Raluca Eftimie (Department of Mathematics, University of Dundee)

Communication and aggregation patterns in self-organised animal communities

Abstract

Communication among individuals forms the basis of social interactions in every animal population. In general, communication is influenced by the physiological and psychological constraints of each individual, and in large aggregations this means differences in the reception and emission of communication signals. Here, we take a new approach on animal aggregations and use a nonlocal mathematical model to investigate theoretically the simultaneous use of two communication mechanisms by the members of a population. We show that the use of multiple communication mechanisms can lead to behaviours that are not necessarily predicted by the behaviour of subpopulations that use only one communication mechanism. We also show that the use of multiple communication mechanisms leads to the sorting of individuals inside aggregations: individuals that are aware of the location and movement direction of all their neighbours usually position themselves at the centre of the groups, while individuals that are aware of the location and movement direction of only some neighbours position themselves at the edges of the groups. Finally, we use bifurcation theory to investigate the mechanisms behind the formation of aggregation patterns displayed by these communities.