A SUMMARY OF COMMERCIAL WHITEFISH DATA

NORTH ARM - RAINY LAKE

License FF901

Ontario Ministry of Natural Resources
Fort Frances District
February 2010

Alyson Bisson
Resource Technician
Fort Frances Area

Table 1: Population characteristics of whitefish from the commercial catch of FF901, North Arm of Rainy Lake. 1997 to 2009.

year	sample size (n)	mesh size (mm)	mean age* (yrs)	modal age (yrs)	age range (yrs)	mean TL (mm)	TL range (mm)	mean RWT (g)	RWT range (g)	total annual mortality (%) (ages)	sex ratio M:F (%)
1997	321	127	8.95	8	5-16	470	362-581	1235	500-2620	36	51:49
2009	200	140,152	11.53	9.5	4-24	544	451-745	1993	1080-4700	46 (9-14)	44:56

* age determination from pectoral fin ray
T.L. = Total Length
RWT = Round Weight

Table 2: Population characteristics of lake whitefish from the commercial catch, North Arm of Rainy Lake, 1960 to 1971.

year	sample size (n)	mesh size (mm)	mean age* (yrs)	modal age (yrs)	age range (yrs)	mean TL (mm)	TL range (mm)	mean RWT (g)	RWT range (g)	total annual mortality (%)	sex ratio M:F (%)
1960	94	?	7.34	6	5-10	508	388-686	-	-	42	-
1965	168	?	5.95	6	3-14	460	356-686	-	-	39	-
1966	55	?	6.37	7	4-8	462	406-518	-	-	-	-
1968	261	?	6.44	6-7	4-9	462	343-660	-	-	54	-
1969	300	?	7.68	8	2-12	472	335-597	-	-	44	-
1970	206	?	7.41	8	3-14	475	381-650	-	-	55	-
1971	69	?	6.63	7	4-11	480	414-645	1041	610-2810	63	-
1973	33	?	5.15	5	3-8	458	381-516	-	-	68	-

* age determination from scales
T.L. = Total Length
RWT = Round Weight

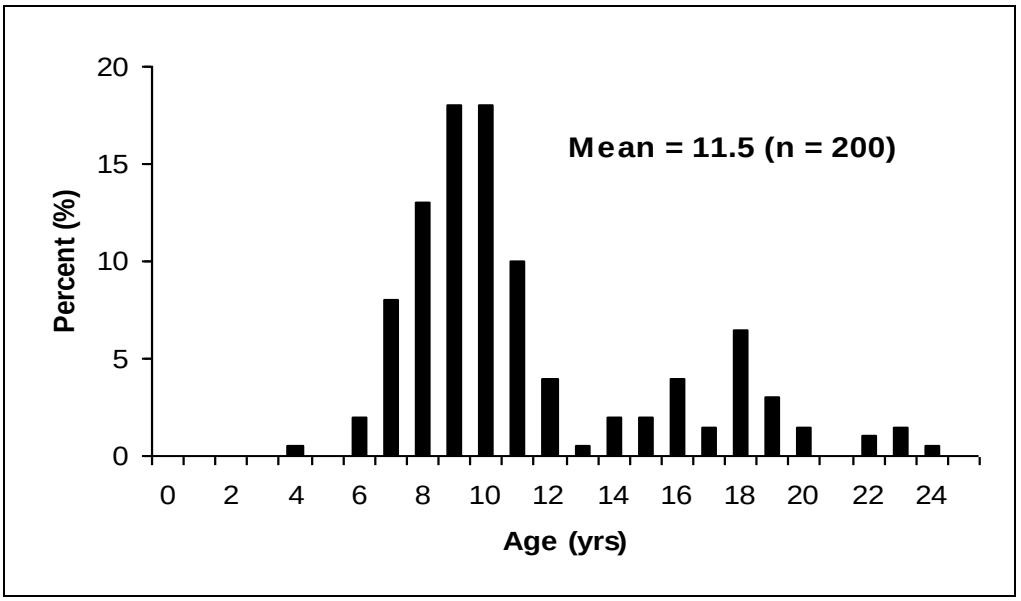

Figure 1: Age composition of lake whitefish from the commercial catch of FF901, North Arm of Rainy Lake, 2009.

