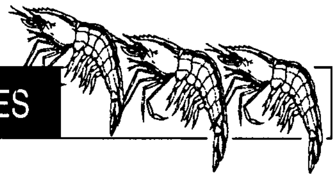
1996

Grouper, mudcrab and company

Aquaculture Department, Southeast Asian Fisheries Development Center

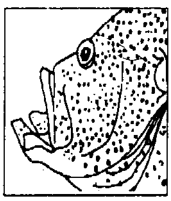
Southeast Asian Fisheries Development Center, Aquaculture Department (1996). Grouper, mudcrab and company. Aqua Farm News, 14(4-5), 22-27.

http://hdl.handle.net/10862/2436



Grouper, mudcrab and company

Shrimp farmers can opt to culture other high-value commodities while R&D institutions struggle to develop sustainable methods. Three such commodities include grouper, mudcrab, and sea bass. Shrimp farmers can even explore milkfish culture or perhaps shrimp-seaweed and shrimp-mollusc polyculture but the latter two are still ongoing studies at AQD. Five aquaculturists share their experiences in raising what are now called shrimp alternatives.



Grouper culture

Elmer Blasurca[1] of Roxas City (west central Philippines) is a successful grouper farmer. "Grouper species popular and farmed in the Philippines include brown-spotted grouper, black-spotted grouper, red grouper and the *señorita* or panther fish," Elmer reported. "Although grouper can be cultured in cages and in ponds, we Capiz farmers like cage culture better." Capiz grouper cage farms are mostly centered in Brgy. Basiao (Ivisan) and Brgy. Cagay (Roxas City). Grouper ponds are not many. "Pond culture is still in its infancy," noted Elmer.

The major constraint grouper farmers identified is shortage and uncertain supply of fingerlings from the wild. Capiz farmers, Elmer noted, have searched for fingerlings even up to Cagayan in the north to Dadiangas in the south. The provinces that are major fingerling sources include Cavite, Mindoro, Quezon, Masbate, Bulacan, Cagayan and Dadiangas.

AQD has undertaken studies in breeding captive grouper, and so does BFAR, the Bureau of Fisheries and Aquatic Resources of the Department of Agriculture. "But sad to say," Elmer assessed, "hatchery techniques are still very experimental. But I'm thankful that AQD, the pioneer research center in Asia, is now on-the-go, (having instituted a technology verification program), and can now answer the major contraints in aquaculture." Elmer listed these contraints as follows:

- inadequate knowledge of biology and ecology
- lack of appropriate techniques for culture
- lack of trained personnel
- inadequate support from financing institutions

"Grouper culture in ponds is considered 'piggy bank' savings because farmers can get a minimum of 90% return-on-investment," Elmer noted, "It is capital-intensive considering the high price of seed. Extra large sizes cost ₱60 a piece but culture period is shorter. If farmers are renting the pond, it is better to stock bigger than 1-inch fingerlings." (See table next page.)

In general, the technology developed for tiger shrimp can be applied to grouper pond culture. So, abandoned shrimp ponds can be used. These ponds must have at least one meter in depth, good water quality (including salinity of 15-32 ppt), and can admit or drain water easily. Unlike shrimp and milkfish, grouper do not appear to go with the current when the ponds are drained.

To grow grouper, ponds are prepared using traditional methods (repair of dikes, canal and gates; levelling pond bottom; eradication of predators and competitors using tea seed powder applied at 100-125 kg per ha). Tilapia, the essential natural live food for grouper, is grown two months in advance in a separate pond.

Fry are first acclimated before stocking. "This is better done early morning or late afternoon when it is cool," Elmer reported, "and avoid stocking when it is raining." Stocking density is 2,000 fingerling per ha. The target average body weight upon harvest is 450-700 grams which can be attained after 10-12 months. There can only

[1] Contact address: Doña Elena St., San Jose Village, Tisa, Roxas City.

be one run a year.

Grouper are fed live tilapia fingerlings; trash fish is a good supplemental feed. "It is better to give trash fish during high tide so that water change could be made easily," Elmer advised, "in case pollution occurs due to excess feeds. Also, remove and take out excess or unconsumed feeds." Feeding is at least 10% of fish body weight. Trash fish are usually placed in feeding trays near sheltered areas. "If feed is consumed within an hour, adjust feeding rate," Elmer advised.

To maintain good water quality, water change should be frequently made. Dissolved oxygen should be kept at no less than 3 ppm; water should be relatively clear and free from pollutants. Grouper stocks are graded monthly to prevent cannibalism. "Enough and regular supply of tilapia and trash fish can also minimize cannibalism," Elmer reported.

