Wednesday September 5th – Langevin / Cartier
Toxicology / Pathology
Moderator - Dave Groman (Aquatic Diagnostic Services – AVC / UPEI)

1:45 PM	Toxicology / Pathology	Casanova - Biomarkers for Effects of Assessment of Specific Marine Life in the Grand Banks of Newfoundland and Labrador
2:00 PM		Gonzalez - Effects of Glyphosate on Plasma and Brain Cholinesterase in Finfish of Importance in Colombia
2:15 PM		Nwamba - Effect of Propanil on Biochemical, Haematological and Oxidative Stress Parameters of *Clarias gariepinus* Juveniles.
2:30 PM		**Omovwohwovie - Haematological Effect of Iron and Lead on *Clariasgariepinus* Juveniles**
2:45 PM		Primus - Initial Findings from an Aquatic Ecosystem Health Study Site

Biomarkers for Effects Assessment of Specific Marine Life in The Grand Banks of Newfoundland And Labrador

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A biomarker is a measurable biological state or response of a species that provides information about the condition of a species and its surrounding environment. The biomarker concept can include animal condition indices, observations on gross pathology, organ histopathology, select biochemical responses and xenobiotic metabolites. There is limited information available to assess the baseline health of marine organisms that exist on the Grand Banks. Furthermore, there is uncertainty surrounding which species' biomarkers can be reliably used as effective assessment tools in characterizing and monitoring the Grand Banks ecosystem. Increasing knowledge in this area would improve the understanding of the current condition of a variety of species, as well as the natural variation present within these species and their surrounding environment. This improved understanding would increase our ability to detect natural variation from the effects and impacts of an environmental incident.

Our project followed a model similar to that of studies ongoing in the Gulf of Mexico that apply a number of biochemical and other tools to perform investigations on ecosystem health as well as recommendations made by agencies such as the International Commission for the Exploration of the Sea, on the need for the development and expansion of the role and use of biomarkers in monitoring and assessment studies. This multi-year project focused on measuring a battery of biomarkers on marine species of commercial and/or ecological importance to Newfoundland and Labrador such as snow crab, Icelandic scallop, sea urchin, Northern shrimp Atlantic cod, sand lance, redfish and yellowtail flounder. The overall objective of the study was to develop a set of biomarkers that could be reliably applied as part of offshore petroleum environmental effects assessments in response to incidents that could occur in Newfoundland and Labrador. Final results of the project will be presented.

Conference Session Designation: (Toxicology / Tox Path)
Presentation Format: **(** Oral)

Effects of Glyphosate on Plasma and Brain Cholinesterase in Finfish of Importance in Colombia

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Glyphosate is widely used in Colombia to control illegal crops such as poppy and coca plants as well as weeds of edible crops. Acute (96-h), glyphosate exposures (as Roundup®) in different finfish species of importance in Colombia determined from mild to severe central nervous system (CNS) effects and changes in plasma and brain cholinesterases (AChE, BChE). Ghost fish (*Apteronotus albifrons*), an electric fish of the Orinoco and Amazonas Rivers, exposed to 0, 10 and 90 ppm Roundup® (v/v) (n=27) displayed a higher plasma AChE activity (nmols/ml/min) (anova, $p<0.05$) at 90 ppm Roundup® (112.8 ± 46) as compared to controls (65.0 ± 25.6) and 10 ppm (67.4 ± 26.4). These changes were accompanied by mild CNS signs. Juveniles of red tilapia (*Oreochromis* sp.) (n=36) exposed to 0, 1, 5, 15, 45 and 90 ppm Roundup® (v/v) showed significant increases in both plasma AChE and BChE at the two highest concentrations (anova, $p<0.05$) along with severe CNS symptoms in comparison to controls or low-concentration exposures; whereas in Nile tilapia (*Oreochromis niloticus*) juveniles (n=12), exposed to 0 and 15 ppm Roundup®, there was a low AChE plasma activity in glyphosate-exposed fish (171.7 ±34.2) as compared to controls (334.5 ± 56.8) (T-test, $p<0.05$). Interestingly, AChE activity returned to normal baseline levels in tilapias that had been exposed to Roundup® after 10 days of suspending the exposure. Bocachico (*Prochilodus magdalenae*) (n=12) and yamú (*Brycon amazonicus*) (n=18), two indigenous fish species of Colombia, showed reduced brain AChE (nmols/min/mg protein) at 10 ppm (bocachico 1.8 ± 0.6, yamú 7.2 ± 1.8) as compared to controls (bocachico 47.0 ± 4.5, yamú 160.2 ± 13.7) whereas bocachico increased ACHE at 30 ppm Roundup® (113.0 ± 8.0) as compared to controls and 10 ppm. A mechanistic approach to explain interactions between this herbicide and the cholinesterases enzymes remained unknown in our investigations as well as likely ecological implications on fish behavior or interrelations amongst fish in natural bodies of water due to the presence of the herbicide as a contaminant and the effects on cholinesterase activity.

