DISCUSSION PAPER:

THE DOMESTIC FISHERY OF THE

MACKENZIE RIVER DELTA

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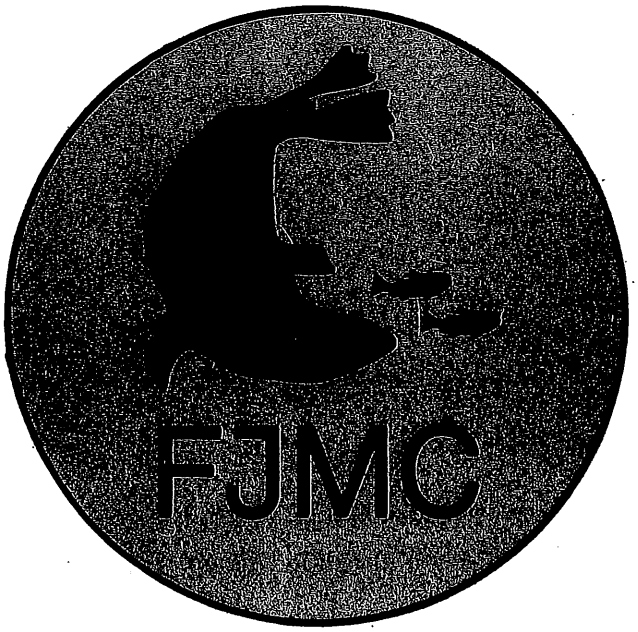

FISHERIES JOINT MANAGEMENT COMMITTEE

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THE DOMESTIC FISHERY OF THE

MACKENZIE RIVER DELTA

by:

P.D.SPARLING and J.Y.SPARLING

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by:
P. SPARLING CONSULTING
804 Fleet Avenue
Winnipeg, Manitoba
R3M 1L4

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ABSTRACT

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This report contains a discussion of the movements and migration patterns of fish species common in domestic fishery harvests in the Mackenzie Delta. Fish species discussed include: broad whitefish (Coregonus nasus); lake whitefish (C. clupeaformis); inconnu (Stenodus leucichthys); Arctic cisco (C. autumnalis; Arctic charr (Salvelinus alpinus) and burbot (Lota lota). Also discussed are a summary of fish utilization, a discussion and summary of domestic fish harvests. The report is concluded with a discussion of fishery management in th Mackenzie Delta region and recommendations.

Key words: domestic fishery; fish migration; fish movement; Mackenzie River Delta; Arctic.

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INTRODUCTION

The fish resources of the Mackenzie Delta area are of considerable cultural and economic importance to the residents of the area. Domestic fisheries have historically been the greatest users of the resource. Increased commercial fishing along with native land claim settlements have prompted a wider understanding of this fishery.

Historic flow rates and water quality of the Mackenzie River remain relatively undisturbed by human activities within the region of the delta at the present time (MRCB 1981). This suggests that ecosystem processes and relationships within the delta, and other waterbodies used by the regional fish populations are similarly undisturbed. The domestic fishery is the only significant direct influence at this time. Attempts at commercial fisheries have met with little success (Corkum and McCart 1981).

The relationship between fish migrations and fishing success was well reported in interview information reported in Sparling and Sparling (1988). An understanding of fish migrations is therefore key to understanding the domestic fishery. Table 1 summarizes what is known at present about fish movements and migrations in the delta and surrounding area.

Information on actual levels of harvest have largely been unreliable and an accurate measure of mean annual harvest has not been achieved at present.

FISH MOVEMENTS AND MIGRATIONS

BROAD WHITEFISH

There is very little published information about the activities of this species in the Mackenzie Delta. The information in this report comes from unpublished data collected by K. Chang-Kue.

Young of the Year (YOY) broad whitefish move downstream from spawning grounds above the Mackenzie Delta to fresh water creeks along Tuktoyaktuk Peninsula. YOY spend their first year feeding in these creeks. Juveniles (immature fish older than one year) continue to use the freshwater creeks and lakes as rearing grounds. These areas are likely not the only nursery areas juvenile fish use as they have been observed throughout the delta (pers. observation, 1981).

