TRADE

MUD CRAB STORAGE AND TRANSPORT IN AUSTRALIAN COMMERCE

by N C Gillespie

of the Queensland Department of Primary industries (QDPI).
Brihie Island Aquaculture Research Centre, Bribie Island. Queensland 4507. AUSTRALIA

and

J B Burke

ot the Queensland Department of Primary industries (QDPI). Southern Fisheries Centre.
Deception Bar, Queensland 4508.
AUSTRALIA.

ABSTRACT

Mud crab, usually packed in waved *cardboard cartons, are distributed in Australia using air and road transport. Since the mortality rate is high during such Transport. an attempt was made to find out what the ideal conditions for transport would he. Relative humidity of 95 per cent at 16-20 C were found to he optimal transport conditions. The use of ventilated, insulated polystyrene containers instead of cardboard ho.ves was also recommended.*

INTRODUCTION

About 600t of the mud crab *Scylla serrata* are harvested annually by commercial fishermen in Australia. A considerable proportion of this is caught in Northern Australia, in remote locations in the Northern Territory and the Gulf of Carpentaria, usually several hundred kilometres from the nearest major transhipment centre. Crab are transported alive from these production areas, which are thousands of kilometres away from the markets in southern Australia.

This paper describes techniques used in Australia for storage and transport of live mud crab over these long distances and provides details about the factors which influence survival of mud crab during transport.

HANDLING AFTER CAPTURE

Immediately after capture, the crab are bound with coarse twine to render their claws immobile. After servicing their traps, commercial fishermen either pack their catch immediately or, in more remote locations, store them under water until enough have accumulated for a full shipment (upto 200 crab), either by road or by light plane. These holding structures take the form of net-pens or floating steel cages. Some holding arrangements include the use of pumps and above-ground swimming pools established on the river bank. Some fishermen attempt to hold the crab out of water, keeping them moist by covering them with damp bags or mangrove leaves.

Packing for transport

Over the past 15 years, live mud crab have almost always been packed in waxed cardboard cartons. Crab that have been bound as described above are packed tightly into the carton in a vertical position, with their claws uppermost. Australian airline companies insist on the use of heavy-duty plastic liners, as leakages of blood or regurgitated digestive juices can severely damage aircraft. The liner is inserted in the carton first and several layers of newspaper placed in the bottom to absorb fluid lost by the crab. Ten to twelve kg of crab are packed to ensure availability of sufficient oxygen.

The second group consists of baby crab of size 5-10 cm CW and weight 10-40 g each. Price for baby mud crab is 45-50 centavo/piece for females and IS-25 centavo/piece for males. In Aparri Cagayan, mud crab seedlings of 3 cm CW sold for 1.00P/pc, and in Coron and Talampulan, Palawan, juveniles sold at P 30.00/15-25 Pcs.

The third group comprises mature crab for fattening. They are bought in Banguil Bay in Cotabato and Capiz at IO P/piece. Male crab that have mated several times have very little meat and are sold for very low prices. To avoid this, mud crab are harvested and sold before September. Sometimes these crab are fattened in a month's time to fetch better prices.

Another group comprises exportable crab with CW exceeding 10 cm and weighing more than 200 g. FAO Law #I62 prohibits the export of live crab measuring less than 10 cm CW and weighing less than 200 g. Mud crab for export are classified into four different groups. based on weight, as follows :

Small mud crab	:	250-300g
Medium mud crab	:	300-500g
Large mud crab		500-850g each
Extra large		850g - I kg.

Mud crab for export should be clean and healthy. Before shipment, an application for shipment is made to BFAR. A permit, obtained for a fee of PSO, is attached to the shipment. Production is often insufficient to meet exporters' demands. In Capiz, for instance, buyers reported that only about 20 per cent of their demand is met.

Buying stations are usually set up by traders and brokers or middlemen. Agents who supervise the delivery and payment of the product may be salaried employees of these establishments or they may be paid on a commission basis. All buying stations are open at all times of the day, throughout the week. Most of the supply that goes to the different buying stations comes from nearby island barangays. Suppliers meet the handling, freight and transport costs, incurred from the landing site to the buying stations. Usually the buying stations are located in the municipality nearest the airport or port from which the crab are to be shipped.

