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Central and Arctic Region

Canadian Science Advisory Secretariat
Science Advisory Report 2023/031

IKALUIT LAKE (ROBERT PEEL INLET) ARCTIC CHAR ASSESSMENT

Arctic Char from Ikaluit Lake. Photo by Z. Martin (DFO Science).

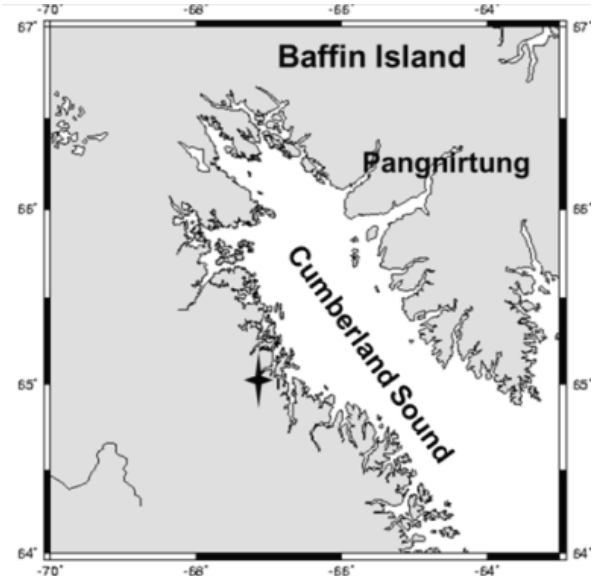

Figure 1. Map of Cumberland Sound with Ikaluit Lake (Robert Peel Inlet) marked with a star.

Context:

*Arctic Char (*Salvelinus alpinus *(Linneaus)) are widely distributed throughout the Arctic and are an important commercial and subsistence resource for Inuit. Ikaluit Lake (Robert Peel Inlet) Arctic Char are an important resource for the communities of Iqaluit and Pangnirtung, Nunavut. They have been harvested under various licences since 1977. The initial quota for Ikaluit Lake was established based on test fishery data collected in 1977–1983.*

Fisheries and Oceans Canada (DFO) Resource Management requested an updated summary of information collected from Cumberland Sound Arctic Char stocks. A Regional Advisory Process was held to evaluate the status of the Ikaluit Lake (Robert Peel Inlet) Arctic Char stock and recommend a long-term plan for this fishery.

This Science Advisory Report is from the following meeting: June 24–25, 2014 Stock status and sustainable harvest levels for Arctic Char in Ikaluit Lake (Robert Peel Inlet), Cumberland Sound Area, Nunavut. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule *as they become available.*

SUMMARY

- Ikaluit Lake Arctic Char have been harvested under various licences since 1977. Most recently, under a stage II exploratory licence since 2006.
- Historically, fishing occurred in the winter months on Ikaluit Lake. More recently, fishing has occurred in the summer months in Robert Peel Inlet.
- The communities of Pangnirtung and Iqaluit rely heavily on the Ikaluit Lake Arctic Char stock for subsistence.
- The results from this assessment indicate that despite harvest pressure this stock appears to be stable.
- Harvest at a rate of 5% of the standing stock, which is approximately 1,000 kg, will keep the stock sustainable.
- Keeping in view subsistence pressure, it is recommended that the stock be monitored annually for biological and catch effort information.

INTRODUCTION

To assess the status of the Ikaluit Lake Arctic Char stock a Regional Advisory Process meeting was held in Iqaluit, Nunavut, June 24–25, 2014. Participants included Pangnirtung Hunters and Trappers Organization (HTO), Amaruq Hunters and Trappers Association (HTA), Pangnirtung fishers, Government of Nunavut Fisheries and Sealing, Nunavut Tunngavik Incorporated, Fisheries and Oceans Canada (DFO) – Resource Management and Science programs, and the University of Calgary.

Species Biology

Anadromous Arctic Char are found in Ikaluit Lake. Anadromous Arctic Char make annual spring/early summer migrations from freshwater environments where they overwinter to saltwater environments where they feed. In late summer/early fall the Arctic Char complete their return migration from the saltwater environments back to freshwater environments (Moore 1975). This migration is thought to occur because the Arctic saltwater environments are more productive (have more food sources) compared to freshwater environments (Gross et al. 1988). Anadromous Arctic Char in Cumberland Sound marine environments feed primarily on amphipods, other aquatic invertebrates (Moore and Moore 1974), and larval fish (Ulrich 2013). The importance of fish in the diet of Arctic Char may have shifted in recent years with the occurrence of fish species that were historically not common to the area (e.g., Capelin *[Mallotus villosus*]) (Ulrich 2013).

Tidal cycles are pronounced in Cumberland Sound compared to other regions of Nunavut. Pangnirtung reported the importance of tidal cycles on the timing and movement of Arctic Char into different lake systems throughout the Sound. Spawning has been observed in other Cumberland Sound systems as early as September (Moore 1975) however, there is no specific information on spawning time for Ikaluit Lake Arctic Char.

Habitat

Ikaluit Lake is a large lake situated on the southern coast of Cumberland Sound (Figure 1) with freshwater input from inland and freshwater output into Robert Peel Inlet and subsequently

Cumberland Sound (Figure 2). Arctic Char are able to access the marine environment from Ikaluit Lake by a short river that is not a barrier to fish passage.

Ikaluit Lake Arctic Char overwinter in Ikaluit Lake, however details of overwintering habitats have not been documented.

