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Quality of Artemia Cultured in  
Thailand Salt Ponds

U.S. AID Cooperative Agreement  
Mariculture in Developing Countries  
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and

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## OVERVIEW:

One of the major reasons for the low use of mariculture in developing countries is the difficulty in rearing larval stages of marine organisms. Brine shrimp nauplii are probably the most widely used food world-wide for the culture of larval fish and crustaceans, specifically, at certain critical stages in development of the species. Thus, a food chain has been established with generally algae at one end and brine shrimp the other. It has now been established that the survival of the post-larval shrimp in the grow out ponds is directly related to the Artemia that are fed to the pre-larval shrimp in the hatchery. At present there is no shortage of Artemia on the world market. The supply of good Artemia is, however, very short. The survival of the shrimp fed for a short period of time on Artemia in hatcheries is good. Based on unpublished data, we would predict that the survival of post-larval shrimp in the ponds of present hatchery shrimp is much lower than sea captured post-larval shrimp. Artemia are not native to Thailand, yet it is an area suited to the cultivation of Artemia. Since its inoculation, biomass production has increased and many small farms have been devoted to Artemia as part of a polycultural system. Preliminary results, however, indicate marginal quality of the Thai cysts. Because of the short dry season, many Thai farmers have shifted to biomass production rather than cyst production, either for local consumption or for shipping to Hongkong. The type of production is not intensive and the quality of the Thai cysts and biomass has been marginal in specific fatty acids. The proposed Thailand project aims at the analysis of the nutritional value and the pesticide residue of the Thai Artemia cysts and biomass. The project will also include the effects of

environmental factors on the nutritional quality of Artemia. The project also aims at the training of a faculty staff person who will be assigned to participate in the Artemia project in the above mentioned aspects.

#### OBJECTIVES

1. To analyze the effect of environmental factors on salt farms.
2. To analyze nutritional quality and pesticide residues of Artemia reared in salt farms.
3. Conduct experiments on the suitability of Artemia as live food for larval stages of cultured sea bass and shrimp.
4. Basic studies with the Ph.D. thesis of Mayuree Chaiyawat - the Ph.D. program will commence in 1986 with Mrs. Chaiyawat studying for approximately two years at the University of Rhode Island learning techniques and will do her research at Kasetsart University. Basic study is to determine the pond characteristics that lead to good algae production, hence, good Artemia quality.

#### PURPOSE OF STUDY:

The culture of sea bass (Lates cacarifer) and Penaeus shrimps (P. monodon and P. merguensis) is presently playing a vital role in the mariculture development of Thailand. However, the annual seed productions of these species are insufficient due to a high mortality rate of produced larvae. A significant factor is the suitability and nutritional quality of the food for the fish and shrimp larvae.

Brine shrimp (Artemia sp.) nauplii are extensively used as live food for the early life stages of most marine animals, including sea bass and Penaeus shrimps. In addition Artemia biomass

or adult Artemia are fed to latter stages in the shrimp and finfish development. While Artemia are not native to Thailand, very successful inoculations have occurred in salt farms along the eastern coast of the upper gulf of Thailand in 1979. Since this period of time, a number of salt farms have been converted to integrated Artemia and salt farms. Since other salt farms are suitable for converting to Artemia in salt integrated farms, Artemia cysts and biomass can thus be sufficiently produced to meet the local demand of the aquacultural industry, as well as to provide an export product of both brine shrimp cysts and biomass. To move from the situation where fertilization of the ponds in the salt farms is light to one of intensive culture will require very well trained pond experts to manage these farms. At present the "passive" production of brine shrimp biomass is progressing smoothly. However, in a completely integrated system, the lab lab production to feed finfish as part of an integrated system would require intensive culture. Under these conditions, it is anticipated that the production of biomass with good fatty acid profiles would be obtained. This has certainly been the experience of the Sycip farm in the Philippines where intensive culture is practiced in a very well integrated polyculture system.

