

Supply Chain Improvement of Mud crab Industry in Northern Mindanao, Philippines

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Abstract: The study was conducted to assess the existing supply chain for mudcrab in Region 10 and to identify areas for improvement. The study covered major mudcrab producing areas in Region 10. Reconnaissance survey, courtesy calls and visits to the Local Government Units, Bureau of Fisheries and Aquatic Resources, and Department of Agriculture Offices in the mudcrab producing areas were done to identify the study sites. Results revealed that almost half (49.42%) of the mudcrab production in the country is from Region 10 which were majority caught/sourced from Panguil Bay. There are four specific supply chains traced. Computation of the marketing cost and margin for each key player revealed that the profit margin is higher towards downstream key players (traders). Also, the shorter the supply chain the more equitable distribution of income is observed. There is no face to face interaction between the local traders and the metro manila traders which resulted to information asymmetry. Some of the issues included mortality of mudcrabs during transport, price fluctuation, opportunistic behavior of the fisherman, and political intervention. Finally, common perception of the interviewed respondents pointed out that mudcrab supply is decreasing in Region 10. Therefore, the need for further intervention project on the production technology/ reinforcement of mudcrab industry should be done.

Keywords: Supply Chain, Mudcrab Industry and Key Players, Cost and Return Analysis, Geographical Flow

1. INTRODUCTION

Mudcrab is commercially important fishery specie cultured mostly in brackish water ponds. In Capiz and Misamis Occidental, the availability of quality crablets and its high demand for local and export markets encouraged mudcrab growers to stock more (BAS, 2012). The country's major export markets include China, Hong Kong, Singapore, Malaysia, Korea and Taiwan.

In Northern Mindanao, the abundant supply of mudcrab and the viability of the business is evidenced at Lala, Lanao del Norte celebrating its Annual Alimango Festival (Mudcrab Festival).

Meanwhile, upstream-downstream players in the mudcrab supply chains include the fishermen, hatchery/nursery operators, crab seed traders, crab culturists (grow out/fattening) and key customers both in the spot and institutional markets. The link between the supply chains for seed stock is intertwined with that of the grow-out. The supply of seed stock is a huge constraint, which considerably limits the growth of the mudcrab industry in the country

The production and market potential of mudcrab remains largely untapped to the fullest. In Western Visayas alone, where the largest area of brackish water pond in the country, the volume of mudcrab output is only two percent of the country's total. The marketing system is also not well understood, but there are available information points to some inefficiency particularly on product distribution. Recently, study examined the constraints and prospects of the mudcrab industry in the Philippines (Gaillard, 2010) but remains to be investigated to fully understand the existing supply chains and identify key intervention measures to unleash the full potential of the mudcrab industry.

2. METHODOLOGY

From the secondary data gathered, it was found out that two Provinces (Misamis Occidental and Lanao del Norte) in Northern Mindanao are reported to be mudcrab producing areas. Local Government Units (LGU's) in the area were tapped in the identification of study areas and respondents. Courtesy calls to the LGU's, preliminary survey

and meetings with the offices were done. Reconnaissance surveys were done to further validate and was concluded that

Six barangays in Misamis Occidental (Barangays Maquilao, Silangga, Baybay, Minsubing, Bocator, Maloro) and seven barangays in Lanao del Norte (Barangays Pacita, Dunggoan, Maranding, Raw-an, Bucana and Pacita, and Manga) were identified as mudcrab producing areas thus, were considered the location of the study.

Primary data on the other hand, were obtained from actual interview of the fisherman/catcher, mudcrab fatteners, and traders. A tracer methodology was employed to completely document all information along the chain from upstream players (fishermen, pond owners, fatteners.) to downstream players (Consumers, exporters, processors).

