

Peter Jagers

CHALMERS AND U. OF GOTHENBURG

e-mail: jagers@chalmers.se

Finite Populations Regulated by a Carrying Capacity

A population of independently reproducing individuals in a stable environment will die out, if reproduction is critical or subcritical. If it is supercritical, the population may escape extinction. But then it must grow exponentially beyond all limits, which is of course a mathematical artifact, unrealisable in a finite world. But what happens in reality, where there is a bound to growth? A carrying capacity such that individuals reproduce in a supercritical manner while population size is below it, reproduction however turning subcritical as soon as the population is larger than the habitat carrying capacity?

These questions are answered in terms of general branching processes, i.e. populations where individuals have arbitrarily distributed life-spans and may give birth according to an arbitrary pattern, and individual reproductive behaviour is influenced by population size in the manner described.

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