



CULTURE OF GIANT FRESHWATER PRAWN: PHILIPPINES



Westly R. Rosario

**National Integrated Fisheries Technology Development Center
Dagupan City, Philippines**

and

Melchor M. Tayamen

**National Freshwater Fisheries Technology Center
Science City of Muñoz, Nueva Ecija, Philippines**

INTRODUCTION

Freshwater prawn thrives in inland bodies of water like rivers, lakes, swamps, irrigation canals, estuaries and even in rivers upstream. More than 100 species were reported to exist worldwide. A recent survey in Luzon Island, Philippines identified 12 species of freshwater prawn found in the island.

The country's interest on freshwater prawn fishery started in 1914 as explained by Cowles (1914), when he identified that freshwater prawn was one of the important fisheries during that time. Likewise, he discussed the geographical distribution of the species, the value of fishery and biology.

In late 1976, trials were conducted to culture the freshwater prawn, however, the studies were never sustained. For these trials, the collection of wild spawners and larval rearing of *M. rosenbergii* was conducted in Misamis Oriental, Mindanao between 1976-1979 by Dejarme et al. Post larval stage was attained but larval rearing lasted only for 39 days. There were more attempts in the past to adopt the technology for the propagation of the species but the efforts never progressed beyond research at institution level.

In 1981, a local banker-industrialist established a 100-hectare commercial *Macrobrachium* farm in Sta. Rosa, Nueva Ecija and a hatchery in Bulacan. Services of experts from Israel were utilized for the project. Marketable prawns were sold live in Metro Manila utilizing in-house retail outlets. After a few years, the company diversified their operations to include tilapia culture. However, even the diversification failed to save the first commercial production venture of *Macrobrachium rosenbergii* in the Philippines.

ECONOMIC IMPORTANCE OF FRESHWATER PRAWN

The culture of freshwater prawn in the Philippines is intended to diversify the commodities used for freshwater aquaculture, which is currently dominated by tilapia. It is a high value species and its culture could offer better profit. Alternate cropping or polyculture with tilapia may also result to more than 20% increase in yield (Guerrero and Guerrero, 1976).

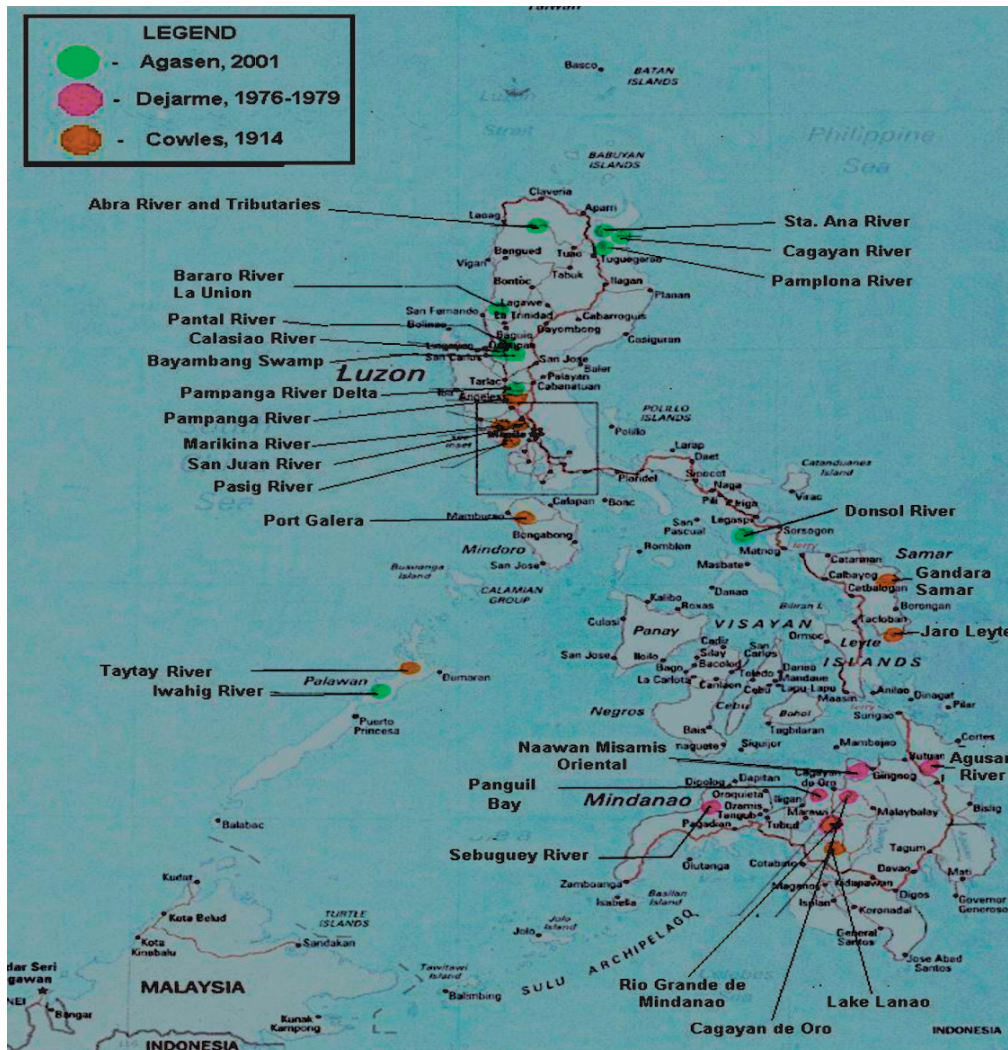
Freshwater prawns are hardy and fast growing, being able to grow in freshwater and low brackishwater conditions. The species possesses many biological advantages for commercial culture including attaining maturation in captivity, a relatively large size, and rapid growth rate. They feed on anything, such as terrestrial animal feeds, any fish feeds, kitchen refuse, etc.

