Redclaw Crayfish Aquaculture in Ecuador: The New Boom?

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Photo by X.M. Romero

Adult male redclaw crayfish, weight of animal is 135 g. At low density (3/m²) males can reach this size in 210 days of culture. Some companies are trying to market redclaw crayfish as "freshwater lobster". The biggest animals are usually used as broodstock.

In recent years, the Australian redclaw crayfish, *Cherax quadricarinatus*, also known as freshwater lobster, has emerged as a potential candidate for aquaculture in the tropical areas of Australia and other parts of the world (Jones 1990a, 1990b; Morrisy et al. 1990; Rouse et al. 1991; Medley et al. 1994). Ecuador, characterized by year-round tropical weather in most of its coastal areas, has experience in the aquaculture of white shrimp *Penaeus vannamei*. There have also been attempts to culture red swamp crayfish (*Procambarus clarkii*) commercially but without much success. A young biologist saw the potential for culturing *C. quadricarinatus* under Ecuador conditions and began importing juveniles of this species from Australia.

The species was brought to Ecuador for the first time in 1994 and raised on a farm approximately 110 km from Guayaquil using well water (Rouse 1994). Apparently, the growth rates were good, reaching an average weight of 80 to 100 g in 6 months, with some individuals reaching a bigger size (Rouse 1994; Salame 1995). The favorable weather in Ecuador allowed for two growing seasons, encouraging the culture of the species. By September of 1994 the words "Langosta Australiana" or Australian crayfish, were heard more frequently and were sounding like a very attractive investment. Although several companies importing juveniles from Australia initially had problems with survival after arrival in Ecuador, the second generation that was obtained gave a good survival rate of 80% or higher.

At the same time, the Ecuadorian shrimp farming industry was experiencing difficulties with low growth and survival rates of shrimp in the ponds. The brackishwater pumped from the estuary was used for the shrimp ponds and many shrimp farmers attributed the low survival rate to deterioration in water quality caused by the excessive use of fungicides and pesticides in banana plantations. For this reason, many farmers started to look at redclaw crayfish as an alternative species for aquaculture.

From the beginning, mystery surrounded the technology for growing redclaw. Local farmers did not know much about this species since it was

relatively new to commercial aquaculture and Australia was a long way from Ecuador. In the commercial sector, more companies started importing juveniles directly from Australia, just as the first company had done. The scale of investments ranged from pilot projects showing the versatility of the species to large investments in the form of joint-ventures with large farms in Australia. The redclaw crayfish aquaculture industry in its native Australia is not very big, with few farms larger than 12 ha in pond area (O'Sullivan 1995). By April 1995, two companies in Ecuador were offering juveniles, with the lowest price of US$0.20 per juvenile for delivery in October of the same year. The different companies involved tried to keep the technology secret as long as possible but the farmers were able to gather information from published literature. This was similar to when shrimp hatcheries started in the early 1980s in Ecuador; however, after a few years, the technology became so widely known that backyard hatcheries appeared in Manta and other coastal cities in Ecuador. With the successful culture of the species, associations of redclaw crayfish producers or growers called "Asociaciones de Langosteros" have been formed to market the product.

Disease Free?

The first promoters described the redclaw crayfish as disease free. As a sales strategy it was excellent, since the potential clients were former shrimp farmers who had to close their farms because of disease problems. Since the species is new to aquaculture, there have been few reports of major disease problems, but this does not mean that we are dealing with a "disease-free animal". Nothing in nature is completely disease-free. It is well known that stress and other factors, such as bad water quality, can trigger the onset of diseases in crustaceans and aquatic animals (Sindermann and Lightner 1988; Raghuvendra et al. 1995; Tomasso 1996). Virus, bacteria, and microsporidians have been reported to infect redclaw crayfish (Herbert 1987, 1988; Anderson 1990; Owens et al. 1992; Anderson and Prior 1992; Groff et al. 1993; Edgerton et al. 1994; Edgerton 1995). Edgerton et al. (1995) warned against selling the idea of a disease-free animal because this would eventually work against the farmers who may not pay attention to the health of culture organisms if they expect to have a "disease-free" species. Although it has been reported that the family to which redclaw crayfish belongs is susceptible to the "crayfish plague" (Unestam 1975), studies undertaken to test whether red swamp crayfish can induce the "plague" in redclaw crayfish proved negative (Medley et al. 1993).

The introduction of certain aquatic animals can have positive effects for the development of aquaculture, such as has been the case of the worldwide introduction of tilapia, and its different strains. Although there are benefits in some cases, the effects that an introduced species can have upon local aquatic animals are lifficult to predict. The risk is always taken whenever a new animal is introduced to a foreign environment.

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The Future

There are currently two schools of thought with regard to culture methods of redclaw crayfish. One is an intensive technology with small (0.25 ha) gravel bottom ponds, aeration, and densities of 7 animals/m^2 with a total projected production of around 4 t/ha for a 6-month cycle. The other does not use gravel bottom ponds and is less intensive with densities of 3 to 4 animals/m^2 and a projected production of 2 t/ha. It is difficult to decide which technology is better suited for the culture of the species. The species is new to large-scale commercial production and many lessons will be learnt as the culture of the species in a new habitat progresses. Technology that might be successful in one farm or country may not be successful elsewhere.

The use of well water was recommended from the beginning to prevent problems caused by pollution and pesticides. However, this does not mean that redclaw cannot be cultured using river water. If only well water is used, one of the constraints for the future growth of the industry would be finding enough areas with sufficient water in the aquifers to provide water to a large number of farms located in each area. One company is already experimenting whether river water can be used for culture. Good survival and growth were achieved after 6 months' culture, but success will depend on the condition of the river water in the future and the agricultural activities that will develop in the nearby areas. The potential for the growth of this new aquaculture industry will be limited by the capacity of the aquifers, but conservative estimates put the area suitable for culture of the species in Ecuador at 8 000-10 000 ha. Growth will be influenced by demand for the product and economic returns. Depending on the size, farm-gate prices for whole animals range from US$4.50 to US$7.00/pound.

