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Sustainable Aquaculture for a Secure Future

Title: Effects of shrimp farming on the hydrography and water quality of El Pedregal and San Bernardo Estuaries, Gulf of Fonseca, Honduras

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Abstract: Intensive data collection and a modeling study have been underway for the past several years addressing two of the channel estuaries draining into the Gulf of Fonseca, Estero El Pedregal and Estero San Bernardo. Data have been compiled on the shrimp farm configurations, exchange rates, and effluent chemistry. Temperature, salinity, and dissolved oxygen profiles have been measured in the estuary channels during both rainy and dry seasons. Physiographic, hydrographic, and meteorological data have been obtained to supplement the estuary data. This report examines 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 and section-mean concentrations of salinity and DO. The model predictions of DO—based on 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 worse 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, which 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

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exchange employed. 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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