Pragmatism vs. axioms?

I cannot agree more

[Ecology]….”has undergone intense development for more than a century of history which has led to a great number of very useful models to learn about phenomena [1–4]. Organizing these models into a cognitively manageable framework could help prevent spurious debate and foster quicker identification of gaps of knowledge.”

Are there no laws in ecology?

„The strict view of law discussed here highlight that laws are axioms that had their empirical adequacy widely verified.”

no clearly agreed fundamental principles ?

„Axioms”, observations, conditions

A1: Organisms are capable of reproduction.
A2: The capacity of any region to support any reproducing population is finite.
A3: External conditions change stochastically in space and time.
A4: Replication of the genetic material is imprecise.
A5: Some mutations affect survival or reproduction of the organism.
A6: Variations of individual traits are usually not independent.

Theorems, conclusions, rules, laws

T1: Principle of Exponential Growth: The number of reproducing organisms grows exponentially in lack of feed-backs between per capita population growth rate and population size.

T2: Principle of Population Regulation: Population sizes either vary between limits or the populations go extinct.

T3: Principle of Stochasticity: Stochastic changes in population sizes are unavoidable due to finite population size and changing external conditions.

T4: Principle of Variation: Equivalent and non-equivalent reproductive units (gene-kinds, clonal-types, species) are emerging.

T5: Principle of Survival of the Fittest / Competitive Exclusion: In a community of non-equivalent reproductive units regulated by a single agent or factor in common, one variety excludes all others.

T6: Principle of Trade-offs: Not all components increasing the per capita population growth rate can change independently.

T7: Principle of Robust Coexistence: Robust coexistence is possible in a community of non-equivalent reproductive units regulated by more than a single regulating agent or factor. The larger the difference between the competing reproductive units' growth regulation, the more robust their coexistence is.

T8: Principle of Exclusive Resource Limitation

Model-independent theorems, rules, laws 1

Principle 1. The number of reproductive units is expected to grow exponentially in the absence of regulating feedbacks.

Related models:

- individual-based simulations

- models of unregulated populations of identical individuals in a constant environment

- stochastic population growth in discrete time of large populations with small fluctuations

- stochastic population growth in a stationary fluctuating environment

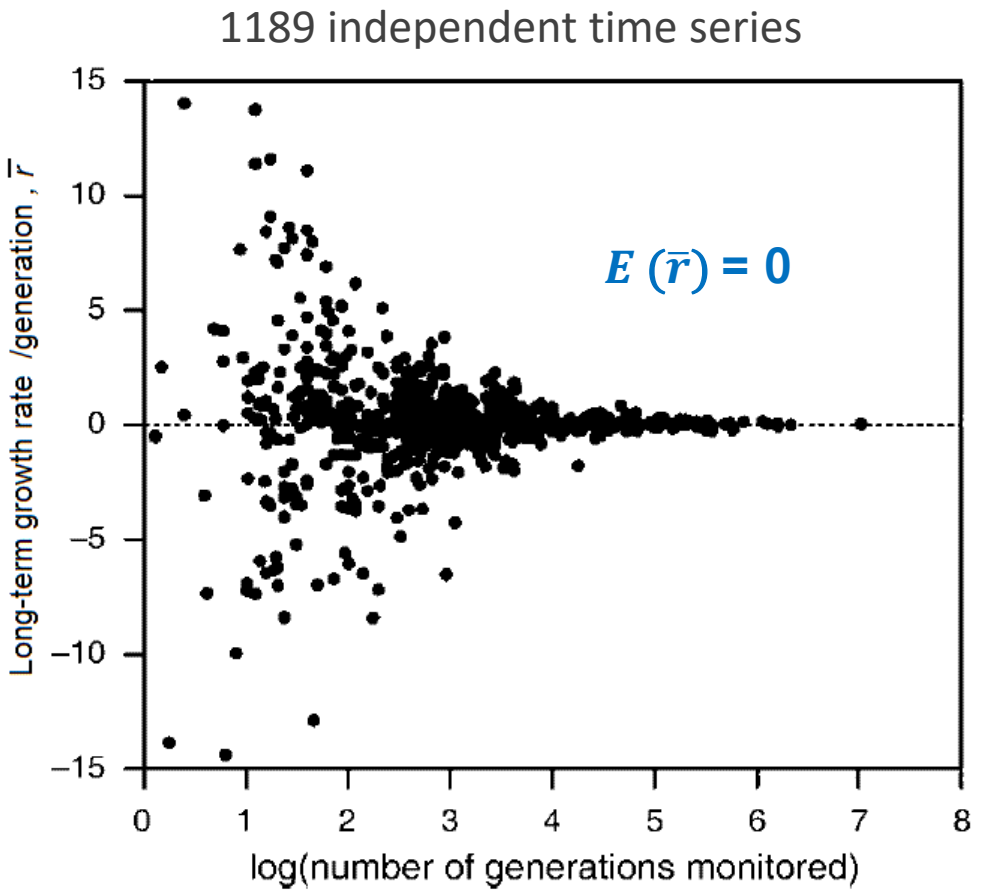
-exponential growth in continuous time

- exponential growth of structured populations

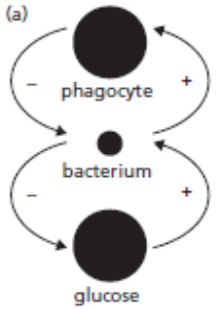
Model-independent theorems, rules, laws 2