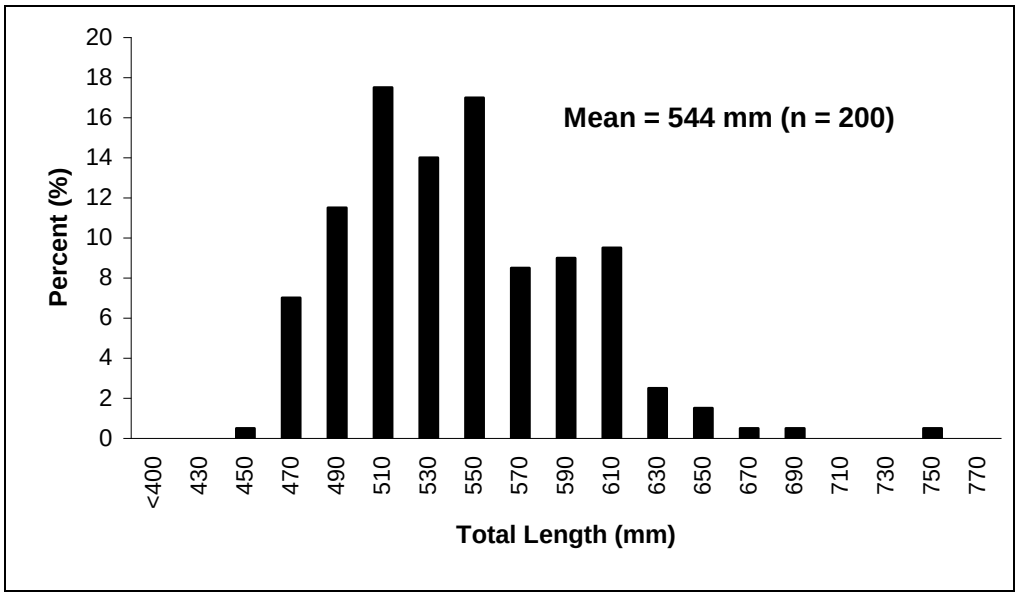

Figure 2: Length composition of lake whitefish from the commercial catch of FF901, North Arm of Rainy Lake, 2009.

