

Trophic structure and functioning in a eutrophic and poorly flushed lagoon in southwestern Taiwan

Hsing-Juh Lin ^{a,b,*}, Xiao-Xun Dai ^a, Kwang-Tsao Shao ^c,
Huei-Meei Su ^d, Wen-Tseng Lo ^e, Hwey-Lian Hsieh ^c,
Lee-Shing Fang ^f, Jia-Jang Hung ^g

^a Department of Life Sciences, National Chung Hsing University, Taichung 402, Taiwan, ROC

^b Institute of Marine Environmental Chemistry and Ecology, National Taiwan Ocean University, Keelung 202, Taiwan, ROC

^c Research Center for Biodiversity, Academia Sinica, Taipei 115, Taiwan, ROC

^d Tungkang Marine Laboratory, Taiwan Fisheries Research Institute, Tungkang, Pingtung 928, Taiwan, ROC

^e Department of Marine Resources, National Sun Yat-sen University, Kaohsiung 804, Taiwan, ROC

^f National Museum of Marine Biology and Aquarium, Pingtung 994, Taiwan, ROC

^g Institute of Marine Geology and Chemistry, National Sun Yat-sen University, Kaohsiung 804, Taiwan, ROC

Received 31 July 2005; received in revised form 21 February 2006; accepted 6 March 2006

Abstract

Tapong Bay, a eutrophic and poorly flushed tropical lagoon, supports intensive oyster culture. Using the Ecopath approach and network analysis, a mass-balanced trophic model was constructed to analyze the structure and matter flows within the food web. The lagoon model is comprised of 18 compartments with the highest trophic level of 3.2 for piscivorous fish. The high pedigree index (0.82) reveals the model to be of high quality. The most-prominent living compartment in terms of matter flow and biomass in the lagoon is cultured oysters and bivalves, respectively. The mixed trophic impacts indicate that phytoplankton and periphyton are the most-influential living compartments in the lagoon. Comparative analyses with the eutrophic and well-flushed Chiku Lagoon and non-eutrophic tropical lagoons show that high nutrient loadings might stimulate the growth and accumulation of phytoplankton and periphyton and therefore support high fishery yields. However, net primary production, total biomass, fishery yields per unit area, and mean transfer efficiency of Tapong Bay were remarkably lower than those of Chiku

* Corresponding author. Address: Department of Life Sciences, National Chung Hsing University, Taichung 402, Taiwan, ROC. Tel.: +886 4 22840416; fax: +886 4 22874740.

E-mail address: hjlin@dragon.nchu.edu.tw (H.-J. Lin).