Mature fish move into freshwater lakes to feed during early summer, or move directly into the Mackenzie Delta. Non spawners may remain in the lakes over the summer and fall. Adult fish do not spawn in consecutive years, and may spawn as infrequently as every five years (Scott and Crossman 1973). Spawners move downstream to the coast and the along coastline, following bays and inlets to arrive at the Mackenzie Delta by mid August migrations through the delta are slow as feeding takes place. Mature fish congregate at "pre-spawning aggregation sites" near spawning grounds from late August through September. One such location has been observed near Horseshoe Bend on Main Channel. In early November ripe fish move onto spawning grounds, spawn, and quickly disperse downstream to the estuary. Spawning areas have been located at Point Separation and several places upstream from Arctic Red River. Ripe spawners are known to move up the Peel River, however, as yet no spawning sites have been identified.

Spent spawners have been recorded moving downstream from Point Separation to Kittigazuit Inlet in as little as 16 days. Most broad whitefish are believed to overwinter at estuarine sites located in the outer west edge of the delta and in Kittigazuit Inlet.

LAKE WHITEFISH

Juvenile lake whitefish use delta lakes, channels, and back eddies as nursery areas (Jessop et al. 1974).

Older fish begin moving upstream from the lower delta in early May and June, and disperse throughout the delta to feed for the summer (Jessop et al. 1974; McCart 1983). Large groups of fish begin spawning migrations in mid August to the main Mackenzie River above Arctic Red River. Spawning occurs during late October, at unknown sites, although one site has been observed just above the Arctic Red River (Jessop, per. comm.). No major runs of lake whitefish have been apparent on either the Peel or the Arctic ed Rivers. Post spawning migrations pass quickly through the delta and arrive at the outer edge during late October and early November (McCart 1983).

Being less anadromous than broad whitefish, this species is thought to overwinter on the fringes of the delta (McCart 1983). Fishermen interviewed in 1981 said lake whitefish were caught through the ice in winter on several deep lakes within the delta indicating these lakes are also used for overwintering.

INCONNU

Few inconnu fry have appeared in the Mackenzie system, possibly being washed out to the coast during spring floods (Jessop 1974).

Mature fish begin moving upstream prior to spring break up in early June (Stein et al. 1973) and wander through the delta feeding and moving upstream towards spawning grounds through July and August with peaks occurring in mid June at Aklavik and Arctic Red River. Tributaries of the Peel, Arctic Red and Mackenzie Rivers are suspected spawning areas. Little is known of the actual spawning although ripe and exuding specimens are frequently encountered in the above mentioned rivers in early October (Jessop, per. comm.).

Spectacular downstream migrations of post spawners occur on suspected spawning rivers during the first two weeks of October (Stein et al. 1973). The overwintering habitat of the Mackenzie Delta inconnu has not been discovered.

ARCTIC CISCO

Being truly anadromous, Arctic cisco rarely enter the Mackenzie Delta other than to spawn (McCart 1983). Immature Arctic cisco have not been reported in the Mackenzie Delta. Adults begin moving into the western delta during late June (Stein et al. 1973) and were observed in 1981 to continue moving in through July.

One group of Arctic cisco move through Arctic Red River from early July through to September to spawning grounds up the Mackenzie (Stein et al. 1973). Another group moves into the Peel River starting in late August and

continuing through to October. Major tributaries of the Mackenzie River are suspected spawning areas, including the Peel and Arctic Red Rivers.

Downstream post spawning runs are rapid (McCart 1983) but last through October (Stein et al. 1973). This long period of time most likely is a result of a large number of different spawning groups spawning at consecutively further distances upstream. Arctic cisco return to the Beaufort Sea after spawning.

ARCTIC CHARR

Juvenile Arctic charr stay in the Big Fish and Rat Rivers until age 4 or 5. Older fish move downstream to the Beaufort Sea in spring prior to or as the ice goes out in early June (Gillman and Sparling 1985; Sparling and Stewart 1986). Sea going charr feed during the summer months along the nearshore Beaufort Sea.

Migrating charr begin returning to the delta in early August, moving into the Big Fish River until the last week of August and the Rat River until the third week of September (Sparling and Stewart 1986). Mature large charr were observed moving up the Peel River during the last weeks of August 1985, but it is not known how long these movements continued.

