

NOTICE OF PUBLICATION

AQUACULTURE COLLABORATIVE RESEARCH SUPPORT PROGRAM



RESEARCH REPORTS

Sustainable Aquaculture for a Secure Future

Title: Modelling Temperature Variation and Thermal Stratification in Shallow Aquaculture Ponds

Author(s): Thomas M. Losordo
Department of Zoology, Campus Box 7646
North Carolina State University
Raleigh, NC 27695, USA

Raul H. Piedrahita
Department of Agricultural Engineering
University of California
Davis, CA 95616, USA

Date: 16 February 2006 Publication Number: CRSP Research Report 92-A1

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

Abstract: A mathematical model to stimulate thermal stratification in shallow aquaculture ponds is described. The dynamic, mechanistic model was developed to simulate the water column of ponds in discrete, completely mixed, horizontal volume elements. Energy exchanges between the pond's surface and atmosphere were calculated with theoretical and empirical relationships commonly applied to heat balance calculations in lakes, reservoirs and waste treatment ponds. Energy transfer between the volume elements caused by turbulent mixing were simulated as functions of the temperature gradient in the water column and a diffusion coefficient. The value of the diffusion coefficient was calculated in each time step as a function of wind speed, depth, and the water column density gradient. The model was implemented using a dynamics simulation language (STELLA™) using an Apple Macintosh™ microcomputer. Also described are the model calibration and verification procedure and results.

This abstract is excerpted from the original paper, which was in *Ecological Modelling*, 54(3-4):189-226.

CRSP RESEARCH REPORTS are published as occasional papers by the Program Management Office, Aquaculture Collaborative Research Support Program, Oregon State University, 418 Snell Hall, Corvallis, Oregon 97331-1643 USA. The Aquaculture CRSP is supported by the US Agency for International Development under CRSP Grant No.: LAG-G-00-96-90015-00. See the website at <pdacrsp.orest.edu>.