MARKETS FOR MONTANA COMMERCIAL FISH

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SO YOU WANT TO GO FISHING

The Economics of Marketing Montana Commercial Fish

Preliminary results of current Montana Fish and Game Department research indicate a substantial supply of fish in the state for commercial markets. Some of the major species included in these estimates are goldeye, carp, and buffalofish, and other miscellaneous species, such as suckers, sheepshead, catfish, and bullhead. Harvesting these fish appears to present no unusual difficulties other than ice conditions during the winter months.

In years past, several individuals have attempted to harvest Montana commercial fish but, with few exceptions, have failed in their efforts. If the social and economic costs of such failures are to be minimized and the prospects for a successful Montana fishing industry improved, a considerable amount of information is needed by fishermen, resource managers, and prospective processors and handlers. The purpose of this report is to provide such needed information.

Montana lakes contain a wide variety of both game fish and commercial species. The Montana species considered to have commercial value because of their numbers and consumer demand are carp, buffalofish, and goldeye. Individual members of other species may be included in fish sales, but they are of no economic significance.

Game fish, as defined by Montana law, are "all species of the family Salmonidae (chars, trout, salmon, grayling, and whitefish); all species of the genus stizostedion (sand pike, or sauger, and walleyed pike or yellow pikeperch); all species of the genus esox (northern pike, pickerel and muskellunge); all species of the genus micropeterus (bass); and all species

of the genus polyodon (paddle fish)."[1] Game fish may not be caught or sold by commercial fishermen.

There are almost no restrictions on entrance into Montana commercial fishing. Licenses are free to anyone who has not had a license revoked in another state and has some way of disposing of the fish caught. Nominal fees are charged for the catch: 5 percent of net receipts for goldeye and catfish; $2.00 per ton for carp, white carp, suckers, and sheepshead; and $5.00 per ton for buffalofish. There are no restrictions on the amount that can be caught.

Preliminary estimates of sustained yield possibilities for several commercial species have been made by Montana Fish and Game Department biologists for Fort Peck Reservoir. These estimates are shown in Table 1. Estimates for the smaller impoundments are not available, but experience has shown that Nelson Reservoir can be fished out easily in one season. The same is probably true for Canyon Ferry.

Table 1

ESTIMATED RANGE OF SUSTAINED ANNUAL YIELD FROM FORT PECK RESERVOIR

Species	Minimum (Pounds)	Maximum (Pounds)
Buffalofish	1,250,000	2,500,000
Carp	3,750,000	5,000,000
Goldeye	500,000	1,000,000
Suckers	500,000	500,000
Totals	6,000,000	9,000,000

Source: Montana Fish and Game Department

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[1] Montana Fish and Game Laws, Revised for years 1965-67, State Fish and Game Department, Helena, Montana, p. 34.

State Fish and Game Department records indicate that commercial fishing was begun in Montana in 1954. Several early attempts failed for lack of experience and markets. During 1966 there were two commercial fishing enterprises licensed in Montana. These enterprises did not operate exclusively in Montana, but sometimes moved into North Dakota and Washington when fishing in those states appeared more profitable. In 1967 a third enterprise began operations in the state.

Most of the carp and buffalofish caught were shipped west to California, Idaho and Washington. Most of the goldeye were shipped to buyers in Winnipeg, Canada, where they are smoked and considered a great delicacy, selling at prices from $1.50 per pound to $1.95 per pound at retail and $3.50 per plate and higher in restaurants.

Demand for Edible Fishery Products

Abundant information on the demand for fishery products is presented in many publications of the Bureau of Commercial Fisheries. However, there is so much data covering so many years that a reader may find it difficult to come to useful conclusions from it. In order to make it immediately useful for one interested in Montana fisheries, the Bureau's data was combined with data from other sources, organized, and then examined with Montana conditions in mind.

The demand for fishery products, like most consumer nondurables, is closely related to the level of personal income, the prices of fish and competing products, the size of the population, and consumer tastes and preferences.

Income and Price Effects

Although fish consumption measured in pounds per person per year has remained stable for many years, fluctuating about an average of 10.7 pounds per year as shown in Table 4, income and price do have minor effects upon demand. It is estimated that the income sensitivity of demand for fish is .42. That is, an increase in per capita real income of one percent will result in an increased expenditure on fish products of .42 percent.

Fish in general, along with many other food items, display an inelastic response to changes in price. A moderate price increase of, say, 10 percent in the price of fillets, will not induce a proportionate or more than proportionate decrease in consumer expenditures for the product.

Population

In the absence of substantial changes in consumer tastes or supplies of fish, the evidence suggests that consumption will continue at approximately the same per capita level as at present. According to current population estimates, the 1980 United States demand for edible fish should be in excess of 2.5 billion pounds per year, a 39 percent increase over the 1960 consumption of 1.9 billion pounds.

