List of sessions for CEW2019

Agricultural contaminants: Evaluation and reduction of environmental risk (A. Bartlett; S. Robinson)

Agricultural contaminants, which include pesticides, nutrients, and pharmaceuticals (i.e., often found in manure/biosolids), are intentionally released into the environment to control a variety of pests or support the growth of crops. These compounds can also affect non-target fauna and flora, which can be exposed during application and/or via movement of the contaminant in the environment (e.g., spray drift, leaching, run-off). Loss of pesticides or nutrients from targeted areas (i.e., agricultural fields) reduces their effectiveness for the crop, results in increased costs for the farmer and escalates the contamination of agricultural areas, thus increasing the potential for toxic effects on non-target organisms living in, or downstream from, these locations. Various organizations (e.g., academia, industry, government and non-profit) are developing new products and mitigation strategies to reduce these costs within agriculture and the environment. In our session, we are interested in research that is investigating the effects of 1) novel pesticides on biota; 2) management practices or mitigation strategies to reduce the offsite movement of agricultural contaminants and 3) climate change on the exposure and toxicity of agricultural contaminants. The purpose of our session is to provide a forum to share the innovative directions that should be considered to better understand and protect our environment and wildlife.

Soil ecotoxicology and soil ecological risk assessment in Canada (A. Gainer; R. Prosser; W. Martin; T. Phillips)

Maintaining soils with healthy functioning ecosystems is the primary goal of risk assessors and researchers whether they be from government, industry or academia. The focus of this session is to better understand the interactions between soil contaminants and ecological receptors and identify the role of abiotic variables that have the potential to influence the fate, behaviour and effects of these contaminants. We invite scientists and managers from a range of backgrounds to showcase their work with industrial, agricultural, natural or urban soils. Projects performed in laboratory or field settings under the following topics are welcomed: soil remediation; soil ecology; ecotoxicology with microorganisms, plants and soil invertebrates; human health soil toxicology; fate and transport in soils; risk communication as it relates to soil contamination and site management; emerging soil contaminants; and, advances in soil toxicity test methods or risk assessment. Through this session, we aim to integrate knowledge from a range of backgrounds to improve and advance the practice of soil ecotoxicology and soil ecological risk assessment in Canada.

Advances in environmental quality guidelines, objectives, and benchmarks (A. Burton; A. Alzizshirazi; I. Guay; J. Little; R. Santore)

Environmental quality guidelines, objectives or other benchmarks form a cornerstone of risk assessment, environmental management and reporting on state of the environment. Recent developments have focused on improving the relevance and applicability of guidelines through advancements such as approaches for incorporation of multiple toxicity modifying factors, accounting for bioavailability, using field data to validate guidelines, inclusion of behavioural and genomic endpoints and improving the statistical basis for species sensitivity distribution. The goal of this session is to investigate such advances in the development of guidelines and bring awareness to the progress of development of individual guidelines. The target audience consists of those interested and/or responsible for developing and applying guidelines including public administrators, consultants, industry representatives and academics.

Mining and the environment (C. Dumaresq; K. Wells)

This session will focus on a range of aquatic and terrestrial issues related to all types of mining (coal, metal, diamond, oil sands, etc.) and the environment. Mines and adjacent ecosystems are the focus of a wide range of chemical and biological monitoring as well as toxicity testing. This includes: baseline monitoring; monitoring required under federal/provincial/territorial requirements (e.g., environmental effects monitoring (EEM) under the Metal and Diamond Mining Effluent Regulations); monitoring conducted under agreements with Indigenous communities; monitoring of remediation and reclamation activities; and academic research. The session could include presentations on a range of topics, including design of monitoring programs, results of monitoring studies, interpretation of monitoring results, and emerging methods. The goal is to provide an opportunity to learn more about emerging or innovative monitoring methods, share perspectives on mining-related monitoring programs, and explore the interface between environmental monitoring and traditional knowledge in the context of mining. The target audience spans all areas from government, consulting, industry, and academia.

