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# *Ecology of the Rupert Bay Cisco populations*

Eastmain-1-A and Sarcelle Powerhouses  
and Rupert diversion project

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# Objectives

- ⑤ Steps to ensure meaningful participation of the Crees in the Cisco Monitoring Program
- ⑤ Describe the monitoring program in place for Rupert River cisco including Cree knowledge
- ⑤ Discuss implications for future research



# Cisco Monitoring Program

- Hydroacoustic surveys to locate areas where spawners congregate (Fall)
- Larval drift study to estimate annual production (Spring)
- Use of neighbouring rivers as control sites
- Work in collaboration with Crees, including collecting Traditional Knowledge

# Participation of the Crees

- Monitoring Committee (since 2007) :
  - Composed of 8 Cree representatives and 7 HQ representatives
- Smokey Hill Liaison Committee (since 2010)
  - Local Waskaganish fishermen and other stakeholders (CTA, schools, Band Council, etc.)



# Collecting Traditional Knowledge

- Discussions and interviews (2007)
  - Cisco ecology in the Rupert
- Traditional Knowledge Workshop (2008) :
  - Morphological differences in 2 types of cisco :
    - Nuutaamesaniw-names (Rupert – Broadback)
    - Kaachikaasuk-names (Nottaway)
- Additional interviews about the Nottaway cisco fishery (2011)



# Contribution of Traditional Knowledge

- More effective fishing/sampling efforts
- Additional activities to monitoring program :
  - To better assess upstream limits of the cisco run
  - To better document chronology of cisco run at the mouth of the Rupert
  - **To better document the 2 types of cisco**
- Better understanding of the fall cisco run prior to the partial diversion

# Two Different Types of Cisco ?

- **Kaachikaasuk (Nottaway) cisco is :**
  - **Stronger and bigger.**
  - **Has a greenish back**
  - **Smaller eyes**
  - **Smaller eggs**
  - **Shape of the chin and mouth is different**



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**Is each type associated with its own river ?**

Tableau 4-5 Comparaison des caractéristiques biologiques des cisos des populations Rupert-Broadback et Nottaway

## A) 2009

Variable	Unité	Rupert- Broadback				Nottaway				Comparaison statistique <sup>2</sup>	
		n	Moy.	Min.	Max.	n	Moy.	Min.	Max.	p	Classement
<b>Total length</b>	mm	50 <sup>4</sup>	318	272	378	31 <sup>4</sup>	378	305	440	<0,001*	N>RB
	g	50	318	170	480	31	378	240	860	<0,001*	N>RB
		50	3,9	3	4	31	3,5	3	4	<0,001*	N<RB
Masse des gonades (F)	g	24	31,5	14,3	65,5	5	43,4	27,0	57,1	N/A	N/A
Masse des gonades (M)	g	25	3,9	1,9	7,8	2	10,2	9,3	11,0	N/A	N/A
Âge	année	50	4,8	3	7	31	6,1	5	9	<0,001*	N>RB
Coefficient de condition		50	0,850	0,722	1,077	31	0,898	0,736	1,055	0,011*	N>RB
Indice gonado-somatique (F)		24	0,100	0,053	0,139	5	0,129	0,112	0,146	N/A	N/A
Fécondité	œufs/femelle	10	10 277	8 393	20 817	1	7 475	—	—	N/A	N/A
Fécondité relative	œufs/100g	10	3 117	2 411	4 626	1	3 114	3 114	3 114	N/A	N/A
Rapport des sexes	M : F	50	52 : 48			31	16 : 84			N/A	N/A

