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Mathematical Models in Ecological Entomology: Toward Integrated Models for Inter-disciplines

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Mathematical modeling is a unique and long-historical method in animal ecology, especially in the field of population dynamics. Since Malthus brought forward a new doctrine, *An Essay on the Principle of Population*, in the late 18C, modeling has been regarded as a tool to make our understanding and insight broaden for complex natural phenomena. As a major part of animal ecology, mathematical approaches in entomology have been played key roles in the standardization and the quantification of biological systems.From the classical models to the modernized ones, the methodologies in modeling have been diversified along with the development of computer science. Both schools of analytical and simulation models shared the field of modeling and coevolved with their own strength and usefulness. However, a series of debate in the nature and/or size of model has been generated in the last decade, although the common sense, *Ocam's razor*, has been shared among the modelers in both schools. In this study, a model named GPA-Phenodynamics that is a mechanistic model will be introduced and reviewed briefly to demonstrate how these two viewpoints could be integrated. Recently, it is also requested to develop more practical models that closely explaining realistic biological systems as parts of ecosystems. Therefore, it might be an appropriate time to develop models that embody biological community system composing at least two trophic levels. One of possible approaches in desirable integrated modeling for inter-disciplines is proposed and discussed for the prediction of community changes in a certain environmental regime.