3. RESULTS AND DISCUSSION

Background of mudcrab industry in the Region

In the Philippines, out of the 16,359 tons of mudcrabs produced last 2012, almost half (49.42%) comes from Northern Mindanao (BAS, 2012). Mature mudcrabs (100 grams or more) for table consumption, crablets (80 grams below) for pond operation and lean mudcrabs and or bayot mudcrabs for fatteners are caught from Panguil Bay. This means that there is no sourcing of crablets from outside the province and no transport of crablets to outside the province. Mudcrab production in the region is for *Scylla* sp but the researchers identified two species of mudcrab from the Panguil Bay the red mudcrab or *Scylla olivacea* and the green mudcrab *Scylla serrata* but interviews and based on the observation of the researchers supply of *Scylla olivacea* is more abundant in the area compared to *Scylla serrata*.

The local grading system adopted is dictated by the downstream keyplayers and is more complicated than the international grading system.

Based on the supply chain mapping , key players of the supply chain of the mudcrab industry are the catchers/fisherman, consolidators, assemblers, fatteners, pond owners, runners, transporters/shippers, institutional buyers, retailers, and exporters.

Common perception by the key players, including the interviewed respondents from academe of the mudcrab sector in the region has also pointed out that mudcrab production is decreasing. One interviewed fisherman said that they used to catch 10 kilos of mudcrab in a day 10 years before but it has decreased to more than half at present.

The mudcrab supply chain in Northern Mindanao

There are four specific chains traced as follows: Supply Chain 1 – . Mudcrab catchers in Misamis Occidental to local assemblers in Lanao del Norte. From mudcrab catchers/ fisherman in Misamis Occidental, mudcrabs caught daily are delivered to the local assembler in Misamis Oriental who will then sell the mudcrabs to the retailers in Tanguib Public Market and other neighboring areas as well as to the institutional buyers (seafood restaurants in Misamis Occidental), to the walk in buyers from Tanguib and nearby areas, mudcrab fatteners, to the local assembler in Lanao del Norte, and to the retailers in Lanao del Norte, and finally to the end consumers. This chain also showed that mudcrabs in the local assemblers of Lanao del Norte, are mixed with mudcrabs from Misamis Occidental.