Grouper are harvested live to attain maximum profit. Survival is pegged at 85%. Farmers may opt to harvest earlier if majority of the stock weigh 500-700 grams. Buyers sometimes advise farmers not to feed two days prior to harvest for easier transport (fish excreta won't pollute transport water). Crushed ice may be placed inside the transport bags to keep the temperature down. Survival rate in transport tanks should be 95-100%.

Cost-and-returns of grouper culture in a 1-hectare pond (estimated by E. Blascura)

Expenses	
1-inch fingerlings at ₱10 (2,000 pieces)	₱ 20,000
trash fish [about ₱30 worth of trash fish are eaten by each grouper x 1,800 grouper (90% survival)]	54,000
labor (1 feeder at ₱1,500 a month x 12 mos.)	18,000
contingencies (₱500 per mo. x 12 mos.)	6,000

Total investment	**₱ 98,000**
Gross revenue (1,800 pcs x 500 g = 900 kg at ₱260/kg)	234,000
Net profit before tax	136,000
Less: income tax	46,700
Net profit after tax	**₱ 88,400**
Return-on-investment	90%
Payback period	1.11 years

Mudcrab culture (with milkfish)

The feasibility of raising mudcrab in ponds in combination with milkfish has been demonstrated by AQD way back in the 1980s, noted Dan Baliao the Special Assistant to the AQD Chief for Technology Verification. Mudcrab-milkfish polyculture has also been successful in Dumangas (Iloilo) and Buenavista (Guimaras).

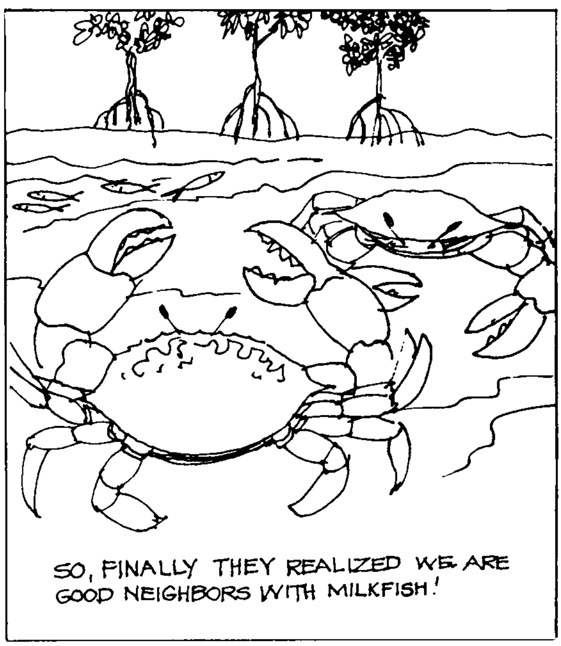
Mudcrab is probably one of the most edible and widely sought crustaceans that inhabit tidal rivers and creeks in Asia and the Indo-Pacific. This "food of the Gods" used to be a nuisance species in ponds, but there is a strong indication that mudcrab culture in ponds along with milkfish is a lucrative industry.

Mudcrab eat trash fish, small crabs, animal entrails, filamentous algae, and detritus. Milkfish subsist on natural food (*lab-lab*, plankton, *lumut*). They do not strictly occupy the same niche, and are thus good partners in polyculture.

Dan reported that a typical brackishwater pond designed for milkfish or shrimp can be used for farming mudcrab. Sites should have good water quality year-round, and seawater can advance and fill ponds to 60 cm during high tide.

Dan noted that mudcrab juveniles measuring 10-40 grams or 5-20 cm carapace breadth

☞



are available throughout the year, more during the months of May to September. Mudcrab can be collected from some areas in Iloilo, Capiz, Aklan, Negros, Camarines Norte, Bicol, Bataan, Lanao, Zamboanga and Misamis. Mudcrab for fattening (5-10 pieces to a kilo) can be bought from local markets. AQD is also conducting studies on producing mudcrab in the hatchery.

Milkfish fingerlings or juveniles on the other hand may be bought from other farmers. There is no useful distinction between wild-caught and hatchery-produced fingerlings.

"Mudcrab compartments should range in size from 0.25 to 1 hectare with independent supply-drain canals," Dan advised. "Provide earthen mounds that crab can use as breathing spots in times of low oxygen. About 12 mounds per ha measuring 5 m³ will suffice. Align these in series at the middle of the compartment." However, farmers using concrete shrimp ponds can use wooden or bamboo platforms.