## B) 2011

Variable	Unité	Rupert-Broadback				Nottaway				Comparaison statistique <sup>a</sup>	
		n	Moy.	Min.	Max.	n	Moy.	Min.	Max.	p	Classement
<b>Total length</b>	mm	57 <sup>4</sup>	331	286	398	32 <sup>4</sup>	399	315	400	<0,001*	N>RB
	g	57	331	184	628	32	399	260	634	<0,001*	N>RB
		57	3,9	2	4	32	3,4	3	4	<0,001*	N<RB
Masse des gonades (F)	g	27	46,3	14,6	79,5	11	25,0	8,4	51,7	N/A	N/A
Masse des gonades (M)	g	28	4,0	1,8	9,1	5	7,0	3,1	10,2	N/A	N/A
Âge	année	57	4,8	2	9	32	5,3	4	6	0,014*	N>RB
Coefficient de condition		57	0,869	0,703	1,024	32	0,903	0,691	1,064	0,092	N.S.
Indice gonado-somatique (F)		27	0,148	0,032	0,220	11	0,075	0,017	0,166	N/A	N/A
Fécondité	œufs/femelle	25	10 539	5 895	16 791	5	21 594	6 032	35 870	N/A	N/A
Fécondité relative	œufs/100g	25	2 927	1 768	4 019	5	6 237	2 320	9 854	N/A	N/A
Nombre de branchichténies		7	43	36	46	5	43	41	46	N/A	N/A
Hauteur maximale	mm	57	66	50	90	32	71	60	81	0,001*	N>RB
Circonférence maximale	mm	57	166	130	220	32	181	151	208	<0,001*	N>RB
Circonférence de la queue	mm	57	62	45	80	32	66	54	78	0,01*	N>RB
Rapport des sexes	M : F	57	53 : 47			32	66 : 34			N/A	N/A

1) Pour les fins de la comparaison, l'assignation populationnelle obtenue par le logiciel Structure 2.3.3. a été utilisée.

2) Le test de Kruskal-Wallis a été utilisé.

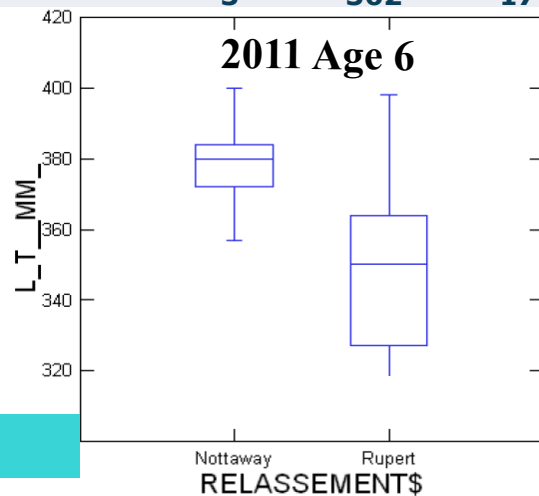
3) Stade de maturité selon l'échelle de Bückmann, 1929 (voir annexe 2-1).

\* L'astérisque indique une différence significative au niveau  $\alpha = 5\%$ .

N/A: non applicable (taille des échantillons insuffisante).



Âge	Longueur totale (mm)						Test Kruskal-Wallis	
	n	Nottaway		Broadback-Rupert			Résultat	Probabilité
		Moyenne	Écart type	n	Moyenne	Écart type		
<b>2009</b>								
3				3	289	16		
4				13	305	16		
5	11	362	32	25	321	19	Nott. > Rupert	p = 0,001
6	13	376	16	7	336	30	Nott. > Rupert	p = 0,013
7	3	392	14	2	336	1		
8	2	413	38					
9	2	418	11					
<b>2011</b>								
2				1	300			
3				2	289	4		
4	4	325	12	23	325	17		
5	15	371	14	16	328	20	Nott. > Rupert	p < 0,001
6	13	379	12	11	349	26	Nott. > Rupert	p = 0,002
7				3	362	17		
9								



# Genetic analysis of larvae



**Finding: cisco larvae  
from Rupert and  
Broadback  
very similar**



# Type of cisco caught in the Nottaway River in Summer and Fall of 2009 and 2011, determined by genetic analysis

Type of Cisco	Period	
	Summer	Fall
2009		
<b>Kaachikaassuk</b>	24/26 (92%)	6/32 (18%)
<b>Nutamessanan</b>	0	21/32 (66%)
Not classified	2/26 (8%)	5/32 (16%)
2011		
<b>Kaachikaassuk</b>	21/27 (78%)	8/73 (11%)
<b>Nutamessanan</b>	3/27 (11%)	51/73 (70%)
Not classified	3/27 (11%)	14/73 (19%)

