



Image Credit: Ben Brenner

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UNDERSTANDING EXPOSURE AND PERSISTENCE OF POLYCHLORINATED BIPHENYLS (PCBS) IN AMERICAN ALLIGATORS FROM THE MOBILE-TENSAW DELTA



COURTLYN ROBINSON

- Native of Birmingham, Alabama
- Environmental justice advocate
- Senior class standing
- University of Alabama at Birmingham
- School of Public Health undergraduate program - Environmental Health Sciences



DR. ALISON ROBERTSON



“ Understanding the links between marine ecosystem health & human health”

- Natural Toxins
- Venoms
- Anthropogenic Contaminants

Ph.D. Biochemistry, 2005
Australian Institute of Marine Science &
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University of South Alabama & Dauphin Island Sea Lab

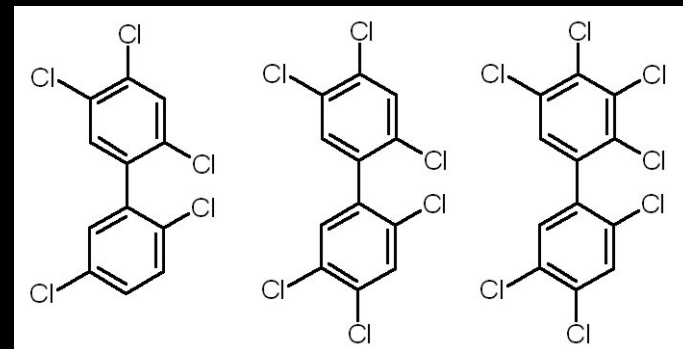
TOXICOLOGY

- The study of toxic substances
- **Ecotoxicology**, specifically, is how those toxins affect the structure and function of an ecosystem
- The importance of toxicology is understanding the effects of toxins in the environment and linking that to human health



POLYCHLORINATED BIPHENYLS (PCBs)

- Organic chlorinated hydrocarbons, manufactured in 1929 for industrial and commercial use, banned by EPA in 1977
- Classified as a probable human carcinogen
- Chemical stable, lipophilic, and highly persistent in the environment



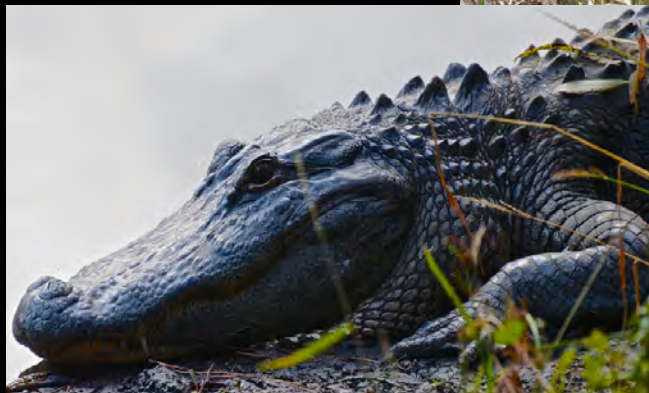
THE MOBILE-TENSAW DELTA

- It is one of the largest estuaries in the United States fed by 7 river systems
- Very high levels of **biodiversity** and **productivity**
- The Delta is a nursery habitats to a multitude of flora and fauna



AMERICAN ALLIGATOR (*Alligator mississippiensis*)

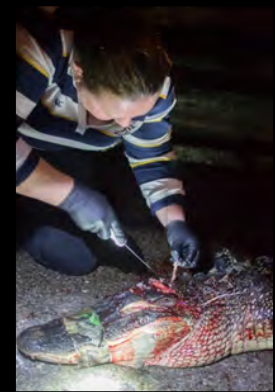
- “King of the Delta” alligators are found in temperate climates
- Diet consists of in fish, turtles, small mammals, birds, and even other alligators
- Apex predators so are a **bioindicator species** for assessment of overall ecosystem health