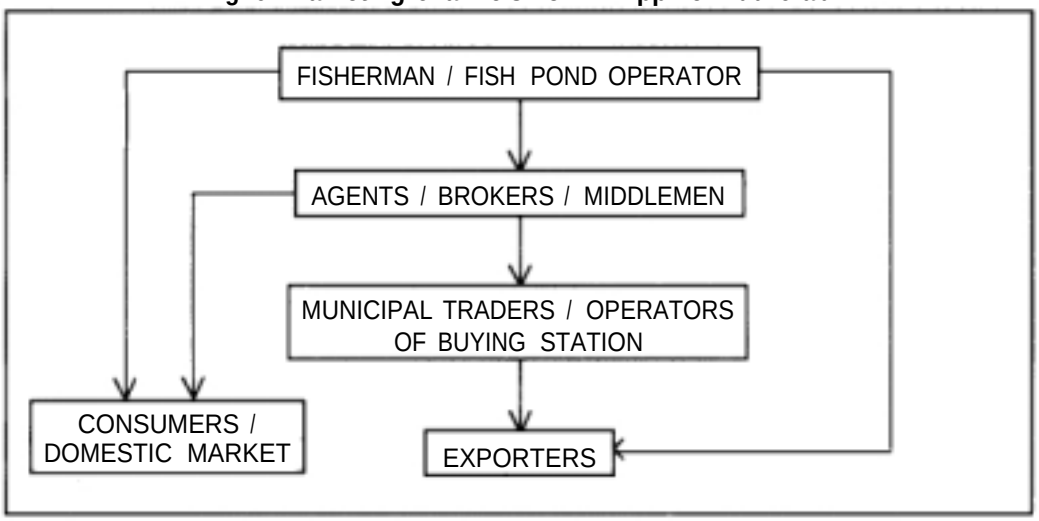
Crab, individually trussed, are packed in bunches in baskets, boxes or other containers, depending on their volume. Most buying stations buy all the crab delivered to them, rejecting only weak and dead crab. A deduction from the agreed buying price is made for undersized crab. These small crab may be fattened by the traders or sold in Manila for the domestic market. No contracts and volume commitments are made by these traders to their suppliers.

However, in some instances, advances. in the form of cash or kind, are given to gatherers to serve as incentives and assure supply. This usually happens when there is more than one buying station in an area and competition is very high. Most exporters usually get their supply from such stations. In some cases. the traders operating buying stations are also exporters. Holding pens are set up at the exporters' stations to prolong the shelf-life of the crab. Shortages in supply force most buying stations to hold their shipment until a desired volume for shipment is reached.

Marketing channels

The trading pattern of the mud crab industry involves a series of intermediaries between the gatherer/supplier and the consumer or the exporter (Figure 3). This network plays an important role in the final pricing of the product; the greater the number of intermediaries, the higher the price of the crab.

Fig 3. Marketing channels for Philippine mud crab



A fish pond operator, or a big producer, usually has a shorter trading route than the fishermen who are small-scale suppliers. A progressive fish pond operator generally has the means to transport his produce and the confidence to establish links with traders and exporters. Therefore, he can sell directly to the large exporters in Cebu or Manila. On the other hand, the product of the small fisherman, particularly if he comes from island *harangays,* passes through a series of agents, brokers and traders before reaching the buying stations. Because the buying price is dictated by the exporters, the fisherman receives only a small part of the eventual price. A big chunk of the profit goes to the middlemen or brokers. Brokers act as middlemen between gatherers and wholesalers and between wholesalers and retailers. They act as financiers of the fisherfolk, when necessary. They may also operate buying stations. In remote areas, where market and consumer demand is low, gatherers sell the crab directly to consumers. Brokers generally sell to retailers or wholesalers in the public markets in Manila.

Transport practices

Mud crab juveniles of assorted sizes are placed in bamboo wicker baskets (called *hakag)* of 40cm x 50cm diameter. Three to five hundred juveniles 2.5 cms CL, with pincers tied are placed in each basket. The baskets are lined with mangrove leaves to ensure a favourable temperature and to minimize fighting among the crab. Some fishermen cut the tips of the pincers to prevent fighting.

Often the *hakag* are packed in larger containers made *of pandan* leaves, or wooden boxes *(hayong).* These larger containers are lined with mangrove leaves and regularly sprinkled with seawater to keep the crab moist and cool.

If crab are to be transported on inter-island vessels, they are placed in rattan baskets with a capacity of 60 kg/basket. The bottom and sides of the baskets are lined with mangrove leaves. Individually tied crab are arranged neatly inside the baskets and these are covered with plastic sheets and placed in the coolest part of the vessel.

Crab are usually transported from the buying stations to Manila or Cebu by inter-island vessel or by domestic flights. Mud crab are placed in cartons lined with plastic sheets for air transport. The plastic sheets and cartons have ventilation holes. Crab may also be placed in polystyrene boxes with holes. Sometimes, outer cartons are required for air transport. Prior to packing, the crab are dipped in seawater to reduce mortality during air transport. Mortality during flight is usually 5-10 per cent, whereas during sea voyages it reaches 40 per cent.