# Genetic Study of the fish populations in the Nottaway

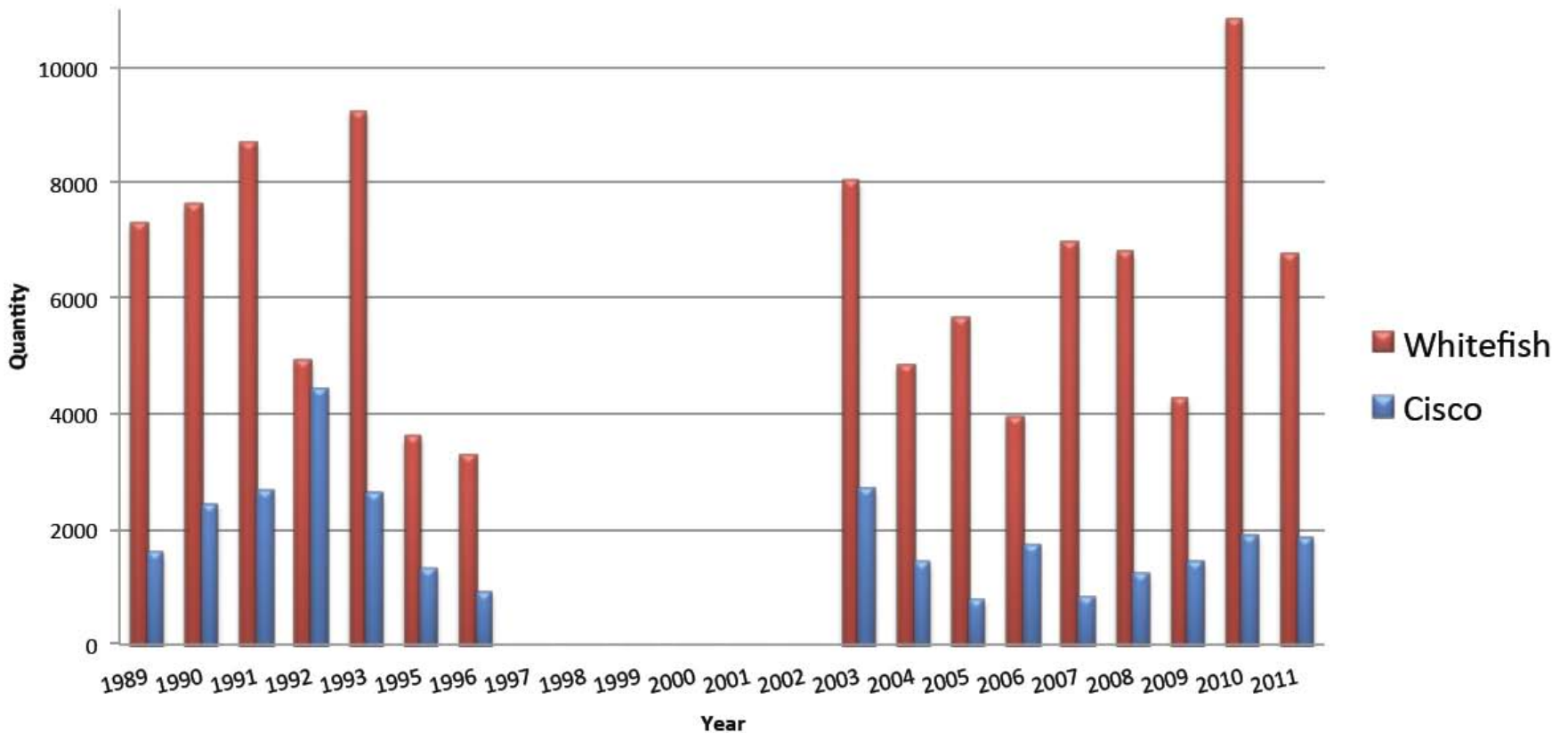
- Two types of cisco are found in the Nottaway (and possibly other rivers)
  - Migration pattern is different for the different types
  - Kachikassuk is a summer-run cisco
  - Rupert / Broadback (Nottaway) a fall run cisco
  - Both types are found in the Nottaway.
  - This phenomena has been observed in other population of coregonids.
  - Need to reconsider the way we refer to the two types of Cisco

# Future Research Avenues

- Studies conducted in 1980's in Eastmain and La Grande River as part of La Grande complex follow-up
  - R Morin, J Dodson, R Baxter
- Focus of studies on presence/absence/abundance (short-term in nature); integration of Cree knowledge minimal.
- Eastmain River: presence of "dwarf" cisco population.

# Coastal Cree Harvesting of Coregonids not insignificant

Funded Community Fishing Programs: Coastal Cisco and Whitefish Catch, 1989-2011



# Niskamoon Corporation



- Mandate to remediate the impacts of hydro-electric development in *Eeyou Istchee*.
- 2013: project initiated to create community scooping site at First Rapids of Eastmain River (on-going).