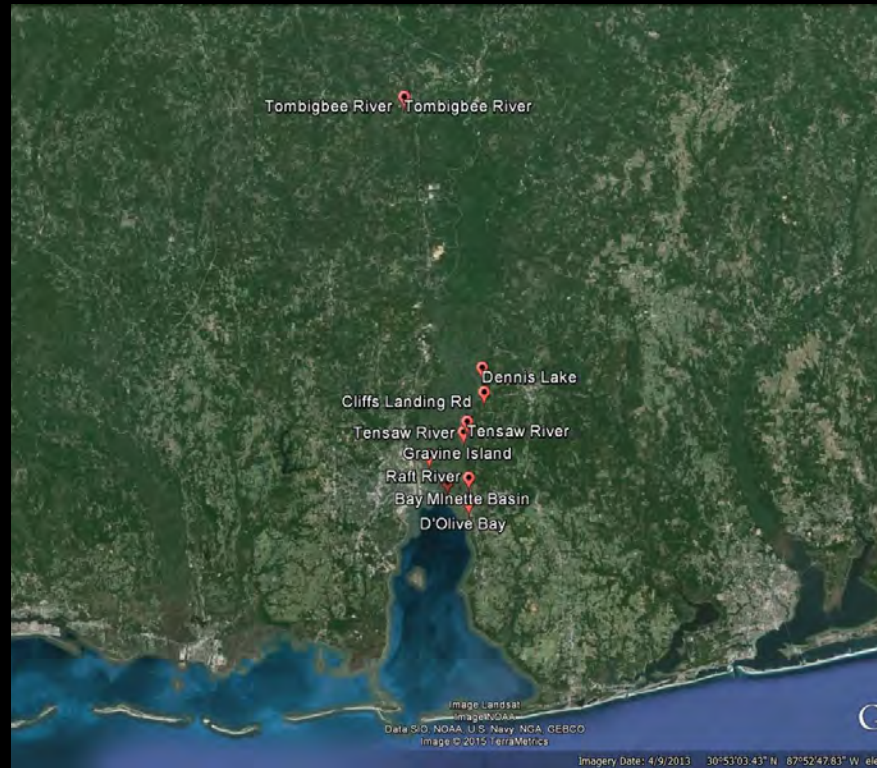
Sampling During the 2014 Alligator Hunt



Alligators were sampled in collaboration with AL-DCNR



WHERE WERE THEY HARVESTED?



- The 15 alligators that were analyzed came from the locations above
- Location of harvest may provide insight into areas of concern and may correlate to total toxicity

ALLIGATOR NECROPSY & SAMPLING

Organ samples collected:

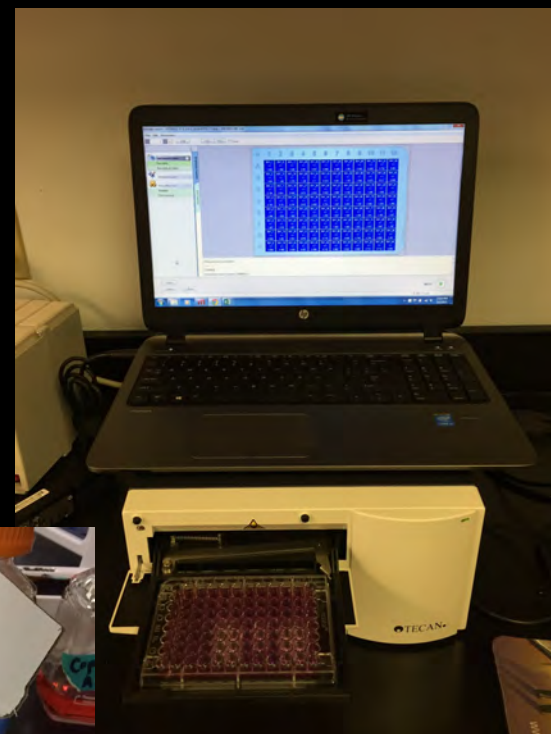
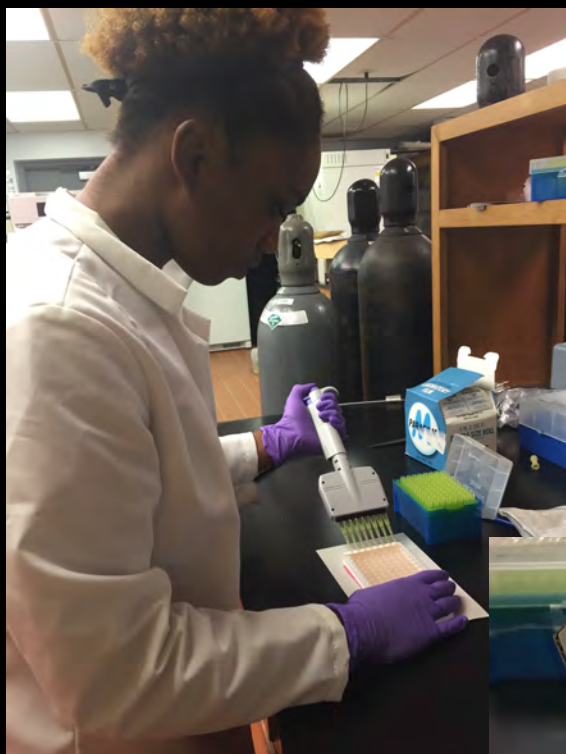
- Lungs
- Heart
- Liver
- Kidney
- Bile
- Body fat
- Muscle
- Stomach and stomach contents