"Also provide shelter or refuge areas," Dan added, "like sawed-off bamboos (50 cm long with 15 cm diameter opening at both ends) or hollow blocks (3 pieces of 10.2 x 20 x 41 cm). Place these strategically; around 100-200 shelters per ha will do."

To prevent the crabs from escaping, farmers can use a *banata* screen (bamboo slats woven 1-cm apart with monofilament). The *banata* is driven 50-70 cm into the base of the dike. It also extends about 30 cm from the waterline, with bamboo overhang or plastic sheets (70-cm wide) on top. *Banata* screens are not needed in concrete ponds.

"The plankton or deep water method of growing natural food can ensure more croppings in mudcrab-milkfish polyculture," Dan reported. "It also shortens the time for pond preparation and increase the carrying capacity because of greater water volume." Plankton can support 500-600 kg per ha incremental weight gain of milkfish for a 90-day culture.

Mudcrab juveniles may be stocked at 5,000 juveniles per ha; 10-15 g milkfish juveniles at 2,000-2,500 per ha.

"It is essential to maintain good water quality favorable to both mudcrab and milkfish," Dan noted. "They grow faster at 23-32°C and <40 ppt. Maintain water visibility between 15 to 40 cm. Change 1/3 of the pond water during spring tides. An irrigation pump may become necessary. Inspect your ponds for leaks."

Mudcrab are fed finely chopped trash fish, animal entrails or hides twice a day every other day at 10% of initial body weight. Feeds are adjusted as the culture progresses. For milkfish, fertilizer dressing (1 bag of 16-20-0 or 1/2 bag of 18-46-0) can be applied every 15 days or when water becomes clear.

To harvest, partially drain ponds during low tide and admit water at high tide. Mudcrab and milkfish swim against the current and they can be caught by scoop net as they congregate in a catching gadget installed near the pond gate. The remaining crab and fish are handpicked after totally draining the pond. If farmers wish to harvest mudcrab alone, they can use baited hand lines.

The yield is about 600 kg per ha per crop mudcrab of sizes 150-200 grams and 600 kg per ha per crop of milkfish. Three crops are possible in a year. Below is the cost-and-return analysis.

Cost-and-returns of mudcrab-milkfish polyculture in a 1-ha pond; 3 crops a year
(estimated by D. Baliao)

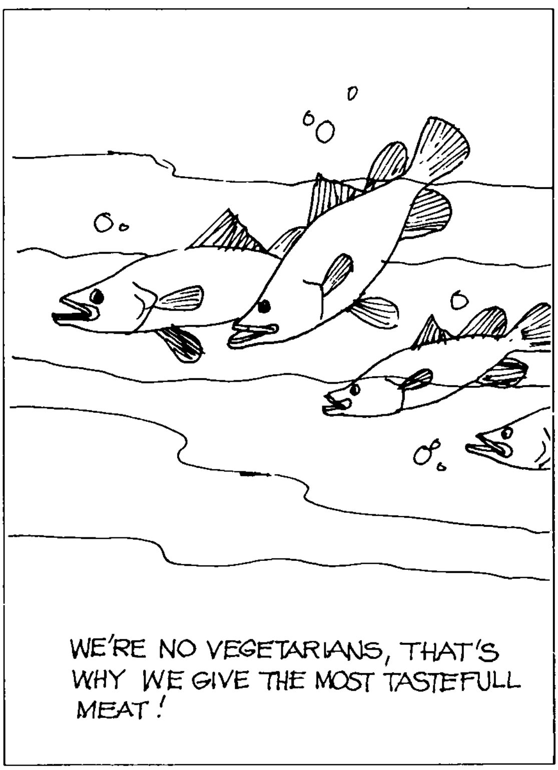
Expenses	
crab juveniles (P6 each x 15,000 pcs)	P 90,000
milkfish fingerlings (P1.50 x 7,500 pcs)	11,250
trash fish (P5 x 3,780 kg)	18,900
fertilizer (P200 x 18 bags)	3,600
caretaker's salary	36,000
laborer (to install fence, 15 days)	1,650
repair and maintenance	3,000
transport, freight	5,000
tools	2,000
bamboo poles (P50 x 50 pcs)	2,500
banata (P60 x 150 pcs)	9,000
Total investment	**P 182,900**
Gross revenue	
mudcrab (1,800 kg x P180)	324,000
milkfish (1,800 kg x P50)	90,000
Total revenue	414,000
Net profit before tax	231,100
Less: income tax (35%)	80,885
Net profit after tax	**P 150,215**
Return-on-investment	82%
Payback period	1.22 years

Sea bass farming

Sea bass (*bulgan* or *apahap*) are highly valued for its tasty, white, and consistent flesh especially in restaurants. Because of this economic potential, AQD conducted research on breeding captive sea bass and produced seeds from the hatchery as early as the 1980s. However, grow-out culture was not actively pursued.