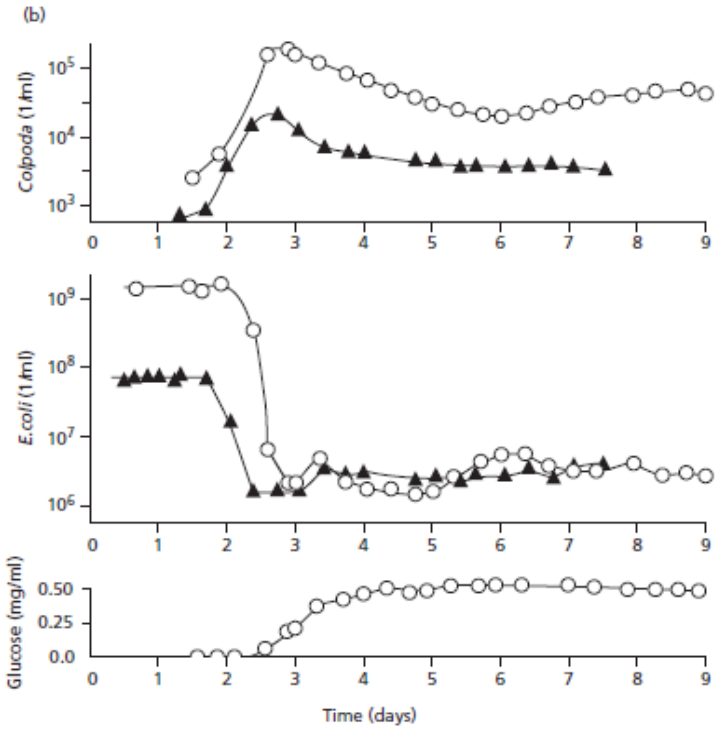
A2: The capacity of any region to support any reproducing population is finite.

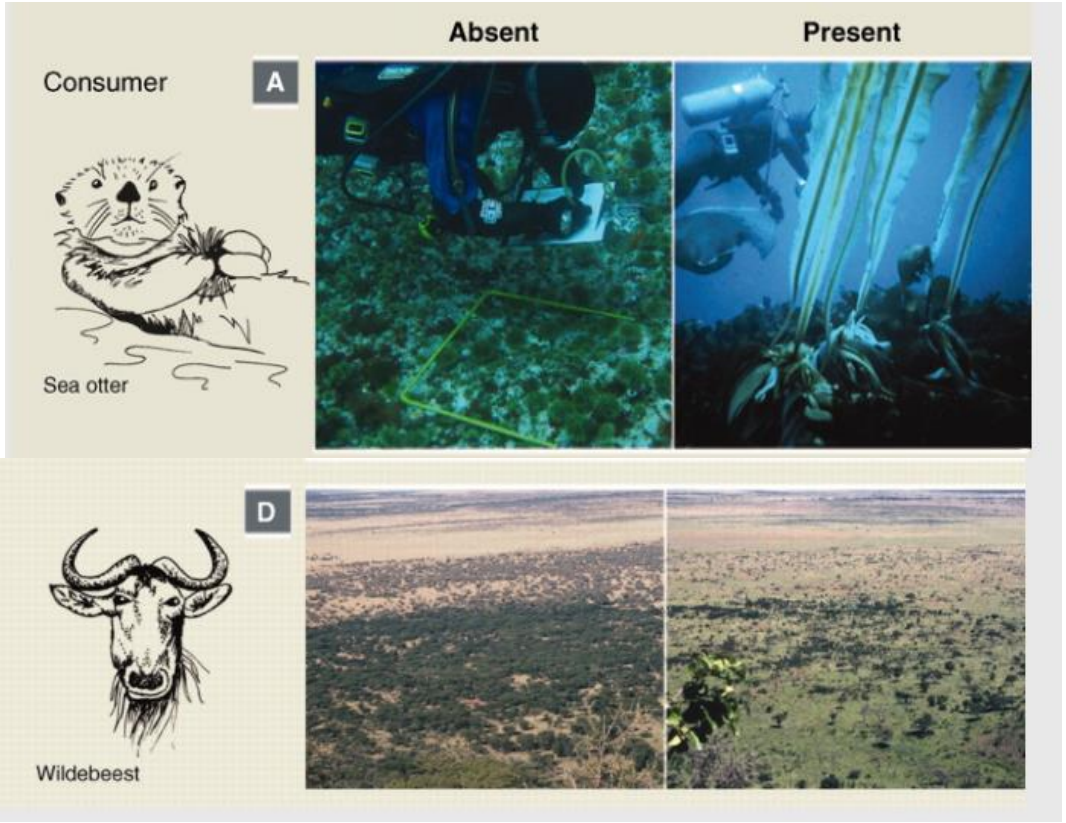
T2: Principle of Population Regulation: Population sizes either vary between limits or the populations go extinct.