Conference Session Designation: (Latin American Fish Health)
Presentation Format: (Oral)

Nwamba - Effect of Propanil on Biochemical, Haematological and Oxidative Stress Parameters of *Clarias gariepinus* Juveniles.

(No Abstract Provided)

Haematological Effect of Iron and Lead on *Clariasgariepinus* Juveniles After 15 Days

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Laboratory study was undertaken to evaluate some physical and haematological changes resulting from the exposure of freshwater fish Clariasgariepinus to sub lethal concentrations ($0.1mg^{-1}$ and $0.4mg^{-1}$ of ion (fe) chloride, and ($0.1mg^{-1}$ and $0.4mg^{-1}$ of lead (Pb) chloride) in the water for a period of 15 days. Five(5) groups of twenty fishes each were subjected to serial dilutions of the stock solution of iron (fe) 0(control), $0.1mg^{-1}$ and $0.4mg^{-1}$ and lead (Pb) 0(control), $0.1mg^{-1}$ and $0.4mg^{-1}$ in a large plastic bowl of 60 litres capacity for 15days at the end , blood sample were taken from the control and experimental fish. Blood was assayed for selected haematological parameters (haematocrit, haemaglobin, red blood cells counts, white blood cell counts, differential white blood cell counts, erythrocyte sedimentation rate, and total plasma protein and plasma glucose concentration). The derived haematological indices of mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), mean corpuscular haemoglobin concentration (MCHC) were calculated. $0.1mg^{-1}$ and $0.4mg^{-1}$ of lead (Pb) when compare to control. There is no significant difference on differential white blood cell count in iron (fe) concentration except Neutrophill and lymphocytes and there is a decrease in red and white blood cells on different concentrations of lead (Pb) $0.1mg^{-1}$, $0.4mg^{-1}$ and iron(fe) $0.1mg^{-1}$, $0.4mg^{-1}$ treatment when compare to their control. In conclusion, the changes observed indicate the haematological parameters can be used as an indicator of iron and lead related stress in fish on exposed to elevated iron and lead levels.

Conference Session Designation: (Toxicology / Pathology)
Presntation Format: (Oral)

Initial Findings From an Aquatic Ecosystem Health Study Site

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Water quality is a critical concern globally and anthropogenic water pollution can have highly detrimental effects on public health, animals, and the environment. Methodologies enabling accurate evaluation and management of aquatic environments is central to ensuring continued resilience of these systems. We have begun to develop a study site and refine methodologies to evaluate the health of freshwater aquatic systems from an ecosystem health perspective. Our current study uses contaminant data and indicators of fish health to evaluate ecosystem health in a group of freshwater lakes in northeastern Minnesota. In our first field season, we gathered data from 18 lakes in the region which we classified as either undeveloped, developed, or discharge-related depending on the relative amount of anthropogenic influence. Water, sediment, and fish tissue from each lake was tested for over 180 contaminants that include heavy metals, endocrine disrupting compounds, industrial and agricultural by-products, and pharmaceuticals. The number of contaminants detected in any one sample range from 1 to 84. We also collected data from each site that may be used as an indicator of fish health. Specifically, we performed a quantitative analysis of several ectoparasites, and conducted a fish health index based on the appearance of gross abnormalities of several organ systems. Up to 20 fish of each of two species – either walleye and yellow perch or lake trout and cisco – were evaluated at each site. This work will shed light on the complex dynamics of this system and serve as a baseline for future studies focused on refining tools and approaches used to evaluate aquatic ecosystems health.

Conference Session Designation: (Toxicology / Pathology)
Presentation Format: (Oral)