"But the fundamentals of sea bass farming is closely similar to other fishfarming practices," reported Joebert Toledo, an Associate Scientist from AQD. "Sea bass can be grown in netcages and in ponds in two phases, the nursery and the grow-out."

The nursery phase grows the fry (~1 cm) to fingerling stage (5-10 cm) for grow-out culture. "Nursery ponds are usually small, not more than 2,000 m^2, with 1-m water depth," Joebert explained. "Fertilizers are added to maintain good phytoplankton growth and to allow copepods, which feed on plankton, to grow and multiply." Copepods are part of the sea bass diet in nurseries; if the ponds do not hold enough of these, additional copepods and other zooplanktons are collected from fish or shrimp ponds. Farmers can use a lamp to attract copepods at night which can be scooped out by a net. Farmers can also place netbags facing the current generated by paddlewheels to collect copepods in shrimp ponds.



Sea bass are stocked in nurseries at 30-50 fry per m^2 in unaerated ponds or 100-200 per m^2 in aerated ponds. After 2-3 weeks, fry may grow to 4-6 cm. To prevent cannibalism, farmers may harvest the fry as soon as the copepod becomes depleted. With enough food, survival may exceed 70%.

From nurseries, sea bass fingerlings can be moved to grow-out ponds. "These ponds usually have a soft substrate, vary in size from 0.2 ha to several hectares, and with 1-m water depth," Joebert noted. "Abandoned shrimp farms are ideal. Pond preparation follows the traditional method; to enrich substrate, chicken manure is broadcast at 500 kg per ha."

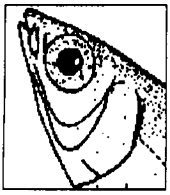
Sea bass may be grown alone or in combination with tilapia to save on feeds. For monoculture, stocking density is as low as 5,000 to as high as 40,000 fingerlings per ha. Feeding with trash fish or pellets is initially done to satiation at least once in the morning and once in the afternoon. As sea bass reach 100 grams, feeding can be reduced once daily. "Sea bass come to the surface to feed," Joebert noted, "and feeds that sink to the bottom are usually not eaten. Farmers, however, should take care to maintain water transparency of not less than 30 cm."

After 4-6 months, sea bass may be harvested. Survival can be >80%, and total yield as much as 2.5 tons for properly managed ponds.

"For polyculture with tilapia, tilapia are stocked at 5,000-10,000 fry per ha 2-3 months before stocking sea bass fingerlings," Joebert explained. "Tilapia are allowed to reproduce in the pond so that sea bass can have more live food. Farmers can stock 1 male tilapia for every 3 females."

Farmers must take care not to stress their stock too much. White spot, fin or tail rot, and other ulcers can develop from injuries during handling and stress.

"Prevalence of diseases increases as the culture system increases in intensity," Joebert noted. "Fishfarmers should manage fish health and water quality as an integral part of their overall production strategy." ☞



Milkfish farming*

AQD scientist Renato Agbayani noted that productivity of milkfish ponds has increased from 500 kg per ha in the '70s to about 2,000 kg per ha today through the adoption of better farm technology. He estimated the cost of producing milkfish using semi-intensive methods in converted shrimp ponds and in new ponds. He also looked at the economics of the extensive and modular milkfish farming systems.

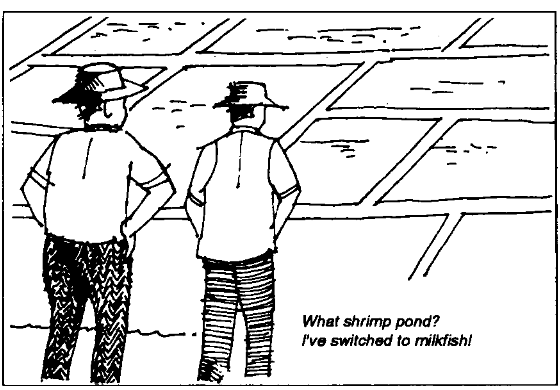
"Shrimp farmers can get the highest revenue in a year if they use the semi-intensive system," Rene reported. "This is because of good production (1,159 kg of milkfish per run times 2.5 runs a year). However, farmers should note that the variable cost is also the highest because of the need for commercial feeds and the additional labor to do the feeding. And for new ponds, fixed cost is the highest because of the capital outlay for deepening the pond and the purchase of new water pumps for efficient water management. Of course, this is not a problem for converted shrimp ponds."