Charr moving into the Big Fish River system congregate at spawning the spawning ground at the "Fish Hole" on Cache Creek. Charr moving into the Rat River System congregate at spawning grounds at the "Fish Hole" on Fish Creek. Nothing is known of the tributarie(s) used by charr in the Peel River system. Spawning occurs during the first week of November at the "fish holes". Charr winter in deep pools near the spawning areas.

BURBOT

Burbot do not move as widely as other species in the delta. They are suspected of moving slowly in and out of freshwater creeks and lakes in the delta, and often are found feeding near the mouths of small tributaries during the summer (Stein et al. 1973; Jessop et al. 1974). They appear to move short distances upstream towards gravel bottom stream beds for spawning which occurs in late winter under the ice.

SUMMARY OF FISH UTILIZATION

Fish harvested by the domestic fishery in the Mackenzie Delta are eaten by fishermen and their families or fed to dogs, and a small amount is used for trap bait. Fish are eaten by humans fresh, after drying on open racks, or are stored frozen. Dogs are fed fresh fish, or it is preserved by drying, freezing, "sticking" or put in pits. "Sticked fish refers to fish skewered on long poles and left hanging in the cool weather. "Pitted" fish is stored in log lined pits in the ground with a roof at ground level.

Broad whitefish and Arctic cisco are the most commonly harvested species for which humans showed a preference (Table 3). The majority of lake whitefish harvested were used as dog food. Humans ate 100% of the few Arctic charr recorded during this survey and as such were the most desirable species taken.

Burbot taken incidentally during the summer whitefish fishery were used as dog food or were culled. During early winter burbot are specifically sought by "jiggling" with baited hook and line through the ice. The large, rich burbot livers are considered to be at their prime at this time and are treated as a delicacy by most delta residents.

DISCUSSION OF DOMESTIC HARVESTS

Wide fluctuations in annual domestic fisheries harvests in the Mackenzie Delta are reported in the diary records kept by the Roman Catholic Mission in Arctic Red River from 1800 to 1954 (Hunter 1975). It was noted that in years of low catch nets, could either not be set or catches landed, because of adverse weather at the time of passing migrations at fishing sites.

Corkum and McCart (1981) report estimates of annual harvests by domestic fisheries from 1960 to 1975 (Appendix 1). This data shows a wide fluctuation in reported harvests, with a high of 1,227,273 kg reported in 1962 for the Mackenzie Delta area excluding Tuktoyaktuk. The lowest estimate reported was 50,454 kg taken over the same area in 1972. These variations suggest the data should be used with caution.

Information collected by Wildlife Officers from the Government of the Northwest Territories (G.N.W.T.) in Fort Macpherson and Arctic Red River (Table 2) during December of 1980 was based on estimates of catches made by individual fishermen. The data provides a good representation of catch compositions but the total catch estimates made with this technique are likely inaccurate.

Information shown in Table 2 for 1981 reported in Sparling and Sparling (1988) was based on a survey which began after spring fishing ended and before the fall fishery began, and thus is not a complete estimate of the total catch. These estimates do reflect accuratly the summer fishery.

Data collected by Barnes, DFO, Inuvik (Table 2) were collected from fishermen when they purchased their domestic fishing licences and were asked to complete a report of their total harvest in the previous year. Obviosly poor response or gross under reporting of harvests by fishermen has occurred because the estimates are considerably lower than other estimates.

DISCUSSION AND RECOMMENDATIONS

The draft of this section is not in a form suitable for inclusion at this time. Please be advised that this section will follow directly.

ACKNOWLEDGEMENTS

The authors thank Ken Chang-Kue for his cooperation and Art Sparling for the use of his computer system.

TABLE 1: Summary of known fish movements and migrations of fish species important to the domestic fishery in the Mackenzie Delta region.

