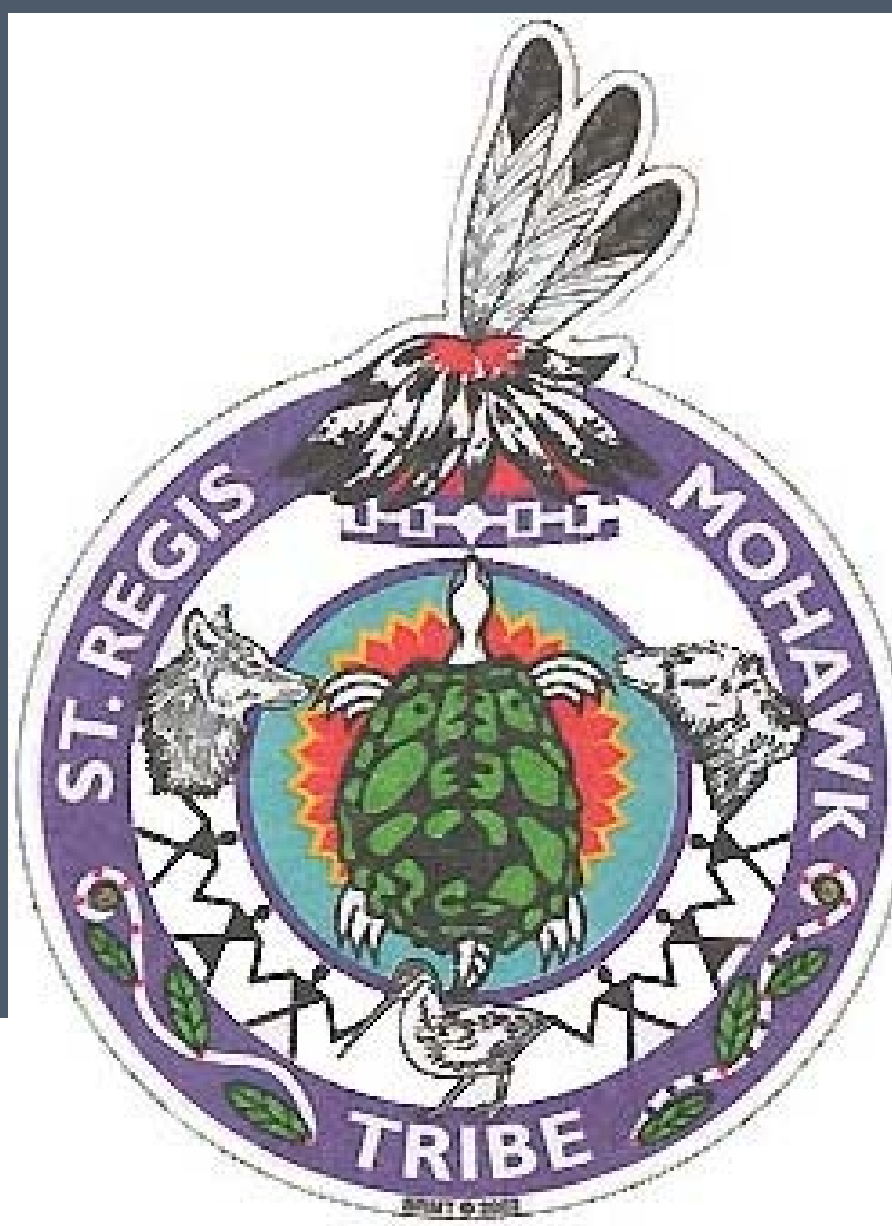


FISH TUMOR EVALUATION

Beneficial Use Impairment Advancements for the Massena/Akwesasne Area of Concern

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ABSTRACT

Brown bullheads are commonly affected with epidermal neoplasms of the mouth and skin, where neoplasms are defined as an abnormal tissue that grows by cellular proliferation to form a distinct mass of tissue that may be benign or malignant. The neoplasms are diagnosed as either papillomas (benign) or carcinomas (malignant) and occur singly or in multiples varying in size from several millimeters to several centimeters. Bullheads are a species of choice due to their abundance, bottom-feeding and sediment burrowing behaviors, tolerance, human consumption concerns for bioaccumulation, and prevalence across the Great Lakes nearshores.