# Conclusion

- Future research in Eeyou Marine Region could re-visit past cisco/whitefish studies applying "new" methods.
- Including Cree knowledge has greatly improved the Cisco Monitoring Program.
- Dialogue between fishermen and biologists has resulted in greater understanding of monitoring activities by Waskaganish fishermen.
- Building consensus can be challenging and time-consuming, but well worth it!



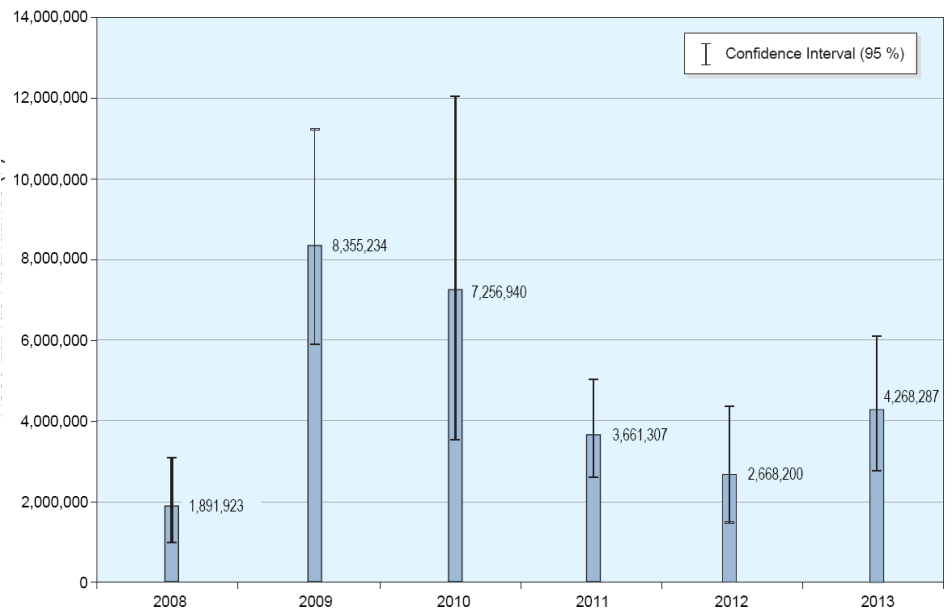


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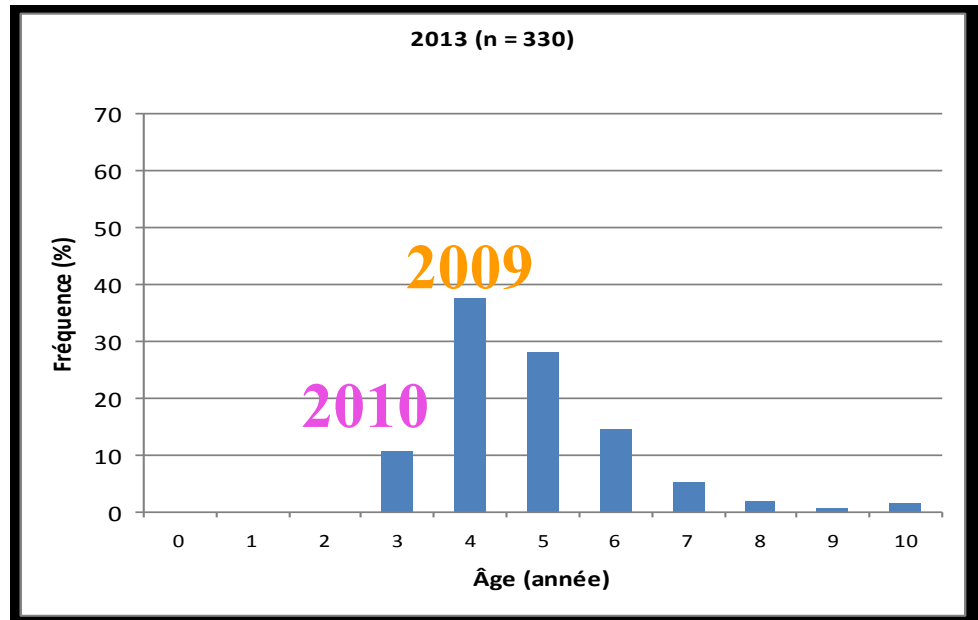


# Others

- Larvae drift monitoring demonstrate yearly fluctuations



- Cohort analysis confirms return the cisco born post-diversion



# Results

## Larval abundance 2012

Rupert KP 10.6  
2 668 200 larvae

Broadback KP 11.3  
132 225 larvae