Their feed conversion ratio is comparable to tilapia. In Philippine condition, their rate of growth is high even after attaining sexual maturity. They reach a weight of about 45 g after four months and 90 to 100 g after seven months of culture in earthen ponds (Rosario, 2002). The current market price of *M. rosenbergii* is more than PhP250.00/kg in Central Luzon.



GEOGRAPHICAL DISTRIBUTION

The species is endemic in the Philippines, where wild catch is available from river tributaries and lakes in the provinces of Ilocos, Cagayan, Pangasinan, Pampanga, Bulacan, Laguna, Palawan, Bicol region, Leyte, Samar, Cotabato, Lanao, Maguindanao, Agusan and some parts of Mindanao (Figure 1). It is locally known as ulang, udang, kising-kising, paje, padao, kalig, urang and budsang. Table 1 indicates the freshwater prawn species in Luzon, Philippines, while the estimated production, peak season, fishing gear used and market of freshwater prawns in major fishing grounds in the Philippines are shown in Table 2.



Cowles (1914) reported that the Palaemons were collected from the rivers in Luzon Island namely, Marikina, San Juan, Pasig River near Manila and Pampanga River. Other sources included streams near Port Galera in Mindoro, Taytay in Palawan, Gandara in Samar, Lake Lanao in Mindanao and Jaro in Leyte.

A study conducted by Dejarme et.al. from 1976 to 1979 reported a collection of *Macrobrachium rosenbergii* in Naawan, Misamis Oriental. The species were mostly found in the upper tidal reaches of Agusan River, Cagayan de Oro River, Rio Grande de Mindanao, Sebuguey River and Panguil Bay.



Table 1. Freshwater prawn species caught in different fishing grounds in Luzon, Philippines (Agasen, 2001)

Fishing Area	Species											
	1	2	3	4	5	6	7	8	9	10	11	12
1. Ilocos Norte												
-Bacsal Vintar		11						1		1		1
-River & Tributaries												
2. Cagayan												
-Cagayan River	1		11		1						1	
-Sta. Ana River	11		1		1							
-Pampora River	11		1		1							
3. Ibabala												
-Atgal Dam					1	11						
4. Abra												
-Abra River and Tributaries	1	11	1					1		1		1
5. La Union												
-Bacelo River	1		1									
6. Pangasinan												
-Pantol River	1		1	1	1							
-Cabrera River												
-Bayambang Swamp	11		1									
7. Pampanga, Subic, Tarlac												
-Pampanga (via Dalis)	11		1	1					1	1		
8. Laguna												
-Laguna de Bay				1						1	1	
9. Camarines Norte												
-Laka Bala				1						1		
10. Sorsogon												
-Dinaloa River	1		1							1		
11. Palawan												
-Iwahig River	1						11			1		