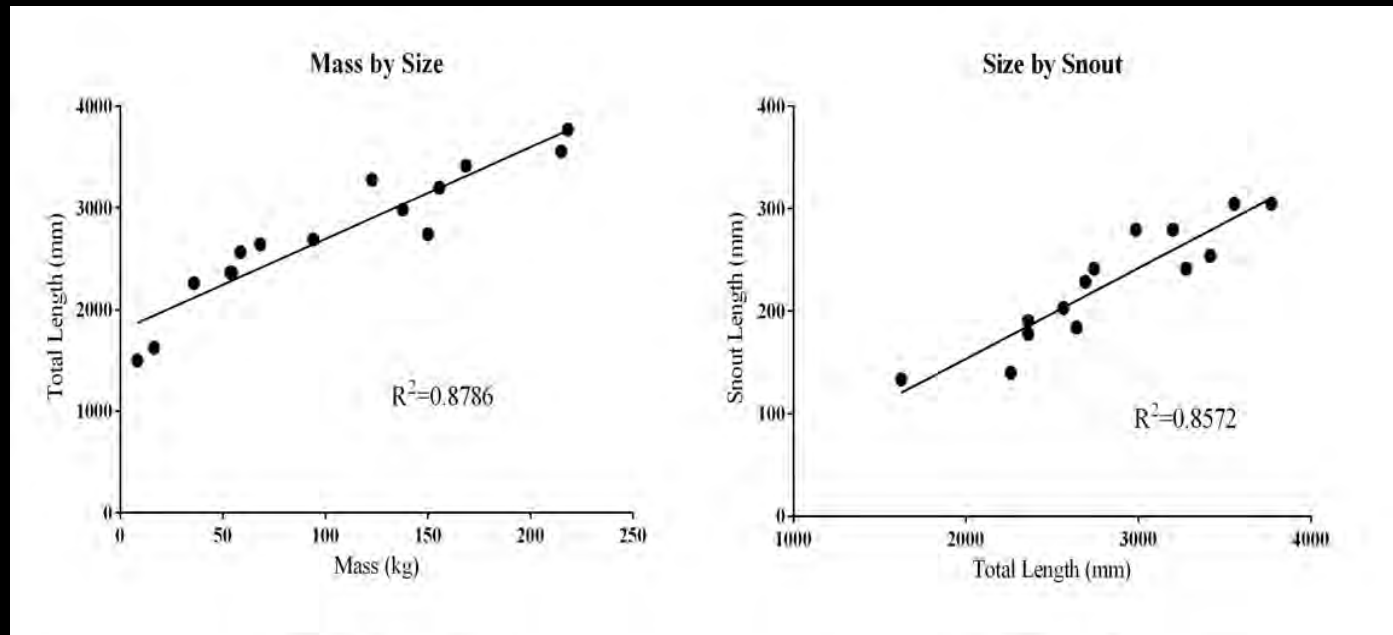
ALLIGATOR SUBSAMPLING & CHEMICAL EXTRACTION