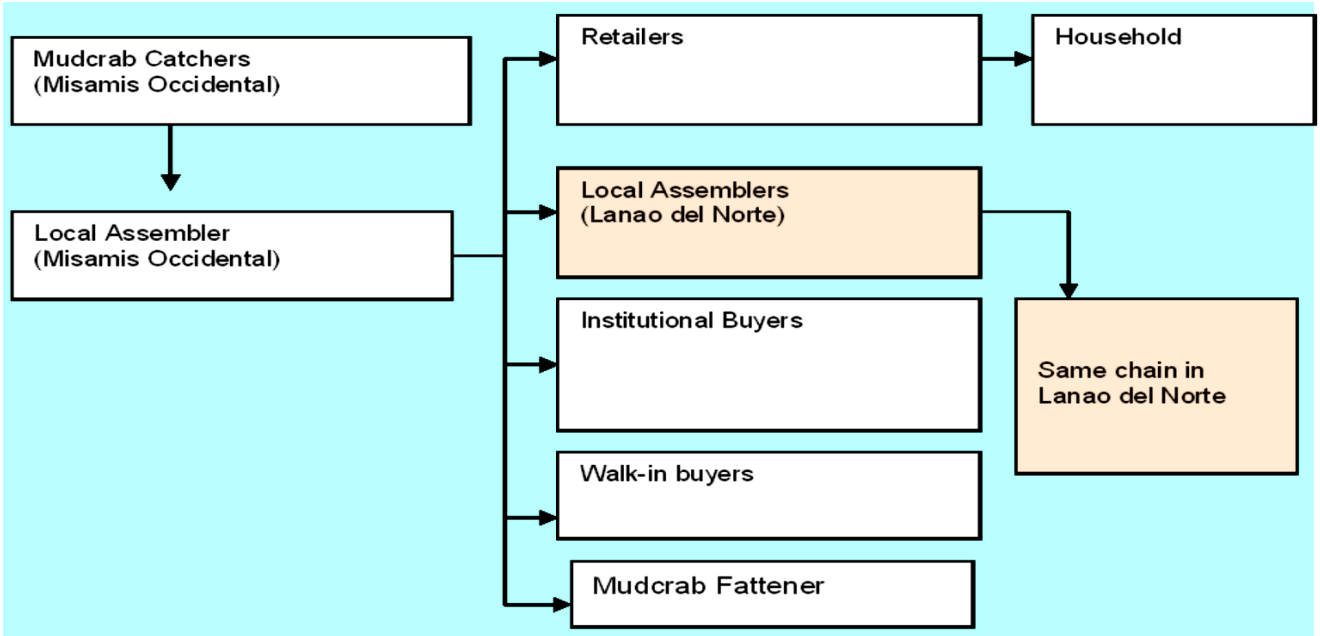


Figure 1. Supply Chain 1. Mudcrab catchers in Misamis Occidental to local assemblers in Lanao del Norte

Supply Chain 2. Mudcrabs from Misamis Occidental to the retailers in Lanao del Norte. This chain showed the two ways of which retailers in Lanao del Norte sourced their mudcrab supply from Misamis Occidental. First, directly from local assembler and second, from wholesaler-retailer. The retailers are aware that the selling price of mudcrabs by wholesaler-retailer is higher compared to the local assembler but they do not mind specially to retailers who maintained the “suki” system, those whose capital is provided by a certain wholesaler-retailer, or some even availed of credit to be paid after generating sales. Naturally, as a result of higher purchase price of mudcrabs, retailers also offered a higher selling price. Institutional buyers and walk in buyers’ reasons why they prefer to buy from this chain is convenience in placing and picking up orders which can be attributed to wholesaler-retailers trading post which is located near the business areas.

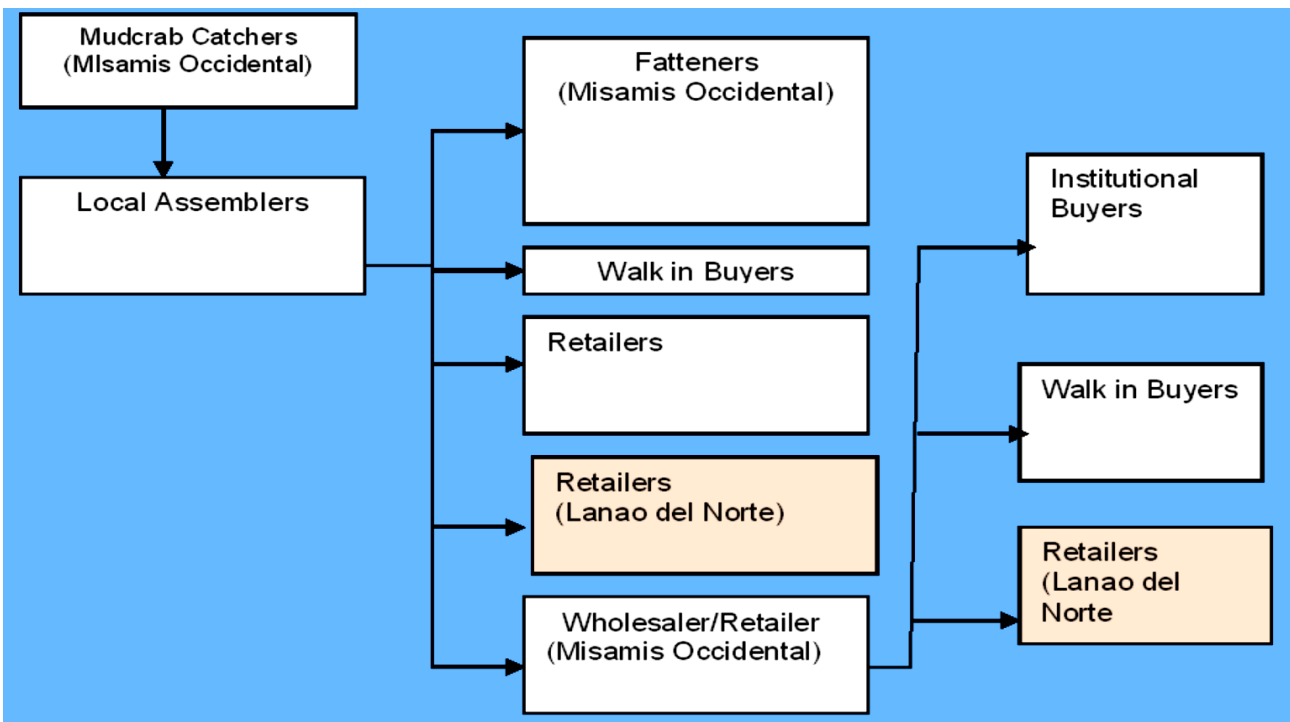


Figure 2. Supply Chain 2. Mudcrabs from Misamis Occidental to retailers in Lanao del Norte