The overall objective of this survey is to evaluate the status of Fish Tumor and Other Deformities beneficial use impairment and to make progress in understanding the impairment specific to the Massena AOC. This study will determine tumor prevalence and examine possible association between tumor prevalence and contaminant exposure to PCBs and PAHs. It is hypothesized that incidence rates of internal and external fish tumors within the Massena/Akwesasne St. Lawrence River Area of Concern (AOC) will not exceed an acceptable incident rate to comparable sites outside the Area of Concern.

BACKGROUND

The Massena/Akwesasne Area of Concern (AOC) has previously been identified as an AOC due to discharge of hazardous industrial byproducts to nearby tributaries, land, and the St. Lawrence River itself, thus causing ecological impairments and impaired water quality. Three industrial facilities in Massena, NY were known to have historically released discharges that contained persistent organochlorine chemicals (POCs) such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), dibenzo-p-dioxins, dibenzofurans, dichlorodiphenyldichloroethylene (DDE), mirex, as well as nutrients and metals into the Massena Area of Concern.

PCBs have been listed as the primary contaminant of concern for all three of these sites (General Motors, Reynolds Metal (now Alcoa East) and Aluminum Company of America (now Alcoa West), but cleanup threshold for PAHs were developed for risk reduction goals as well. PAHs are assumed to be associated with the St. Lawrence River Area of Concern (AOC) due to the aluminum processing plants. "One of the most important industrial sources of PAH is the production of Al by electrolysis using the Soderberg anode. The electrode used in the process is a paste consisting of coal tar and pitch (Thrane, 1986)." The Soderberg potline is still used today at Alcoa East, while Alcoa West has changed to Carbon Anodes processes. PAHs have been shown to be associated with skin and liver tumors of bullhead at other sites in the Great Lakes, and have been historically detected in the St. Lawrence River AOC sediment up to concentrations as high >500ppm total PAHs (adjacent the former Reynolds Metals, now Alcoa East).

2012-2013 FIELD OBJECTIVES

- Assess the prevalence of liver tumors (neoplastic and pre-neoplastic) or other deformities (non-neoplastic) in AOC fish, compared with AOC background reference sites.
- Prevalence and severity of external tumors and other deformities in bullheads, compared with AOC background reference sites using a severity scoring system.
 - Severity Scoring:**
 - 0- No visible anomalies
 - 1- Mild condition
 - 2- Moderate
 - 3- Severe
- Evaluate and weigh the gonads, liver, and spleen for index measurements for health and reproduction observations of each fish.