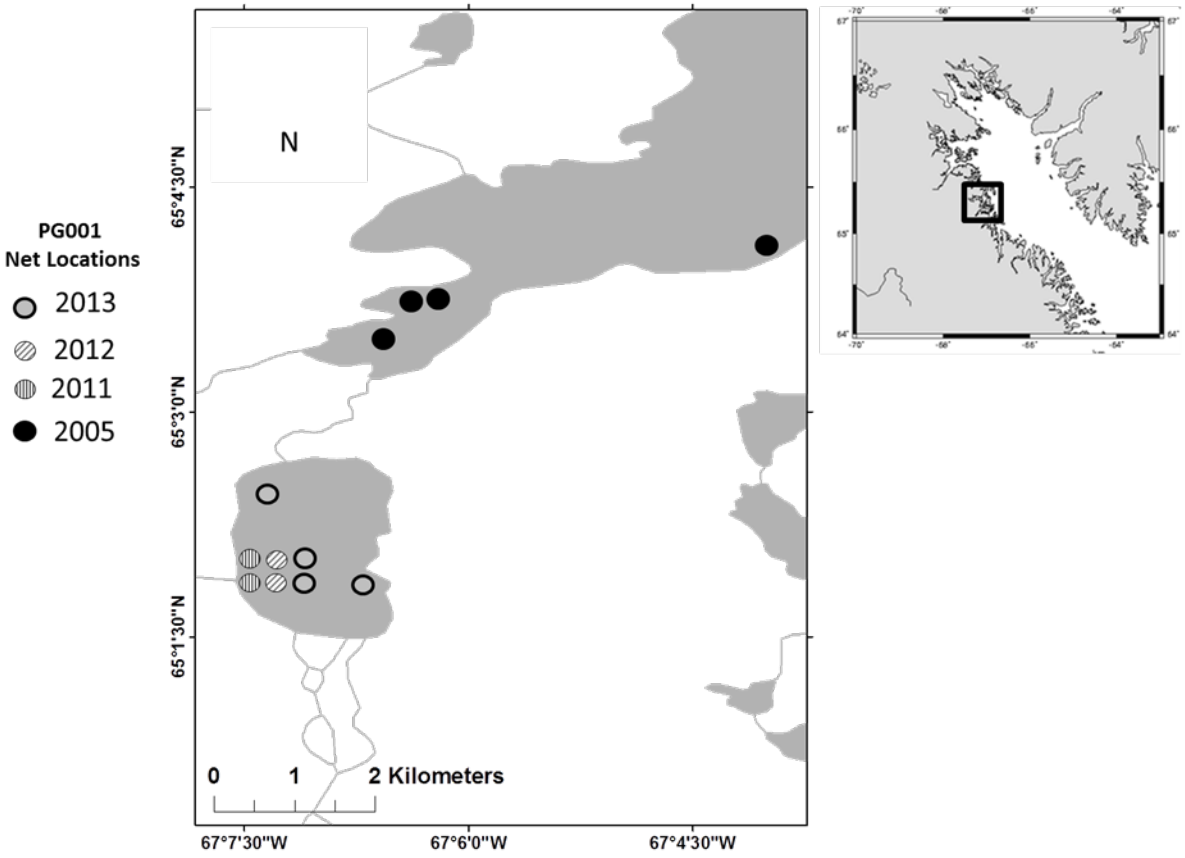

Figure 2. Map of Ikaluit Lake (Robert Peel Inlet) with fishing locations noted. The net set locations for fishery-independent data presented by collection year. Map made by S. Wiley (Fisheries and Oceans, 501 University Crescent, Winnipeg, MB).

Fishery

Data Sources

Four sources of data were used for the Ikaluit Lake Arctic Char assessment: test fishery data (1977, 1982, and 1990); fishery-independent data (2000, 2001, 2005, 2011, 2012, and 2013); plant sampling data (2006 and 2008); and fishery-dependent data (1977–2014).

Test fishery data were included in the assessment as a historical reference (Table 1). The test fishery data from Ikaluit Lake were collected by Resource Development Officers from Pangnirtung (McGowan 1985). Fishery-independent data were collected by DFO Science (Central and Arctic Region) (Table 2). Fishery-dependent data were compiled from Fisheries Management and Harvest Information System (FMHIS) and included total weight harvested annually under the various licences (Table 3). It should be noted that the fishery-dependent data does not necessarily represent the actual catch by fishers (for more information see Martin et al. 2023).

Table 1. Summary of historical test fishery data (from Kristofferson and McGowan 1981, McGowan 1985) and DFO survey data (from McGowan et al. 1993) including sample dates, location fished, number of fish captured in 139.7 mm nets, and total number of fish captured per year.

Sampling Year	Start Date	End Date	Number of fish captured	Total soak time (hours)	Location fished
1977	August 25	August 25	51	Insufficient Data	River/Ocean?
1980	March 14	March 14	100	54.4	Lake
1990*	April 23	April 24	158	53	Lake

* DFO survey completed similar to a test fishery but with smaller mesh net (114.0 mm).

Table 2. Summary of fishery-independent data includes sample dates, gear type used, number of net sets, total soak time, number of fish captured for each net type, and total number of fish captured categorized by year. Total soak time was calculated by adding all the hours that each net type was left to soak for each set.

Sampling Year	Start Date	End Date	Number of fish captured		Experimental net mesh size (mm)	Number of nets set		Total soak time (hours)	Total number of fish captured	Location fished
			139.7 mm mesh	38.1–114 mm mesh		139.7 mm mesh	38.1–114 mm mesh			
2000	August 13	August 17	172	-	-	27	-	75.64	172	Mouth of the river
2001	July 31	August 1	134	-	-	unknown	-	48.00*	134	Mouth of the river
2005	August 16	August 18	133	5	38.1–101.6	17	2	115.76	138	Tidal Area
2011	February 22	February 26	-	191	38.1–139.7	-	32	281.47	191	Lake
2012	March 21	March 24	-	190	38.1–139.7	-	23	135.12	190	Lake
2013	February 27	March 4	-	197	38.1–139.7	-	29	228.67	197	Lake

* Total soak time (hours) are estimated because no net set data was recorded, only dates on the individual sampled fish were recorded (July 31 and August 1).