ENZYME-LINKED IMMUNOSORBENT ASSAY (ELISA) FOR COPLANAR PCBs

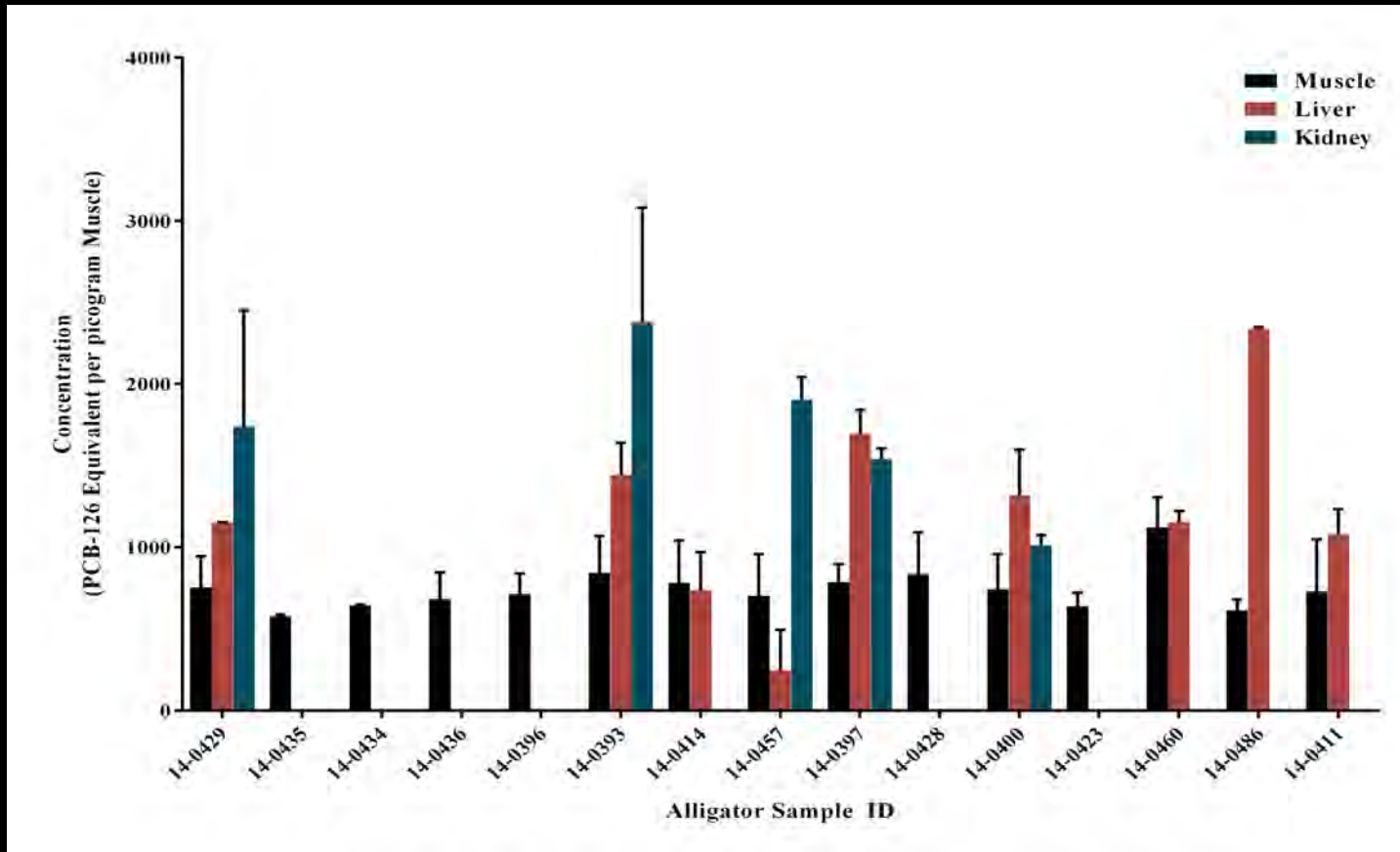


ALLIGATOR SIZE



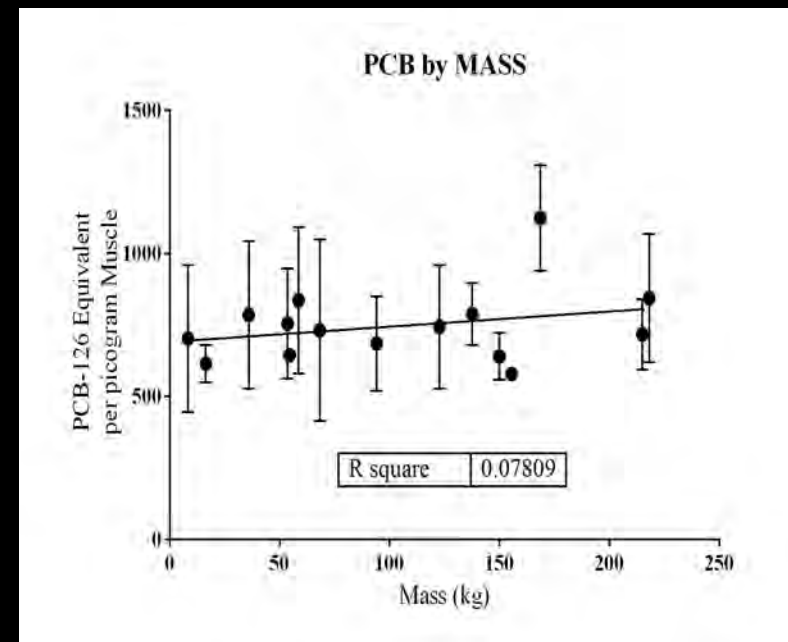
