FJMC SUPPLEMENTAL REPORT:

HUSKY LAKES LAKE TROUT MERCURY CONTAMINATION ANALYSIS

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FJMC 98-004

PROJECT DESCRIPTION

BACKGROUND

Residents of Tuktoyaktuk and Inuvik, NWT have traditionally fished for lake trout (Salvelinus namaycush) in Husky Lakes, NT. In addition, for more than a decade a sportfishing operation, catering both to local fishermen and tourists, has operated on this lake. Significant numbers of lake trout are harvested and consumed from Husky Lakes by these people, throughout the spring, summer and fall seasons.

This study is a continuation of the FJMC investigations into contaminant loading present in various fishery stocks occurring within the FJMC mandated region. To date several fish and marine mammal species have been studied within the ISR. Results of these studies, and analysis performed on beluga whales entrapped in Husky Lakes in 1989, indicated a somewhat elevated level of mercury present in the beluga stock that frequents the region. Analysis of broad whitefish and charr to date proved negative in this regard. This project was designed to determine the level of mercury present in the Husky Lakes stock of lake trout.

OBJECTIVES

1. To determine presence, form and levels the environmental contaminant mercury (Hg) in the Husky Lakes stock of lake trout, including an analysis of differing levels related to size, age and sex.

2. To develop an age - growth curve for the Husky Lakes stock of lake trout.

METHODS

The Project Manager provided on-site training in measurements, sexual identification and sample collection to Saunatok Lodge owner/operator Jame Gruben and guide Peter Ovayuak (according to specific instructions provided by Lyle Lockhart of the Contaminants Section: DFO Freshwater Institute). Lake trout samples were subsequently procured by collecting the heads and internal organs, identifying sex and recording measurements of fish harvested during the sportfishing operations conducted from Saunaktok Lodge through the 1995 season. Samples were individually packaged, carefully labeled and immediately frozen on site. Two shipments of samples were received from the Lodge, one mid-summer and one in the fall, and immediately stored in the biological freezer unit at the Inuvik Research Center.

The Inuvik Age Lab sufficiently thawed each sample head to allow the removal of brain material (contaminants sampling) and otoliths (age determination), reviewed each sample's labeling/packaging for accuracy, and forwarded the contaminants samples and related physical information to the Freshwater Institute for analysis. Contaminants samples included a potion of muscle, liver and brain from each fish. The Age Lab then conducted standard preparation of otolith samples age read each providing an age estimate for each fish sampled. The age data set was then forwarded to the FJMC office, and subsequently the Freshwater Institute.

METHODS *(continued)*

The Project Manager developed an age/growth mapping based on a) the age determined by the Inuvik Lab; b) fork length measurements provided by Lodge technicians, and; c) area the fish was captured from within the lakes.

MILESTONES *(actual)*:

ACTIVITY	TIMING
On-site technician training	June 1995
Collect samples and measurements	June - August 1995
Transport Samples to Inuvik	July and August 1995
Otoliths and brain samples excised Samples checked, packaged and shipped	November 1995
Age determination (otoliths)	January 1996
Age/Growth data analysis	February 1996
Analysis of Samples (DFO)	?
Report Writing	March 1998

RESULTS AND DISCUSSION

Although informed that the mercury analysis has been performed by the DFO Lab, the Project Manager has not been successful in attempts to procure these results. Therefore, this report is based upon the findings relating to the age and growth of lake trout sampled from Husky Lakes, supplementary to the related DFO technical report.

In total, forty-nine lake trout were sampled in 1995. Twenty-seven of these were obtained from the 'outer lake' area, adjacent to Saunaktok Lodge (12 male, 15 female). Twenty two of these were obtianed from the 'inner lakes' area, being designated as from the downstream mouth of Zeeman's channel and upstream.

The data regarding length and age is presented below

FEMALE LAKE TROUT: OUTER LAKE AREA		**MALE LAKE TROUT: OUTER LAKE AREA**	
LENGTH(mm)	AGE(years)	LENGTH(mm)	AGE(years)
460	11	520	12
510	12	525	13
580	16	557	8
593	14	565	12
610	12	585	16
627	15	588	16
642	18	590	13
670	13	590	13
685	15	605	16
697	19	664	15
710	12	664	12
722	16	760	21
755	18		
870	18		
910	19		

