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Research activities of team MEPS team aim at proposing integrated mathematical and statistical modelling approaches to predict the effects of environmental disturbances at different levels of biological organisation. We are also interested in their functional and evolutionary consequences whether on individual fitness, population, community and/or ecosystem dynamics. In order to build generic enough models with a high predictive power, team MEPS is particularly interested in understanding the functioning of the complex systems under consideration, and not only a very refined description of them. Thus, our models always respect the parsimony principl, ensuring that they remain sufficiently simple with limited "black box" effects. Particular attention is also paid to the robustness, and therefore the generalizability, of the knowledge produced through these models, with the final goal of improving the overall acceptability of modelling approaches in support of decision-making for environmental risk assessment.

Reducing the complexity of systems in order to produce relevant and generic enough models must not preclude having solid mathematical foundations, so that these models remain useful tools for understanding the mechanisms underlying disturbance processes and effects observed on tissues, organisms, populations, communities and/or ecosystems. Such mechanistic models must also include the temporal dimension, which is essential when we are talking about dynamic processes as for realistic exposure scenarios to several environmental pressures. At the same time, complementary criteria of short- and long-term effects must be taken into account to address issues such as remediation and restoration of some specific environments as well as the potential of providing a dynamical and integrative prediction of effects over several generations.
In this context, team MEPS is today focused on the following topics:

- The development of mechanistic models based on physiological, namely physiologically based toxicokinetic-toxicodynamic (PBTKTD) models, in the perspective of providing predictive and diagnostic tools for the environmental quality;
- The plasticity of individual responses to one (or a combination of) stress factor(s) (e.g. contamination and/or global warming) and the effects of adaptation phenomena on the long-term dynamics of populations;
- The prediction of the species sensitivity distribution within communities when exposed to chemical contaminants by integrating inter-species variability on various biological parameters of interest and not only on a critical effect concentration;
- The development and the maintenance of the MOSAIC web platform (MOdeling and StAtistical tools for ecotoxICology, http://mosaic.univ-lyon1.fr) which freely and in a user-friendly way provides a collection of tools for data analysis and modelling in the field of ecotoxicology.