Principle of Exclusive Resource Limitation







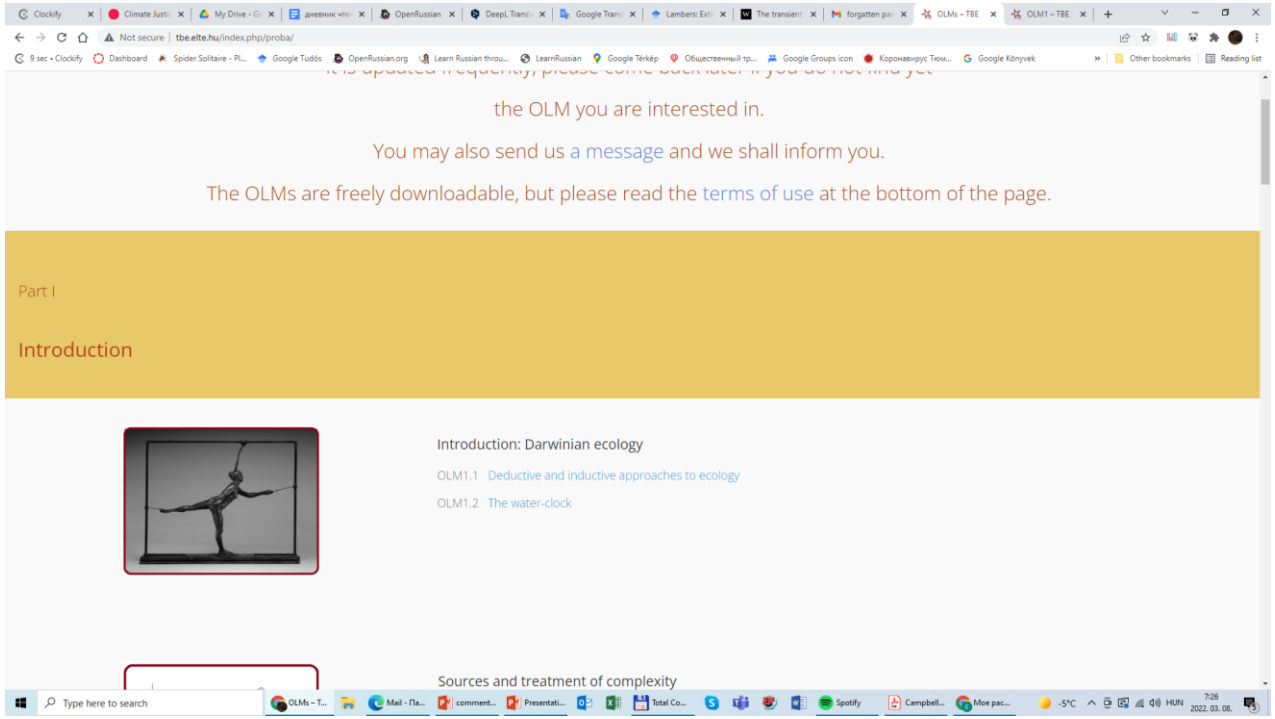
Theory-based ecology, Chapter 6.

Drake and Tsuchiya 1976; Estes, et. al., 2011

No framework to organize ecological knowledge?

OLM 1.1. Deductive and inductive approaches in ecology

The introductory chapter of this book (TBE for short) has shown that the conceptual background of Darwin's encyclopaedic work is an explicit and logically coherent theory (Figure 1.1). This section is a brief exposition of our approach to the discipline of ecology from a theory of science aspect. TBE provides a theory-based, deductive approach attempting to integrate the results of model-based, inductive research. In this sense we follow the Darwinian tradition on modern methodological grounds.



Model families associated with principles

Succession

Proposition 1:
At any moment in time, there is the possibility that resources will be available for use.

Proposition 2:
Organisms from different species or at different ontogenetic stages have different probabilities of taking a fraction of the total available resource units. This difference can be due to (a) differential probabilities of site colonization, or (b) different probabilities that the individuals at the site or their propagules will take resource units.

Proposition 3:
The dynamics of the resource and the probabilities of the species taking resource units are contingent on the abundance of species in the community and other environmental settings where the communities are changing.