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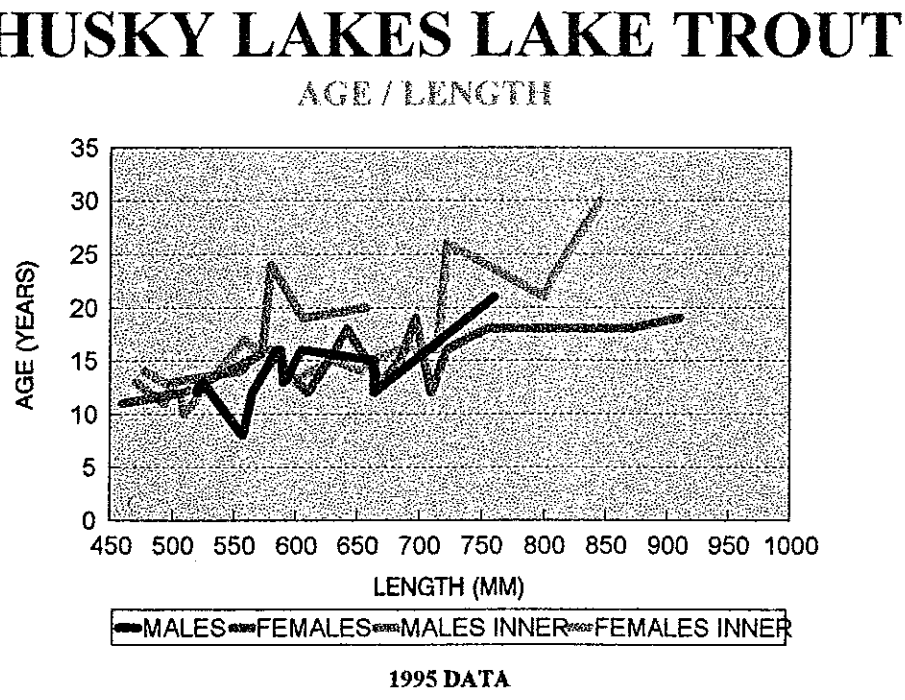
FEMALE LAKE TROUT: INNER LAKES AREA		MALE LAKE TROUT INNER LAKES AREA	
LENGTH(mm)	AGE(years)	LENGTH(mm)	AGE(years)
478	14	471	13
507	12	494	11
510	10	500	13
559	17	555	14
599	13	573	16
629	15	580	24
655	14	606	19
661	15	658	20
685	16		
715	16		
722	26		
800	21		
808	23		
846	30		

Figure 1: Graphical Representation of Lake Trout Age/Growth Data



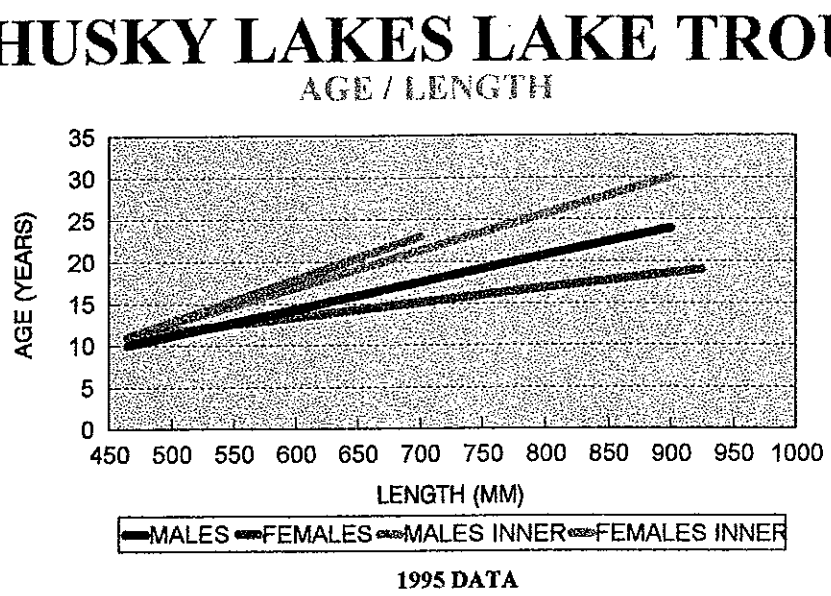


Figure 2: Line of Best Fit Graphical Representation of Lake Trout Age/Growth Data

FIGURE 3: SELECTED COMPARATIVE LAKE TROUT GROWTH RATES

	AGE (years)																			
SOURCE **	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
*Husky Lakes Outer Lake	-	**557**	-	-	**460**	**597**	**595**	**593**	**659**	**616**	-	**756**	**804**	-	-	-	-	-	-	-
*Husky Lakes Inner Lakes	-	-	-	-	**494**	**507**	**523**	**563**	**645**	**658**	**559**	-	**606**	**658**	**800**	-	**808**	**580**	-	**722**
Lac la Ronge Rawson 1961	589	612	643	660	691	709	754	787	813	833	889	919	-	-	-	-	-	-	-	-
Great Bear Lk. Miller 1948	293	320	354	372	412	412	420	449	487	515	556	574	607	626	656	700	698	-	-	-
Lac Mistassini Dubois 1968	412	428	483	491	511	542	528	528	528	543	521	568	576	520	599	588	618	-	-	-
Colorado Range (yrs)	-	254 8-19	254 8-19	292 10-16	292 10-16	381 12-20	381 12-20	381 12-20	381 12-20	381 12-20	508 17-22	508 17-22	508 17-22	597 20-25	597 20-25	597 20-25	597 20-25	597 20-25	597 20-25	622 23-26

ALL TABLE VALUES IN MILLIMETERS (mm)

NOTES:

* Husky Lakes values determined by averaging all lengths for each given year, combining data from both male and female samples.

