

St. Regis Mohawk Tribe Bullhead Liver Tumor Project

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Overview:

Bullheads were collected from St. Lawrence River AOC by the staff of the Environment Division, Saint Regis Mohawk Tribe, in 2012, 2013, and 2014. Liver tissue from these fish were preserved in 10% neutral buffered formalin and submitted to the Aquatic Animal Health Program at Cornell University where they were prepared for microscopic evaluation. A total of 470 fish livers were evaluated during the course of this effort.

Pathologists:

Paul R. Bowser, PhD
Laura L. Coffee, DVM, DiplACVP
Julia Rodriguez-Ramos
Fernandez, DVM, DiplACVP
Anabel Montiel-Del Valle, DVM,
Pathology Resident

2012 Results - Tumors

Location	Fish Species	Liver + Biliary Tumors	Percent with Tumors	P-value Tumors	Significant
SLR AOC	22 WS 1 BB 1 SMB	6	25.0%	0.2728	No
SLR Ref.	30 BB	4	13.3%		
GRA AOC	26 BB 4 CF	2	6.7%	0.4531	No
GRA Ref.	8 BB	0	0.0%		
RAQ Ref.	5 BB	0	0.0%	---	---
AOC vs. Ref.	54	8	14.8%	0.4127	No
	43	4	9.3%		

Tumors - 2012



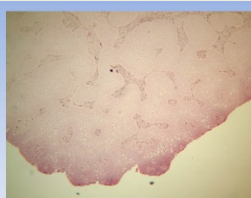
Bullhead: Adenoma



Bullhead: Cholangiocarcinoma



Bullhead: Hepatocellular carcinoma (4X objective)



Bullhead Skin: Papilloma

Pre-Neoplastic Lesions Summary

2012 – Pre-Neoplastic Lesions

Location	Fish Species	Pre-Neoplastic Lesions	Percent Pre-Neoplastic Lesions	P-Value	Significant
SLR AOC	23 WS 1 BB	20	83%	0.1649	No
SLR Ref.	30 BB	20	67%		
GRA AOC	26 BB 4 CF	19	63%	0.0105	AOC > Ref.
GRA Ref.	8 BB	1	12.5%		
RAQ Ref.	5 BB	3	60%	---	---
AOC vs. Ref.	54	39	72%	0.0925	No
	24	24	55.8%		

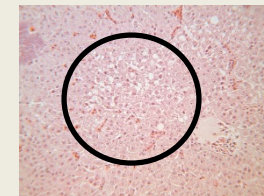
2013 – Pre-Neoplastic Lesions (no tumors were observed in 2013)

Location	Fish Species	Pre-Neoplastic Lesions	Percent Pre-Neoplastic Lesions	P-Value	Significant
SLR AOC	26 WS	1	3.8%	0.9326	No
SLR Ref.	30 BB 2 WS	1	3.1%		
GRA AOC	23 BB 7 CF	1	3.3%	0.3054	No
GRA Ref.	31 BB	0	0.0%		
RAQ AOC	10 BB 13 WS 15 BB	1	4.3%	0.7544	No
RAQ Ref.					
AOC vs. Ref.	79	3	3.8%	0.6599	No
	78	2	2.6%		

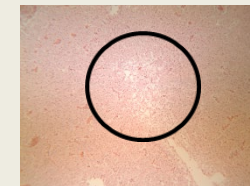
2014 – Pre-Neoplastic Lesions (no tumors were observed in 2014)

Location	Fish Species	Pre-Neoplastic Lesions	Percent Pre-Neoplastic Lesions	P-Value	Significant
SLR AOC	35 WS 22 BB	0	0.0%	---	---
SLR Ref.	32 BB 3 WS	0	0.0%		
GRA AOC	30 BB 5 CF	0	0.0%	0.1101	No
GRA Ref.	14 BB	1	7.1%		
RAQ AOC	32 BB	0	0.0%	0.0428	Ref. > AOC
RAQ Ref.	8 BB	1	12.5%		
STR AOC	35 BB	0	0.0%	---	---
AOC vs. Ref.	159	0	0.0%	0.6599	Ref. > AOC
	57	2	3.5%		

Pre-Neoplastic Lesions

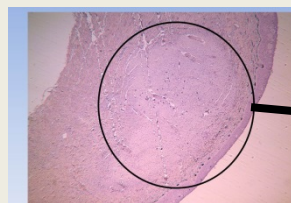


Vacuolated Focus

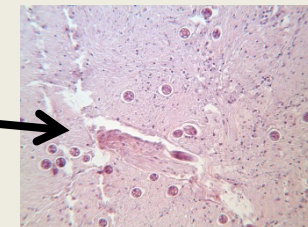


Clear Cell Focus

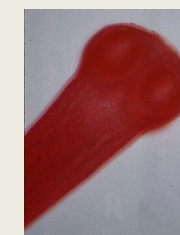
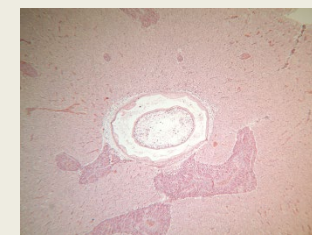
- Parasites -



Bullhead: Skin (stained area observed grossly upon necropsy) (4X objective)



Nematode (Round Worm)



Cestode (Tapeworm)

***No Tumors in 2013 & 2014**