Table 3. Summary of available harvest information from fishery-independent, fishery-dependent, and test fishery data detailing quota, number of fish captured, and weight (kg) where available, by year. Data for the exploratory and commercial harvest landings was compiled from Fisheries Management and Harvest Information System (FMHIS). Exploratory and Commercial Harvest Landings reported as dressed/head off (typically open water fishing) were converted to round weight by a factor of 1.15 for licence year 1980–2006, and a conversion factor of 1.0918 from licence year 2007 to present to account for removed viscera. When 0 appears as the harvest by weight, there was no recorded harvest for that licence year.

Year	Harvest Month	Quota		Harvest by Weight		Source	Fishery-Independent Data	
		kg	lb	kg	lb		Number	Weight (kg)
1977/1978*	8	1,500	3,300	286	629	Kristofferson and McGowan 1981 &FMHIS	-	-
1978/1979	-	No known harvest, unsure if licenced this year				-	-	-
1979/1980*	-	1,500	3,300	797	1,753	Excel spreadsheet	-	-
1980/1981*	3	908	1,997.6	797	1,753	McGowan 1985	-	-
1981/1982*	-	1,500	3,300	1,500	3,300	Excel Spreadsheet	-	-
1982/1983*	-	1,500	3,300	1,500	3,300	McGowan 1985	-	-
1983/1984*	-	1,500	3,300	1,334	2,935	Excel Spreadsheet	-	-
1984/1985	-	-	-	0	0	-	-	-
1985/1986*	-	1,500	3,300	2,552’	5,614	Excel Spreadsheet	-	-
1986/1987	-	-	-	0	0	-	-	-
1987/1988	-	-	-	0	0	-	-	-
1988/1989	3	?	?	227	499	FMHIS	-	-
1989/1990	-	-	-	0	0	-	-	-
1990/1991	3	1,400	3,080	1,182	2,600	McGowan et al. 1993 FMHIS	-	-
1991/1992	3	1,400	3,080	1,400	3,080	FMHIS	-	-
1992/1993	3	1,400	3,080	1,816’	3,995	FMHIS	-	-
1993/1994	3	1,400	3,080	998	2,196	FMHIS	-	-
1994/1995	3	1,400	3,080	1,356	2,983	FMHIS	-	-
1995/1996	8	1,400	3,080	1,680’	3,696	FMHIS	-	-
1996/1997	5,7,8,3	1,400	3,080	4,747’	10,443	FMHIS	-	-

Year	Harvest Month	Quota		Harvest by Weight		Source	Fishery-Independent Data	
		kg	lb	kg	lb		Number	Weight (kg)
1997/1998	7	1,400	3,080	1,001	2,203	FMHIS	-	-
1998/1999	7,3	1,400	3,080	1,410	3,103	FMHIS	-	-
1999/2000	5,8	1,400	3,080	2,289’	5,036	FMHIS	-	-
2000/2001	-	CLOSED				FMHIS/ DFO survey	172	405
2001/2002	-	CLOSED				FMHIS/ DFO survey	134	330
2002/2003	-	CLOSED				FMHIS	-	-
2003/2004	-	CLOSED				FMHIS	-	-
2004/2005	-	CLOSED				FMHIS	-	-
2005/2006	-	CLOSED				FMHIS/ DFO survey	138	444
2006/2007	7	1,000	2,200	956	2,103	FMHIS	-	-
2007/2008	7,8	1,000	2,200	2,034’	4,475	FMHIS	-	-
2008/2009	8	1,000	2,200	719	1,582	FMHIS	-	-
2009/2010	7	1,000	2,200	1,422’	3,128	FMHIS	-	-
2010/2011	7,8	1,000	2,200	1,058	2,328	FMHIS/ DFO survey	191	300
2011/2012	-	1,000	2,200	995	2,194	FMHIS/ DFO survey	190	232
2012/2013	-	1,000	2,200	292	644	FMHIS/ DFO survey	197	281
2013/2014	-	1,000	2,200	984	2,170	FMHIS	-	-
Total	-	-	-	35,332	77,742	-	1,022	1,992

* Harvest information found in sources and files other than FMHIS. Excel spreadsheet can be found only in Resource Management files, but not yet entered formally anywhere.
‘ Years when harvest exceeded the quota.

Harvest Information

Subsistence fishing of Ikaluit Lake Arctic Char is conducted annually by residents of both Pangnirtung and Iqaluit. It is understood but not documented that Iqaluit residents rely more heavily on Ikaluit Lake Arctic Char for subsistence compared to residents of Pangnirtung. The Pangnirtung HTO reported that the community of Pangnirtung prefers to subsistence fish from locations closer to their community with preferred tasting fish. It is understood that the subsistence harvest by the community of Pangnirtung on Ikaluit Lake is minimal. In contrast, the Amaruq HTA reported that there has not been much change over the years in the numbers of families accessing Ikaluit Lake for subsistence purposes and on average 3,000 lbs of fish are

harvested by Iqaluimmiut. The subsistence harvest information from the HTO and HTA were used in this assessment.

Test fishery data were collected in both the summer and winter in 1977, 1980, and 1990 (Table 1). In 1977, a provisional quota of 1,500 kg (3,300 lbs) was set.

Similar to the test fishery data, the fishery-independent data was collected in both the summer and winter in 2000, 2001, 2005, 2011, 2012, and 2013 (Table 2). The number of fish caught varied from 138 in 2005 to 197 in 2013. The sampling methods used for the fishery-independent data were not consistent. Sampling was conducted in different seasons, locations, and different gear type was used; these inconsistencies must be accounted for in the data analysis.