Consumer Preferences

In a society changing as rapidly as that of the United States, no economic sector is immune to the effects of changing consumer tastes and preferences. Increasing discretionary purchasing power beyond the basic necessities permits the housewife the privilege of choosing more tasty, more attractive, and more easily prepared foods. Not too long ago the

housewife bought fish products packed and shipped unprocessed in ice, or cured or canned. Today processed forms of fishery products such as frozen fillets, fish sticks, portions, and other convenience products have almost replaced the earlier forms.

Fresh fish are those that have not been frozen solid but have been packed in ice for a short period of time (three to four days) to prevent spoiling. The fish can be delivered fresh to a retail store by a fisherman or a wholesaler in just about any form. The form depends on the "keeping" qualities of the particular species of fish. The various ways of preparing fresh fish for market are:

1. In the round. The product goes directly from the producer without going through any form of processing.

2. Dressed or gutted. Entrails removed. Some buffalofish and a very high percentage of the game fish caught in the upper midwest and Canada are shipped in this form.

3. Skinned and dressed. Bullheads are usually shipped in this form, although the form in which they are marketed is very dependent upon the climatic conditions during the season of the year the fish are shipped.

4. Fillets. Head, tail, bones, and entrails removed. There appears to be quite a small market for this form of fresh fish, although it is increasing more every year, due to the fact that most consumers do not want to bother with dressing, skinning, and scaling fish.

5. Fleeced. Head, tail, entrails, and outer skin and scales are removed. Some Montana buffalofish and carp are prepared this way.

Tables 2, 3, and 4 show the changing composition of consumer fish purchases from 1954 to 1964.

The fresh water fishery of the central United States is small, representing only three percent of the total United States catch and four

percent of value in 1965. Its output is also increasingly concentrated in fresh and frozen packaged products as is true of total manufactured fishery products.

The Export Market

The United States is not a major exporter of fisheries products. In contrast to 1964 imports of edible and nonedible fisheries products worth $564 million, our exports were valued at only $64 million. This export figure rose to $69 million in 1965. These exports were principally salmon, shrimp, sardines, and fish oils.

Table 2

FORMS OF DOMESTIC EDIBLE FISHERY PRODUCTS*
PERCENT OF VALUE

Product	1954	1959	1964
Fresh & Frozen	37	44	48
Canned	57	49	46
Cured	6	7	6

Source: Fishery Statistics of the United States, 1954, p. 30; 1959, p. 37; 1964, p. 41.

*Clearly, fresh and frozen fishery products are increasing in importance at the expense of canned products.

Table 3

TYPES OF DOMESTIC EDIBLE FISHERY PRODUCTS*
PERCENT OF VALUE

Product	1954	1959	1964
Fresh and Frozen Fish:			
Not Breaded	62	53	47
Breaded	38	47	53
Fresh and Frozen Shellfish:			
Not Breaded	84	67	71
Breaded	16	33	29

Source: Fishery Statistics of the United States, 1954, p. 30; 1959, p. 37; 1964, p. 41.

*The housewife's desire for convenience foods is shown by the growing importance of breaded, ready-to-cook fishery products.

Table 4

SALES OF FRESHWATER FISHERY EDIBLE MANUFACTURED PRODUCTS
FROM GREAT LAKES AND MISSISSIPPI RIVER AREAS
PERCENT OF VALUE

Product	1954	1959	1964
Fresh and Frozen Packaged	27	55	75
All Other	73	45	25

Source: Fishery Statistics of the United States, 1954, 1959, 1964, United States Department of the Interior, Fish & Wildlife Service, Washington, D.C.

Montana and Regional Demand

Montana, Idaho, Wyoming, Utah, and North and South Dakota constitute a regional market that might be expected to absorb a share of Montana fish.

There are no large fisheries in this region and all these states are distant from supplies of marine fish, suggesting that Montana fish may have some competitive advantage.

As summarized in the previous section, population increases represent the only major cause of increases in total fish demand. The level of personal income, the prices of fish and competing products, and consumer tastes and preferences have little influence in changing per capita consumption, although these determinants have had an effect on the total value spent for fishery products.

Until ten or fifteen years ago, relatively little fish was sold in Montana and other states located in the interior of our country and not close to a large supply of fish. Because of earlier transportation problems, residents of these states had an established food habit of eating less commercially caught fish than the United States average.

It appears that this condition continues today. As part of this research a pilot study to determine consumer fish-eating habits and attitudes toward various species of fish was conducted in Missoula during the summer of of 1968. Although a pilot study of 100 consumers in only one city is not conclusive, it can be suggestive of the probable results of a more thorough study. In this case Missoula residents reported the following frequency of fish consumption:

Table 5

FREQUENCY OF FISH CONSUMPTION

Frequency	Percent Reporting
At Least Once Each Week	19
At Least Twice Each Month	46
At Least Twice Each Year	32
Once a Year or Less	3
	100

These findings can be contrasted to a far more thorough survey of consumer fish buying habits conducted in several major seaport cities. In these cities: ". . . more than nine out of ten homemakers serve fish and seafood to their families. . .about two-thirds of them serve it once, or more times weekly." By contrasting these two studies it appears that families in Missoula, Montana may be eating fish less than one-third as often as families in major seaport cities. It seems that Montanans are not fish eaters.

