**BIOS2- Sentinelle Nord Summer School – Behavioural Ecology work package**

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**Context**

Predator and prey behaviour has received a tremendous amount of attention from various disciplines because behaviour is central in explaining how predators and prey coevolve and regulate each other. On the one hand, theoretical models have analysed how predators should optimize their capture success, based on the time spent searching and handling prey or how prey should adjust their foraging behaviour to the risk of predation. On the other hand, empirical studies have used derivatives of a quantitative genetics (including phenotypic selection) approach to assess the key aspects of predator and prey behaviour, their variation, and the selection acting on it. The two approaches are complementary but seldom combined in a single research program. This 3h work package will present the key concepts for studying the role of behaviour during predator prey interactions and teach you to use optimality models and generalized linear mixed models. We will close the activity with ideas for collaborative projects (planned as publication units) for those who want to analyse data on behaviour from the TrophIE game itself.

**Learning objectives**

* Design and use theoretical models to analyse the effect of environmental conditions, prey density, etc. on the optimal predator and prey behaviour
* Build and use generalized linear mixed models to quantify key aspects of predator and prey behaviour and performance (i.e. selection on behaviour)

**Activities**

* Review and adjust theoretical models to analyse optimal prey resource use (food and refuges)
* Reanalyse a dataset on predator behaviour and hunting success in a multiplayer online game to assess foraging mode, its links with success, the selection exerted on predator behaviour, and the role of prey behaviour in shaping this selection.

**Collaborations**

* Solve general optimal models and use empirical data to assess how predation risk or foraging mode shapes prey resource and refuge use.
* Assess foraging mode of predators, its variation among individuals, and its relationship with hunting success in the game.
* Analyse how foraging behaviour and foraging niche of predators vary with experience.
* Assess how prey density and behaviour shapes selection on foraging mode.
* Estimate how predator and prey behaviour shape the functional response of each individual predator (assuming we have enough data for this).

**Variables needed from the game**

* Predator and prey speed
* Predator and prey area covered per unit of time or over a given trial
* The location and time of each interaction among predator and prey (where predator or prey detected the predator)
* The location and time of each successful capture event
* Prey foraging success
* Time spent in the refuges by the prey (in total and per bout)
* Time spent foraging by the prey (total and per bout)
* Time spent searching prey for predators (in total and per bout, can be the latency between captures)
* Time spent handling prey for predators (in total and per bout)