Live crab should be handled minimally after capture. They should not be handled by their claws, as they readily shed them. Crab should also be protected from exposure to intense sun and wind.

While crab are being packed, they should be packed as close together as possible; spaces can lead to movement, fighting and damage. If mangrove leaves are not available, wet sawdust can be substituted and used at the bottom of the boxes.

Packing requirements for export are the same as for domestic air transport, except that the polystyrene boxes are usually smaller and contain 10 kg of crab. A cardboard carton can hold three polystyrene boxes containing 30 kg of crab. If polystyrene boxes are used, each is packed with 20-30 large crab.

Although mud crab are in great demand in foreign markets, they must arrive at their destination alive and in good condition. Most exporters now prefer to export crab weighing at least 300 g. Dead crab are chilled or cooked and sold at a lower price locally. Most exporters practise fattening to build up sufficient inventory for export. Cannibalism is prevented by feeding the crab 12-24 hours prior to shipment abroad.

One of the ways to prolong the shelf life of the mud crab is to pack them in polystyrene boxes with ice placed at the bottom of the box and chicken-wire mesh used to separate the crab from the ice. Mud crab kept in this manner have a 60 per cent better survival rate compared to those packed in bayong or pandan bags. For large shipments, it is best to put the crab in a cool area which has a temperature of 18-22°C.

Pricing

The great demand for mud crab in foreign markets has pushed the price to levels that domestic consumers cannot afford. In 1979, female crab were sold for 50-60 P/kg while for male crab the price was 25-45 P/kg. A survey conducted by the Department of Agriculture in 1986-87 revealed that the highest price observed for females crab was 105 P/kg in Capiz and Iloilo in August, while male crab fetched a price of 60 P/kg. In Aklan, the lowest price for female crab was 72.50 P/kg for January-August while the buying price for male crab was 30 P/kg for the whole year.

By January-June of 1987, the highest average price for female crab in Iloilo was 135 P/kg and 60 P/kg for male. The lowest price for female crab was 50 P/kg in Iloilo in April-June and for male crab 15 P/kg in May-June.

A recent survey conducted by the Marketing Assistance Group of the Department of Agriculture showed increases in retail prices of mud crab in Metro Manila. From 105 P/kg in 1987, mud crab are now sold for 120- 150 P/kg.

Prices vary among retail markets in Manila. For example, in October 1991, male crab were sold for 120- 150 P/kg and females for 220-250 P/kg. Assorted sizes commanded a price of 95-125 P/kg. On the other hand, the prevailing export price was 4 US $/kg. Taiwan buys mud crab from the Philippines at about 4-8 US $/kg while Hong Kong buyers pay 4 US $/kg.

Demand

There is limited quantifiable data on the local consumption of mud crab. However, interviews and surveys made by the Marketing Assistance Group, the agribusiness unit of the Department of

Crab stored at 32°C also died earlier, due to dehydration. Many exhibited a tendency to regurgitate a black fluid, indicating that the animals were stressed.

It is apparent that optimum conditions for maintaining crab alive in air include saturated humidity, temperatures between 16°C and 20°C, and 95 per cent relative humidity.

Implications for storage and transport

As dehydration has such a significant effect on survival, handling conditions after harvest should be such that the crab are not subjected to drying winds. Exposure to direct sunlight for long periods also has a negative effect on survival.

The' mortalities associated with transport in waxed cardboard cartons could be substantially reduced if insulated polystyrene containers are used. While it is difficult to maintain a saturated atmosphere in them, because of the need to provide some ventilation, the improved temperature control afforded by the insulation would greatly reduce losses. Their adoption by industry is still resisted because of cost considerations.

CONCLUSIONS

- Mud crab are distributed live throughout Australia by air and road transport, usually packed in waxed cardboard cartons. But mortalities are common when these containers are used.

  There is data demonstrating that survival times up to ten days are possible at 16-20°C and 95 per cent relative humidity.

  Maintenance of these conditions requires packaging in insulated polystyrene containers, but these practices are not yet in commercial use in Australia.