Montana fish production is small, even when compared to the limited consumption in the region. Data from the Montana Department of Fish and Game would indicate a 1967 catch of 1,275,000 pounds valued at $90,000. This estimate is based upon fish caught between April and September 1967.

The wide fluctuations in the Montana catch shown in Table 6 are explained by the fishing practices in the area. When carp and buffalo-fish are in short supply in the Midwest or on the West Coast, fishermen and buyers move into Montana to meet their needs. When supplies nearer their markets are adequate they stop drawing upon Montana supplies.

Table 6

FISH CAUGHT BY COMMERCIAL FISHERIES IN MONTANA

Year	Quantity (Pounds)	Value
1956	14,000	$ 1,000
1957	41,000	5,000
1958	141,000	10,000
1959	74,000	5,000
1960	21,000	2,000
1961	17,000	1,000
1962	86,000	9,000
1963	268,000	32,000
1964	237,000	16,000
1965	354,000	32,000
1966	692,000	51,000
1967	1,275,000	90,000

Source: Fishery Statistics of the United States, 1956-1967, U.S. Department of the Interior, Fish and Wildlife Service, Bureau of Commercial Fisheries, Washington, D.C., and State Fish and Game Department, Helena, Montana.

In view of the foregoing evidence, the demand for Montana fish for human consumption can be characterized as light and irregular. Fish consumption in the United States is moving in the direction of more completely prepared items made from expensive marine fish and shellfish--frozen breaded fish, fish sticks and shrimp are three examples. Even if Montana fish could be prepared as convenience foods, research discussed below suggests that Montana fish would not be generally acceptable to most housewives in the United States.

Present Marketing Channels

Most inland fisheries are faced with conditions creating risks which are similar to farming. In some cases, such as Montana's Fort Peck Reservoir, prevailing weather conditions and water level management practices will eliminate spawning seasons for years at a time. It is mandatory that the right kind of weather conditions prevail in order to harvest. During the spring, summer, and fall, high winds and rough waters often make it impossible for the fishermen to get on the water with small craft. Large nets of several varieties are difficult to handle in rough water. One study of Great Lakes fishing found that for small, part-time enterprises expenses ranged up to 80 percent of gross sales, not including returns to the labor and capital of the owner-manager. The transportation cost of commercially harvested fish is generally absorbed by the fisherman who harvests the fish. The price that he receives from the buyer is the Chicago or Los Angeles wholesale price less transportation and commission costs. The average cost of shipping to Chicago ranges from 2.5 cents per pound from Iowa to 5.3 cents per pound from Minnesota to 8 cents per pound from Montana. The difference in transportation costs can be attributed to distance from the wholesale market. Nearly all of the fish marketed are moved by motor carrier.

The largest percentage (estimated 70 percent) of the fish from the upper midwest states are shipped to Illinois and Iowa. There are large wholesale fish markets located in these two states (Chicago and Spirit Lake, respectively). The remainder of the fish are shipped to southern states. A large percentage (estimated 35 to 40 percent) of the fish shipped to

southern states is shipped live to be planted in fish ponds for public fishing. Most Montana fish are now shipped west. Montana buffalofish are shipped to the San Francisco Bay area for sale to fish retailers. Some carp and suckers are also sold on the coast. One Montana fisherman has been supplying carp and suckers to a trout farm in Southern Idaho. All goldeye are shipped to Winnipeg. Montana fishermen have found that selling in the Chicago market puts them in direct competition with fishermen located in much nearer midwest states. When they sell on the west coast they are the nearest supplier of these particular species and therefore have a cost advantage.

Chicago Fish Markets

Chicago is considered the major fish marketing city in the United States. Fish price quotations from the Chicago market affect virtually all other major and minor fish markets throughout the country.

A daily fish marketing report is compiled by the Bureau of Commercial Fisheries from data collected from wholesale fish markets in the Chicago area. Unless otherwise noted, the fish prices quoted in this report represent an average price for fish paid by all major fish wholesalers in the Chicago area. Wholesalers often pay a wide range of prices in a given day for the same quality fish. As a result, the price listings that appear in the daily market report may not be representative of any one particular transaction that might have taken place during a day of trading.

The quantity of each particular species of fish marketed in one day is also included in these daily reports, but is not necessarily correct.

Fish wholesalers are not required to report their total daily volume of purchases if they do not choose to do so. This provides wholesalers the opportunity to withhold information from the market in an effort to maintain a false market atmosphere concerning supply of specific species of fish during a given market day or week. It is reported they use this technique as a means of holding the price of fish up when the market becomes flooded.

