Notice of Publication

POND DYNAMICS/AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM

RESEARCH REPORTS

SUSTAINABLE AQUACULTURE FOR A SECURE FUTURE

Title: A bioenergetics growth model for Nile tilapia (Oreochromis niloticus) based on limiting nutrients and fish standing crop in fertilized ponds

Author: Yang Yi
Agricultural and Aquatic Systems Program
School of Environment, Resources and Development
Asian Institute of Technology
P.O. Box 4
Klong Luang, Pathumthani 12120 Thailand

Date: November 6, 1998 **Publication Number:** CRSP Research Report 98-128

The CRSP will not be distributing this publication. Copies may be obtained by writing to the authors.

Abstract: A bioenergetics growth model for Nile tilapia in fertilized ponds, which linked Nile tilapia growth with limiting nutrients in pond water, was developed. The model incorporated six key variables affecting Nile tilapia growth in fertilized ponds: body size, water temperature, photoperiod, dissolved oxygen, unionized ammonia and food availability. In the model, food availability was estimated by a relative feeding level parameter, which was a function of potential net primary productivity based on limiting nutrients, and standing crop of Nile tilapia. The model was validated using growth data of Nile tilapia in 30 fertilized ponds, and successfully detected growth variations among ponds receiving the same nitrogen and phosphorus inputs. The model described 76% of the variance in growth in these ponds, and the relationship between predicted and observed growth rates had a slope of 0.93 and an intercept of 11.51, not significantly different from 1 and 0, respectively. The model indicated that the growth variations were caused by carbon limiting primary production during 55-99% of the culture period. Sensitivity analysis indicated that the parameters related to net energy from feeding were more sensitive than those related to fasting catabolism, and that the growth was most sensitive to photoperiod and then food availability when DO was above its critical limit (1.0 mg l^{-1}), but was most sensitive to DO when it was below the critical limit. Tilapia growth was more sensitive to DO than UIA. Initial tilapia size was the least sensitive variable when UIA was above the critical limit in the model. Compared with previous models, this study provides a more reasonable and accurate way to estimate relative feeding level (f) based on fish standing crop and potential net primary productivity derived by a limiting nutrient.

This abstract was excerpted from the original paper, which was published in Aquacultural Engineering, 18(3):157-173.

CRSP RESEARCH REPORTS are published as occasional papers by the Program Management Office, Pond Dynamics/Aquaculture Collaborative Research Support Program, Oregon State University, Snell Hall 400, Corvallis, Oregon 97331-1641 USA. The Pond Dynamics/ Aquaculture CRSP is supported by the U.S. Agency for International Development under CRSP Grant No.: LAG-G-00-96-90015-00.