TRADE AND MARKETING PRACTICES OF MUD CRAB IN THE PHILIPPINES

by Daisy F Ladra
of the Bureau of Fisheries and Aquatic Resources. 860. Arcadia Building Que:on Ave.. Quezon Metro Manila 3008. PHILIPPINES
and
Jeff C Lin
President/General Manager the Shining Sea Export Trading 7 Sunset Drive Sunset Village, Tambo, Paranaque Metro Manila. PHILIPPINES

ABSTRACT

The mud ciab fishery in the Philippines involves more than 50.000 fishermen. Production has increased from 1747 tin 1983 to 2367 *tin 1990. The fishery supplies both the domestic and overseas rnarket.c. Taiwan is the most important export market, hut Taiwanese purchases have been negatively affected by red tide scares. Aquaculture production of mud crab has increased from 924 t in 1983 to 1135 tin 1990. The market includes seed crab, ovigorous females and market size males. A brokerage system has developed to supply these markets. Transport mortality is 5-40 per cent depending on the mode of transport. Mortality can he reduced by better handling and packing, particularly with the use of ice in insulated and ventilated plastic foam containers. Roth fattening and culture should expand, given the strong demand and large expanse of brackishwaier ponds in the Philippines.*

INTRODUCTION

Mud crab are widely distributed in the Philippines and are easily available in the markets throughout the year. This crustacean, considered a delicacy, is an important fishery in the country. 'Red claw' and green claw' varieties are found. Most fishpond operators prefer the 'red claw' because it exhibits a faster growth rate and is stress-tolerant.

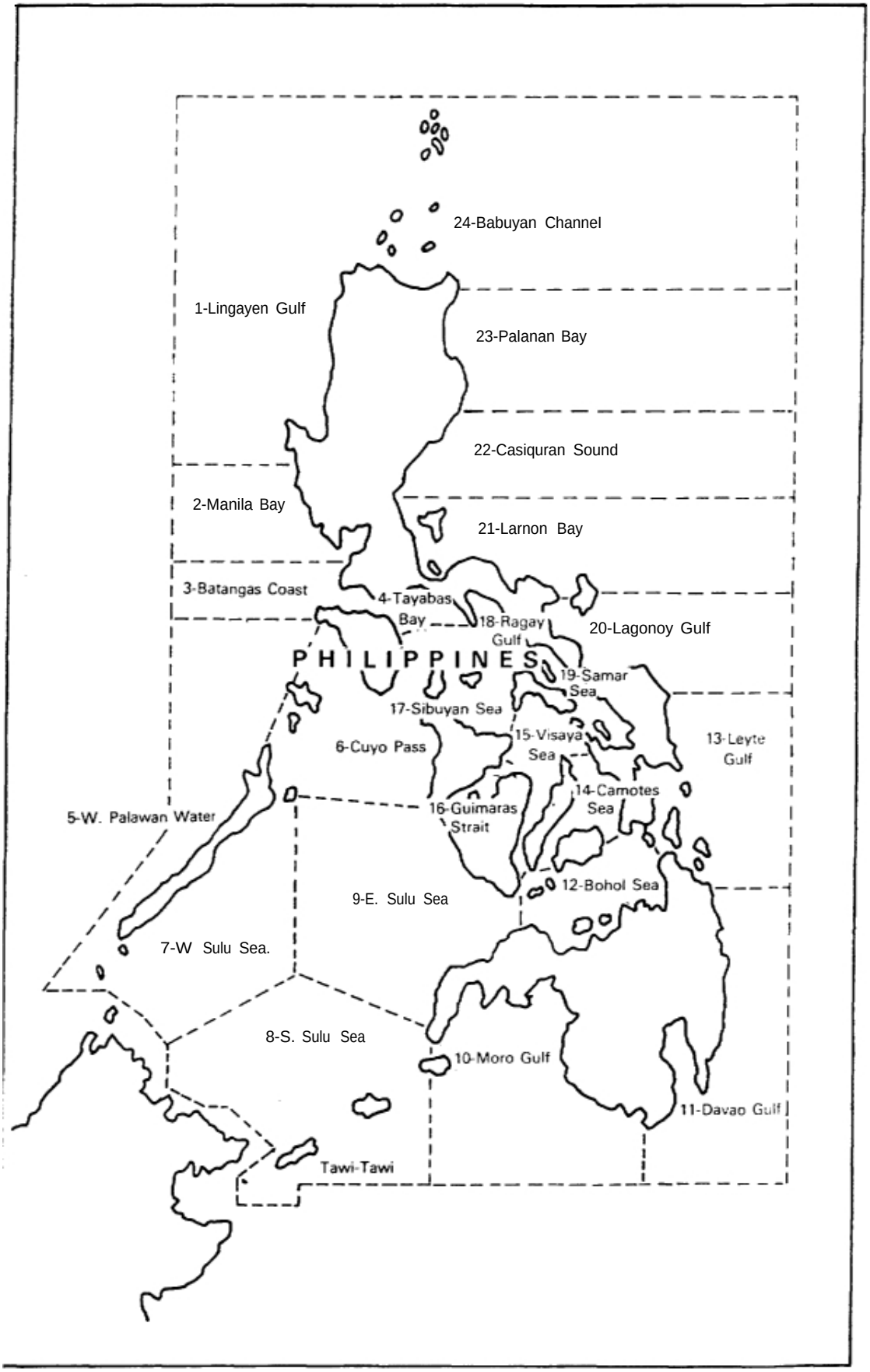
Mudcrab gathering, culture and fattening provides income and livelihood to many Filipinos. In fact, in Region VI (see Figure ! overleaf) alone, about 50,000 fishermen are dependent on mud crab for their livelihood. What was considered as a minor fishery product before is now an export commodity and a foreign exchange earner.