There are indications that, with some exceptions, the level of business ethics practiced throughout the fish trade is very low. Fishermen report that they are victimized, both in Winnipeg and Chicago, by wholesalers who cheat them on weight, price, or are slow to pay. A marginal fisherman who arrives at the market with a truck load of fresh fish is in no position to bargain effectively with wholesalers. There are reports by fishermen of suckers being sold in urban markets as northern pike and of badly deteriorated fish being sold for fresh.

A significant percentage (estimated 30 percent) of commercial fish that was once channeled through the Chicago wholesale market is now marketed directly to large chain stores. These chain stores have facilities for preparing fish for sale on the retail fresh fish market. This practice of shipping directly to chain stores from small town wholesalers and fishermen seems to be developing as a trend in the fish business. This change has caused the elimination of many of Chicago's wholesale and retail fish firms.

The few wholesale fish firms that are left in the city of Chicago ship most of their fish in and out by truck. Fresh fish arrive at the

plant in various forms. Some are ready for immediate shipment directly to retail markets. Most fish require further processing, such as gutting, scaling, or heading, before they are packed for shipment to a retail market.

Each wholesale firm has cooling facilities for holding fresh fish. When the fish are brought into the plant, they are usually packed in ice and stacked in wooden boxes in a large cooler. After they are processed into a marketable form, they are packed in special boxes for shipping to a retail market outlet.

There are no daily price quotations posted by a fish wholesaler as are found in a grain elevator or a livestock marketing center because no two fishermen may get the same price for their fish (regardless of quality) during a given market day. Wholesalers base their prices paid on the number of pounds of fish offered by the individual fisherman during that particular day, the dependability and regularity of the fisherman throughout the year, demand for the particular species of fish, as well as the quality of fish. The quantity and quality of a particular species that has already reached the market during that particular market day or week is also of major importance.

When climatic conditions are unfavorable for commercial fishing operations in a certain area, the particular species of fish harvested becomes scarce. The price of that species is then bid up. The fact that fresh fish can be stored for only short periods before spoilage eliminates the possibility of building up a reserve supply of fish to take care of periods when supply becomes short.

Local Fish Markets

Not all fish caught in a commercial fishing area reach wholesale markets, such as those existing in Chicago, New York, or St. Louis. A significant percentage of commercially harvested fish is marketed through local retail fish markets.

The volume of fish that each firm handles depends on the original purpose underlying the creation of the market. Some local retail fish markets are organized to market lots of fish that are too small to be shipped to a large wholesale market, such as Chicago or New York. Some are organized to supply tourist trade in an area where a particular species of fish is harvested. Others are organized by individual fishermen and are used as a means of diversifying their business enterprises. These usually operate on a part-time basis. They sell fresh or smoked fish in small backyard markets. There are also a few full-time retailers of fresh fish and fish products. These firms are organized to handle a wide variety of fish and generally do not limit their stock of fresh fish to the particular species caught in their area. They also ship in fish and shellfish from various parts of the United States and Canada. These firms will sometimes have processing facilities to handle those fish that come in to the market directly from the producer.

Interviews with a few of these full-time retailers indicated that the processed forms of fish being demanded today are considerably different from those of five or six years ago. Consumer demand for fish that are not scaled and headed is dropping. Consumers are willing to pay considerably more (per pound) for a fillet even though the fillet may not possess the quality (taste) that fish marketed in the round possess. Montana fishermen reported that all their fish were shipped fresh; carp and suckers in the round, goldeye gutted, and buffalofish either gutted or fleeced. To the best of their

knowledge it was all sold fresh at retail outlets except for carps shipped to trout farmers for use as trout food.

The Winnipeg Market

The wholesale market for goldeye is for the most part located in Winnipeg, Manitoba, Canada. The demand for goldeye in the Winnipeg wholesale market has in the past been largely satisfied by the harvest of the province of Manitoba. Recently the supply area has expanded to various states in the central part of the United States (Table 7). Data on prices paid to fishermen were not available because records of these prices were not kept by the Canadian Department of Fisheries. Information that was available indicated that retail prices on the Winnipeg market ranged from $1.50 to $1.95 per pound.

Table 7

GOLDEYE MARKETED IN WINNIPEG FROM HARVESTS IN THE UNITED STATES AND CANADA, 1961 THROUGH AUGUST, 1967

Province of Origin	1961	1962	1963	1964	1965	1966[a]	1967[b]
				Pounds of Fish			
Alberta	7,900	13,500	6,900	1,400	400	---	---
Manitoba	56,000	43,000	53,000	70,000	132,000	---	---
Ontario	24,000	34,000	20,000	28,000	19,000	---	---
State of Origin							
Minnesota	---	---	3,508	5,540	9,954	4,469	---
North Dakota	---	---	---	---	---	1,100	---
Iowa	---	---	---	---	---	39,870	37,610[b]

Table 7(Continued)

State of Origin	1961	1962	1963	1964	1965	1966[a]	1967[b]
Tennessee	---	---	---	---	---	---	28,190[b]
South Dakota	---	---	---	---	---	---	11,783[b]
Montana	---	---	---	---	---	---	41,213[b]

[a]Canadian catch data were not available for the years 1966 and 1967.
[b]Pounds of fish caught from January 1 to September 1, 1967.