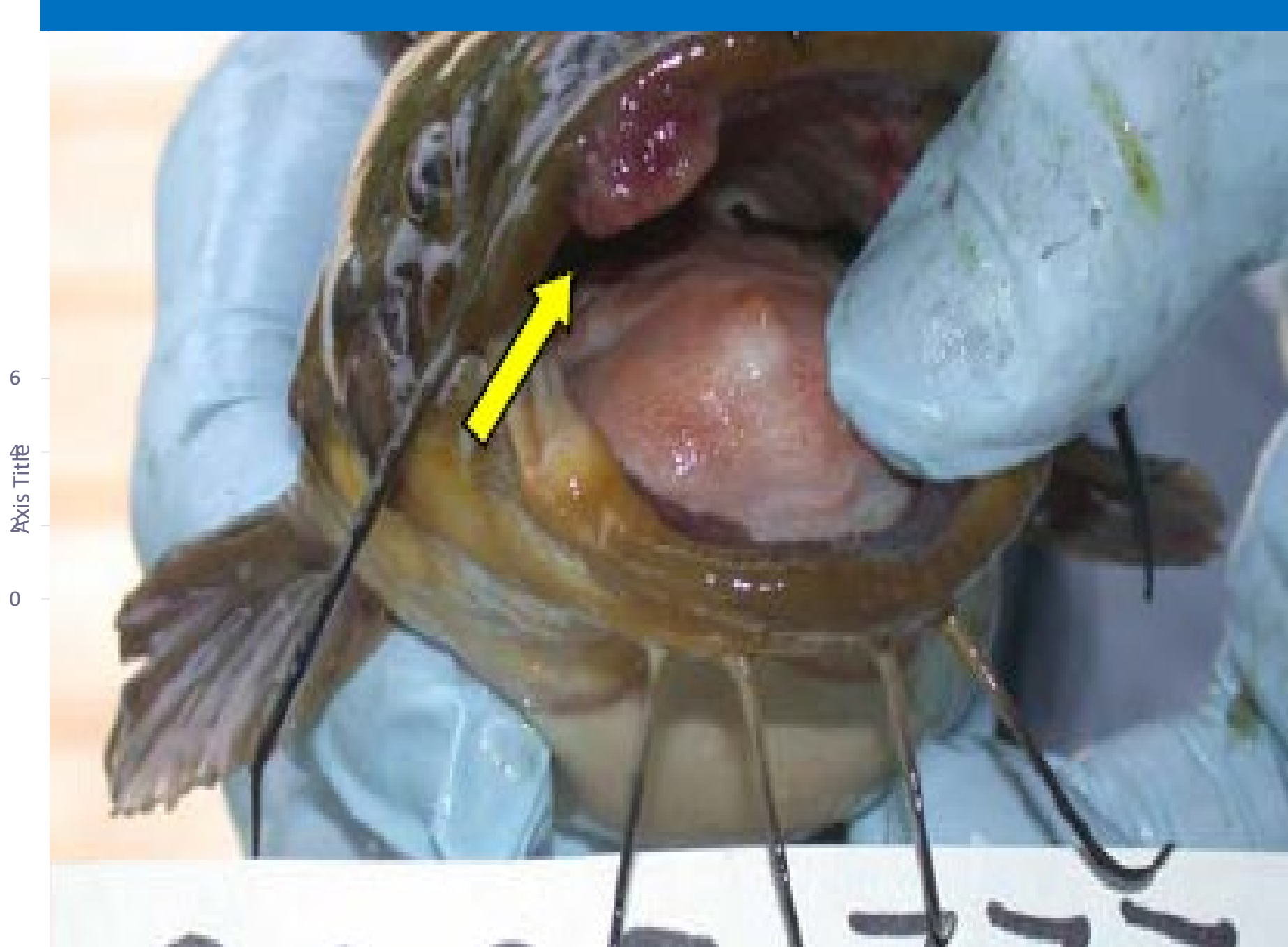
DEFORMED BARBEL



RAISED SKIN LESION



RAISED MOUTH LESION



PIGMENTATION



ULCERS



SCARS/WOUNDS



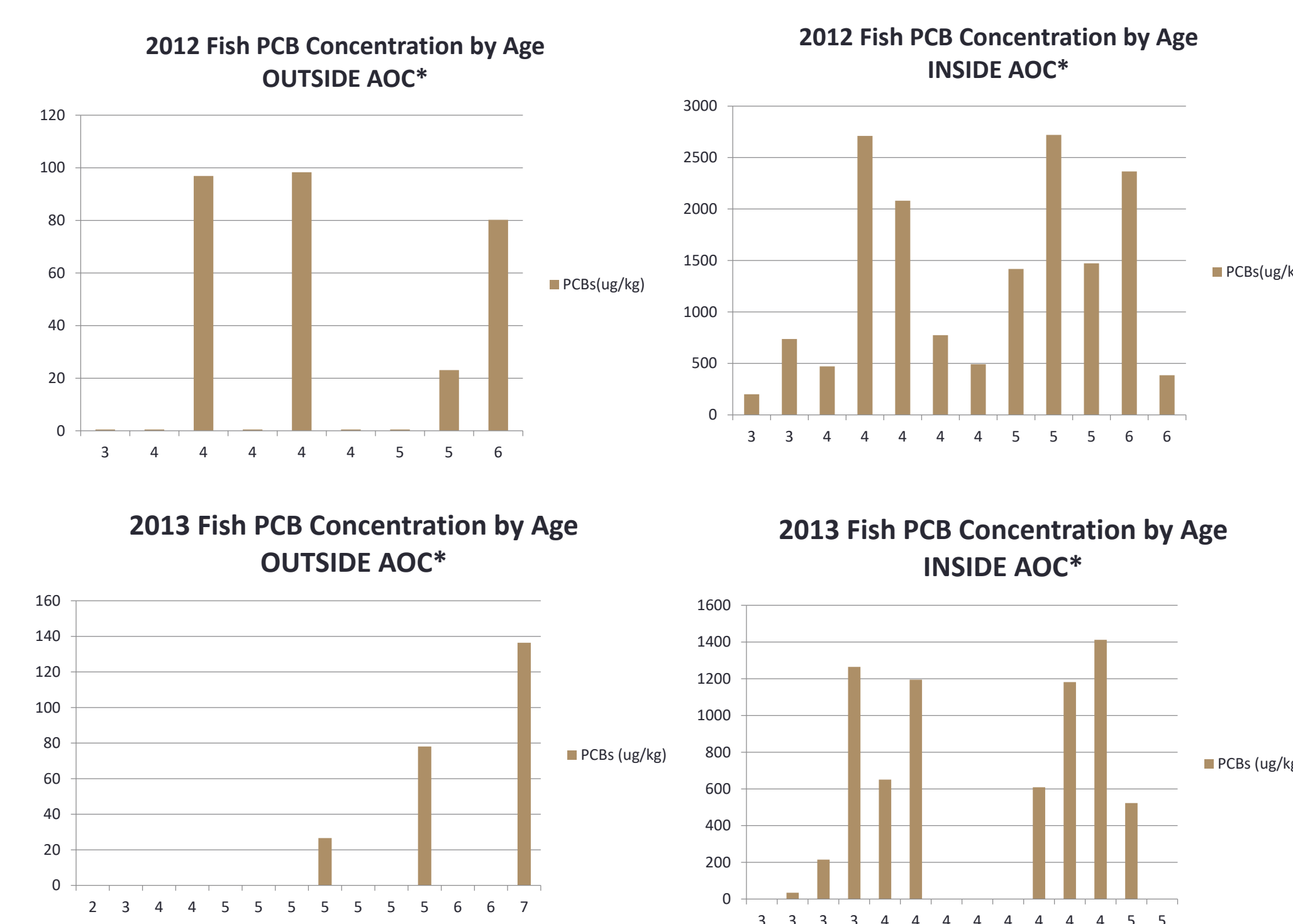
HISTOLOGY RESULTS

2012 LIVER RESULTS					
SITE	N=Fish	Liver: Non-neoplastic	Liver Pre-Neoplastic	Liver: neoplastic	AOC Liver Neoplastic
SLR-AOC	24	17 (71%)	20 (83%)	6 (25%)	Inside
SLR-R	30	25 (83%)	20 (67%)	2 (7%)	14.8%
GRASSE-AOC	30	23 (77%)	19 (63%)	2 (7%)	Outside
GRASSE-R	8	6 (75%)	1 (13%)	0 (0%)	5.2%
RAQ-R	5	4	3	0	