Toxic effects in aquatic organisms: Integrating biochemical, physiological, and ecological responses (D. Janz; C. Kennedy)

The first step of virtually all toxicological responses is an interaction between a xenobiotic and a cellular macromolecule (i.e., DNA, protein, lipid), referred to as the molecular initiating event (MIE) in the emerging adverse outcome pathway (AOP) approach. The MIE then causes one or several key events (KE; usually physiological responses at the cell, tissue, or organ level) that translate to apical responses, referred to as adverse outcomes (AO; usually organ, organism, or population level responses). The AOP approach has gained much recent attention in ecological (and biomedical) toxicology as a framework to better quantify and harmonize the risks associated with exposure to xenobiotics. In this session we invite Abstracts from aquatic toxicologists who employ a mechanistic, integrative approach to investigate such linkages between different levels of biological organization. Research topics in any related areas of aquatic toxicology will also be considered for this session.

Toward a better prediction of metal bioavailability and toxicity to aquatic organisms (I. Aharchaou; M. Rosabal; C. Fortin)

Metal contamination in aquatic ecosystems is a current environmental issue. Over the past few decades, many efforts have been made to advance our understanding of the relationship between the chemical speciation of trace metals and their biological effects. In particular, bioavailability is an important factor in determining metal toxicity and bioavailability-based methods for the ecotoxicological risk assessment of metals are progressively finding their way in environmental regulation. Such methods are based on models (e.g., the Free Ion Activity Model and the Biotic Ligand Model) whose predictive ability has been validated for a number of divalent metals. On the other hand, the validity of these methods remains to be demonstrated in some situations (e.g., trivalent and higher valence metals; unusually high bioavailability in the presence of natural organic matter). This session invites contributions describing recent advances in our ability to predict metal bioavailability and toxicity to aquatic organisms. Studies dealing with the prediction of the toxicity of trivalent elements are particularly welcome along with investigations focusing on complex environmental conditions (e.g., presence of organic ligands, metal mixtures). In addition to bioavailability studies, new methods for assessing metal toxicity in laboratory and field environment at different levels (molecular, subcellular or individual) would be of great interest.

Multi-generational ecotoxicology and epigenetics (J. Head; S. Wiseman)

A growing body of literature from the human and biomedical sciences suggests that early life exposures to environmental chemicals can affect health outcomes later in life, and even into subsequent generations. The epigenetic basis for these findings is a fascinating area of research that is just beginning to be explored in the ecological sciences. This session will bring together scientists who are interested in epigenetic mechanisms of environmental contaminants (e.g. DNA methylation, histone modification, non-coding RNA) with those studying persistent and multi-generational effects in animal models. We invite submission of abstracts directly related to epigenetic mechanisms as well as abstracts concerned with phenomena that may have an epigenetic basis (e.g. multi-generational studies, acquired resistance to chemicals, effects of parental behaviour on offspring).

Effects of contaminants and other stressors on the microbiome in the environment and organisms (K. Kidd; E. Millar)

Whereas it has long been recognized that microbial communities play critical roles - such nutrient cycling - in a healthy environment, the composition of an organism's microbiome is only recently being recognized as critical to its health. Contaminants such as antimicrobials and other stressors can modulate environmental communities of microbiota, but their effects on microorganisms associated with organisms and the subsequent impacts on the health of non-human species are less well understood. Some evidence suggests that the disruption of the symbiotic relationship between host and microflora can alter immune function, behaviour and development of fish. Studies are needed to further explore the interactions between exogenous stressors including contaminants, host organisms, and microbiota. This session invites investigations of environmental and organismal microbiota responses to environmental change and stressors, including those that report on microbial richness and diversity in relation to an organism's habitat, diet and health. Such studies will increase the understanding of how environmental stressors impact a key component of food webs and regulate host-microbiome interactions.