Source: Department of Fisheries, Central Region, Winnipeg, Manitoba, Canada. From Bloufuss, op. cit., p. 7.

The major portion of the goldeye harvest sold in the Winnipeg wholesale market is dressed and needs little processing before it is smoked and sold on the retail market. Each processor-wholesaler of goldeye has specialized customers for his product. Some retail outlets require 9 to 10 ounce smoked goldeyes, whereas others require a much larger finished product (12 or 13 ounces). Prices paid to fishermen on the wholesale market are very dependent on the quality and size of fish that the particular retail outlets are demanding during that particular week or month of the year. The major retail outlets for goldeye are restaurants and railroad dining cars.

In the early 1960's, the supply of goldeye from Canadian sources decreased rapidly. This made it difficult for wholesalers of goldeye to maintain fringe markets and at the same time guarantee supply to major

principal retail markets in the Winnipeg area. During the past two years, however, supply has exceeded the demand for goldeye at current prices. Wholesalers of smoked goldeye have been attempting to expand their retail market outlets because of optimism concerning the future supply of goldeye.

Many Canadians know of smoked goldeye and hold it in high regard as a delicacy, even to the extent that some prefer goldeye, when properly prepared, to steak.[2] Thus there exists a small but ready market that needs only to be exploited.

Information from the Department of National Revenue at Ottawa discloses that either fresh or smoked goldeye can be shipped into Canada subject to a duty of 1/2 cent per pound. Fish are exempt from the sales tax. The only other relevant regulations, as explained in a letter from the Canadian Department of Fisheries, are: ". . .the Canadian Fish Inspection Regulations requires that any fish imported into Canada that are found to be tainted, decomposed or unwholesome shall be disposed of in such a way as to prevent the possibility of the fish being marketed or sold for human consumption. . .also section B.21.025 of the Canadian Food and Drug Regulations states that: 'No person shall sell smoked fish or a smoked fish product packed in a container that has been sealed to exclude air unless it (a) has been heat-processed after sealing at a temperature and for a time

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[2]The most popular way of preparing goldeye, both in restaurants and at home, seems to be according to the following recipe: Wipe fish with damp cloth. Season fish with salt and pepper. Measure thickness of fish. Wrap fish tightly in an envelope of greased aluminum foil. Make double folds in foil and pinch folds to make steam tight. Place package on baking sheet and bake in hot oven (450°F). Allow 10 minutes cooking time for fresh fish and 20 minutes per inch thickness for frozen fish plus additional cooking time for heat to penetrate foil and fish. An extra 5 minutes for fresh fish, 10 minutes for frozen fish is recommended. Department of Fisheries, Canadian Fish Cook Book (Ottawa, Ontario: Queen's Printer, 1964) p. 17.

sufficient to destroy all spores of the species clostridium botulinum; or (b) contains not less than 9 percent salt, as determined by the official method; or (c) is customarily cooked before eating.'"

In addition, it should be noted that no fish may be imported into Canada unless they have been consigned to a Canadian broker. Thus it is not possible to drive a truckload of fish to Winnipeg in the hope of finding a buyer after arrival; arrangements must be made beforehand.

It can be seen that the organized markets for Montana fish species are centered in Chicago, Winnipeg, and major west coast cities. Fishermen selling in these markets are subject not only to fluctuating demand and prices, but also to unethical treatment by middlemen. As a consequence, Montana fishermen have diverted as much as possible of their catch around these markets and direct to retail outlets. Because of legal requirements this diversion does not appear feasible in the case of goldeye shipped into Canada.

Survey of Buyers' Attitudes Toward Montana Fish

Between July 25 and August 13, 1968, fourteen interviews in depth were conducted with freshwater fish buyers in Chicago, Illinois, and Los Angeles, California. Three leading retailers and four important brokers, or wholesalers, were interviewed in each of these cities, which--together with New York--constitute the major freshwater fish markets in the U.S.A. New York was omitted because of its greater distance from Montana, which was felt to limit its potential as a market for Montana fish. The interviews were conducted by a professional interviewer with extensive experience in market research and psycho-social investigations.

Summary of Chief Findings and Impressions

1. Most of the retail and wholesale buyers interviewed in this study purchased a wide variety of fish and seafoods among which freshwater varieties constituted, at most, less than 10 percent of their total volume and probably an even smaller percentage of their total profits. They displayed a commensurate low degree of interest in, and knowledge about, the subject of freshwater fish.

2. All of these men regarded buffalofish, carp and suckers as relatively low-priced, low-quality species. The chief factor behind their negative assessment seemed related to the species' mode of eating. These fishes' reputation as "bottom feeders" seemed to evoke unpleasant connotations of their ingesting "debris" and "filth" from "polluted waters."