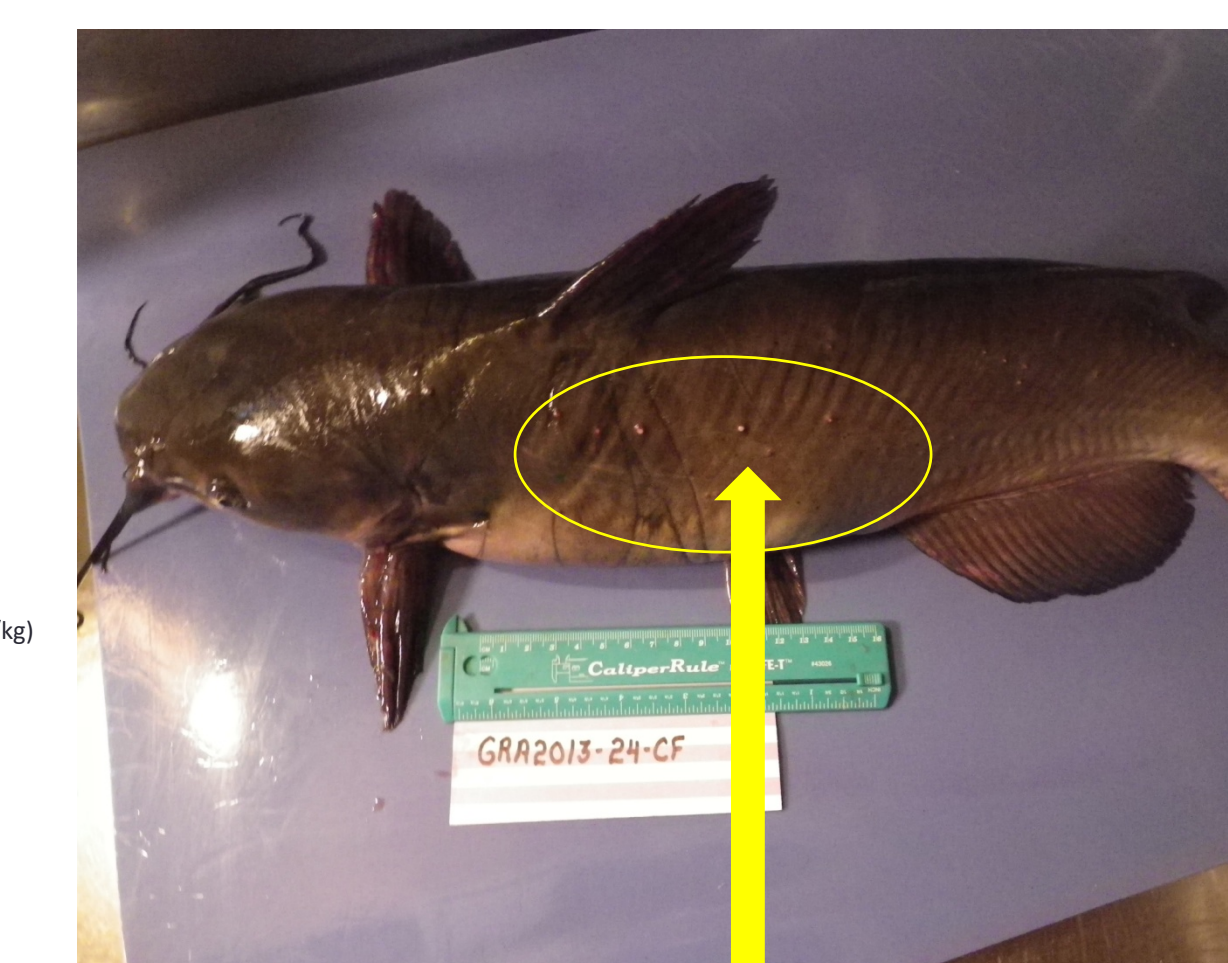
2013 LIVER RESULTS					
SITE	N=Fish	Liver: Non-neoplastic	Liver Pre-Neoplastic	Liver: neoplastic	AOC Liver Neoplastic
SLR-AOC	26	22 (85%)	1 (4%)	0	Inside
SLR-R	32	31 (97%)	1 (3%)	0	0.0%
GRASSE-AOC	30	26 (87%)	1 (3%)	0	Outside
GRASSE-R	31	25 (81%)	0 (0%)	0	0.0%
RAQ-AOC	23	12 (52%)	1 (4%)	0	
RAQ-R	15	11 (73%)	1 (7%)	0	

*Only two fish with raised lesion for histology in 2012 and 2013. (see photos to the far right for results and explanation).

CHEMICAL RESULTS



*All PAH data, non-detect (ND) for both 2012 and 2013.



Granulomas: raised smooth nodules on the skin containing numerous small nematodes (parasitic roundworm)



Papilloma: Small benign tumors known as warts (Dermal Sarcoma)

For more info, go to:
www.srmtenv.org/index.php?spec=stlawrenceriver-aoc/main