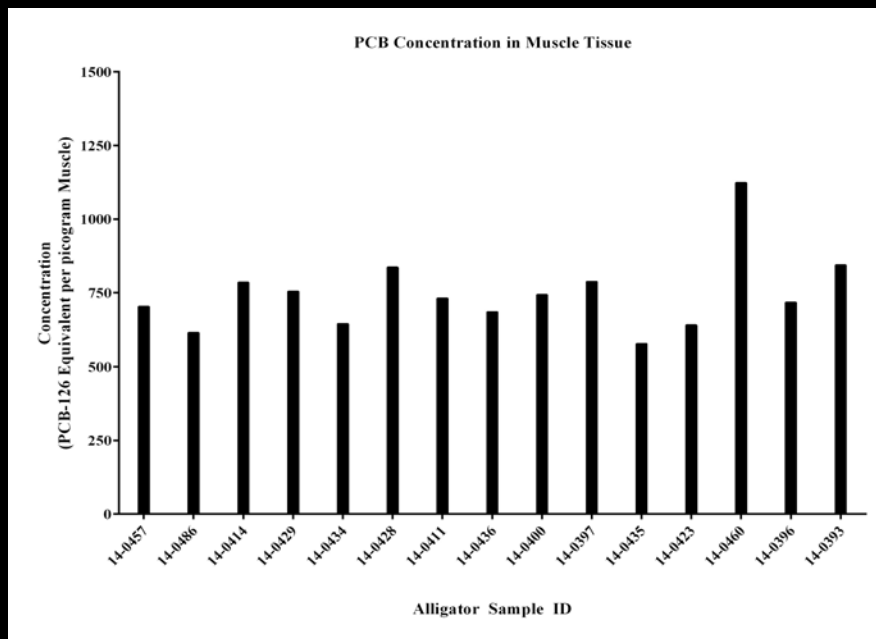
- Total length and mass correlated well
- Snout and total length was highly correlated