Emerging environmental challenges linked to the mercury cycle (M. Amyot; JF Lapierre; D. Ponton; L. Negrazis)

Mercury is a global pollutant that affects ecosystems worldwide. It is one of the main causes of consumption advisories targeting wild fish. In this session, we will explore different aspects of its biogeochemical cycles, from its transformations in the environment, its bioaccumulation and trophic transfer, up to its accessibility in our gastro-intestinal track. Of particular interest will be recent advances on emerging issues such as the interactions between the mercury cycle, the carbon cycle and climate change, the behavior of mercury in the rapidly changing North and the interactions of multiple landscape disturbances on Hg cycling (fire, logging, hydroelectric dams). Also, the development of new approaches to study Hg accumulation and toxicity are welcomed.

Alternative approaches to animal testing for ecotoxicology (N. Hogan; M. Hecker)

Legislation in North America, Asia and Europe mandates the assessment of risks of tens-of-thousands of chemicals to the environment and human health. Current testing strategies under these legislations rely on extensive live animal testing, which is associated with excessive time and resource requirements in addition to being a significant ethical concern that render this approach infeasible in the context of current regulatory needs. Therefore, there is an urgent need for alternative approaches to the use of vertebrate animals for hazard assessment of chemicals and pollutants. Accordingly, some regulatory frameworks such as REACH have banned the use of vertebrate organisms for the safety testing of certain products (e.g. cosmetics) while in other situations, integration of the 3Rs (reduction, refinement, and replacement of animal tests) will be required for future regulatory acceptance. The development of animal alternatives is based not just on ethical considerations but also on reducing the cost of performing vertebrate ecotoxicity tests. However, numerous technical challenges need to be met if these tests are to provide reliable, robust, and applicable data for chemical and ecological risk assessments. This session will explore non-animal alternative approaches to the use of vertebrate species (e.g. fish amphibians and birds) for the assessment of chemicals, chemical mixtures and environmental samples with a focus on understanding the role that animal alternatives have in supporting environmental hazard and risk assessments. These include in vitro models such as primary and immortalised cells, organoids, and tissue explant systems, as well as on embryo testing as a surrogate model systems. Additionally, presentations that focus on in silico approaches such as quantitative structure activity relationships (QSARs) and generation of computational models that predict bioaccumulation and concentration of chemicals at target tissues (e.g. PBTK models), are encouraged. Furthermore, it is recommended that abstracts consider how any new approach could be accepted into current regulatory frameworks or integrated test strategies.

Behavioural ecotoxicology (P. Razmara; W. Dew; G. Pyle)

An animal's behaviour integrates its external environment with its internal physiology. This integration can reflect the health of the animal, particularly under changing or challenging environmental conditions. The use of behavioural endpoints has many advantages including higher sensitivity relative to other endpoints, high ecological relevance, its non-invasive nature, and short response time. The implementation of behavioural endpoints in a regulatory context remains elusive owing to a lack of standardized protocols that are suitable for compliance testing purposes. There is also a need to create a link between behavioural responses and other levels of biological organization (e.g. cellular responses). Technological advances for detecting contaminant-induced behavioural changes have led to an increasing number of behaviours affected by contaminants in a wide range of species, making it difficult to identify one suite of behaviours for regulatory needs. Establishing criteria for choosing the most suitable species, establishing a link between behavioural responses and other biological responses, and developing standardized behavioural testing protocols for testing the most ecologically relevant endpoints remains a challenge to the field. This session proposes to address some of the most important issues facing environmental managers today in terms of how to implement behavioural toxicological endpoints as regulatory tools. We aim to attract researchers from government, industry, and academia to provide a diversity of perspectives on these challenging issues. By showcasing research that focuses on cutting-edge behavioural testing and analysis, we can continue an important dialogue about how these techniques can improve our ability to protect the environment.