The Ikaluit Lake stock has had a long and complex licencing history. As mentioned above, the test fishery set an initial quota of 1,500 kg (3,300 lbs), which was reduced in 1990 to 1,400 kg (3,080 lbs) when the fishery was licenced as commercial. Following licence year 1999/2000 the Pangnirtung HTO requested that the Ikaluit Lake commercial fishery be closed for 5 years due to a reduction in large fish being caught. This request was presented by DFO Resource Management and approved by the Nunavut Wildlife Management Board in 2000 (Resolution 2000-173). In licence year 2006/2007 the fishery was reopened as a stage II exploratory waterbody with a quota of 1,000 kg (2,200 lbs).

Arctic Char harvested from Ikaluit Lake from all recorded sources (test fishery data, fishery-independent data, and fishery-dependent data) totals 37,324 kg (82,113 lbs) round weight since 1977 (Table 3, Martin et al. 2023).

ASSESSMENT

Stock Delineation

Ikaluit Lake Arctic Char is assumed to be a discrete stock based on observations from Pangnirtung and Iqaluit fishers and the physical characteristics of the freshwater and marine systems in the area. There are a limited number of suitable habitats for Arctic Char around the area of Ikaluit Lake, further supporting stock discreteness.

Stock Size

A Baranov catch equation (Ricker 1975, Liu and Heino 2014) was used to estimate the size of the Ikaluit Lake Arctic Char stock. Fishery-independent, fishery-dependent, and subsistence harvest information were used in the abundance model (see Martin et al. 2023 for details).

The abundance model estimated a median stock size of 6,588 Arctic Char. When a harvest rate of 5% is applied to the median stock size it results in a sustainable harvest rate of 329 individuals, with an approximate weight of 1,000 kg (see Martin et al. 2023 for more detailed information).

Currently, the harvest rate on the Ikaluit Lake stock could be from 5% to 20%, depending on the rate of subsistence harvest (see Martin et al. 2023 for details).

Stock Trends

Catch Per Unit Effort (CPUE)

There is no trend in the catch per unit effort (CPUE) data (Figure 3). No trend indicates that there has been no change in the catch rates and thus, no change in the abundance of Arctic Char in Ikaluit Lake. There is a large amount of variability in the CPUE data collected in the

summer in the saltwater environment (2000, 2001, and 2005). In contrast, there is very little variability in the CPUE data collected in the winter (2011, 2012, and 2013). The highest CPUE was recorded in 2001, while the lowest was recorded in 2011 (Figure 3).

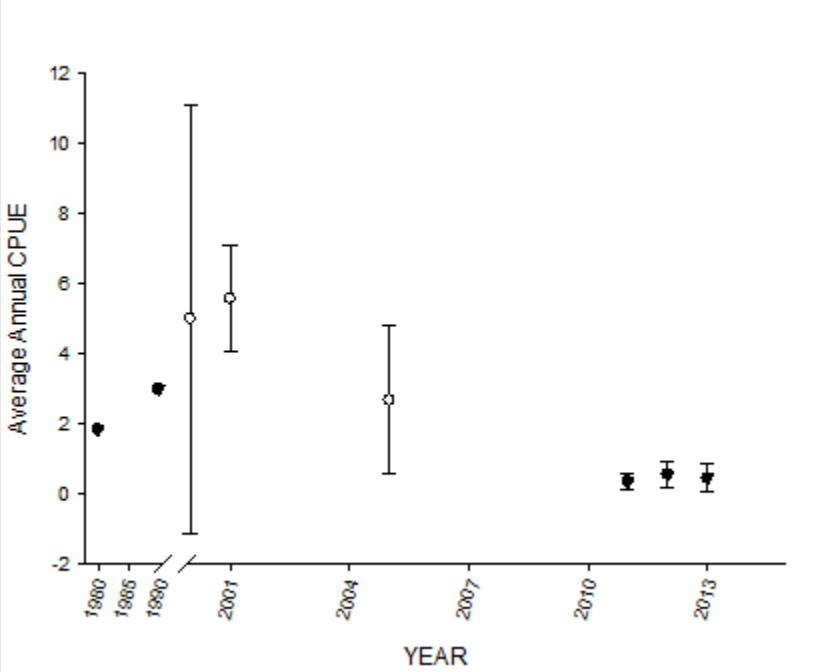

Figure 3. Catch Per Unit Effort (CPUE) for Ikaluit Lake, average annual CPUE with standard deviation error bars. The years 1980, 1990, 2011, 2012, and 2013 were winter sampled in the freshwater lake environment (closed circles symbol); 2000, 2001, and 2005 were summer sampled in the estuary environment (open circle symbol). The 1980 data came from McGowan 1985; the 1990 data came from McGowan et. al. 1993; all other data was from fishery-independent surveys conducted by DFO.

Biological Results (Length- Frequency Distributions)

There is no overall trend detected from the length-frequency distributions (Figure 4). The range in length-frequency appears to remain consistent when factoring in size selectivity of the gear type used (see Martin et al. 2023 for more information).

Biological Results (Age-Frequency Distributions)

The range of ages for Ikaluit Lake Arctic Char remains consistent from year-to-year indicating that there is no change in the age structure of this stock (Figure 5). From these graphs, age classes can be followed throughout the years. Fish born in 1990 may have been a strong year class, appearing in 2000 as age class 10 and in 2001 as age class 11. Additionally, the presence of young fish (< age 6) in the age range shows a stock that is reproducing and that there is recruitment into the fishery (see Martin et al. 2023 for more information).

Biological Results (Trend Analysis)

Fishery-independent data, test fishery data and plant data were used where applicable for the trend analysis.

