

第42回 MIMS Mathematical Biology Seminar

2013年6月5日(水) 13:15~14:30

明治大学中野キャンパス601

June 5, 2013. 13:15~14:30 Meiji Univ. Nakano campus 601

JR中央線快速・総武線、東京メトロ東西線／中野駅 下車 北口より徒歩約8分

詳しくは、http://www.meiji.ac.jp/koho/campus_guide/nakano/access.htmlをご覧ください。

Does toxicity promote coexistence?

Tommaso Scotti (Meiji University)

I will investigate a two-prey one-predator system in which one of the prey has a toxic effect that inhibits the growth of the predator. In nature, examples of such interactions are given by particular plankton communities as well as by the reaction of fence lizards to the invasion of a novel toxic prey: fire ants. I will study a mathematical model of the Lotka-Volterra type in order to answer the following questions: does killing out predators, that also control the growth of a competitor for resources, promote the survival of a toxic prey? Should predators always avoid eating such a prey as intuition would suggest?

In compact form, for $i=1,2,3$, the system can be written as:

$$\frac{dN_i}{dt} = N_i(\rho_i - \sum_{j=1}^3 \alpha_{ij} N_j) \text{ where } \rho_{1,2} > 0, \rho_3 < 0 \text{ and } \alpha_{ij} > 0 \text{ except } \alpha_{31} < 0, \alpha_{33} = 0.$$

The system will be analyzed and all its equilibrium points classified. Through numerical simulation and bifurcation analysis I will show that small values of the toxicity parameter may lead to a monopoly of the toxic species while higher ones promote coexistence of the three species. Moreover, I will build bifurcation diagrams and show that chaotic dynamics may also occur. Interpreting these results I will conclude that sometimes the two questions stated above can be both answered negatively.

参加自由です。皆様のお越しをお待ちしております。

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