Subtleties and subterfuge in analyzing and interpreting fish health and chemistry data in aquatic environmental effects monitoring (R. Sharpe; C. Arens)

The panel will consider 2-3 separate topics that relate to aquatic environmental effects monitoring fish health and tissue chemistry data. We anticipate presenting short (2-3 min) technical concept presentations to introduce each "part" of the session as co-chairs, and then asking our invited panel members (expected 2 panel members per "part" in addition to the co-chairs) to be prepared to speak and/or present a 1-3 minute-position statement on their invited topic. We will then open the panel for discussion with the room for the remainder of the allotted time for that "part" of the session. A maximum of 3 topics will be discussed. Topics currently being considered for each "part" include (but are not necessarily limited to) the following: (1)   variations in the ways fish health indices (such as condition factor, gonadosomatic index, liversomatic index) are calculated and interpreted, and the subtle influence differences in approach and/or interpretation can have on outcomes in effects assessment; (2)   approaches for estimating natural variability, specifically what data should be used to calculate normal ranges (i.e., historical, baseline, regional reference, some or all of the above?); (3)   appropriate methods for handling censored data in biological chemistry datasets versus water chemistry datasets (should we be treating these types of data differently?); (4)   variability in approaches to determining fish maturity and the range of accepted levels of "precision" in various programs/regions in Canada; and (5) approaches to meeting the requirements of regulations in Canada that age data must be considered despite the technical community having low confidence in the accuracy of small-bodied fish lab-assigned age data.

Early detection and rapid response: the role of environmental DNA (eDNA) as a 'molecular canary' to enhance the quality of risk assessments and to promote aquatic ecosystem health (S. Crookes; J. Tetreault; C. Helbing; A. Weir)

Early Detection and Rapid Response (EDRR) programs have been developed across North America initially to deal with the clear and present danger of aquatic invasive species (AIS) to naïve ecosystems (Jake et al. 2010). However, in an age of increasing human pressure on our critical aquatic habitats including, but not limited to, AIS, climate change, industrial pollution, agricultural run-off, warm wastewater disposal, processing plant effluents, etc., it is highly desirable that an early-warning system be applied that can sensitively indicate the earliest signs of ecosystem damage. We propose using environmental DNA – free and cellular eDNA shed from aquatic organisms – as a 'molecular canary', a concept put forth fifteen years ago to promote genomics approaches to gauge organism health (Klaper and Thomas 2004). This session will provide a forum for academic, government and industry researchers and practitioners to present their applied environmental DNA (eDNA) approaches to improve risk assessments of vulnerable aquatic habitat by applying targeted or passive environmental DNA detection of candidate ecosystem health indicator species' (ECOHIS) and species-at-risk (SAR). Two divergent examples of adoption of eDNA detection utility include: i) determining the immediacy of the decline of Brook trout *Salvelinus fontinalis*, whose presence is indicative of cold-water refuges necessary for many fishes, but are at risk from warming associated with climate change; ii) early detection of outbreaks of pathogen (e.g., *E. coli*) and algal blooms in the Great Lakes. We commend the early adoption of eDNA science as a keystone analytical tool to underpin risk assessments of aquatic ecosystems in Canada and beyond.

Effects of conventional and unconventional oils in freshwater ecosystems (V. Langlois; G. Triffault-Bouchet)

Transport of conventional and unconventional oils across Canada to refineries or marine ports depends on pipeline, road, and railway shipment. With the worldwide increase in energy demand, it is likely that oil transport will increased in Canada. Knowing that the actual shipment routes cross freshwater watersheds containing economically-important and foodweb key-species, this augmentation in oil transportation will likely increased the risk for oil spills in these vital habitats. While the behaviour and toxicity of oil in marine environments has been well studied, there remains a lack of information regarding impacts and rates of recovery for freshwater species and the ecosystems being affected by oil spills. Active oil-related research is currently ongoing in Canada; therefore, the aim of this session is to welcome researchers to present their work on the effects and fate of weathered and unweathered conventional and unconventional oils in freshwater ecosystems, including aquatic and terrestrial species.