TISSUE DISTRIBUTION OF PCBs



- PCBs in all 3 tissues analyzed
- Highest in Liver and Kidney

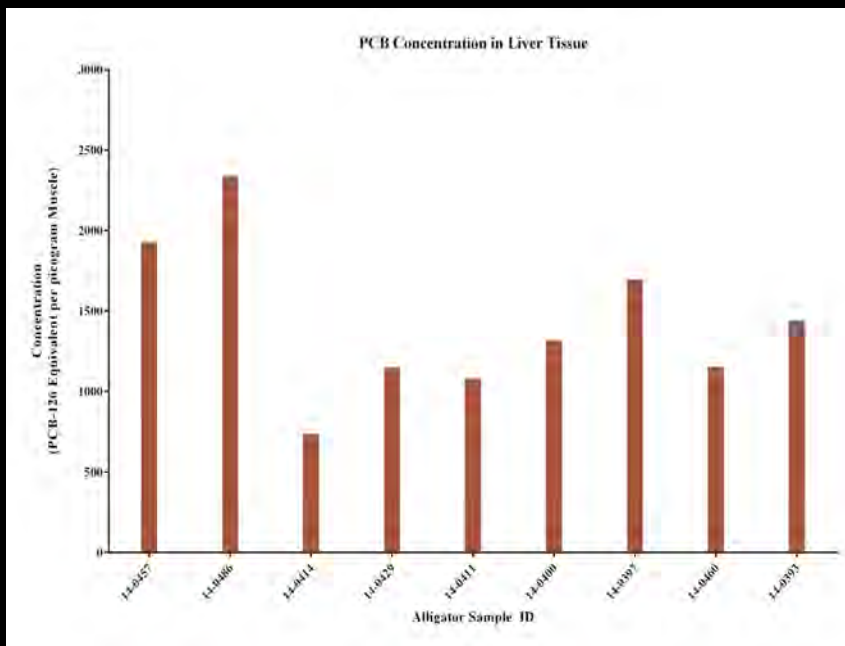
A CLOSER LOOK AT PCBs IN MUSCLE



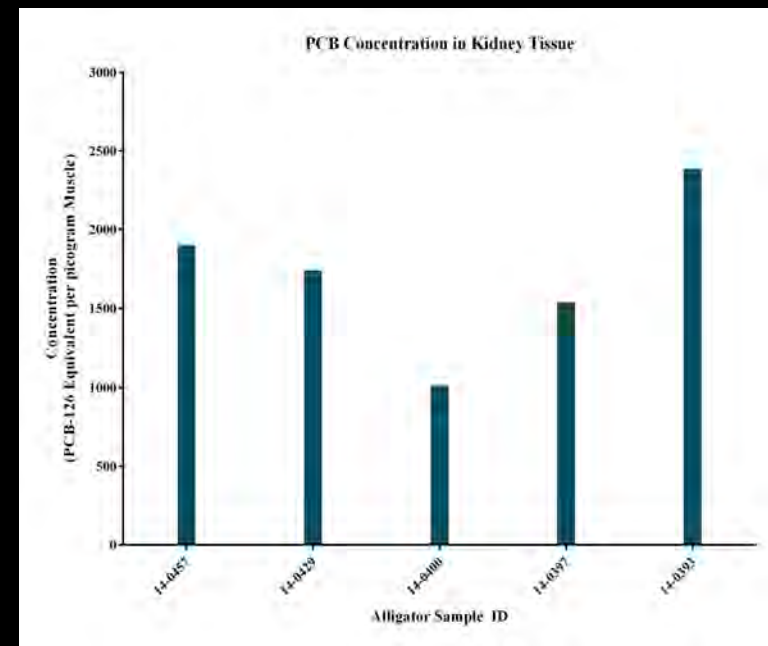
- PCB concentration in Alligator muscle did not correlate with body mass

A CLOSER LOOK AT LIVER & KIDNEY

LIVER



KIDNEY



- No correlation to body mass
- More variation in Liver
- 2-3 times higher PCB concentrations in liver and kidney compared to muscle

WHAT DOES THE DATA MEAN FOR HUMAN HEALTH?

Sample ID	Mean (ng/kg)	Mean PCB-126 in 200g Portion (ng/200g)
14-0429	753.9	150.8
14-0435	578.0	115.6
14-0434	643.5	128.7
14-0436	684.0	136.8
14-0396	716.6	143.3
14-0393	843.1	168.6
14-0414	784.0	156.8
14-0457	702.4	140.5
14-0397	787.0	157.4
14-0428	835.5	167.1
14-0400	742.6	148.5
14-0423	639.3	127.9
14-0460	1123.0	224.6
14-0486	613.7	122.7
14-0411	730.7	146.1

- The U.S. FDA human health guidance for fish consumption is: 2 ppm (2mg/kg) in edible flesh of all fish
- WHO have set a tolerable daily limit of 3-5 ppb (ng/kg) body weight per day for human consumption

IMPLICATIONS TO PUBLIC HEALTH

- PCBs were banned several decades ago so determining the sources and sinks in the Mobile Delta will be critical for remediation efforts
- This study shows that we need to raise awareness of PCB levels for public health officials and community members when harvesting alligators for consumption
- PCBs have been linked to cancer, neurological and behavioral problems in children, as well as immune dysfunction liver and skin disorders

PROBLEMS & FUTURE DIRECTIONS

- Recovery and detection of PCBs in fat by standard methods was problematic so we will use alternative extraction methods (e.g., soxhlet) and GC-MS to verify total PCBs
- An important direction will be to identify the source of PCBs in the Mobile Tensaw Delta so that remediation efforts can begin
- Determine the exposure levels in lower trophic levels to determine potential impact on local fisheries resources



SPECIAL THANKS TO...

Dr. Alison Robertson, Katie Baltzer & the Marine Ecotoxicology Lab,
University of South Alabama & Dauphin Island Sea Lab



- Dr. Tina Miller-Way & Ms. Rachel McDonald
- Northern Gulf Institute
- National Oceanic and Atmospheric Administration