Mean fork length (mm) (Figure 6) for fish captured in single mesh nets (1977, 1980, 1990, 2000, 2001, 2005, 2006, and 2008) were consistent over time, ranging from 562 mm in 2000 to 674 mm in 1977. In contrast, the mean fork length of fish captured in the multi-mesh nets (2011,

2012, and 2013) ranged from 445 mm in 2012 to 478 mm in 2013. Despite the difference in mean fork length the standard error bars from all years overlap, indicating that there is neither a trend nor a change in the mean fork length over time. This indicates that the stock is stable.

Mean age (years) (Figure 6) of fish captured in Ikaluit Lake show a decreasing trend. The single mesh nets show older fish being caught in 1977 (mean age 17) and younger fish being caught in 2001 (mean age 11). It should be noted that the methods and age readers were not consistent from 1977 to 2001. This inconsistency is not believed to account for the 6 year age difference, and there is perhaps a true trend of decreasing overall mean age in the Ikaluit Lake Arctic Char stock. The multi-mesh nets have a lower mean age (age 9–10) with less annual variability compared to the single mesh nets. Despite the overall decrease in mean age, the standard error bars around each mean lead to the conclusion that the stock is stable.

Mean round weight (g) (Figure 6) shows an overall decreasing trend from year to year, with standard error bars that overlap. Gear type, sampling location, and timing of sampling changed over the years (Table 1 and 2). When comparing within gear types alone, there is no trend in mean round weight. Similarly, there is no trend in the mean round weight when comparing data from multi-mesh nets. The lack of trend in the mean round weight when comparing within gear types indicates that the stock is stable

Mean condition factor (K) (Figure 6) for the Ikaluit Lake Arctic Char stock appears to be stable over time. Although there is annual variability, overall, there is no trend, indicating that the stock is stable. The lowest mean condition factor values with the least amount of annual variability were measured in recent years (2011–2013). Sampling in these years took place in the lake environment in the winter when Arctic Char are assumed to not feed. In contrast, the highest mean condition factor with the greatest amount of variability was measured in 2001,when samples were taken in the summer in the saltwater environment where Arctic Char would have been feeding.

Catch Curve

Fishery-independent data and plant data from 2008 were used for the catch curves and mortality estimates.

The catch curves of the Ikaluit Lake Arctic Char stock appear to be stable (Figure 7). Instantaneous mortality (z) shows little variability between years and ranges from 0.1075 in 2011 to 0.2217 in 2001 (Table 4). No trends in mortality (annual or instantaneous) or survival could be resolved from these data but overall, it appears that survival is high, and mortality is moderately low.

