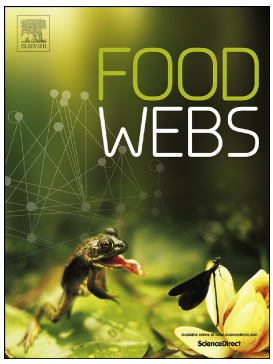

Assumptions about trophic cascades: The inevitable collision between reductionist simplicity and ecological complexity

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Assumptions about Trophic Cascades: The Inevitable Collision between Reductionist Simplicity and Ecological Complexity[1]

By

Patricia A. Lane[2]

Highlights

1. **Several trophic cascade assumptions and their logical outcomes are flawed.**
2. **Marine food webs cannot be controlled in the sense of the machine metaphor.**
3. **Loop analysis shows that sometimes the role of trophic cascades has been exaggerated.**
4. **Ecologists should apply complex system thinking in studying food webs.**

Abstract:
The assumptions ecologists make both influence and constrain their conclusions. Too often these assumptions are not explored or validated rigorously enough. The purpose of this paper is to critically review seven trophic cascade assumptions frequently used in the current literature and to identify whether their conclusions are compatible with results from loop analysis. Assumptions center upon food web conceptualization, food chain to food web extrapolations, constancy of food webs, role of driving forces or parameter inputs, top-down versus bottom-up phenomena, associated dichotomies, and the notion of food web control by keystone predators and parameter inputs. Data-fitted marine loop models involving about 500 species show how complex, biologically-reasonable food webs are qualitatively different from food chains as well as simple intuitive food webs. Both supporting and opposing views of other authors are contrasted in regard to loop analysis results. This review concludes that the roles of trophic cascades are sometimes afforded an exaggerated importance using over-simplified reductionist logic especially in marine pelagic food webs. It would be useful if these seven assumptions could be similarly analysed using other modelling methodologies to determine a more realistic role for trophic cascades and to facilitate consensus among ecologists. It would also be worthwhile to construct data-fitted loop models for more types of ecosystems. Regardless, biological reality should not be sacrificed for convenience.

Key Words: Trophic Cascade, Trophic Escalade, Marine Food Webs, Loop Analysis, Keystone Predator, Control

[1] Abbreviations: ES(s) = Ecological Skeleton(s), KP = Keystone Predator, LA = Loop Analysis, PI(s) = Parameter Input(s), TC = Trophic Cascade, TCC = Trophic Cascade Concept, and TE= Trophic Escalade

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