- | | | | |
|----------------------------|----------------------------|-------------------------------|----------------------------------|
| 1 - <i>M. rosenbergii</i> | 2 - <i>M. lepidactylus</i> | 3 - <i>M. equidens</i> | 4 - <i>M. adella</i> |
| 5 - <i>M. malcolmsonii</i> | 6 - <i>M. rude</i> | 7 - <i>M. mamillodactylus</i> | 8 - <i>M. sp1</i> (medium sized) |
| 9 - <i>M. sp2</i> | 10 - <i>M. lanchestri</i> | 11 - <i>Cardina spp.</i> | 12 - <i>Atya mollucensis</i> |
| ++ major species | + minor species | | |



In 2001, Agasen (2001) reported nine commercial fishing grounds of freshwater prawns in Luzon, Philippines namely: Cagayan, Sta. Ana, Pamplona rivers in Cagayan province; Abra River and its tributaries; Bararo River in La Union; Pantal and Calasiao Rivers, and Bayambang swamps in Pangasinan; Pampanga River Delta in Pampanga; Donsol River in Sorsogon; and, Iwahig River in Palawan (Table 1). The survey identified 12 species of freshwater prawns in Luzon. Along with four other species, *M. rosenbergii* was a dominant species. The other four species caught in commercial quantity throughout the year were *M. lepidactylus*, *M. idella*, *M. rude* and *M. mammillodactylus*. The species found to have aquaculture potential were *M. rude*, *M. mammillodactylus* and *M. malcolmsonii*.

STATUS OF PRODUCTION

There are no available data on aquaculture production of freshwater prawn because it is only recently that commercial hatcheries for *Macrobrachium rosenbergii* have been established. Investigations by BFAR-NIFTDC indicated that the species attain weights from 40 to 50 g in four to five months of culture. After six to seven months of culture in earthen ponds, they may grow to a size larger than 90 g/pc (Rosario and Roxas, 2000; Rosario 2002). More information on production is yet to be collected from researchers and from established Farmer Pilot Projects.

Table 2. The estimated production, peak season, fishing gear used and market of freshwater prawns in major fishing grounds (E.V. Agasen, 2001)

Area/Species	Estimated Production (in MT)	Peak Season	Fishing Gear	Market
1. Pamplona River <i>M. rosenbergii</i>	0.5 to 0.75	summer time	Spear Gun	Local tourist
2. Pampanga river delta and tributaries <i>M. rosenbergii</i>	15-30	Year-round	Shrimp pot, scissors net	Export and Local
3. Donsol River <i>M. rosenbergii</i>	Unknown	summer time	Prawn pot	Local tourist
4. Iwahig river and tributaries <i>M. mammillodactylus</i> <i>M. rosenbergii</i>	Unknown	Year-round	Shrimp pot, scissors net	Export and Local
5. Magat Dam <i>M. rude</i>	1 to 2	summer time	Push net	Local
6. Cagayan River <i>M. spp</i>	3 to 5	May-December	Push net, shrimp pot, cast net	Local
7. Bacarra/Vintar River and Tributaries <i>M. lepidactylus</i>	35 to 40	May-December	Barricades, shrimp pot, scissors net	Export and Local
8. Abra river and tributaries <i>M. lepidactylus</i>	10 to 15	May-December	Barricades, shrimp pot, scissors net	Local
9. Lake Bato <i>M. idella</i>	900-3,600	Year-round	Push net, seine net, fish corrals	Export and Local



Table 2 shows the production of freshwater prawn collected from the wild in Luzon as recorded by Agasen (2001). The production of *M. rosenbergii* is estimated at 0.5 to 0.75 mt in Pamplona River and 15-30 mt in Pampanga River Delta. *M. rosenbergii* is likewise caught in Iwahig River and its tributaries and Donsol River but the catch was not quantified.