Supply Chain 3. As illustrated in Figure 3, mudcrabs from local assemblers in Lanao del Norte and Misamis Occidental were consolidated by a local consolidator in Lanao del Norte. It was further documented that from the local consolidator in Lanao del Norte mudcrabs are transported to as far as retailers in Bukidnon and to assemblers in Metro Manila and Cagayan de Oro. Mudcrab supply in the assemblers of Cagayan de oro were found to be solely from Lanao del Norte and Misamis Occidental while mudcrab supply in Metro Manila assemblers are from various sources throughout the country including those from Lanao del Norte and Misamis Occidental. Also, exporters were found to be sourcing mudcrab supply from Metro Manila assembler. Another unique characteristics of this chain is the presence of runners, who are responsible for transporting the mudcrabs from catchers/fishermen

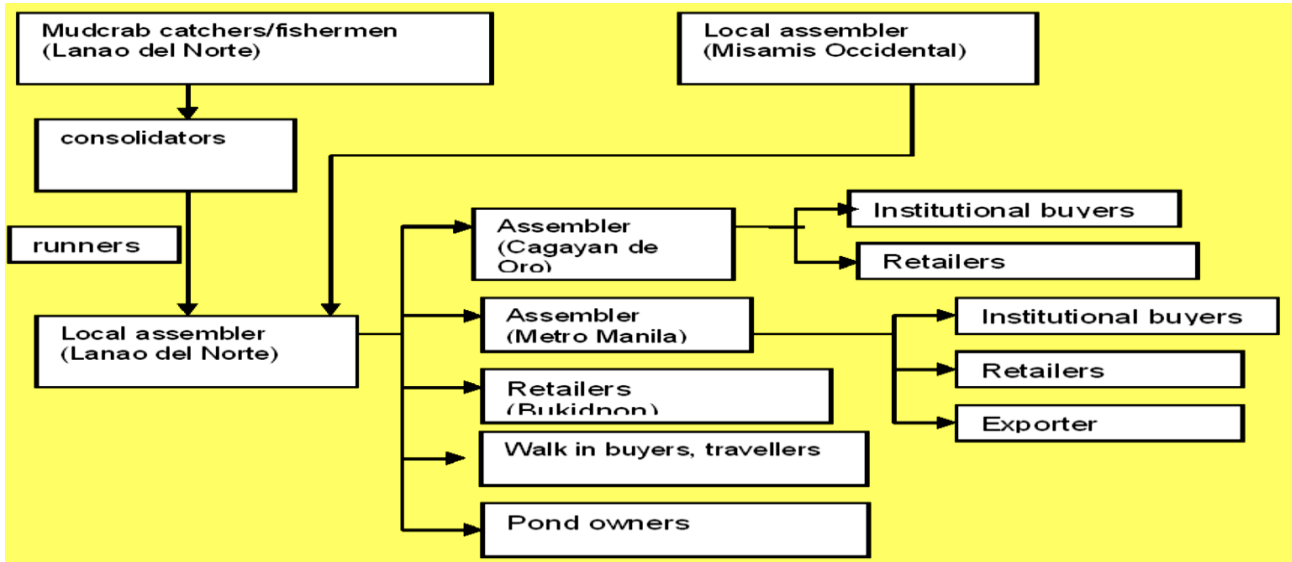


Figure 3. Mudcrabs from Misamis Occidental and Lanao del Norte to outside the Region

Supply Chain 4, the supply chain of fatteners and pond owners. Mudcrabs weighing 80 grams (for pond culture) and “bayot” (for fattening) is purchased by the pond owners and fatteners either from consolidators or local assemblers. Pond culture specifically in Lanao del Norte practiced poly culture of mudcrab, prawn, bangus and tilapia. After three

(3) months, harvest will be done at the same time with the other cultured species. On the other hand, mudcrab fattening (mostly practiced in Tangub City) “bayot” mudcrabs is reared for 14 days only then harvesting will follow. Fatteners and pond owners, depending on their choice based on price, “suki” or convenience will sell their mature mudcrabs to either consolidators, local assemblers, retailers, institutional buyers and walk in buyers.