3. Carp and suckers were primarily regarded as fish "for the kosher trade," the members of which were said to want fresh whole or gutted large-sized types for gefülte fish. It was thought that the most important type of retail outlet consisted of small independent stores that catered to the Jewish trade. This market was viewed as extremely busy "during the two holiday seasons," at which time most of the dealers interviewed reported carrying at least a few of these species "to accommodate our Jewish customers." The year-around market for these fish was, on the other hand, viewed as declining--or at least changing from one for wholesalers to one for processors--due to the rapid growth in usage of prepared gefülte fish.

4. Buffalofish were primarily regarded as fish for "the colored market," with a few going to "Southern whites" and Jews. Negroes were thought

to prefer to buy their buffalofish fresh, dressed, headless, scaled and sliced for frying. Though buyers did not think buffalofish was "a good enough fish" to promote for sale to other groups of consumers, they were in general agreement that the demand for buffalofish exceeded the current supply and showed no signs of declining. Most of the wholesalers carried it from time to time. However, the bulk of the supply in both cities seemed to be handled by a small number of wholesalers who specialized in "Southern" or "freshwater" fish of "that type."

5. These buyers who were most experienced in purchasing buffalofish considered Louisiana buffalofish to be far more satisfactory than buffalofish from Montana. They reported that the Southern consumers preferred the "fatter, richer" Louisiana fish to its leaner counterpart from Montana and were, therefore, willing to pay more for the fish from Louisiana. More important, they complained--to a man--that Montana buffalofish, were not adequately dressed or graded, were not iced properly for transport, were not shipped regularly, and/or arrived in poor quality.

6. Almost two-thirds of the respondents have never purchased fish from Montana because, "nobody ever tried to sell me any." They were not aware of what types of fish products Montana suppliers might have to offer and were open-minded on the subject. That is, they had no strong predispositions to view Montana fish either positively or negatively and were inclined to suppose that fish from this state would be "up to standard" and "competitively priced" unless and until they found out differently.

7. The type of fish which buyers most frequently associated with "the Rocky Mountain States" was brook trout from Idaho or Utah. Almost all of

the interviewees had purchased this fish and were very pleased with its quality, flavor and rapid transport. They reacted positively to the idea of frozen trout from Montana, although a few thought that Rocky Mountain trout was too high-priced in comparison to that from Denmark and Japan.

8. Respondents did not react favorably to the idea of buffalofish, carp and suckers in processed forms such as sausage, fish sticks, portions or fillets. Their major objections were that these fish were "too bony" to process and not sufficiently flavorful, tender or familiar to consumers to have much appeal outside of Negro ghettos.

9. Few of the buyers were familiar with goldeye or with the smoked fish market in general. They advised contacting smoked fish processors for assessment of the potential for smoked goldeye from Montana.

Alternative Uses for Montana Fish

Past and present attempts at commercial use of Montana fish have not been outstandingly successful. Buffalofish, with a sales value exceeding $50,000 was the most important Montana species in 1967. Too few catfish were caught to have any economic significance, and the price--2 cents per pound--was too low to make carp, suckers, and sheepshead important. Goldeye are a potentially valuable species, but the 1967 sales of the one individual fishing for them were only $15,613 so he did not fish at all in 1968.

Using Montana Fish and Game Department minimum estimates as a basis, the future for buffalofish looks moderately promising with a minimum sustained yield estimate of 1,250,000 pounds annually. If Montana

fishermen could sell this quantity for the present price of 20 cents per pound, sales would be $250,000. The error in this sort of projection lies in the price/quantity relationship. The bulk of buffalofish is now being sold fleeced, directly to west coast retailers by the fishermen. By selling in this way, fishermen are receiving payment not only for the fish but for some processing and for performing the wholesaling function as well. If it were necessary to sell in Midwest wholesale markets, a substantially lower price would be realized and costs would be reduced slightly. Of course, transportation costs of some 8 cents per pound must be subtracted from these prices to determine the price the Montana fishermen would receive. As an example, if the Montana fishermen sold Number 1 fish at 16 cents per pound and then subtracted the transportation cost he would receive a net price of 8 cents per pound. If 1,250,000 pounds were sold, net sales would be $100,000. In view of both quantity and price, buffalofish remains the Montana commercial species with the greatest fresh fish potential.

Sustained yield estimates for goldeye are especially hazardous because so little is known about this species in Montana waters. If the minimum estimate of 500,000 pounds annually could be caught by experienced fishermen and the current average price of 25 cents per pound is accepted, the market potential for this fish would reach $125,000. The evidence suggests that at no time in the near future would 500,000 pounds of Montana fish be absorbed by the Winnipeg market without serious results to the goldeye price structure. In 1967, when Canada imported 119,000 pounds from the United States, stocks on hand reached 400,000 pounds and Canadian middlemen refused to buy more from the United States.

