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RESEARCH REPORTS

SUSTAINABLE AQUACULTURE FOR A SECURE FUTURE

Title: Estimation of carrying capacity for shrimp aquaculture in the eastern estuaries of the Gulf of Fonseca

Authors: George H. Ward
Center for Research in Water Resources
The University of Texas, PRC-119
Austin, Texas 78712 USA

Bartholomew W. Green and David R. Teichert-Coddington
International Center for Aquaculture and Aquatic Environments
Department of Fisheries and Allied Aquacultures
Auburn University, Alabama USA

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Abstract: An intensive data collection and modeling study has been underway for the past several years addressing two of the channel estuaries draining into the Gulf of Fonseca, namely Estero El Pedregal and Estero San Bernado. Data have been compiled on the shrimp farm configurations, exchange rates, and effluent chemistry. Temperature/salinity/dissolved oxygen profiles have been measured in the estuary channels in both rainy and dry seasons. Physiographic, hydrographic and meteorological data have been obtained to supplement the estuary data. We examine the assimilative capacity of these estuaries with respect to dissolved oxygen (DO). The oxygen demand of organics is measured by biochemical oxygen demand (BOD). Shrimp farm BOD loadings were estimated from effluent data and exchange. A transport model for salinity and DO in the estuaries was applied to predict the tidal-mean, section-mean concentrations of salinity and DO. The model predictions of DO given 1995 BOD loadings were satisfactory. Future loadings based upon full shrimp farm development along these two estuaries were then input to determine the resulting DO under these conditions. It was found that the 1995 configuration is already pressing the carrying capacity of both systems, and the DO will be worsened at full development. Shrimp farms placed farther upstream than about 20 km from the mouth will most likely have excessive impact on the DO in the estuary. The impact is exacerbated under dry season conditions. Negative impacts of a specific farm can be ameliorated by reducing or eliminating pond discharges during the dry season, and by reducing the level of water exchange employed.

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This work needs to be extended to address additional water-quality parameters, and to incorporate larger spatial scales, especially to establish the interaction between different estuaries draining into Fonseca.

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