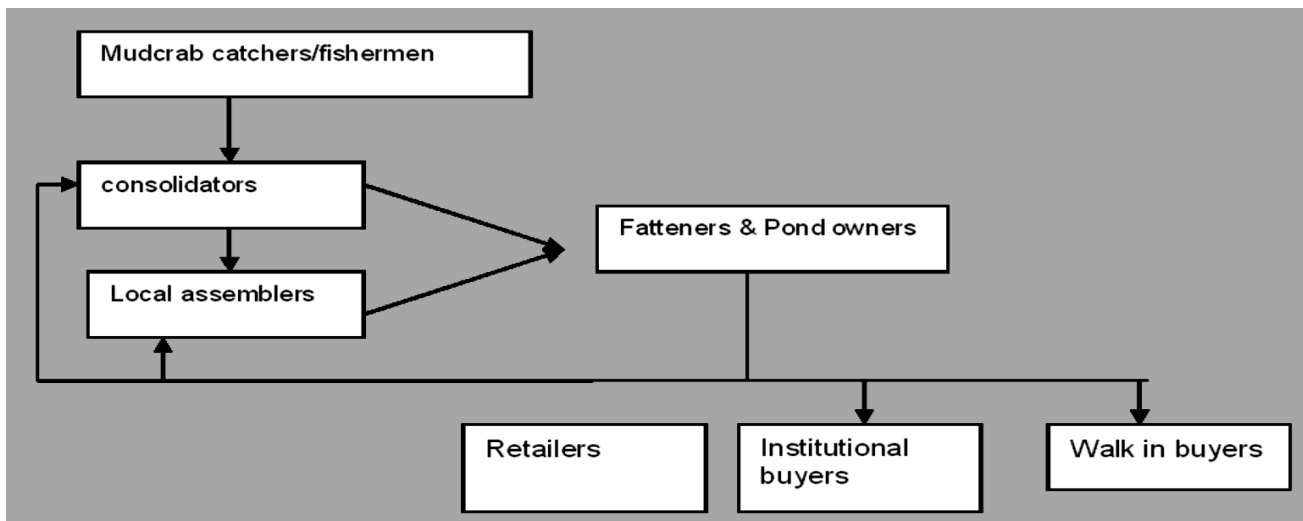


Figure 4. Mudcrabs from fatteners and pond owners

Keyplayers, Customers, and Product Requirement

Across all study sites the keyplayers, customers, and product requirements of the four supply chains mapped are the same as shown in Table 1.

Table 1. Product Requirement and the keyplayers in the mudcrab supply chain of Northern Mindanao

Key Player /	Key Customer/	Reasons for choosing customer	Frequency demand	Mode of delivery	PRODUCT REQUIREMENT			
					Volume	Quality	Type of Packaging	Time of transaction
Mudcrab catcher Fishermen	Consolidators	cash advance suki	daily	delivered by keyplayer	no limit	mixed	net	5-7AM 7:00AM
Consolidators	Pond owners	suki	occasionally	picked up by keyplayer	no limit	80 g below	pale/container	7-10AM
	local assembler	suki/cash advance	daily	picked up by keyplayer	no limit	mixed	ice bucket & plastic trays	8-11AM
Local assembler	Metro Manila assembler	suki/cash advance	daily	transported by keyplayer	no limit	mixed	cartoons	5-10PM
	CDO wholesaler/retailer	suki	daily	transported by keyplayer	no limit	mixed	cartoons	5-10PM
	Retailers	suki/quality	occasionally	picked up by key customer	20-30 kls	mixed	cartoons/ ice bucket	6AM-6PM
	Walk-in		daily	picked up by key customer	1-2 kls	mixed	ice bucket	anytime
Metro Manila assembler	Institutional buyers	suki/quality	daily	picked up by key customer	5-7 kls	mixed	cartoons	6-7 AM
	Pond Owners		occasionally			80 g below	pale/container	7-10AM
	institutional buyers	suki/quality	daily	picked up by key customer	10-15 kls	mixed	cartoons	7-8 AM
Metro Manila assembler	retailers	suki/quality	daily	picked up by key customer	10-20 kls	mixed	cartoons	7-8 AM
	Exporter	suki/quality	daily	picked up by key customer	no limit	200 g above female		