The development of the mud crab industry has, however, been quite slow, compared with other exportable commodities like tuna and shrimp. One reason for this is the lack of government attention to research and baseline studies that could provide information helpful to the development of the industry.

Mud crab being a supplementary crop from brackishwater milkfish and shrimp ponds, it has virtually been overlooked as a potential species for culture. Some fishpond operators even consider mud crab a nuisance because of their burrowing habits which cause extensive damage to pond dykes.

But with the increase in prices and demand from both domestic and foreign markets, the attitude towards mud crab has been changing. A series of experiments conducted on a trial and error basis was initiated by fishpond operators and gatherers who sought to get better yields in a shorter time. This has triggered the development of mud crab polyculture and fattening projects in the Philippines.

Fig. 1 Locations of fishing grounds in the Philippines



DOMESTIC PRODUCTION

Mud crab, like any other aquatic product, exhibit seasonality. They are abundant during the rainy months (May-September, which also happens to be the breeding season. The peak breeding month is July. Crab fry are stocked in fish ponds from the last week of May to the first week of June. Harvest occurs in September. The second stocking period is from the second week of September to the first week of October, with the harvest in January.

Although mud crab can he found all over the country. the major mud crab producing areas are Cagayan Province. Bataan, Pangasinan, Bulacan. Pampanga. Cavite, Palawan, Mindoro, Quezon, Camarines Norte. Sorsogon. Masbate. Negros Oriental and Occidental, Barotac Nuevo and Dumangas in Iloilo, Guimaras, Aklan and Capiz. Guian in Eastern Visayas. Zamboanga and Basilan, and Cotabato. particularly the coastal communities in Panguil Bay (see Figure 1).

The Philippines fishing industry is divided into the commercial, marine municipal fishery. inland municipal fishery and aquaculture sectors. The supply of live crab comes from the last-named three sectors. The marine municipal fishery involves artisanal fishing using small craft or *buncos* of not more than 3 t gross. It is active mostly in shallow coastal waters. Adult mud crab that migrate to the sea to reproduce are fished from these areas by using different fishing gear, such as fish corrals, crab liftnets fishpots and pushnets.

Mud crab also inhabit the muddy bottoms of estuarine areas and tidal rivers along the shore in mangrove areas and river mouths. These inland municipal waters are where sizeable quantities of mud crab gather.

Domestic production of mud crab in the Philippines from the different sectors is shown in Table I and Figure 2. However, production has been rather erratic between 1983 and 1990. Of the three sectors, aquaculture consistently contributed the largest share to the total production from 1986-1989 4.734 t or an average of 1.1 84.5 t/year.