Species	Season			
	Spring	Summer	Fall	Winter
immature BWF 1-8 yrs.	Move along Tuk. Penn. and other areas to fresh water creeks for feeding and rearing (1).	Move up and down freshwater creeks and/or utilize lakes as summer feeding grounds or rearing grounds (1).	Move downstream to estuarine waters, remain near shore (1).	Overwinter in deep estuarine waters near shore, eg. Kittigazuit Inlet (1).
mature BWF >8 yrs.	move into small freshwater lakes along Tuk. Penn. for feeding or may move directly towards delta (1).	early to mid summer move down stream to Beaufort Sea. Non spawners may not migrate. Migrants follow shore line to reach the delta by mid August (1).	migrants congregate at several sites in the delta close to spawning areas during late Aug. and Sept. Spawn at Pt. Separation and other locations above Arctic Red R.in early Nov. (1).	Rapid downstream post spawning migration to over wintering sites, eg. outer west edge of delta and in East Channel near Kitigazuit Inlet (1).
LWF	move into delta area. Spawning cohorts may move upstream as far as Arctic Red R. (2).	feed throughout the delta in early summer (3). Move up stream to spawning areas during late summer (4).	Spawn late Oct. near Arctic Red R.(5). No major spawning runs on the Arctic Red or Peel Rivers (4).	Post spawning runs pass Aklavik quickly late Oct. and early Nov. (4). Likely winter in outer delta, maybe delta lakes (6).

TABLE 1 (cont.): Summary of known fish movements and migrations of fish species important to the domestic fishery in the Mackenzie Delta region.

Species	Season			
	Spring	Summer	Fall	Winter
INC.	Begin moving upstream prior to spring break up (2). Move into delta to begin upstream migration by July (4).	Continue to migrate and feed through out delta during July and Aug. (4 + 6).	Move to spawning sites in Peel, Arctic Red and main Mackenzie Rivers. No specific sites recorded. Spawn early Oct. (7).	Rapid post spawning runs through delta first two weeks of Oct. Believed to winter in estuarine waters off delta (3 + 4).
A. Cis.	Begin moving into delta late June from marine waters. Enter fresh water only to spawn (2).	Move through west side of delta through July, past Arctic Red R. by mid Aug. (4).	Thought to spawn in tributaries of Arctic Red, Peel R. and other feeders of Mackenzie (3 + 4).	Post spawning runs on west side of delta in early Oct. Probably winter in near shore Beaufort Sea (2).
A. Ch.	Move down stream from clear tributaries to delta then Beaufort Sea prior to or during breakup. (9).	Adults feed in near shore Beaufort Sea (8). Juveniles rear in Big Fish and Rat Rivers. Adults begin spawning migrations in early August.	Adults move up Big Fish, Rat and Peel Rivers to spawn in early Nov. in pools known as "fish holes".	Remain in spawning rivers in deep, often spring fed pools.

Burb.	unknown.	Move and feed throughout Delta, often found at stream mouths. Localized migrations occur.	Move slowly upstream towards spawning streams in delta, arrive late Oct. (4).	Move slowly upstream towards spawning streams in delta, arrive late Oct. (4).

TABLE 1 (cont.): Summary of known fish movements and migrations of fish species important to the domestic fishery in the Mackenzie Delta region.

NOTES:

Reference Code

(1) K. Chang-Kue, per. comm.
(2) McCart 1983
(3) Jessop et al. 1974
(4) Stein et al. 1973
(5) E. Jessop, per. comm.
(6) Study observations
(7) Scott and Crossman 1973
(8) Gillman and Sparling 1985
(9) McPhail 1961

Species Abreviations

BWF = broad whitefish
LWF = lake whitefish
INC. = Inconnu
A. Cis = Arctic cisco
A. Ch = Arctic charr
Burb. = burbot

TABLE 2: Summary of domestic harvest estimates for the Mackenzie Delta, by species and area for 1980, 1981 and 1982.

YEAR	AREA		Species BWF	LWF	INC.	Burb	A. cis.	A. ch.	Other	Total
1980	5	#	10,850	5,700	1,707	580	400	–	662	19,899
A		kg	–	–	–	–	–	–	–	–
1980	4	#	12,970	19,300	2,625	2,285	3,630	–	2,283	44,864
B		kg	–	–	–	–	–	–	–	–
1981	1	#	2,400	5,200	900	–	–	–	–	8,500
D		kg	4,288	6,566	3,626	–	–	–	–	14,480
1981	2/3		5,500	13,300	1,100	–	–	–	–	19,900
D		kg	12,250	18,844	5,468	–	–	–	–	36,562
1981	4	#	5,700	850	2,600	–	–	–	–	9,150
D		kg	13,389	769	11,545	–	–	–	–	25,694
1981	5	#	6,600	14,100	9,700	–	–	–	–	20,400
D		kg	14,591	18,083	49,095	–	–	–	–	81,759
1982	1	#	–	–	–	–	–	–	–	–
C		kg	152	114	143	27	–	591	32	1,059
1982	2/3		–	–	–	–	–	–	–	–
C		kg	22,755	–	–	41	–	227	23	23,046
1982	4	#	–	–	–	–	–	–	–	–
C		kg	59	–	159	–	–	–	–	218
1982	5	#	–	–	–	–	–	–	–	–
C		kg	984	164	545	40	–	–	128	1,861

TABLE 2 (cont.): Summary of domestic harvest estimates for the Mackenzie Delta, by area for 1980, 1981 and 1982.