Analysis of the chain efficiency, effectiveness and responsiveness

Efficiency of the marketing chain is measured through the marketing cost and margin of each key player.

For supply chain 1, the marketing cost is higher at the local assemblers in Lanao del Norte computed at Php 12.75 per kg of mudcrab and has a higher profit margin of Php 19.13 per kg gaining 53.50% of the total profit when mudcrab will only pass through from consolidators in Tangub City (Misamis Occidental) to Local Assemblers in Lanao del Norte. However, when mudcrabs from Misamis Occidental are directly passed to the retailers in Misamis Occidental also, marketing margin is Php 42.24 per kg gaining a total of 73.96% profit margin.

Supply chain 2 from consolidation centers to local assemblers and then to retailers in Misamis Occidental only, marketing cost is lowest among retailers computed at Php 7.05 per kg thereby obtaining the highest profit margin of 61.26%. On the other hand, when mudcrabs from consolidation centers and local assemblers in Misamis Occidental to retailers in Lanao del Norte, marketing cost is highest among retailers in Lanao del Norte at Php 14.50 per kg of mudcrab but as expected they also gained the highest marketing margin at Php 85.50 per kg with 74.10% share of the profit among the key players. Moreover, mudcrabs from consolidation centers in Misamis Occidental when directly sold by retailers in Lanao del Norte has a marketing margin of Php 85.5 per kg gaining 85.39% of the profit margin. Mudcrab marketing cost and margin of supply chain 3 traced from Misamis Occidental and Lanao del Norte directly to end consumers showed that retailers within Lanao del Norte and Valencia City in Bukidnon gained the highest marketing margin with Php 85.50 and Php 142.50 per kg of mudcrab, respectively gaining a profit

margin of 71.58 % and 80.76%, respectively. Mudcrabs from local assemblers in Lanao del Norte to wholesaler-retailer in Cagayan de

Oro City incurred a marketing cost per kg of Php 20.48 and Php 12.50, respectively and a profit margin of Php 93.89 and Php 62.50 per kg of mudcrab, respectively. Local assemblers in Lanao del Norte are expected to gain the highest profit margin because of the volume of mudcrab traded per day. Note that the marketing cost and margins for exporters in this chain were not documented.

For Supply Chain 4. the cost incurred by the fishermen in their fishing operation includes their expenses in the maintenance of their fishing gear, gasoline and their labor (family) is very difficult to compute since they are not only catching mudcrab but as well as other aquamarine products found in Panguil Bay.

Effectiveness and responsiveness in terms of product flow, information flow and price flows were also taken into consideration both for upstream and downstream key players.

In upstream keyplayers, the local assembler to Metro Manila traders, volume of order is controlled by Metro Manila traders (assembler/wholesaler/retailer) though most of the time according to the local assemblers Metro Manila traders will always have unlimited order, meaning local assemblers can send as many mudcrabs they want but it has an implication on the purchase price of the product. Problems sometimes, according to local assembler is that the price will fluctuate for reasons of more (high) supply in Metro Manila, thus the local assemblers are affected. In this case, the local assemblers are at a loss since they have already set their buying price from the consolidators and or from the catchers/fishers.

