

cordially invites you to a

## **NIMBioS Interdisciplinary Seminar**

with

**Dr. Luc Doyen**

on

### ***“Tragedy of open ecosystems”***

**Tuesday, September 18, 2018**

3:30-5 p.m.

*Reception & refreshments at 3 p.m.*

Hallam Auditorium, Room 206

1122 Volunteer Boulevard



Dr. Luc Doyen is the Director of Research at the Centre National de la Recherche Scientifique (CNRS) at Univ. of Bordeaux, France, where his research focuses on bio-economic modeling, viable management of biodiversity and mathematics of sustainability. He also leads the team devoted to ecosystem dynamics at GREThA (Research Group Theoretical and Applied Economics) at the University of Bordeaux. His publications (60 in international peer-reviewed journals, 1 book Springer, H-index=27, 2300 citations), his international network of collaboration, his supervision and teaching activities (10 doctorates) emphasize both the scientific excellence, the international dimensions and the interdisciplinarity of his work at the interface between economics, ecology, mathematics and computer science.

**Abstract:** This presentation investigates the role played by cooperation for the sustainable harvesting of an ecosystem. To achieve this, a bio-economic model based on multi-species dynamics with interspecific relationships and multi-agent catches is considered. A comparison between the non-cooperative and cooperative optimal strategies is carried out. Revisiting the Tragedy of Open Access and over-exploitation issues, it is first proved analytically how harvesting pressure is larger in the non-cooperative case for every species. Then it is examined to what extent gains from cooperation can also be derived for the state of the ecosystem. It turns out that cooperation clearly promotes the conservation of every species when the number of agents is high. When the number of agents remains limited, results are more complicated, especially if a species-by-species viewpoint is adopted. However, we identify two metrics involving the state of every species and accounting for their ecological interactions, which exhibit gains from cooperation at the ecosystem scale in the general case. Numerical examples illustrate the mathematical findings.