Fig 2. Mudcrab production 1983-90

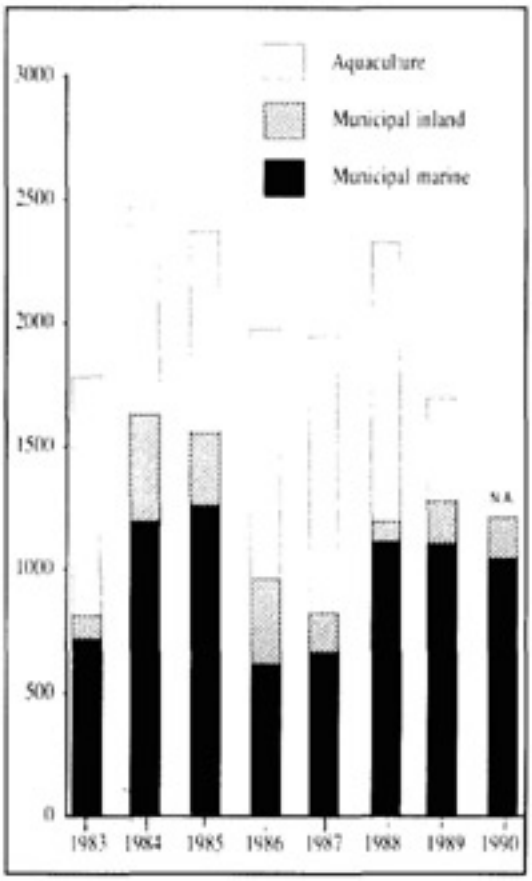


Table I: Mud crab production by sector in the Philippines 1983-1991

Sector	Volume (t) Year							
	1983	1984	1985	1986	1987	1988	1989	1990
Total	747	2462	2374	972	1959	2311	709	NA. *
MUNICIPAL								
A. Marine	688	1255	1297	637	613	1113	099	1056
B. Inland	35	374	244	301	224	62	68	79
Total	823	629	541	938	837	1175	1267	235
AQUACULTURE								
Brackishwater fish ponds	924	833	833	1034	1122	1136	442	NA.

*NA. Not available

Comparisons of 1983- 1990 sectoral production data shows that brackishwater fish ponds registered a high growth rate of 26.94 per cent in 1989. The substantial increase in the share of aquaculture is indicative of aquaculture very likely becoming the primary source of supply, especially with the technology of fattening gaining acceptance by many artisanal fishermen and fish pond operators.

The high production of live crab from the brackishwater fish ponds is due to the abundance of fish ponds in the country. which now occupy 210.700 ha (1989). Yet mud crab account for only 0.34 per cent of the total catch of all species harvested from fish ponds as part of the extensive development of brackishwater culture in the Philippines. The main products are milkfish (83.14%). tiger shrimp (10.01%), tilapia (5.84%'), white shrimp (0.82%) and endeavor shrimp (0.21%).

The average annual production of mud crab from the municipal sector from 19X3-1990 was 1,089 t. The yearly growth rate was 3.14 per cent. The decrease in production from 1984 to 1987 may be attributed to deteriorating conditions in the municipal waters due to periodic outbreaks of algal blooms or red tide, destructive methods of fishing and indiscriminate use of chemicals.

The municipal inland sector has been the lowest contributor to production (Table I). The low production from this sector may be attributed to the rapid destruction of tidal flats, estuarine areas and river mouths which were converted to fish ponds. There has been a rush to join the fish pond business in the last few years, stimulated by high shrimp prices. Another reason is the low catching efficiency of traditional fishing gear. Further, mud crab gathering is a well-kept secret among fishermen to avoid others from encroaching upon their fishing ground and depriving them of their livelihood. It involves skill. patience, and experience to determine the hiding places of mud crab.

MARKETING

Mud crab marketing practices vary in different parts of the country, but in all cases the crab are marketed live. Females with mature ovaries are particularly expensive. Mud crab are sold in the market year-round, but, generally, those found in the domestic markets are grouped in mixed sizes and are smaller than exportable crab. Mud crab sold in restaurants are 250g and above (Table 2 see facing page). Prices may vary with markets and seasons. Usually, during the Christmas season, the price is relatively high because of the increased demand.

There is a market for both male and female crab with or without ripe gonads. Experienced farmers can tell whether the ovaries are full by examining the crab against the light and also by pressing its shell to feel if the crab is firm and full.

Mud crab sold in the Philippines can be classified into three major groups. Mud crab seed are for stocking in fish ponds for culture and are gathered from February to April. Mud crab of 15-18 pcs/kg are utilized for culture. In six months, they attain a carapace width (CW) of 12- 15 cm and weigh 200-250 g each, fetching a farmgate price of 60-75 P*/kg.