Downstream keyplayers (catchers to the consolidators to the local assemblers) on the other hand, has a shorter time of storing the product. Mudcrabs caught by the catchers and fishermen or harvested by the fatteners in the morning will be sold to the assemblers at around 5:00 AM 7:00AM to 9:00AM then, the consolidated mudcrabs by the assemblers are either sold directly to customers then the volume to be shipped to Metro Manila consolidators are transported to Laguindingan airport at around 5:00PM to catch the early cargo flight the next day and reached Metro Manila two hours after leaving the airport, or it follows a 24 hour time frame from catching to its destination in Metro Manila. This practice is advantageous to the downstream keyplayers since there is only a very minimal or even no storage and surplus problems on their part.

Since mudcrab is a perishable product (like any other aquatic product), time of delivery is very crucial specially that mudcrabs is moved via air and that it should be live upon arrival to its destination. Problem was seen for the information flow for the feedback of the dead mudcrabs during travel. Metro Manila Assemblers will inform the local assembler of the number of kilos of the dead mudcrabs upon arrival of the mudcrabs in their respective collection areas and will automatically deduct it from the total sales of the assembler. This scenario will put the local assembler at a loss for two reasons: first, they are deducted certain amount for dead mudcrabs, second they do not have the way of validating the number of kilos of the actual dead mudcrabs, so they will just have to believe on the declaration of the Metro Manila Assembler. This information flow will somehow tell us that up to the local assemblers level, they are at a losing end but if we continue to examine the flow to upstream players, we can conclude that for sure it's the catchers/ fishermen who are at the losing end since the local assembler will not do business if they do not earn profit from it, and the fact that they continue their business operation for years already then they already have devised a mechanism to address this loss. One mechanism is that they will purchase mudcrab from consolidators at very low price and will tell them "this much is only the price I can give, since as expected, there are still mudcrabs which will die during the transport and that is to be deducted from me". But of course consolidators will not bear the losses, they will again set price in which they can still get profit, so now the end of the chain which is the catchers/fishermen born the actual loss. A very clear information asymmetry is seen in here. The local traders will set the price by allegedly including an estimate for the dead mudcrabs so that they can maximize their profit. Local assemblers make sure that they will set a purchase price for mudcrabs most beneficial to them. Aside from this dead mudcrabs, local traders can also benefit from the fact that the consolidators and fishermen do not know the exact or actual cost incurred by the local assemblers in marketing the product.

The purchase price of mudcrab was dictated from Metro Manila meaning the local assemblers will wait for feedback from Metro Manila assemblers then the price of mudcrabs will be determined based on that price. Whether the mudcrabs are for sale to other keyplayers of the chain, local assemblers will purchase mudcrabs from catchers,

fishermen, pond owners, fatteners at the same price. Such flow gives an advantage for local assemblers because they have the control of the price to wholesaler-retailers, retailers, walk in customers, institutional buyers, and even to pond owners.

In terms of communication, face to face interaction happened for local assemblers and upstream keyplayers but for downstream keyplayers they used mobile phone in communicating the very important activity of the chain like the placing of orders and payment of mudcrabs. Local assemblers in Metro Manila or in Cagayan de Oro have direct transaction with the assemblers in Misamis Occidental and Lanao del Norte as to the volume and price but most of them were not able to interact face to face or make transaction personally. For wholesaler-retailer in Cagayan de Oro most of the time transactions are validated by the transporter who delivers the mudcrabs to their trading posts. This practice possess only minor problem. Bigger problems are seen with Metro Manila assembler where placing and receiving orders are done through text messaging. Information as to price, volume, place, mode and time of delivery and mortality during the transport is communicated through text messaging or call. This practice seemed to be convenient but the absence of face to face interaction makes them very prone to abuse. For the local assembler, they have problems on the declaration of more dead mudcrabs after the transport; price fluctuation and payment while Metro Manila wholesalers-retailers reported of some local assemblers getting cash advance from them but will not deliver mudcrabs as agreed.

Key players, their roles and activities in the chain

Key players of the mudcrab trading performed the same roles and activities in all study sites.

Fisherman. An individual who catches mudcrab (including different species of fish) in the Panguil Bay with the use of “bungsod”, tower, bintol and even with their bare hands.

Pond Operators. Pond operators’ main function is to grow mudcrab. They purchase the stock and will culture it in their ponds.

