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SÉMINAIRE

Next-generation ecological risk assessment of chemical pollution on reptiles

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Chemical risk assessment is, to date, predominantly focussed on “single species – single compound” toxicity testing of short-lived species. This approach cannot practically be used to assess all possible wildlife-pollutant combinations, and particularly falls short when assessing risk for species with life histories that do not suit laboratory experimentation. Long-lived species such as sea turtles and crocodiles are one example. In this seminar, we will present ongoing work on the exposure and accumulation of organic pollutants in sea turtles and crocodiles, and the application of computer models that integrate ecology, physiology and ecotoxicology as a basis for risk assessment for such long-lived species.

Sea turtles can accumulate organic pollutants for extended periods and across large spatial scales matching their extensive oceanic migrations. Upon reaching sexual maturity, these pollutants can then be transferred via egg yolk to subsequent generations, thereby exposing developing embryos to potentially high doses of organic pollutants. Cynthia C. Muñoz will present her research into the compound-selective maternal transfer of organic pollutants in sea turtles in relation to the process of vitellogenesis and the framework of fugacity theory, as well as an ongoing collaboration with the Predictive Modelling and Ecotoxicology Group at LBBE on developing a more generally applicable model for maternal transfer of organic pollutants in reptiles.
Extending this research into a broader modelling framework, Peter Vermeiren will present his research, in collaboration with the Predictive Modelling and Ecotoxicology Group at LBBE, on an American ALligator Pollutant bioAccumulation model (AIPA). This model consists of a bioenergetics module that simulates the development of an individual over its lifetime as a result of the allocation of energy (obtained from food sources) to vital life processes such as growth, maintenance and reproduction. Coupled to this bioenergetics module is a toxicokinetic module that simulates the internal accumulation of pollutants resulting from the balance between processes governing uptake and elimination of pollutants, with maternal transfer as one of those processes. The AIPA model leverages agent-based modelling to simulate several individuals and their interactions with local environmental conditions, thereby allowing evaluation of cohort and population-level patterns. This allows the AIPA model to provide refined risk assessments that couple ecology, physiology and ecotoxicology for populations of wildlife species for which the current laboratory testing approach is not a viable approach. Peter Vermeiren will present further development of the AIPA model as a next-generation ecological risk assessment of chemical pollution for populations of apex species.