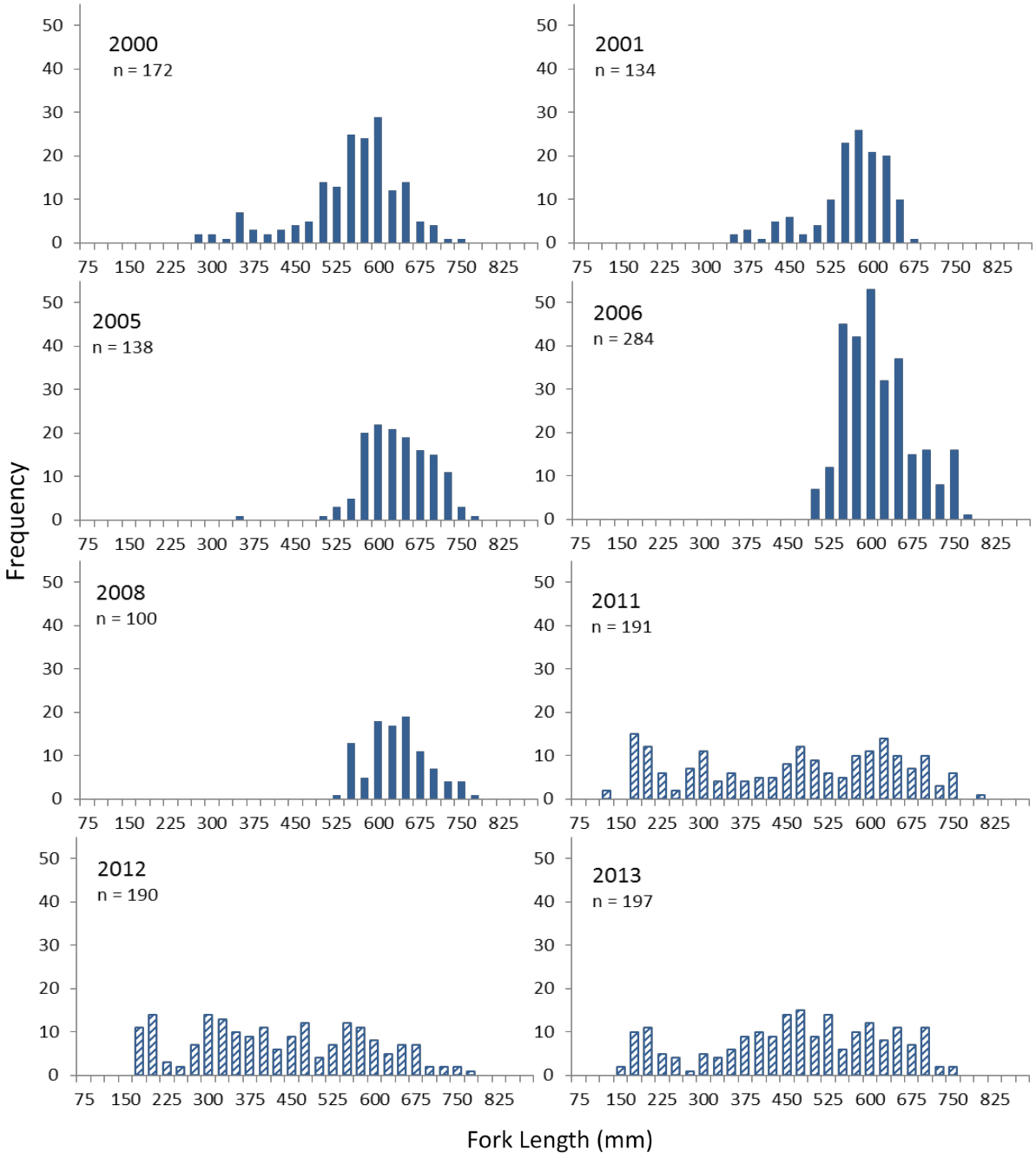

Figure 4. Length-frequency distributions of Arctic Char from Ikaluit Lake (Robert Peel Inlet) fishery-independent data (2000, 2001, 2005, 2011, 2012, and 2013) and plant sampling data (2006 and 2008). Solid lined data represents 139.7 mm mesh nets, hatched lined data represents multi-mesh nets (38.1–139.7 mm), n = sample size.

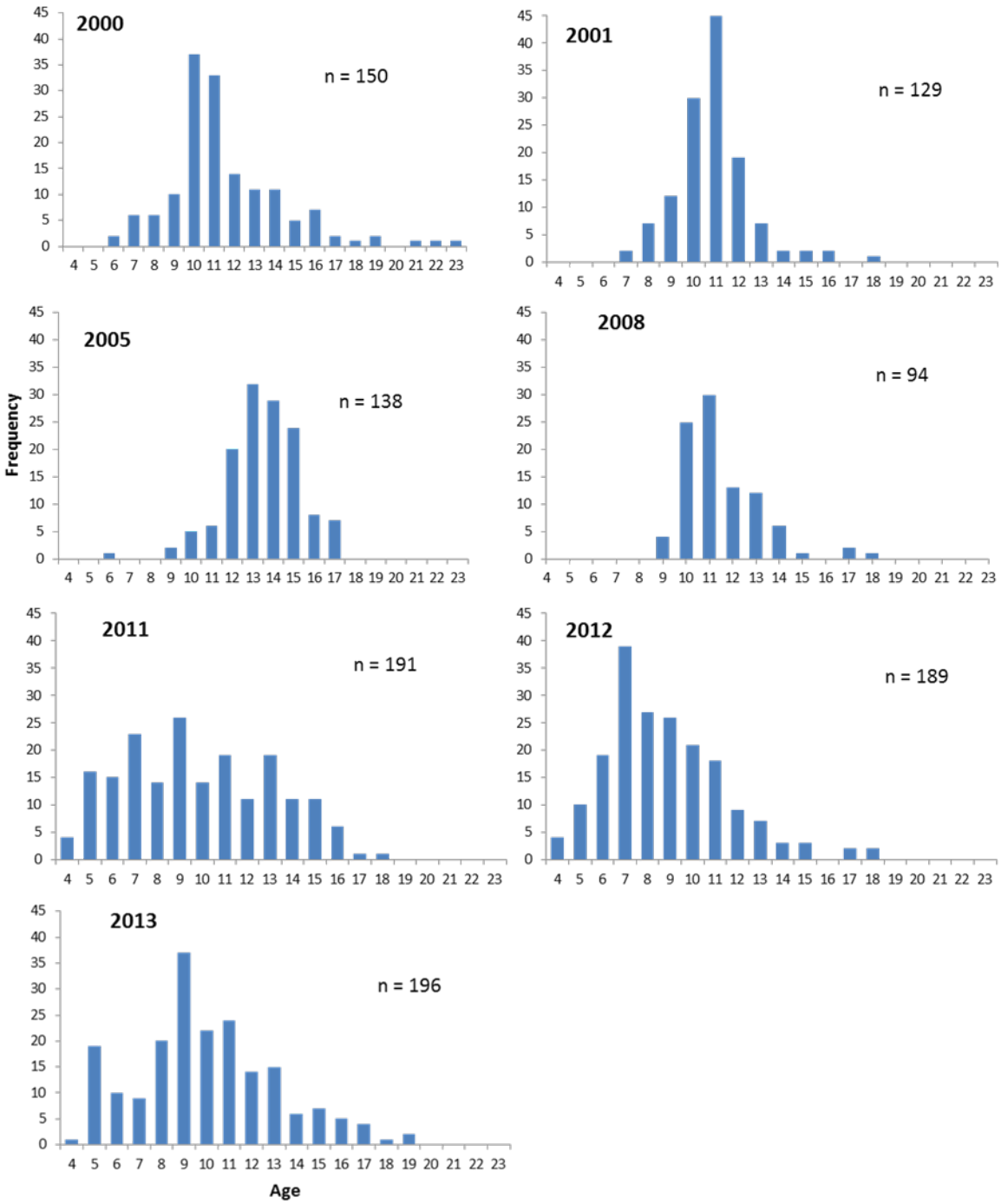

Figure 5. Age-frequency distributions of Arctic Char from Ikaluit Lake (Robert Peel Inlet) fishery-independent data (2000, 2001, 2005, 2011, 2012, and 2013) and plant data (2008), pooled by gear type, n = sample size. Graph made by E. Sudlovenick (Fisheries and Oceans, 630 Mivvik, Iqaluit, NU).