NOTES

Reference Code

A. 1980 Survey conducted by B.Krutko, Wildlife Officer, G.N.W.T.
B. 1980 " " " J.Snowshoe " " "
C. 1981 Information collected for domestic fisheries survey, Sparling and Sparling 1988.
D. 1982 Survey conducted by R.Barnes, DFO, Inuvik

Species Abreviations

BWF = broad whitefish
LWF = lake whitefish
INC. = inconnu
Burb = burbot
A. cis. = Arctic cisco
A. ch. = Arctic charr
Other = pike, sucker, salmon and grayling

TABLE 3: Domestic harvest utilization by species from the Mackenzie Delta study area, 1981.

			Human Consumption				Dog Consumption				
	Catch	Cull	Fresh	Dried	Frozen	Total	Fresh	Dried	Pit	Frozen	Total
LWF	549	50	8	32	0	40	246	2	76	137	461
%		9	1	6	0	7	45	<1	14	25	84
BWF	483	11	63	171	11	245	186	12	25	4	227
%		2	13	36	2	51	39	2	5	1	47
AC	584	10	50	306	0	358	60	0	153	1	214
%		2	9	52	0	61	10	0	26	<1	37
LC	61	4	4	0	0	4	50	0	0	3	53
%		7	7	0	0	7	82	0	0	5	87
B	6	3	0	0	0	0	3	0	0	0	3
%		50	0	0	0	0	50	0	0	0	50
NP	54	21	0	0	0	0	20	0	9	4	33
%		39	0	0	0	0	54	0	17	7	61
C	5	0	4	1	0	5	0	0	0	0	0
%		0	80	20	0	100	0	0	0	0	0
I	230	5	18	58	8	84	81	25	12	23	141
%		2	8	25	3	37	35	11	5	10	61
Total	1972	104	149	568	19	736	646	39	275	172	1132
%		5	8	29	1	37	33	2	14	9	58

Appendix 1: Estimates of annual fish harvests by domestic fishermen in the Mackenzie Delta and environs (from Corkum and McCart 1981).

Year	Locale	Number of Estimated Pounds	References
1960-61	M.D. excluding Tuktoyaktuk	950 000	Usher (1975)
1960-61	Tuktoyaktuk	735 000	"
1960-61	Coppermine R.	150 000	"
1961-62	Inuvik and Aklavik	113 000	Sinclair et al (1967)
1961-62	Fort McPherson	506 040	"
1961-62	Arctic Red River	74 600	"
1962	M.D. excluding Tuktoyaktuk	2 700 000	Olesh (1979)
1963	"	1 750 000	"
1964	"	2 000 000	"
1965	Inuvik	350 000	Wolforth (1966)
	Aklavik	500 000	"
	Tuktoyaktuk	600 000	"
	Reindeer Station	100 000	"
	Fort McPherson	550 000	"
	Arctic Red River	110 000	"
1965-66	Banks Island	2 000	Usher (1975)
1970-71	"	2 000	"
1970-71	M.D. excluding Tuktoyaktuk	166 000	"
1971	Arctic Red River	50 000	Hunt (1972)
1972	M.D. and Tuktoyaktuk	111 000	DIAND/MPS (1973)
1972	Fort McPherson, Arctic Red River	450 000	"
1972	Big Fish River	3 000 - 5 000	Hunt (1973)
	Fish Hole	5 000 - 7 000	"
	Rat River	6 500	"
1973	Aklavik	994 306	"
1973	Arctic Red River	129 465	Jessop et al (1974)
1973	Aklavik	295 000	Olesh 1979
	Inuvik	99 750	"
	Tuktoyaktuk	172 900	"
1975	M.D. excluding Tuktoyaktuk, Paulatuk, Banks Island and Holman	690 400	"
		189 000	"