M. rosenbergii can be found during summertime in Pamplona River and Donsol River while it is found year-round in Pampanga River Delta and its tributaries and in Iwahig River and its tributaries. They are commonly caught using spear gun, shrimp pot, and scissors net. The prawns are sold to local tourists or exported abroad.

MARKET

Freshwater prawns are usually sold from the place of origin, and any excess is sold to local markets. In areas where wild stocks abound like in Bulacan, freshwater prawn with an average weight of 30 g, are sold at PhP250.00/kg or \$4.54/kg. Live prawns are likewise sold at P350.00/ kg or US \$6.36/kg. The biggest prawn from Bulacan was recorded to weigh about 500 g/pc.

COMMERCIAL HATCHERIES AND SEED QUALITY

While freshwater prawn is a major commodity in other countries, the prospect of culturing *M. rosenbergii* in the Philippines was hampered by unavailability of seeds. It was not until 2001 when the Philippine Government, through BFAR-NIFTDC in Dagupan City and BFAR-NFFTC in Muñoz City, embarked on a semi-commercial production of *M. rosenbergii*.

At present, these two Aquaculture Technology Research Centers are dispersing freshwater prawn seeds throughout the country. Specifically, the Centers accomplished the following developments:

BFAR-National Freshwater Fisheries Technology Center (NFFTC) in Muñoz, Nueva Ecija

In 1992, *M. rosenbergii* was imported from Thailand by BFAR and trials were conducted to breed the species. This was during the implementation of the AADCP in the Philippines. It was during the AADCP that collection of Philippine founder stocks was conducted in the upper Pampanga River system, Bulacan; Chico River in Bugalla, Pangasinan; and Cavinti, Laguna. In 1998, breeding trials in aquaria succeeded by mass production in tanks, were successful. Figure 2 shows the production of post larvae at the NFFTC. Currently, BFAR-NFFTC operates a *Macrobrachium* hatchery and actively conducts farmers training in many parts of the country.

BFAR-National Integrated Fisheries Technology Development Center (NIFTDC)

Studies on hatchery management at the NIFTDC started during the second quarter of 1999. The commercial protocol that entail lower production cost but with higher survival rate was developed in 2001. More than 903,000 PL 18 and juveniles were produced and dispersed to the different regions of the country.

Different strains of *M. rosenbergii* are being collected, bred and evaluated for growth performance. Other information on the culture of the strains are considered. The collection of strains will serve as the Center's gene-bank of the species for future genetic program.

Collaboration with other institutions like SEAFDEC is encouraged particularly in larval nutrition and grow-out systems to facilitate the adoption of the species as a major aquaculture commodity by the Filipino farmers.



FRESHWATER PRAWN CULTURE

The NFFTC has been conducting studies on freshwater prawn culture. Since results (Table 3, Figure 2) of such studies have been promising, the technology developed has been packaged and disseminated to the fish farmers.

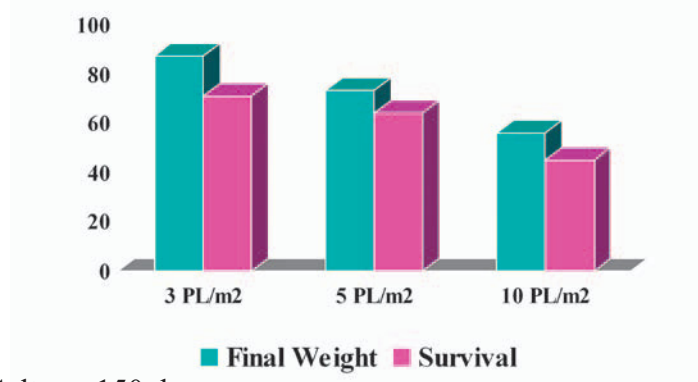
BFAR through the NFFTC has promoted the establishment of Techno-Demonstration Projects involving: (1) small-scale backyard ponds; (2) integrated prawn-rice culture; and (3) grow-out culture with tilapia in fishponds.