** Sourcing references listed in attached bibliography.

ANECDOTAL OBSERVATIONS

At the initiation of the project in late July, the study lake was just in the process of losing it's seasonal ice cover. Husky Lakes usually freeze up in October, and ice thickness varies to ten or twelve feet in any given winter. Lake trout captured for the purposes of sample technique training were observed to contain well above average (comparative with other local and southern stocks) fat content for fish sampled in this very early spring season. The entire gut cavity of all captured specimens was lined with a thick layer of fat, to a depth of in excess of one-quarter inch in most cases. The flesh from these specimens was also found to contain large reserves of oils (upon cleaning/cooking). As all samples were collected from the 'outer lake' area adjacent to the sportfishing lodge, the technicians were requested to compare those fish captured in the 'inner lakes' area in this regard. Subsequent reports, and an eventual on-site observation led to the conclusion that this high fat content was a phenomena only observed frequently in the 'outer lake' area. Fish captured upstream of the area locally known as Zeeman's channel were much slimmer, and in cases almost snake-like in physical appearance. Gut cavity fat reserves were mostly limited in these inner fish to a very few fat bodies associated with internal organs, and in no case was gut cavity fat layering observed. Flesh from these inner fish was also found to be much less oily. This verifies local Traditional Knowledge information to the effect that fish in the outer lake are consistently more fatty/oily than those found in the inner lakes areas.

One other note related to stomach contents of fish captured. Large numbers of herring (believed to be *Coregonus sardinella* and/or *Osmerus dentex*) were reported found in the stomachs of fish captured throughout the study lakes. It is known that a substantial population of these small fish inhabit Husky Lakes, and large anadromous runs return each year to spawn. In numerous cases of the larger fish captured in the 'outer lake' area, larger fish - often comprising up to one-third of the predator fish's body length, were observed and recorded. These were chiefly whitefish (broad and lake), but also included Arctic grayling and inconnu. No records of these larger fish in stomach contents were observed/recorded from fish captured in the inner lakes.

DISCUSSION

Review of the data, and Figures 1 and 2 suggest there is perhaps two differing growth rates for lake trout within the study system, dependant upon location. Although not enough data exists to analyze this hypothesis statistically, there does appear to be a general trend towards this divergent growth pattern. The area of the 'outer lake' is open to the Beaufort Sea's Liverpool Bay, and therefore subject to marine influence - in effect displaying many of the characteristics associated with estuaries. As a consequence, it can reasonably be expected that the ambient water temperature fluctuates less widely, and a potential presence of increased species and overall biomass over conditions found within the inner lakes of the system. It is distinctly possible that these obvious advantages contribute to the apparent favour in lake trout growth/development observed in the area nearest the system outlet. It also appears that this enhanced growth develops a more aggressive feeding pattern in the larger fish of this particular area, as observed by the number of large prey items in area sampled stomach contents.

As is often found in the case of fish maturation, the females of the study species appear to develop

faster (and possibly to greater size) than their male counterparts within the two area locations noted above.

Figure 3 compares values found for lake trout captured in the study system with those sampled in various other lake systems. With the exception of Lac la Ronge (Saskatchewan) the growth rate for lake trout observed in Husky Lakes appears to be faster than those observed elsewhere. These include the NWT's Great Bear Lake (closest geographically), Lac Mistassini in northern Quebec, and an average rate for Colorado. Perhaps this phenomena as well is related to the near proximity and influence of the Beaufort Sea upon the Husky Lakes system productivity levels.

CONCLUSION

The age/growth information generated by this project suggest at least two divergent growth patterns occur within Husky Lakes. These appear to be a product of proximity to the system outfall to the Beaufort Sea, and that area's presumably enhanced biological productivity characteristics.

Overall, lake trout growth within the system appears to be escalated to those occurring in the majority of systems compared against. The ramifications regarding potential lifespan may preclude that these faster developing fish live for a shorter period of time than their slower growing relations elsewhere..

RECOMMENDATIONS:

1. In 1996, a further 30-40 samples were collected, shipped to Inuvik, and are currently stored in the Research Center's biological freezer unit. The majority of these fish were frozen whole, allowing for potential condition factor analysis in addition to age determination. The Inuvik Age Lab should be considered for analyzing these samples, and providing more points to the data set of this project.

2. An ongoing, inexpensive sample arrangement with the owners of Saunaktok Lodge or the Husky Lakes Monitor should be considered to augment this data set. Eventually sufficient numbers would be collected to conduct statistical analysis on the data base, and address the possibility of divergent growth rates occurring within the study system suggested within this report.

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The Colorado Fishing Federation, 1996; Average Growth Rate of fish in the Central Front Range of Colorado; website: http://www.canoecreek.com/CFF/growth.htm