</b>
<b>Vic Hryshko</b>	<b>ITT (retiree)</b>
<b>Archy Gamvrelis</b>	<b>EDB</b>
<b>Gerry Moore</b>	<b>EDB</b>
<b>Peter Smith</b>	<b>FFMC</b>
<b>Dennis Kork</b>	<b>FFMC</b>
<b>Bruce Popko</b>	<b>FFMC</b>
<b>Maurice Blanchard</b>	<b>Chairman of Board, FFMC</b>
<b>Barb Scaife</b>	<b>DNR, Fisheries Branch</b>

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## **Appendix 16: Rationale for 200 gram serving size**

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**Serving in this research paper has defined as a meal as the questionnaire was designed to elicit meal serving information. The rationale in using 200 grams for conversions is as follows:**

**@ 1200 Calorie Eating Plan one would require**

**2 protein rich servings of food of which one serving = 4 oz cooked fish**

**therefore require 8 oz**

**8/16oz divided by 2.205 kg per pound ~ 227 grams**

**@ 1 serving ~ 150 calories or 4 oz fish or 3 oz tuna or salmon**

**need 2-3 servings daily**

**3 oz @ 28.3 grams per oz**

**2 servings =  $6 \times 28.3 = 170$  grams and**

**3 servings =  $9 \times 28.3 = 255$  grams**

**average ~ 213 grams**

**It seems reasonable to use the 200 grams per serving (meaning meal) in querying respondents and in making calculations of consumption.**

---



# Appendix 17: Computer generated data

Variable name	Value generated in SASPRGM	Unit description
HSHDNUM	997	# in household
mean of HSHDNUM	3.096	
TOTADULT	651	adults
TOTKIDS	352	children
TOTHOME1	41,345	home servings
mean of TOTHOME1	135.557	
TOTAWAY1	2,541	meals away
SMOKED	1,027.5	smoked
CANNED	3,218	canned
OTHER	228	other
PICK	11,574	pickerel
PIKE	2,214	jackfish
TROUT	2,796	lake trout
CAT	720	catfish
WHITE	3,474	whitefish
GOLD	2,322	goldeye
MULLET	174	mullet
DRUM	570	drum
BASS	210	white bass
PERCH	762	yellow perch
STURG	1,446	sturgeon
TULLB	258	tullibee
OCEAN	19,620	ocean fish
SHELL	8,754	shellfish
FRESH1	1,119.5	whole
FRESH2	1,715	fillets
FRESH3	539	dressed
FRESH4	899	boneless
FROZEN1	534.5	whole
FROZEN2	1,532.5	fillets
FROZEN3	382	dressed
FROZEN4	670.5	boneless
FROZEN5	1,263.5	breaded
TOTBURG	2,370	fish burgers
TOTFNCHP	5,484	fish n chips
TOTMAIN	6,858	main meal