One of the Techno-Demo Projects in Cauayan, Isabela produced 150 kg in 500 m² ponds after a 4-6 months culture period. The cost and return analysis for this Techno-Demo site is shown in Table 4.

Table 3. Average growth of freshwater prawn culture at BFAR-NFFTC

Treatment	Final Weight (g)	Survival (%)
3 PL/m ²	87.50	71
5 PL/m ²	73.47	64
10 PL/m ²	55.97	45

Figure 2. Final weight of freshwater prawn cultured at BFAR-NFFTC



Days of Culture: 150 days

POTENTIALS FOR DEVELOPMENT

The culture of freshwater prawn in the Philippines is still in its infancy stage. Much is yet to be done to lower the production cost of seeds. More effort is necessary to attract and convince farmers to adopt the species as an aquaculture commodity. The market for the species is yet to be established for *Macrobrachium* farming to evolve into an industry similar to that of tilapia and milkfish.

RECOMMENDATIONS

- To produce *Macrobrachium rosenbergii* in commercial scale, the following strategies and policies are recommended.
 - Stock assessment of all major lakes, rivers, marshes, estuarine, reservoirs and other inland waters should be conducted to ascertain adequacy of supply including broodstock for propagation purposes



- The current program of BFAR serves as a good start for investment opportunities, hence feasibility study should be undertaken to attract potential investors
- Environmental impact studies in major inland water areas where these species are in abundance should be conducted
- Credit financing in banks and financial institutions should be made available, through representations to the Board of Investment to promote the industry as an identified priority in the fisheries sector
- Freshwater prawn hatchery technology should be commercialized
- On-site grow-out culture demonstration through technology verification/dissemination on the monoculture or polyculture schemes for the freshwater prawn should be conducted
- Available sites in Central Luzon especially in the Lahar area and other prospective freshwater areas should be identified
- Pilot testing at local government freshwater stations for grow-out demonstration and also private fish farmer's project should be pursued
- A national master plan for freshwater prawn aquaculture should be formulated and designed to identify sources of supply (abundance and deficit) and necessitate definite market linkages so that benefits shall accrue to producers and consumers
- Since lack of data on the culture of *Macrobrachium* species in the country led to difficulty for both domestic and international markets especially in assessing the local supply and demand, linkage with other government agencies and international organizations should be strengthened in order to gather continuing data on the *Macrobrachium* outlook
- An inter-agency collaboration is necessary during the initial stages of the program implementation to assess all resources, e.g. manpower, facilities/laboratories, equipment, financial, etc.
- Since prawn farming requires developed aquaculture support services, training, research, extension, infrastructure facilities, and development of marketing and distribution systems should be pursued

FUTURE PLANS FOR *Macrobrachium rosenbergii* AQUACULTURE IN THE PHILIPPINES

- ⊕ Development of the NFFTC and NIFTDC as the National Centers for the production of quality broodstock and post larvae of freshwater prawn
- ⊕ Improvement of the quality of *Macrobrachium rosenbergii* through crustacean genetic research
- ⊕ Development of appropriate technology for the mass production of *M. rosenbergii* post larvae
- ⊕ Development of technology for grow-out culture adopting the different aquaculture farming systems
- ⊕ Distribution/dispersal of quality post larvae for grow-out culture in various areas of the country
- ⊕ Dissemination of freshwater prawn technology to new entrepreneurs and the stakeholders – the fisherfolk



Table 4. Cost and Return Analysis of Freshwater Prawn Culture Techno-Demo in Cauayan, Isabela