*** US $ 1= Peso 27 appz (1991)**

Table 2: Marketing practices for live crab in Metro Manila, July 1991

Source of information	*Quantity reqd/day*	*Buying price/kg (P)*	*Preferred si:e*	*Terms of payment*	*Source of supply*	*Problems encountered*
Restaurant 1				C.O.D.	Farmer's Market, Cubao, Quezon City	Low demand
Restaurant 2	10 kg	120/kg	600 g/kg	C.O.D	Cavite, Pampanga Cotabato	
Restaurant 3	8 kg			C.O.D	Farmer's Market. Cubao	
Restaurant 4	5 kg	110/kg	Big	C.O.D	. do .	
Restaurant 5	20-30 kg	240	250-500 g	7 days		Low supply
Restaurant 6	50*	100/kg	400g/kg	17 days	Seaside Market	Low supply during lean months
Restaurant 7	25*	110	Small-Medium, Big	C.O.D	Masbate, Bicol Iloilo	
Restaurant 8	10*	100.00/kg	Big	C.O.D	Trader	
Hotel 1	10*	100-150/kg	200g/pc	C.O.D	Farmer's Market, Cubao	
Hotel 2	20*	100-120/kg	Medium-Big	C.O.D	Trader	
Supermarket (Grocery)				C.O.D	Farmer's Market, Cubao	
Supermarket				7 days	Trader	
Restaurant	10kg	90/kg	Small-Medium. Large	7-15 days	Zamboanga del Sur	
Restaurant	2 kg	130-150/kg.	400g/pc	C.O.D	Seaside Restaurant	
Restaurant	5 kg	120-150/kg	Big/Female	C.O.D	Seaside Market	
Restaurant	15 kg	220/kg	4pcs/kg	7 days	Seaside Market	
Restaurant	2 kg	80/kg	3-4pcs/kg	7 days	. do .	
Supermarket					Trader	
Hotel	5 kg	120	Big 350-800/pc	15 days	RGA Resources	
Restaurant Seafood market	76 kg	150-200	3pcs/kg	7 days	Seaside Market	
Hotel	17kg	120-190/kg	4pcs/kg	15 days	-do .	
Hotel	10 kg	120-200/kg	3pcs/kg	30 days		
Hotel	10 kg	200/kg	3pcs/kg	-do .		
Restaurant	80 kg	100-130/kg	2 pcs/kg	7 days	Bataan, Pangasian Samr, Mindanao	

* Numbers

Filipinos consume an average of 30-100 kg of mud crab a day in Quezon City alone

while male mud crab were selling for 150 P/kg (CW 16 cm) in Quezon City.

Crab transported in this way are exposed to variable temperature conditions. While most arrive in southern markets, such as the Sydney Fish Market, in good condition, mortalities can be as high as 30 per cent, but are more commonly less than 10 per cent.

Wholesale or retail storage

Almost all restaurants and wholesale outlets for crab now have re-circulating holding, or display, tanks, with biological usually with temperature controlled at around 18°C.

FACTORS AFFECTING SURVIVAL OF CRAB DURiNG AIR TRANSPORT

We have, using a temperature controlled humidity chamber, examined the effect of humidity and temperature on the survival of mud crab in the air. Mud crab were obtained from commercial fishermen and kept in seawater for several days before being tested. Survival, weight loss and behaviour were noted during each experiment. Tables I and 2 show the results of these investigations.

Table 1: Effect of temperature on survival of the mud crab in air and weight loss until death at *95* per cent relative humidity

Ternpera floe C	n	*Mean survival time (days)*	*Mean weight loss at death (% of hodvweight)*
12	16	1046 ±46 *	8.29 ±68
16	18	10.77 ±48	9.93 ±30
20	15	9.73 ±44	10.72 ±31
24	3	6.53 ±33	10.37 ±47
28	7	6.70 ±38	10.51 ±28
32	17	6.05 ±26	8.57 ±37

* Relative error

Table 2: Effect of humidity on survival of mud crab in air at 20°C

Relative humidity	n	*Mean survival in days*
77	17	3.17 ±21 *
86	19	3.73 ±20
95	15	9.73 ±44

* Relative error

It can be seen that relative humidity had a major impact on survival times. Weight loss in less than a saturated atmosphere was quite rapid and, as can be seen in Table I, crab became moribund and died after losing about 10 per cent of their body weight through dehydration. At 77 per cent relative humidity, this point is reached in 3.1 days.

Temperatures below 20°Csignificantly enhanced survival time relative to those of 24°Cand above. Crab stored at 12, 16 or 20C survived for about ten days, whereas crab only survived 6-7 days at higher temperatures.

It was apparent that at 12°C and 32°C survival was affected by temperature stress as well as dehydration. At 12°C, the crab were almost totally immobile and several died due to dehydration. It would seem that I2°Cis very close to the lowest temperature tolerated by these animals, so should not be used in commercial practice.

Agriculture, reveal that the major consumers of live crab are exporters, hotels and restaurants. A survey of 15 restaurants, six hotels and four supermarkets in Metro Manila showed a consumption of about 11,916 kg/month of live crab. Quezon City consumption was 30-100 kg/day.

EXPORTS

Export of live mud crab from the Philippines between 1987 and June 1991 was 1,289 t an average of 287 t/year. Of the total production of *1,959* tin 1987, only 4.1 per cent was exported. In 1988, the Philippines exported *5.43* per cent and in 1989 9.22 per cent (Table 3, and Figure 4).

