

A Chemostat and Biodiversity of Plankton

Yasuhisa Saito¹, Yasuhiro Takeuchi²

¹Department of Systems Engineering
Shizuoka University
Hamamatsu 432-8561, Japan
y-saito@sys.eng.shizuoka.ac.jp

²Department of Systems Engineering
Shizuoka University
Hamamatsu 432-8561, Japan
takeuchi@sys.eng.shizuoka.ac.jp

ABSTRACT

Biodiversity has both fascinated and puzzled biologists (see [4]). In aquatic ecosystems, the biodiversity puzzle is particularly trouble-some, and known as the ‘paradox of the plankton’ (see [1]). For phytoplankton in lakes and marshes, a few resources are potentially limiting: phosphorus or nitrogen (see, for example, [2]). However, an unlimited number of phytoplankton species coexist there (see [1-2]).

Simple chemostat, on the other hand, is well-known to produce competitive exclusion — that is, the extinction of all but one competitor — for a single nutrient (see [3]). This, for natural phytoplankton communities, predicts that the number of species cannot exceed the number of limiting resources, although, as mentioned above, more species than limiting resources seem to coexist. It becomes then an interesting problem to modify the chemostat model, taking into account some new aspect that will produce coexistence. In this paper, a chemostat model is discussed to offer a solution to the paradox of the plankton. Our results state that the robust coexistence occurs whenever each species has self-inhibitory (in its reproduction) well-balanced to the resource.

Key Words: chemostat, biodiversity, coexistence, stability, permanence

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References

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