An interesting approach for the future would be polyculture of the species with fish. Polyculture with tilapia has been tried elsewhere (Brummett and Alon 1994), and in some cases, adverse results were reported (Kahn and Rouse 1996).

An advantage in the culture of the species is that it matures at 5-6 months of age, easily reproduces in ponds (Masser and Rouse 1992; King 1993a, 1993b; Huner 1994) and techniques for the production of juveniles are known (Ackefors 1994; Huner 1994; Jones et al. 1996; Romero 1996). The companies that initially imported juveniles from Australia have started breeding them in ponds and are now offering juveniles for sale. The price of juveniles has declined from US$0.80 to

US$0.20 per juvenile, lowering production costs and benefitting the farmers. Since the species breeds in ponds which affects the growth of culture stock, several producers are trying monosex culture. With the possibility of inbreeding (Gu et al. 1995), and the fact that there is very little published information available except for the study on stock performance and growth rates by Gu et al. (1995), this subject requires research in the near future.

New farms are now being built but because of the secrecy surrounding the industry, it is difficult to give an estimate of the area under construction. An estimated 200 ha are being developed or will be developed in the near future (O'Sullivan 1996), but the success of this aquaculture industry in Ecuador should be watched. One invaluable lesson is: look at the mistakes committed in the past in other aquaculture operations and try to learn from them. If not, a few years from now everyone will be looking for another "gold mine" in aquaculture, after redclaw crayfish culture has failed.

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Photo by X.M. Romero

Berried female taken from a breeding pond. The eggs are at one of the last stages of development called "eyed larvae". One of the advantages of this species is that it easily breeds in captivity.

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Culture of Prawn in Rotation with Shrimp

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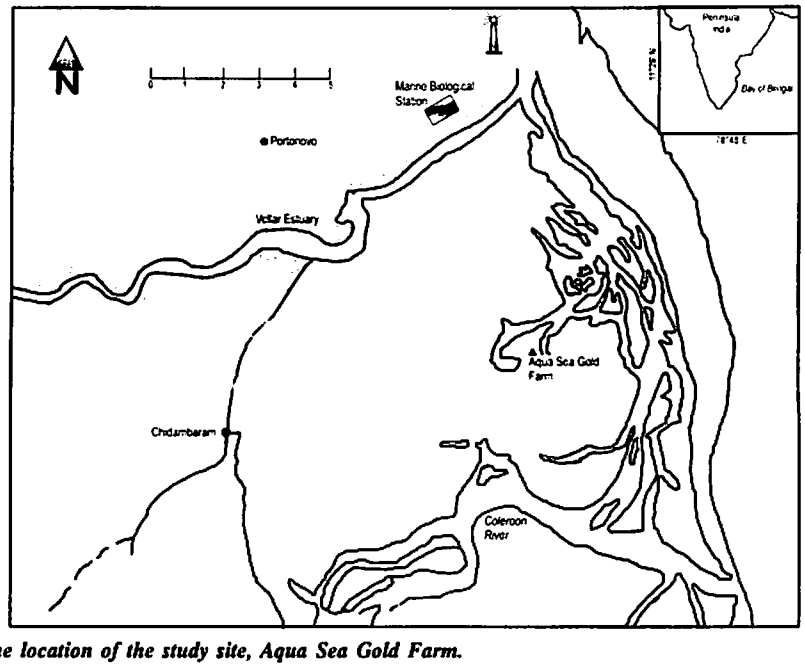
Aquaculture is playing an increasingly important role in world food production. The scope for this industry in India with its strategic location, climate, and rainfall is vast. Brackishwater shrimp (*Penaeus monodon*) and freshwater prawn (*Macrobrachium rosenbergii*) culture is receiving much attention in India, as in many other Asian countries, because of the export potential. While traditional and extensive methods of culture are being practised in states like Kerala, Karnataka, Goa, Maharashtra, Orissa, and West Bengal, semi-intensive culture is being practised in Andhra Pradesh and Tamil Nadu states. High yield and returns encouraged many farmers and entrepreneurs to set up shrimp farms. Farms were set up hastily resulting in chaotic development, and social tension arose in many places as paddy fields were converted to shrimp/prawn farms. No one had anticipated any problems for the industry until the outbreak of white spot disease which caused severe losses to shrimp farmers. Crop rotation was suggested as one option for overcoming the problem of disease in *P. monodon* culture. A progressive farmer in Tamil Nadu state experimented with crop rotation and successfully cultured *P. monodon* during the dry season and *M. rosenbergii* during the wet season. The details of *M. rosenbergii* culture are discussed here.



The location of the study site, Aqua Sea Gold Farm.

The Farm

Studies were carried out at the Aqua Sea Gold Farm, situated on the bank of Uppanar Creek, surrounded by agricultural fields and rice paddies. The farm has eight ponds with an area of 0.8 ha each and one pond with an area of 1.4 ha. A vertical axial flow pump pumps water from the creek into a concrete tank measuring 3.6 x 2.4 x 1.5 m. The delivery pipe is covered with a screen of no. 40 mesh net. The concrete tank supplies water to the culture ponds through a feeder canal which is 400 m long, 1.5 m wide and 0.5 m deep. The ponds have monk type outlets, which discharge water into the drainage canal and from there to the creek. The water depth in the pond is 0.9 m at the inlet and 1.2 m near the