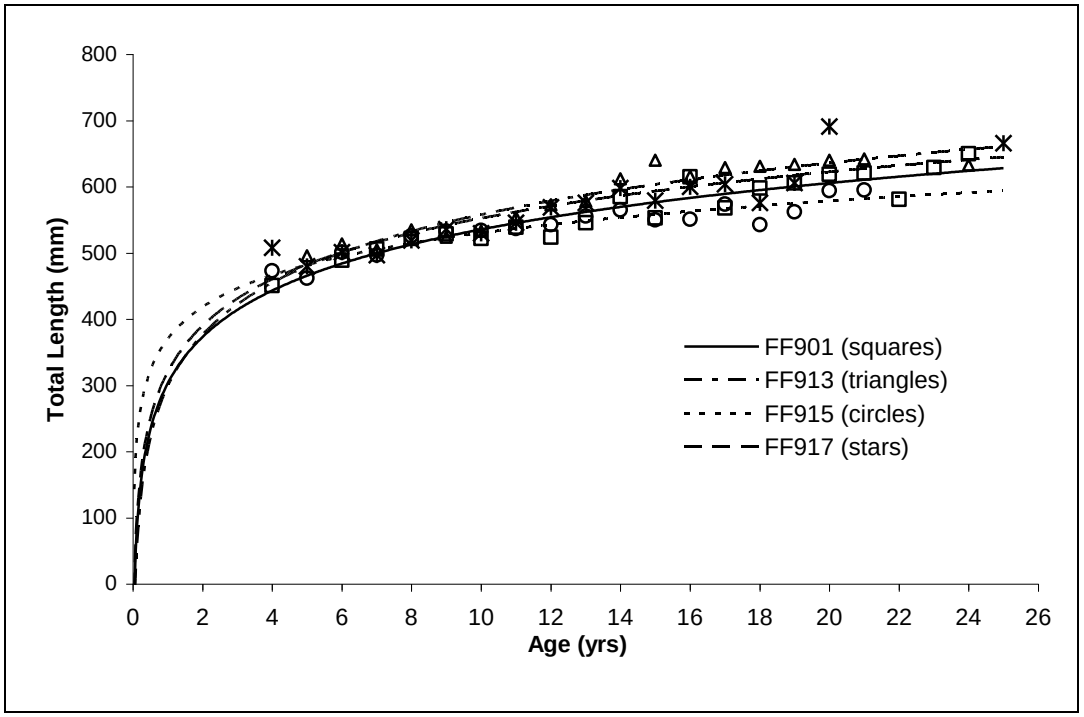

Figure 3: Lake whitefish growth (total length at age) for combined sexes in the South Arm, North Arm and Redgut Bay of Rainy lake based on Commercial catch sampling, 2009.

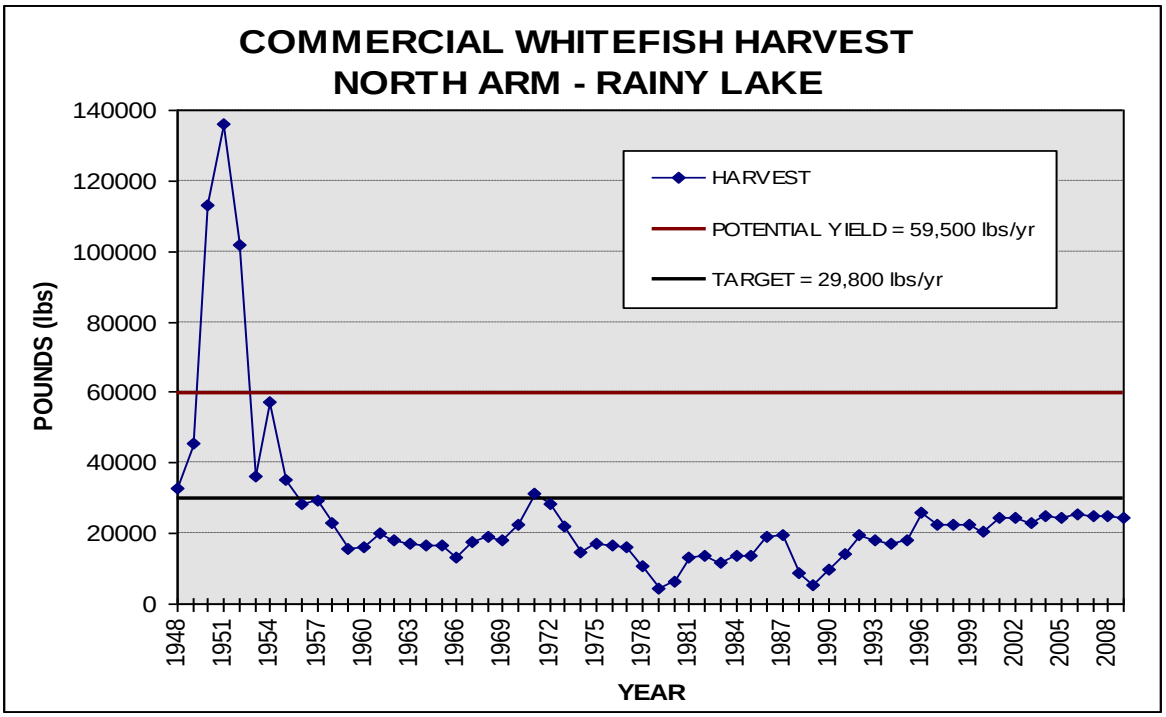

Figure 4: Commercial whitefish harvest, North Arm Rainy lake 1948-2009.

SAMPLING DETAILS:

- dates:
  - July 17 and 21, 1997
  - July 13, 2009

- fish were sampled from 140mm (5.5") and 152m (6”) stretched mesh

- mean total length of fish captured in 140 mm (5.5") and 152 mm (6”) mesh was 544 mm (21 in) in 2009.

- mean round weight of fish captured 140 mm (5.5") and 152 mm (6”) mesh was 1993 g (4.4 lbs) in 2009.

- all female fish sampled were sexually mature and 98% (85 of 87) of males were sexually mature.

- mortality estimates based on Chapman-Robson method from first fully recruited age to age 14. Total annual mortality in 2009 was 46%.