We featured **milkfish culture in our November-December 1995 issue. -Ed.*

Comparative costs-and-returns of extensive, modular and semi-intensive milkfish production systems; 1-ha farm (estimated by R. Agbayani)

	Extensive	Modular	Semi-intensive[1]	
			New ponds	Converted shrimp
Revenue[2]	**₱ 68,125**	**94,200**	**144,875**	**144,875**
Less: variable costs[3]	23,790	39,328	99,091	99,091
fixed costs[4]	17,724	19,632	32,560	13,260
Total cost	**₱ 41,514**	**58,960**	**131,651**	**112,351**
Operating income	30,211	39,740	45,784	45,784
Net income before tax	26,611	35,240	13,224	32,524
Return on investment	71.5%	83.3%	13%	75.2%
Return on working capital	154.4%	203.5%	25.6%	75.2%
Payback period (years)	1.23	1.06	4.57	1.25

[1]Stocking rate at 7,000 fingerlings per ha; production at 1,150 kg per ha per run; 2.5 runs per year
[2]Prices in early 1996 in Iloilo
[3]Includes cost of pond preparation, seedstock, feeds, labor, among others
[4]Includes depreciation, repairs and maintenance, among others



Rene also projected a five-year cash flow for shrimp farmers using semi-intensive methods (table next page). He uses a discount rate of 15% which represents the weighted average inflation (7-10%) and interest rates (20%). "More than a decade ago, feasibility studies on intensive shrimp farming used low discount rates of about 10% which led to very attractive or very profitable levels for tiger shrimp," Rene noted.

Discounted 5-year cash flow of semi-intensive milkfish production in newly renovated ponds at 15% discount rate; per hectare (estimated by R. Agbayani)

Year	Revenue	Cost	Net cash flow	Discount factor	Discounted revenue	Discounted cost	Discounted net cash flow
0	0	50,000	(50,000)	1.00	0	50,000	(50,000)
1	144,875	122,651	22,224	0.87	125,983	106,657	19,326
2	156,465	132,463	24,002	0.76	118,303	100,155	18,148
3	168,982	143,060	25,922	0.66	111,106	94,062	17,044
4	182,501	154,505	27,996	0.57	104,354	88,346	16,008
5	197,101	166,865	30,236	0.50	97,999	82,965	15,033
Net present value							**₱ 35,560**
Benefit-cost ratio							**1.07**
Internal rate of return							**40.53%**

"But the profit taking was short-lived because of risks associated with environmental deterioration. This was not considered in the computations then." The high discount rate used in Rene's analysis is intended as fair warning for investors to look into the associated risks in high-density aquaculture systems to avoid similar losses and to prevent environmental deterioration which caused many intensive shrimp farms to go under.

REFERENCE

R. Agbayani. 1996. *Economic analysis of various milkfish culture systems.* Paper presented at the **National Conference-Exhibit on Technical Considerations for the Management and Operation of High-Density Milkfish Culture Systems**; 24-25 October 1996; Quezon City; U.P. Aquaculture Society, Inc. Miag-ao, Iloilo.

PROBIOTICS/*BACILLUS* - FROM PAGE 17

make-up). This is very useful in making "designer" bacteria.

- *Bacillus* are thermophilic, growing at high temperatures (50-70°C) in areas like hot springs and heated industrial wastes
- *Bacillus* are easy to isolate from soil or air. They grow well on synthetic media containing sugars, organic acids, alcohols, among others, as sole carbon sources. Ammonium can be its sole nitrogen source. Few isolates have vitamin requirements.

REFERENCES

DJW Moriarty. ***Asian Shrimp News,*** 2nd Quarter 1996. p. 3.

DJW Moriarty. Control of luminous *Vibrio* species in aquaculture ponds. Abstract of seminar given at SEAFDEC / AQD. Undated.

RQ Gacutan, MY Tabbu and RT Dal. 1996. The beneficial effects of probiotics on selected chemical and growth parameters in *Penaeus monodon* pond waters. Abstract of seminar given at SEAFDEC / AQD. Undated.

TD Brock and MT Madigan. 1991. **Biology of Microorganisms**. Prentice-Hall Internatl Ed. p. 44, 249, 327, 693, 775-777.