Research & Regulations of Endocrine Disruptors (V. Marlatt; V. Langlois; J. Mennigen)

It has been recognized that endocrine disrupting chemicals (EDCs) can interact with the endocrine system of non-targeted animals once found in the environment. However, species sensitivity, sex, developmental stage, routes of exposure, and concentrations tested contribute in clouding the identification of primary endocrine mechanisms of action. Together with the classical endocrine endpoints, the fast-developing 'omics technology, DNA methylation, histone modification, and miRNA are assisting researchers in identifying EDC molecular initiating events, among others. There is a need to seek the identification of such molecular mechanisms of action and to extend the study of individual EDC in developing adverse outcome pathways, which may aid regulatory agencies in taking action on the use/release of certain EDCs. This session invites research on newly discovered EDCs, legacy EDCs with novel mechanisms of action, and new approaches and methodologies to assess EDCs in non-human species.

Application of traditional ecological knowledge (TEK) in Canadian environmental management (L. Bonnie; V. Marlatt)

Traditional ecological knowledge (TEK) refers to the knowledge acquired by Aboriginal or Indigenous Peoples regarding the environment, how it functions and its characteristic ecological relationships. Both in Canada and abroad, there is growing recognition that TEK provides unique knowledge about the local environment, and incorporation and consideration of this information is required by many jurisdictions for assessing environmental impacts of human activities. Thus, TEK is a key piece in managing resources in Canada and the inclusion of TEK assists in creating stronger, more well-rounded environmental impact assessments and policy decisions. This session invites TEK examples/case studies and strategies for improved integration and application of TEK for assessing the potential environmental impacts of toxicants in Canada.

Effects of nanomaterials in the environment (C. Gagnon)

Nanomaterials (NM) are increasingly used in Canadian consumer products and can pose ecotoxicological issues upon its released into the environment. Novel characterisation methods have to be developed for understanding the fate of NM under environmental conditions. The identification of NM in real samples still represents a huge analytical challenge with the need for specific methods to clearly distinguish engineered NM from natural nanoparticles (colloids). Transformation processes, such as aggregation or degradation, control the environmental fate and exposure of NM released into the environment. Such changes in forms and properties may influence significantly their potential toxicity. Investigations on the bioaccumulation and effects in aquatic and terrestrial organisms have resulted in the development of new ecotoxicological biomarkers and assays. Research on nanotoxicity should consider exposure conditions, and then transformation by-products, for risk assessment studies.

Micro- and nanoplastics in the environment: Fate and effects (V. Langlois)

With the accumulation of microplastics and their degradation into nanoplastics in the marine and freshwater environments from all latitudes, there is an increasing research need to better understand the fate and effects of this environmental issue. Microplastics, and in particular nanoplastics, are somewhat unique as they can be ingested, bioaccumulated, and depurated by aquatic organisms, but can also sorb/concentrate contaminants and support microbial activity. In addition, their particle size and surface properties influences their toxicity. Analytical methods to detect and study microplastics and nanoplastics are still being developed. This session wishes to highlight the ongoing Canadian research effort in this field. The target audience includes all areas from government, consulting/industry, and academia.

Emerging organics (Z. Lu; JP Gagné; PT Robidoux)

Emerging contaminants, such as nonylphenols, perfluorinated alkyl substances (PFAS), nitroaromatics, industrial additives, pharmaceuticals, personal care compounds, and illicit drugs, are not commonly monitored but may enter the environment and cause adverse health effects in organisms including humans. These chemicals have attracted increasing scientific and public concern because of their large production volumes or potential environmental risks. However, our knowledge about the environmental fate, exposure and toxicities of these contaminants is limited. Improved understanding of environmental fate, effects and impacts of emerging contaminants will provide enhanced insights into risk assessment and management of these chemicals. The objective of this session is to highlight researches investigating the distribution, bioaccumulation, transport, transformation and toxicity of emerging contaminants under field or laboratory conditions.

Atmospheric Contamination (M. Desrosiers)

Ecological receptors in ecosystems are in daily contact with an amalgam of air pollutants that threaten their integrity. The potential ecotoxicological risk of adverse effects on these biological receptors is often difficult to establish because of the extent of contamination and poorly documented ecotoxicological effects after air pollutant exposure.

General Ecotoxicology (V. Langlois)

This is a session welcomes all abstracts related to ecotoxicology.