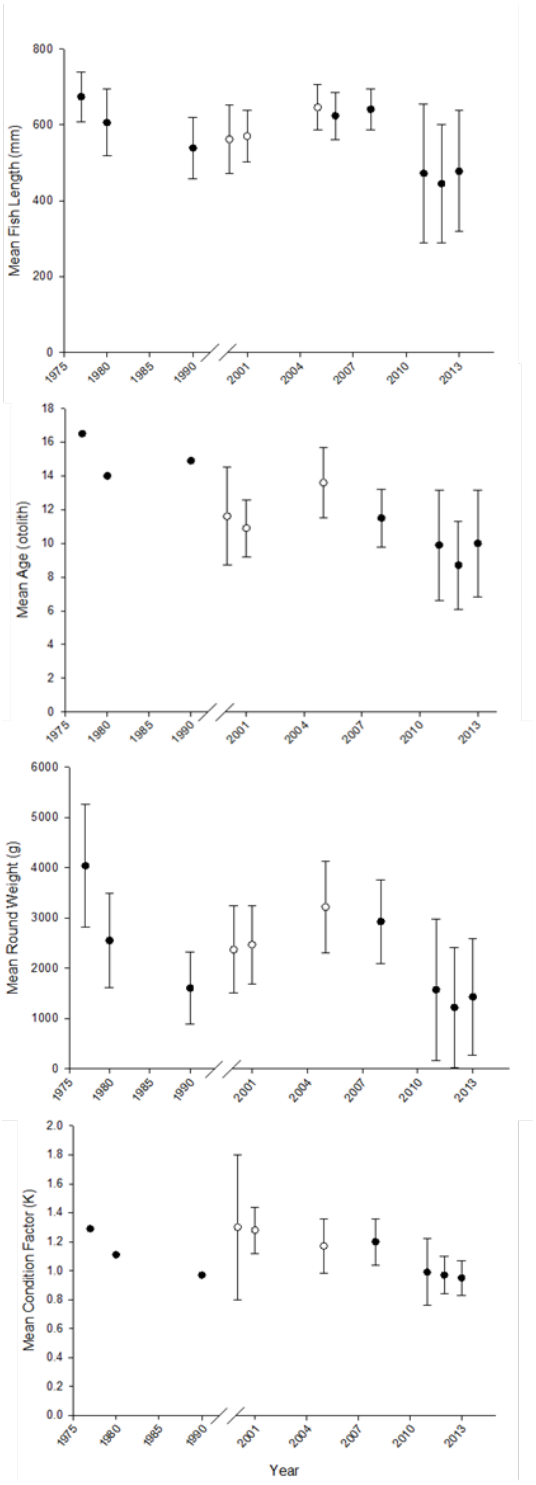

Figure 6. Trend analysis – plot of means (fork length mm, age year, round weight g, and condition factor K) from test fishery (1977 – Kristofferson and McGowan 1981, 1980 – McGowan 1985, 1990 – McGowan et. al. 1993) fishery-independent (2000, 2001, 2005, 2011, 2012, and 2013) and plant data (2006 and 2008). Standard error bars of the mean included. Closed circles represent winter fishing, open circles represent summer fishing. Single mesh nets were used in every year except 2011, 2012, and 2013 when multi-mesh nets were used.

