

SHRIMP AQUACULTURE ENVIRONMENTAL DIAGNOSIS IN THE SEMIARID COASTAL ZONE IN MEXICO

Héctor A. González-Ocampo¹, Luís F. Beltrán Morales¹, Carlos Cáceres-Martínez², Hernán Ramírez Aguirre², Sergio Hernández-Vázquez¹, Enrique Troyo-Diéguez¹ and Alfredo Ortega-Rubio¹

¹ Centro de Investigaciones Biológicas del Noroeste, S. C. Apdo. Postal 128, 23090 La Paz, BCS México

² Universidad Autónoma de Baja California Sur. Apdo. Postal 19-B., 23080 La Paz, BCS, México

SUMMARY

Environmental diagnosis of supra-littoral and semi-intensive shrimp farm systems (SCS) in the northwestern part of Mexico had been developed for a 10-years period (1993 to 2003). The activities in the construction, operation and abandonment phases were evaluated by an environmental impact diagnosis analysis, causal diagrams, complex analysis systems, relevant environmental criteria analysis, and fuzzy logic impact assessment. The SCS, divided in Natural and Socioeconomic subsystems, showed important negative impact in the construction phase affecting the flora and fauna because of vegetation removal, but as positively was detected the employment because of the number of people hired. During the operation phase, positive impacts in the Socio-economic subsystem (SEC) were produced by high-educated employments offers, and increase of life quality. Opposite, the most important negative effect was caused by pollutant-enriched water discharges. In the abandonment phase, negative effects were identified by soil salinization, acidification, erosion increase, or the ecological barriers' role that ponds play. The combination of the methods applied in this work help to identify in an ordinal way the magnitude of the environmental impacts on shrimp cultures in any region and different conditions.

KEYWORDS: Environmental diagnosis, complex system analysis, semiarid region, environmental assessment, fuzzy logic.

INTRODUCTION

During the last 15 years, shrimp aquacultures have maintained a sustainable growth, and had generated positive and negative effects on the society [1, 2], as well as in nature [3-6]. In Mexico, shrimp aquacultures followed the same trend, growing from 0 tons/year in 1984 to more than 48,000 tons/year in 2000 [7]. The study area located in the Gulf of California (Fig. 1) groups 21 shrimp ponds in scrubland regions with a very dry semi-warm, temperate weather (average annual precipitation 150 mm [8, 9]),

and, since 1984, its noticeable national contribution to shrimp culture production (25%) are steadily increasing by rates up to 0.76%. During 2003, more than 31,000 tons were produced in only 14,000 ha, while other Mexican states, such as Sinaloa, Nayarit and Baja California produced 21,841 tons in 24,000 ha, 5,714 tons in 4,731 ha and 306 tons in 19 ha [7]. According with these statistics, these areas represent the first shrimp producers throughout México.

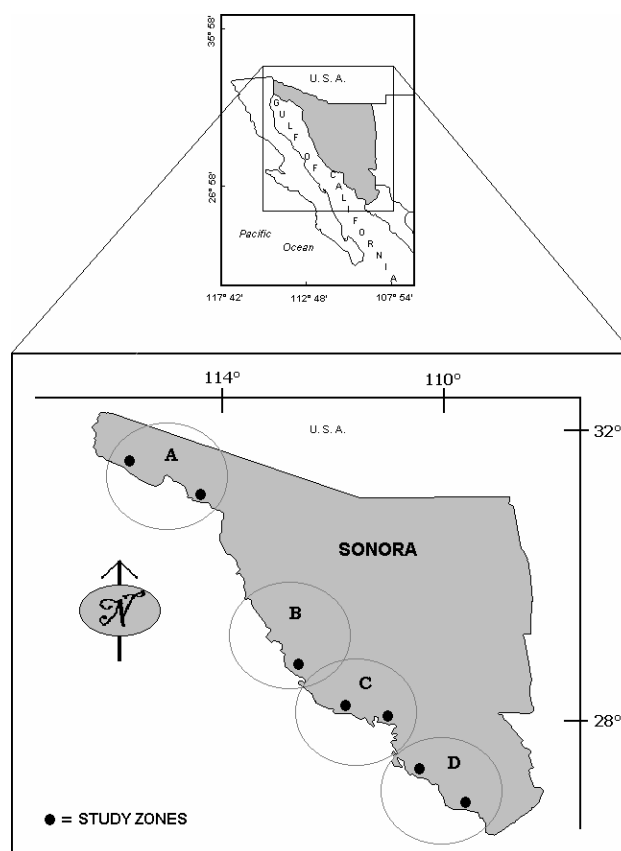


FIGURE 1 - Location of grouped shrimp farms evaluated (A = Puerto Peñasco-San Luis Río Colorado area; B = Hermosillo-Pitiquito area; C = Gyamas-Empalme area; D = Huatabampo area).