

TT4 - Rui Dilão (Technical University of Lisbon - Portugal)

Realistic Population Dynamics Models: Demography Cycles, Chaos and Resources

Saturday, Sunday – 14:40-16:00

Portuguese

Abstract:

We introduce the most common quantitative approaches to population dynamics and ecology, emphasizing the different theoretical foundations and assumptions. These populations can be aggregates of cells, simple unicellular organisms, plants or animals.

The basic types of biological interactions are analysed: consumer-resource, prey-predation, competition and mutualism. Some of the modern developments associated with the concepts of chaos, quasi-periodicity, and structural stability are discussed. To describe short- and long-range population dispersal, the integral equation approach is derived, and some of its consequences are analysed. We derive the standard McKendrick age-structured density dependent model, and exhibit some particular solutions of this model. In this context, the problem of existence of demography growth cycles is discussed. We discuss the relation between the McKendrick and the Leslie models, and we derive some explicit applications to human demography. In the context of Leslie type models, the problems of quasi-periodicity versus chaos, resource dependence and harvesting are also discussed. These lectures can be used as a first introduction to the modelling aspects of population growth.