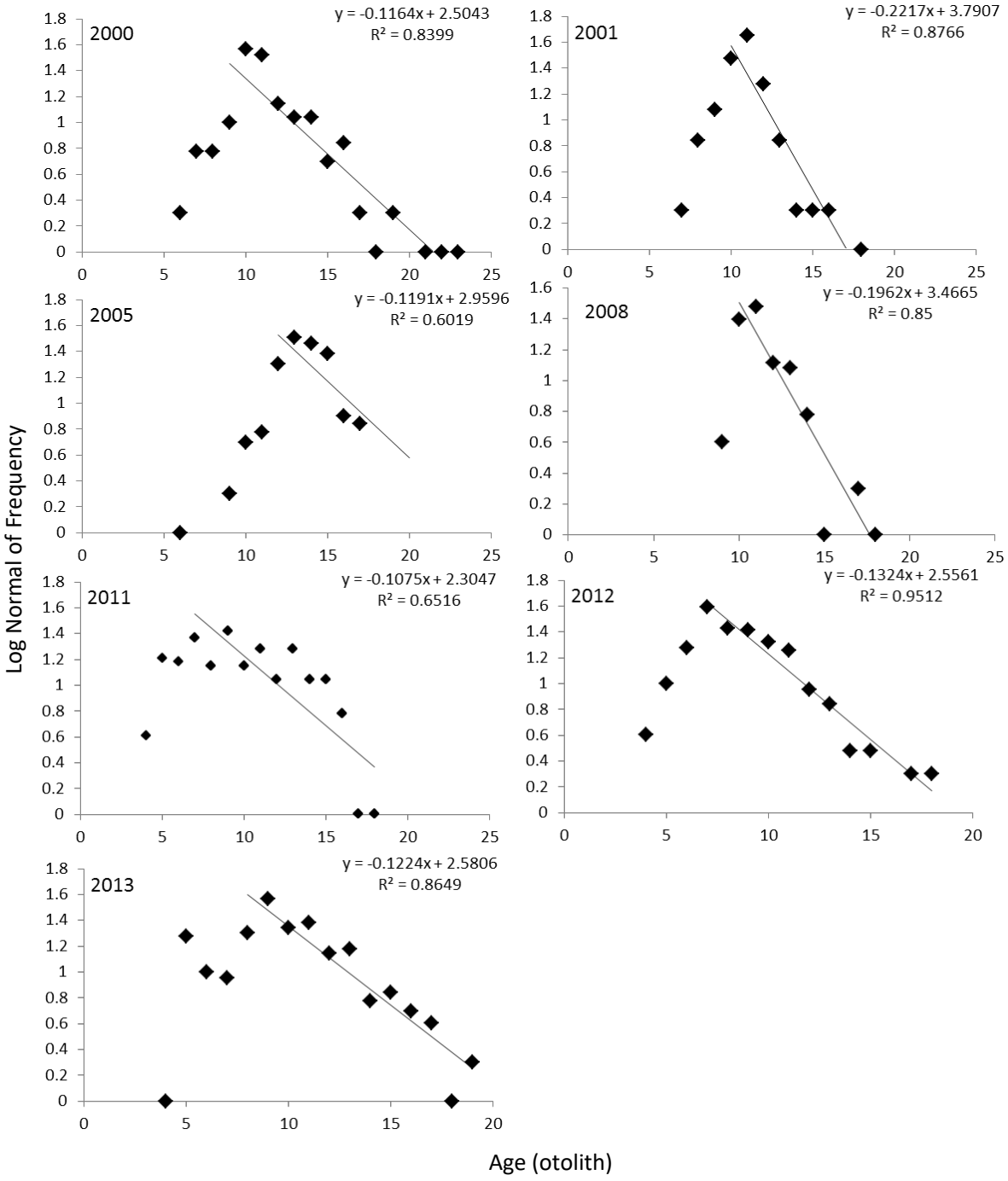

Figure 7. Annual age frequency catch curves for Arctic Char from Ikaluit Lake (Robert Peel Inlet), fishery-independent data (2000, 2001, 2005, 2011, 2012, and 2013) and plant data (2008). Linear regression is applied to the descending part of the curve, line equation and fit of the trend line are present on the graph.

Table 4. Calculations of the instantaneous mortality (z), rate of survival (S), and annual total mortality (A) for Arctic Char from Ikaluit Lake (Robert Peel Inlet), both fishery-independent data (2000, 2001, 2005, 2011, 2012, and 2013) and plant data (2008) are presented annually. Sex and gear type are pooled.

Year	Instantaneous Mortality z	Rate of Survival S	Annual Total Mortality A
2000	0.1164	0.8901	0.1099
2001	0.2217	0.8012	0.1988
2005	0.1191	0.8877	0.1123
2008	0.1962	0.8218	0.1782
2011	0.1075	0.8981	0.1019
2012	0.1324	0.8760	0.1240
2013	0.1224	0.8848	0.1152

Sources of Uncertainty

Fishery-dependent CPUE and biological data are currently not available for this stock.

The fishery-independent data provides a data set with many inconsistencies in sampling (e.g., different timing, locations, and gear type used) (Table 2) (Martin et al. 2023). This makes comparisons from year-to-year difficult and adds a source of uncertainty to the analysis.

Important habitats have not been studied in this system. In particular, there is limited information on: overwintering areas in the lake, spawning locations in the lake, migratory corridors, and juvenile rearing grounds.

The subsistence harvest of Ikaluit Lake Arctic Char is assumed to be significant, yet there is no documented information on this harvest: location, timing, and exact amounts harvested.

CONCLUSIONS AND ADVICE

Sustainable Harvest

From the results of the Baranov catch equation it is estimated that the median predicted stock size of Arctic Char is 6,588 individuals. At present, the current exploratory harvest level is approximately 1,000 kg, which is equal to a harvest rate of 5% (329 fish). However, there is a substantial subsistence harvest that takes place on the Ikaluit Lake stock which suggests an actual harvest rate of up to 20% for the stock. Since information is lacking to truly estimate the sustainable harvest rate for anadromous Arctic Char populations in Nunavut; the conservative rate of 5% for the exploratory fishery is recommended to ensure stock sustainability into the future.

Outlook

The information on the Ikaluit Lake Arctic Char stock indicates that the stock is heavily harvested for both subsistence and fishery purposes. The current rate of harvest from all sources ranges from 5% up to 20%. It is generally thought that anadromous Arctic Char populations should have harvest rates around 5% which is considered precautionary (DFO 2005

and DFO 2009). However, the biological parameters indicate that the Ikaluit Lake stock is stable and able to withstand the current harvest.

Given the importance of this stock for subsistence it is recommended that the stock be monitored annually for biological and catch effort information to ensure that the stock continues to withstand current harvest levels. The data collection should be done in a consistent manner, so data is comparable from year-to-year. For proper stock assessment and management, information on the quantity, status and timing of subsistence harvest is required. Information on the subsistence harvest and continued stock assessment data collection will provide resource managers the information they need to make informed management decisions.

OTHER CONSIDERATIONS

Traditional Knowledge from experienced fishers and elders in the communities needs to be recorded. This information should be used in the design and execution of all future research on this stock.

The link between past and present hunting and opportunistic fishing areas should be explored. With the reduction of Caribou on Baffin Island it is presumed that there is more pressure placed on other traditional foods (e.g. seals, fish); however, there may be a demographic imbalance on harvest pressure on these resources. For example, locations closer to communities may see higher pressure compared to locations far away where hunting is no longer good. This is important information to know and should be recorded as it may represent a shift in harvest pressure on many resources (increases on some stocks and decreases on some stocks).

LIST OF MEETING PARTICIPANTS

Name	Organization/Affiliation
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Sally Wong	DFO Resource Management, Central and Arctic Region, Iqaluit
Andrew Dialla	Interpreter
John Post	University of Calgary, Calgary
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Patrick Kilabuk	Pangnirtung Hunters and Trappers Organization
Jackie Maniapik	Pangnirtung Hunters and Trappers Organization
Jacobie Maniapik	Pangnirtung Hunters and Trappers Organization
Corenna Nuyalia	Government of Nunavut Fisheries and Sealing
Danica Crystal	Nunavut Wildlife Management Board

SOURCES OF INFORMATION

This Science Advisory Report is from the regional peer review of June 24–25, 2014 on the Stock status and sustainable harvest levels for Arctic Char in Ikaluit Lake (Robert Peel Inlet), Cumberland Sound Area, Nunavut. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

DFO. 2005. Stock Assessment Report on Kipisa Arctic Char. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2005/028: 14 p.

DFO. 2009. Assessing the impact of harvest on Kingnait Fjord Arctic Char in the Cumberland Sound area of Baffin Island. DFO Can. Sci. Advis. Sec. Sci. Resp. 2009/013: 15 p.

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