OBSERVATIONS:

- Age composition of the catch is provided, with ages ranging from 4 to 24 years. The 2009 catch was dominated (67%) by 7-11 year old fish. The possible presence of a strong 1999 and 2000 year class was apparent in the 2009 catch sample.

- Age classes 8, 9 and 10 are 100% mature and make up 49% of the catch. Manitoba DNR (In: MacCallum, 1980) recommends that three year-classes should contribute at least 15% of the age composition, and that two of these year classes should be 75% mature, in order to provide long-term sustainable catches.

- A mean age of 11.53 years in 2009 (Table 1) is slightly higher than that observed on the South Arm (9.53 years in 2009 which included fish captured in 140 mm (5.5”) mesh).

- Mean age of the catch is above the mean age of maturity expected for whitefish ie. 4 to 6 years (5.5-6.5 years on Lake Nipigon). Ideally, the average age of the catch should be a minimum of 1.5 to 2 years above the average age of maturity to ensure a sustained harvest to the fishery (Christie and Regier, 1973). A difference of 1.5 years or greater is indicative of a stock which can replace what is removed by fishing and natural mortality combined (Ritchie, 1989).

- Fewer than 7 age classes available to a commercial fishery would be cause for concern. (OMNR, 1999) In 2009, there were 20 age classes represented in the northern portion of the North Arm fishery.

- When using large mesh gill nets (>5” mesh), care should be taken to not significantly reduce brood stock abundance (Healey, 1975). This also mitigates the dramatic fluctuations in year class strength, and provides increased harvest stability over time.

- Length composition in 2009 indicates the majority (60%) of the catch in the length intervals of 490-550 mm. Mean total length was 544 mm over the fourteen (20 mm) length intervals, with no fish larger than 750 mm sampled.

- Growth rates in 2009 are similar in all 3 basins of Rainy Lake(South Arm, North Arm and Red Gut). Whitefish respond to fluctuations in population size through compensatory changes in growth rate (Healey, 1975).

- Total mortality rate was estimated at 36% in 1997 and 46% in 2009. As a general guideline, total mortality rates exceeding 60% would entail high risk of instability or collapse (OMNR, 1983 - SPOF#15). Mortality on the North Arm (FF901) is similar to the South Arm where mortality estimates have averaged 36% since 1987, but considerably lower than estimated average of 51% from the North Arm (FF913) since 1985.

- In the past, observed differences in growth, age composition and mortality suggested a possible presence of distinct whitefish stocks in the north (FF901) and south (FF913) portions of the North Arm basin. Based on the sampling in 2009, growth, age composition and mortality rates are becoming less distinct between the North Arm fisheries, which may suggest one stocks for the entire basin, or it may simply be an indication that the population(s) are becoming more healthy. Further genetic testing or tagging studies would provide further evidence of stock discreteness or intermixing.

- Rainbow smelt were first confirmed in the North Arm, Rainy Lake in 1991 and reached high levels of abundance in the late 1990's. This invasive species is expected to have long-term negative impacts on whitefish recruitment and population levels. Since 1997, the number of age classes in the catch have increased but mortality has also increased, showing some evidence to suggest that rainbow smelt have had a potential impact on the health of the whitefish population(s) in the North Arm.

REFERENCES:

Healey, M.C. 1975. Dynamics of exploited whitefish populations and their management with special reference to the Northwest Territories. J. Fish. Res. Board Can. 32:427-448.

MacCallum, W. 1980. A review of the Eastern Lake Superior whitefish populations, 1975-1979. A preliminary report.

OMNR, 1983. The identification of over-exploitation. Report of SPOF Working Group Number Fifteen. Ontario Ministry of Natural Resources. 84 p.

OMNR. 1999. Criteria for evaluating lake whitefish quota, Lake Nipigon Fisheries Assessment Unit. Ontario Ministry of Natural Resources. 5 p.

Ritchie, B.J. 1989. Status of the Lake Nipigon commercial whitefish (Coregonus clupeaformis) fishery and potential impacts of rainbow smelt (Osmerus mordax), 1989. Ontario Ministry of Natural Resources. Lake Nipigon Fisheries Assessment Unit Report 1989-2. 31 p.