Montana fish must compete in this market not only with Canadian fish, but also with fish from several Midwestern states. The extent of this Midwestern competition is hard to judge at this time because of reports that South Dakota goldeye have proven to be too oily for Canadian tastes. In time, the Canadian demand might be expanded, but other market expansion efforts are very costly and risky.

The minimum sustained yield estimate of 4,250,000 pounds of carp and suckers would probably stagger the imaginations of most Montanans. However, when the price received by the fishermen is only 2 cents per pound, this quantity of fish represents only $85,000 of gross revenue, hardly enough to start an economic revival.

In an effort to find higher value uses for these low-priced fish, several other intermediate and end products were considered and investigated. These products were divided into two broad categories--those for human consumption and all others lumped together as industrial.

Two products considered possible at the beginning of this study were rejected because interviews with people in the trade indicated a belief in strong consumer resistance. The first of these products was fish sausage, which has been tried and failed to sell well in this country. The second was smoked fish, which was in considerable consumer disfavor following several deaths due to botulism poisoning traced to smoked Great Lakes fish.

Fish Protein Concentrate (Fish Flour)

Fish flour in various forms has been produced and consumed by inhabitants of several Asian countries for centuries. However, it has

only been within the last few years that a process has been developed which results in an odorless and tasteless product supposedly adaptable to existing diets. This process, developed by the U.S. Bureau of Commercial Fisheries, is the only one at present that has U.S. Food and Drug Administration approval; and it marks a significant step forward in the production of a palatable fish flour.

The process must be conducted under carefully controlled conditions in order to comply with rather exacting FDA specifications and standards. The FPC must be made from "whole, wholesome hake and hakelike species handled expeditiously and under sanitary conditions. . ." In order to reduce the fluorides, an excess of which may mottle the teeth of children, partial removal of the bone is necessary. Extraction of fats and moisture can be accomplished only with isopropyl alcohol or with ethylene dichloride followed by isopropyl alcohol. Protein content must not be less than 75 percent by weight, moisture content must not be over 10 percent, and fat content cannot be above .05 percent. Nor must the final product have "more than a faint characteristic fish odor and taste."

Preliminary information suggests that FPC can be produced in the United States for a cost to the consumer of about 24 cents per pound, based on a fish to flour conversion ratio of 6 to 1. Yet even made from fish worth only 2 cents per pound, FPC costs from twice to three times as much as other protein concentrates, such as that derived from oil seed, when calculated on a per unit of protein basis.

Turning to Montana, it is fairly obvious that our capacity to compete with marine fisheries in the production of FPC is almost nonexistent.

Presumably the production and marketing of FPC from carp for other than experimental purposes would be illegal. Experiments are now being conducted on the feasibility of using other fish in the production of FPC, and FDA approval may eventually be forthcoming. Even if this does happen and species common to Montana may be used, the state's competitive position will be little changed from the present. The large scale of operations being contemplated, presumably necessary for efficient production, will utilize whole fish at a rate simply unavailable from Montana waters. The experimental plant being built by the Bureau of Commercial Fisheries will be able to process 50 tons of raw fish every 24 hours, as will a new plant being built in Morocco. In all likelihood, the tendency will be toward even larger plants if problems of consumer acceptance can be solved.

Pet Food

Despite the increasing demand for fish as a basic ingredient of pet foods, there is little chance that a viable pet food plant could be established in Montana. As with the production of FPC, the limited supply of fish precludes operations on a scale comparable to pet food plants on marine coasts. For instance, pet food plants along the coast of the Gulf of Mexico require 6,000 to 7,500 tons of fish per year, which is the year-around production of about 42 shrimp trawlers. Moreover, since these are trash fish, caught incidental to the main operation of a fishing vessel, they can be harvested and sold for no more than 1 cent per pound, which is only one-half the price necessary to provide Montana fishermen with a subsistence income. This low price also makes it impossible

to deliver Montana fish to marine coast plants at competitive rates. Transportation costs alone would drive the price well above the 1 cent per pound maximum paid for marine fish. Further, pet food is manufactured and sold by very large firms with substantial advertising budgets. The difficulty of breaking into this market would be tremendous.

Fish Meal and Oil

Since the most common and valuable use of industrial fish is in the production of fish meal, oil, and solubles (accounting for 86 percent of the catch and 77 percent of the total value in 1965), a seemingly obvious way of utilizing Montana fish is the reduction process. Not quite so obvious are economic conditions in the industry which appear to relegate Montana fisheries to a noncompetitive position.

The production of fish meal has been carried on for centuries. Originally the fish were laid out in the sun to dry before being ground, by mortar and pestle devices, into meal--a method still employed in some underdeveloped countries. Today gigantic plants are in operation throughout the world which use fairly complicated processes and machinery.