Fatteners. They grow lean mudcrab for shorter period usually 14 days in a bamboo pens constructed along Panguil Bay. They purchased lean or “bayot” mudcrabs from consolidation centers, put the mudcrabs in the pens and then feed it with trash fish. They will evaluate if the mudcrab is ready for harvest based on its size then sell the fattened mudcrab.

Local Assemblers. They are those traders or “kumprador” whose trading area/post is located in Misamis Occidental and Lanao del Norte. They will directly purchase the catch of the fishermen and the harvest of pond operators and fatteners. Most of the times they provided the basic fishing needs (fishing gear, gasoline) and basic needs (food) of the fishermen. They are responsible for sorting and grading mudcrabs according to the locally adopted grading system which is dictated by the downstream keyplayers. Local assemblers, performed the wholesaling and retailing function also.

Runners. Are keyplayers who are responsible in collecting the mudcrabs from the consolidation centers to the local assemblers. Usually, they are employed by the local assembler on a monthly basis. Runners are only reported in Lanao del Norte.

Transporters. Mudcrabs are transported from the Local Assemblers trading posts by a hired trucks “elf” or “bongo” to either Bulua, Cagayan de Oro City (for CDO deliveries) and Laguindingan International Airport (for Metro Manila deliveries). Though not at all times, but they are responsible for validating dead mudcrabs in case of Cagayan de Oro deliveries and are responsible in making sure that packaging for Metro Manila deliveries are safe. They usually stay late outside the airport for repackaging and making transaction with the airport freight incharge for the necessary documents and payments.

Freight-in-charge. Are responsible for arranging with the authorities for all the logistics in the airport. They assure the local traders (who are the owners of the mudcrabs) of the good positioning of the mudcrabs in the plane to ensure quality, easy withdrawal and good quality during the flight. Payment is also collected for the services which are included in the billing they charge to the transporters. Transporters will inform the local assemblers of the bill and will in

turn pay the transporters.

Metro Manila assemblers. They will wait and then pick the packed mudcrabs from Metro Manila Airport. They will again sort the mudcrabs and sell the low quality in the local market (within Metro Manila) and mudcrabs qualified for export are sold to the exporters. They will identify the low quality based on fat content and the weight (usually because of travel, weak and dead). They are also responsible in making feedback to the local assembler as to the dead mudcrabs and price. In case of dead mudcrabs, they will feedback the Local Assemblers of the quantity and they will adjust the price in favor of the Metro Manila Assemblers. They also functions as consolidator, wholesaler and retailer.

Cagayan de Oro wholesalers-retailers. They will just wait for the truck loading the delivery since most of the time it is “door to door” delivery by the transporter. They will sort the mudcrab and distribute them to the local market and institutional buyers in Cagayan de Oro.

Exporters. They are responsible in proper grading of the mudcrabs (based on international grade) and functions as consolidator of mudcrabs from different wholesaler-retailers in Metro Manila.

Issues, concerns and areas for improvement in the supply chain

Issues and constraints included the opportunistic behavior of the fishermen, lack of capital, bad weather conditions and economic status of fishermen, competition, swindling, mortality of crabs during transport, price fluctuations for traders while issues on disease and bad weather for fatteners and pond operators. On the other hand, and political intervention is seen to play a very important role since the management of Panguil Bay is in the hand of the local government unit and for the non government organization, technology and project feasibility should be reviewed.

Areas for improvement of the mudcrab industry include the following: strict policy implementation, livelihood programs for fishermen, review of resource utilization of the concerned agencies, a survey/assessment on the aqua marine resources in Panguil Bay to properly address its need, strengthen linkage and partnership for the sustainability of old programs and the possibility of undertaking new program.

Policy Recommendations

Local Government Units to review and revisit their policies on illegal fishing at Panguil Bay. This is very important not only to have a sustainable stock of aquamarine product in the Bay but also to educate fishermen more on their roles; strengthen data collection and monitoring of the concerned agencies such as BFAR and DA since this is the basis for some important actions in legislation; and strengthen inspection report in the areas where mudcrab are traded or shipped for example in the airport and in the consolidation centers.

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