Pond Area	0.05 ha (500 m ²)
Culture Period	4-6 months
No. of croppings	2 croppings/year
Stocking rate	5 pc/m ²
PL Requirement	2,500 pc
PL cost	P 2.50/pc
Survival rate	75%
No. of stock	1,875 pc
Size of harvest	25 pc/kg (ABW 40 g)
Production	150 kg
Price/kg	P 350.00
Total sale	P 26,250.00
Feed required	P 3,000.00
FCR	1.5
Total feeds required	150 kg
Cost of feed	P 3,000.00 @ P 20.00 kg
Fertilizer/chemical required	P 1,500.00
Capital cost for 500 m ²	
Cost of land (500 m ²)	P 20,000.00
Construction cost	2,000.00
Farm implement	<u>1,500.00</u>
	P 23,500.00
Production cost per cropping (2 croppings/year)	
Post-harvest at 5 pc/m ² (2,500 pc @ P 2.50)	P 6,250.00
Feeds (150 kg @ P 20.00/kg)	3,000.00
Fertilizer/chemicals	1,500.00
Labor	600.00
Travel/Shipment Cost	<u>1,500.00</u>
	P 12,850.00
Depreciation/Year	
Construction cost	P 400.00
Farm implements	<u>500.00</u>
	P 900.00



Sales	
500 m ² x 5 pc PL/m ² X 2 croppings 5,000 pc x 75% recovery @ 25 pc/kg	5,000 less 25% mortality <u>150 kg x P 350.00/kg</u> P 52,500.00
Total Project Cost	
Capital Cost	P 23,500.00
Working Capital	<u>12,850.00</u>
	P 36,350.00
Net Income Before Tax	
Sales – 52,500 – (25,700 + 900) = 52,500 – 26,600	= P 25,900.00
Net Income After Tax	
Net Income = P 25,900.00 – 15% provision	= P 22,015.00
Cash Payable Period	
$\frac{36,350.00}{22,015.00}$	ROI = $\frac{22,015.00}{36,350.00} \times 100\% = 60\%$

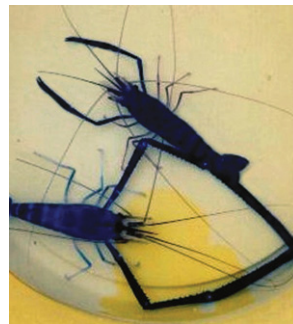
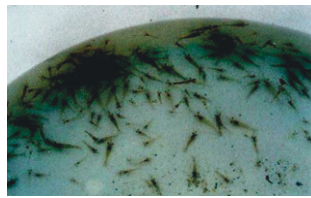


In earthen ponds, freshwater prawns can grow from 40 to 50 g in 4-5 mo and more than 90 g in 6-7 mo



Freshwater prawns are usually sold in farms while the excess are sold in local markets





A semi-commercial production of *M. rosenbergii* promoted by the BFAR-NFFTC in Muñoz, Nueva Ecija, and BFAR-NIFTDC in Dagupan City. These two centers disperse prawn seeds to farmers all over the Philippines.



At BFAR-NIFTDC, various strains of *M. rosenbergii* are bred and evaluated for growth performance.

LITERATURE CITED

- Agasen, E.V. 2001. Commercially Important Freshwater Prawns in Luzon, Philippines. (Unpublished). Inland Fisheries Aquaculture Research and Development Division, NFRDI.
- Cowles, R.P. 1914. The Philippine Journal of Science. Vol. IX. No.4 pp. 319-405.
- Dejarme, H.E., J.B. Dominisac and S.M. Dejarme Notes on Spawner Collection Methods and Larval Rearing of Giant Prawns (*Macrobrachium rosenbergii* de Man) at MSU-IFRD Station, Naawan, Misamis Oriental, Philippines.
- Guerrero, R. D. and L.A. Guerrero. 1976. Culture of *Tilapia nilotica* and *Macrobrachium* Species Separately and in Combination in Fertilized Freshwater Ponds. Philippine journal of Fisheries 14(2):231-235.
- Internet. Overview of Philippine Aquaculture. Website: <http://www.fao.org/DOCREP/003/X6943e06.htm>
- Rosario, W. R. and E.C. Roxas. 2000. Mga Panuntunan sa pagpaparami at Pag-aalaga ng Ulang. BFAR-NIFTDC Technical Paper. 3pp.
- Rosario, W.R. 2002. Culture of Freshwater Prawn (*Macrobrachium rosenbergii*) in Earthen Ponds, BFAR-NIFTDC Extension Paper, 15pp.
- Ulang Information Series. 2003. Bureau of Fisheries and Aquatic Resources. Arcadia Bldg., Quezon Avenue, Quezon City. 19pp.i