The major markets for the Philippine mud crab are Taiwan, Hong Kong, Guam, Japan and the USA. Minor markets are Singapore, Brunei, Germany, Korea and other neighbouring countries (See Table 4 and Figure 4). Since 1987, Taiwan has been the biggest buyer of mud crab from the Philippines. It took 98.63 per cent of all exported mud crab. In 1988, this decreased somewhat to 82.47 per cent while Hong Kong took 9.6 per cent and Guam 6.7 per cent.

Table 3: Live mud crab exports 1987-1991

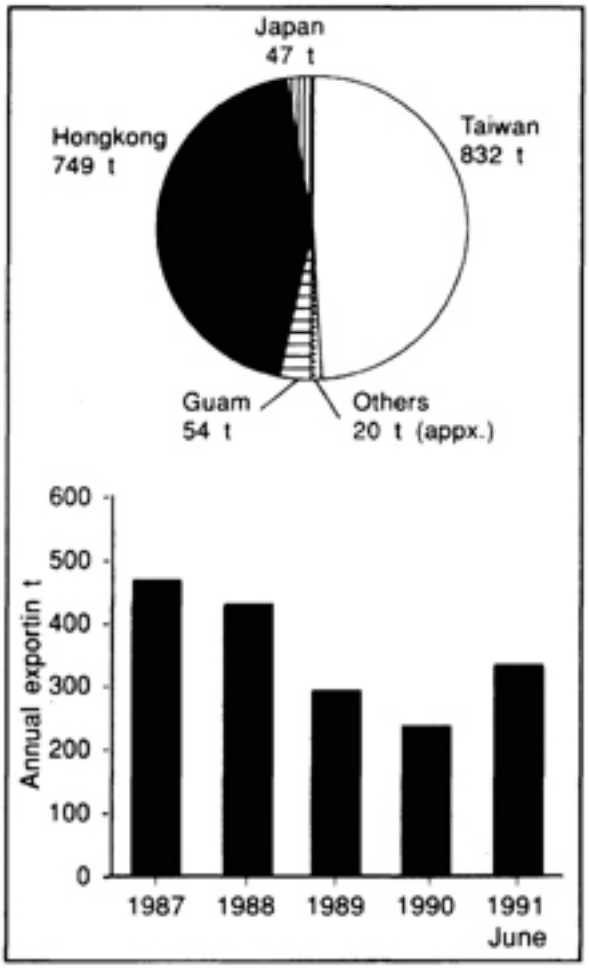
Year		*Volume (t)*	*Value (P 1000's)*
1987		477	383
1988		426	335
1989		294	277
1990		240	226
1991	Jan-Jun	329	361

Table 4: Live mud crab export markets 1987 - June 1991 by country

Country	*Volume of imports (t)*
Taiwan	850
Japan	47
Hong Kong	749
Saipan	5
Guam	54
U.S.A	9

Note Small amounts, of less than 1 t to each, were **exported** to Malaysia. Germany, Korea. Israel. Brunei and Singapore.

Fig. 4: Live mudcrab exports 1987 - June 1991



In 1989, there was a drastic change in international trading for mud crab. Hong Kong displaced Taiwan as the primary market. Taiwan purchased only 6.2 per cent of exports, while Hong Kong absorbed 81.49 per cent. One reason for this was that the Taiwanese restricted the entry of Philippine mud crab due to the widespread incidence of toxic algal bloom (or red tide). Hong Kong re-exported much of these crab to Taiwan. However, mortality was markedly high during this period, from the normal 10 per cent to as high as 40 per cent.

Immediately before the red tide scare, Taiwan was buying an average of 35.6 t/month. But after 1987, Hong Kong increased its imports five-fold, while Taiwan's decreased. The decrease in Taiwanese imports could also be attributed to low market demand and changes in consumer preferences, but during the first half of 1989, Taiwan's imports increased again to 3.5t/month.

REFERENCES

ANON. Fattening mud crabs *Scylla serrata* in bamboo cages. ***Fish. Extension Rep..*** Dept. of Aqua. Phil.

Fisheries Statistics ***1985-1990,*** **Bur. of Fish. and Aqua. Res., Phil.**

BALIAO, D. 1983. The culture of almango and bangur in brackishwater ponds. *Modern Fish Farm.* **A magazine for aquaculture by Federation of Aqua. pp 29.**

CANEU, MURIEL. 1991. Exportation of mud crab. Personal Interview.

LEGAPI, A. 1990. *A guide for* **fish** *handling, marketing and* ***distribution.*** **BFAR Extension.** # 9 **28p.**