In order to increase the cyst and biomass production, the Faculty of Fisheries, Kasetsart University, through its cooperative project with the Artemia Reference Center, State University of Ghent, has developed an extensive inoculation program including research of the optimization of inoculation production and process and techniques. Thus, the analysis of the nutritional value of the

Thai Artemia cysts nauplii and biomass, as well as the suitability as live food for larval stages of tropical finfish and shellfish are, therefore, significantly important. As was mentioned above, the lack of personnel who specialize in nutritional quality analysis and control exists and thus the Faculty of Fisheries together with the University of Rhode Island have worked out a program for the advanced degree training at the Ph.D. level of a staff member of the Faculty of Fisheries. The purpose of this study would include training on various analytical methods of Artemia and nutritional analysis, such as fatty acid analysis, amino acid analysis, pesticide analysis and isoelectric focusing of the proteins as a means of identifying parthenogenetic and bisexual populations for inoculation. Specifically, the culture of Artemia is directly related to the input of the algae that they are fed on. Thus, it is critical that a study be conducted in which the quality of Artemia produced is studied in relationship to the algae that are fed to the Artemia. This is directly related to the pond management and pond dynamics of the system that they are raised in. In this regard the present nomination of Mayuree Chaiyawat to come to the United States and study the techniques and return to do the algae analysis is critical to the program which would become a science rather than an art. Laboratory studies on Artemia cultured on various algae have looked at the fatty acid composition. We know that the Artemia are directly related to the fatty acid composition of the algae they are fed. What we don't know are the conditions under which these algae are produced and favorable Artemia are the result. The world situation is such that San Francisco Bay brine shrimp were once of excellent

quality consistently. They are now marketing cysts and biomass which may be of good quality or may be of poor quality and they do not know the reason for this change in quality. Likewise, Brazil use to be a net exporter of brine shrimp. They are presently not producing brine shrimp for export due to some unknown changes that have occurred in their pond system. This project would aim at understanding the basic characteristics of the algae that are produced and being able to predict the type of management that would result in a superior product; hence the culture of sea bass and Penaeus shrimps that are playing at present a vital role in the mariculture development of Thailand would be on a scientific basis rather than left to chance. This project would dove-tail with the efforts of the Belgium cooperative which is concerned with the inoculation, production and processing techniques. Brine shrimp would compliment this by basic studies on the optimization of the quality of the produced cysts. It is anticipated that other studies on polyculture and pond dynamics which are presently being conducted under USAID programs would be integrated into this proposal.

BUDGET:

The proposed budget is firm for 1986 and projected for the years following. The intent would be that Mayuree Chaiyawat would come to the University of Rhode Island in 1986. She would be funded for her Ph.D. program for 1987 and 1988 and would return to Thailand for a year or two to do her research and return to the U.S. probably in 1990 to defend her thesis. The inputs from the University of Rhode Island Cooperative Agreement are listed as well as the counterpart contribution of Kasetsart University.

Inputs: University of Rhode Island

	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>
Graduate Student*	\$5,000	\$10,000	\$10,000		
Travel/Per Diem	3,000	3,000	3,000	3,000	3,000
Travel/Student *	1,000		1,000		2,000
Supplies*	500	500	1,000		
	<u>\$9,500</u>	<u>\$13,500</u>	<u>\$15,000</u>	<u>\$3,000</u>	<u>\$5,000</u>

\*Mayuree Chaiyawat to come to URI 8/86.

Inputs: Kasetsart University, Faculty of Fisheries

Description	1986 (Baht) <sup>1</sup>	1987 (Baht)	1988 (Baht)	1989 (Baht)	1990 (Baht)
1. Project personnel					
1.1 salary	40,000	82,000	86,000	90,000	95,000
1.2 travel for field studies			10,000	10,000	10,000
2. Facilities and equipment for field and laboratory experiments	-	-	-	Gas* chromatograph	
3. Fellowship: Ph.D. level					
3.1 round-trip airfare	(\$1,000)	(\$1,000)			(\$2,000)
4. Sundry (office supplies, postal services, etc.)	1,500	1,500	1,500	1,500	

Remark: <sup>1</sup> 26 Baht - US \$1

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