Though gigantic meal plants seem to be the rule, there have been numerous attempts to develop a small, efficient, and more flexible plant able to utilize the trash fish and wastes from small operations. One company now has on the market a unit capable of processing 1 1/2 to 4 tons of input every 12 hours by using cyclonic mill dehydration, a variation of the dry-reduction process. The plant is designed to operate on board shrimp trawlers or other small vessels or on shore, and to utilize a variety of raw materials, such as offal, shellfish and crustacea,

whole raw fish, and even vegetable matter. Without any accessories, such as an oil press or pelletizer, this, the smallest unit on the market, costs $19,500 f.o.b. Florida.[3] Whether or not these small plants will be able to compete with large plants, and to therefore survive, is a question yet to be answered.

Fish oils are used in the production of pharmaceuticals, plastics, and chemicals. A large market also exists in the European margarine industry. Since fish oil is produced as a by-product of the fish meal process, supply is linked to the level of fish meal production. Fish solubles, which are used as an additive for animal feeds, are generally affected by the same factors which influence the fish meal market. In 1967, domestic supply was down, but because of heavy imports, prices were low when compared with the preceding year.

Both these low prices, which continued into 1968, and the relatively small volume of fish available from Montana waters are major barriers to the establishment of a fish meal industry in the state. It appears that a fish meal plant is economically unfeasible in the state of Montana.

Summary and Conclusions

The small amount of commercial fishing in Montana has occurred since the building of artificial reservoirs in the Missouri River system. Several early attempts to establish a commercial fishery failed, but now there are three fishing enterprises at work in the state. Two of these have survived a number of years and appear to be rather permanent. The

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[3]From a sales brochure: "Fishmeal in Seconds," Vero Beach, Florida.

third is still in the formative stage and may--or may not--continue. Sales of fishery products have fluctuated over the years with a long-term upward trend. In 1967 sales of 1,275,000 pounds of fish resulted in $90,000 of gross receipts to the fishermen.

Per capita fish consumption has remained almost constant for many years. Total demand has grown only as fast as population. During recent years, there has been a steady trend of consumer demand away from "fish" and toward shellfish. Accompanying this trend there has been an increase in the consumption of imports (especially shrimp) and a decrease in the consumption of domestic fish. Housewives are turning with increasing frequency to the purchase of convenience foods--frozen and breaded fish, fish sticks, and shrimp--and away from foods requiring home preparation. All these trends are working against the type of inexpensive fish produced in Montana waters--especially carp, buffalofish, and suckers.

These Montana species are further handicapped by a popular belief--shared by Montana consumers and Chicago and Los Angeles wholesalers and retailers--that they are dirty, coarse, muddy tasting, and bony.

At present the principal demand for carp, buffalofish, and suckers is in two ethnic markets. Low-income Negroes and some Whites from the South purchase buffalofish when they are able and carp or suckers at other times. Buffalofish is not cheap, retailing sometimes at 59 cents per pound, so the much less expensive carp and suckers are sometimes purchased. It can be expected that as these groups are more fully absorbed into urban, industrial society, their tastes and purchasing

power will more closely resemble the broader, mass market and, as a result, demand for these species will decrease further.

Carp and suckers are also purchased for use in traditional Jewish foods eaten during religious holiday periods. In years past--and to some extent today--these species were bought fresh, or in some cases alive, and prepared in the home. All reports indicate that in this market, too, convenience is becoming of major importance and few younger women are preparing these holiday dishes at home. If Montana fishermen wish to hold some share of this market, it will be necessary to do so by selling to commercial producers of Jewish foods.

Goldeye is sold exclusively in Canada and is considered a very choice food item in the Canadian market. On hotel and restaurant menus, it rivals tenderloin steak and lobster tails in price. There should continue to be a small, but steady demand for this fish for many years to come.

From all accounts, Montana fish find acceptance in the market only when similar species from other sources are not available in adequate quantity. Buyers prefer Louisiana buffalofish and Canadian goldeye. Montana carp are small and, because of high transportation cost and low value, are seldom shipped east.

A number of products not now manufactured in the state were evaluated to determine the economic feasibility of production. Results were generally negative. Industrial products such as fish meal, fish oil, pet food, and FPC (fish flour) were found to require large plants using far more fish than Montana could produce. In these products Montana would

be competing with marine trash fish and offal selling for as little as 1/2 cent per pound. Those plants processing marine fish would have the further advantages of cheaper water transportation and large consumer markets nearby.

From the foregoing, it can be concluded that Montana is a very minor producer of several species of fish enjoying a severely limited market. Montana fishermen are at a competitive disadvantage because of their distance from market and the fish species available to them. These species are considered inferior--even unfit to eat--by many people, and the quantity available makes the production of various industrial products unfeasible.

Within the foreseeable future, there will be a continuing demand for limited quantities of Montana fish. This demand can best be served by "poor boy" operations of the present type which do not require a large capital investment and therefore do not have high fixed costs. Preliminary processing should be encouraged so that specialized retail markets can be served and higher prices obtained. The practice of selling direct to retail outlets also permits the fisherman-processor to reduce the problems of dealing with frequently unethical wholesalers in principal markets by performing the wholesale operations themselves.