Published in "Ecological Modelling, 192: 321, 2006"
which should be cited to refer to this work.

Answer to Hui

Hui argues that the two paradoxes in the logistic equation discussed and solved in our paper rest on a misconception of the concept of carrying capacity. If we agree with him about the lack of clarity with regard to this notion, we show here that the two paradoxes persist when Hui's alternative notion of carrying capacity is integrated in our line of reasoning. Among the definitions of carrying capacity reviewed by Hui, the author focuses on two concepts. He claims that the "good" notion should be the "environment's maximal load" (thereafter noted C), which he opposes to the "classical" population equilibrium (noted K in the logistic equation). It is important to note that C is a characteristic of the environment and is independent of the population dynamics, while K, on the contrary, is a notion derived from a population dynamics model, without explicit reference to any particular environment. According to Hui, if the population size exceeds this maximal load (C), then the whole population will crash to zero.

Obviously, $K \leq C$, and if both notions are not equivalent, there must exist a situation in which $K \neq C$ and thus $K < C$. In this case, it is therefore possible to choose $K < N < C$, a case where Levins' and Ginzburg's paradoxes persist.

Finally we would like to stress that, if we agree with Hui's contention that carrying capacity (understood as C) is not affected by the introduction of an additional mortality factor in Ginzburg's first equation (and that, therefore, Ginzburg's intuition should not be hurt), we never saw any problem in this equation. We also disagree with the fact that the second equation of Ginzburg possesses a "mechanistic problem", nor did we attempt to avoid this problem by a mathematical "trick". We explained this paradox with a clear mathematical argument illustrated by a sound biological situation.

Hui's contribution highlights the difficulty of giving a phenomenological interpretation to the parameters of the logistic equation, a problem that we will tackle in a forthcoming paper. We will attempt to explicitly link population dynamics and environmental conditions while remaining in the framework of the logistic equation.

Jean-Pierre Gabriel
Department of Mathematics, University of Fribourg
ch. du Musée 23, CH-1700 Fribourg, Switzerland

Francis Saucy
Rue des Châteaux 49
CH-1633 Vuippens, Switzerland

Louis-Félix Bersier*
Zoological Institute, University of Neuchâtel
Rue Emile-Argand 11, C.P. 2
CH-2007 Neuchâtel, Switzerland

Chair of Statistics, Department of Mathematics
Swiss Federal Institute of Technology
CH-1015 Lausanne, Switzerland

* Corresponding author. Tel.: +41 32 718 3006
fax: +41 32 718 3001
E-mail addresses: jean-pierre.gabriel@unifr.ch (J.-P. Gabriel), francis.saucy@bluewin.ch (F. Saucy) louis-felix.bersier@unine.ch (L.-F. Bersier)

14 June 2005

Hui, C. Carrying capacity, population equilibrium, and environment's maximal load. 2006. Ecological Modelling 192(1-2), 317-320