The Philippine Journal of Fisheries 27(2): 137-156
DOI: 10.31398/tpjf/27.2.2018A0003

July-December 2020

FULL PAPER

Value Chain Analysis of Maliputo, *Caranx ignobilis* in the Philippines

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ABSTRACT

Maliputo (Caranx ignobilis) is a high-value food fish in the Philippines with limited studies on market potential. This value chain analysis study was conducted to understand the industry, to identify the key actors, supply and value chain, and to identify issues and concerns to support the development of *C. ignobilis* industry. A survey interview was conducted using purposive sampling in nine *maliputo*-producing regions with 224 respondents, and focus group discussion validated the analyzed data. Key chain actors identified are fishers, fish cage operators, fish buyers categorized as small-scale (local vendors and peddlers) and large-scale intermediaries (commission agents and wholesalers), and processors (restaurants and resorts). Annual production was 188,722 kg valued at PHP 33,752,859.79 with 58.12% coming from capture fisheries and 41.88% from aquaculture. Major producing regions for captured and cultured *C. ignobilis* are Regions 2 (Cagayan), 6 (Iloilo), and 3 (Central Luzon). The industry's value chain map showed a gross value addition of PHP 116.58, 135.65, 75.04, 23.58, and 749.71 per kg *maliputo* for capture, aquaculture, small-scale fish buyer, large-scale fish buyer, and processors, respectively. Processors attained the highest net returns while fishers got the lowest. This study noted that *C. ignobilis* is a non-target species in capture fisheries resulting in an inconsistent supply of the fish. For aquaculture, there is a need to improve its culture technology, develop seed production technology, and formulate an artificial diet. Various upgrading strategies to improve the industry and to increase the benefits derived by the key actors had been identified and presented in the paper.

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Received: *October 26, 2018*
Accepted: *June 16, 2020*

Keywords: *Caranx ignobilis, value chain analysis, stakeholders*

1. INTRODUCTION

Caranx ignobilis is a highly prized food fish species in commercial fisheries in the Philippines and is the most popular high-value indigenous migratory fish in Lake Taal (Mutia et al. 2015). It is known by several local names, most notably the popular *maliputo* in Taal Lake in Calabarzon (Region IV-A). It is also known as *sumanga* in Central Luzon (Region III), *mamsa* in Western Visayas (Region VI) and Central Visayas (Region VII), *sibad* in Caraga (Region XIII), and *talakitok* in other regions. Its contribution to total annual fisheries catch was 56,178 kg in 2015, generally caught throughout the areas in the Philippines (NFRDI 2016). *C. ignobilis* fisheries provide a livelihood to coastal residents around the regions of the Philippines, especially the fisherfolk that greatly depend on fishing as their primary source of livelihood and income.

Although ecologically and economically important, reports and information on the supply and value chain of this species are very limited. Value Chain approach for fishers, managers, and policymakers is fundamental as it provides a useful and practical tool in the assessment of the development status of the fisheries and aquaculture sector and identification of constraints and opportunities for its future development (Parke 2013).

Currently, the Freshwater Fisheries Research and Development Center (FFRDC) in Brgy. Butong, Taal, Batangas is conducting the breeding and production program of *maliputo*. The value chain

analysis of this species is needed to continually sustain the fishery resource, ensure the continuous increase in the production, and evaluate its market potential. Thus, a market and consumption study of this species in the Philippines was conducted and presented in this paper. This study is useful in identifying problems and constraints in the supply and value chain of *C. ignobilis* for determining interventions or management options that could help value chain actors mitigate supply changes of *C. ignobilis*. Specifically, the study aimed to identify the actors through the value chain map, evaluate the value-addition created in each actor, and identify the different issues, concerns, and entry points for intervention.

2. MATERIALS AND METHODS

2.1 Conceptual Framework

The study was guided by the VCA research framework adapted from Brown et al. (2010) (Figure 1) which served as a tool in generating and analyzing data which consisted of three major steps:

1. existing market assessment;

2. value chain mapping, which identified five key questions, namely (a) who are the key customers, (b) who are the key actors in the chain and what are their respective roles, (c) what are the activities and processes along the chain, (d) what are the value additions of each actor in the chain, and (e) what are the constraints and opportunities or areas that need to be developed for value chain upgrading; and

3. identification of possible government interventions.

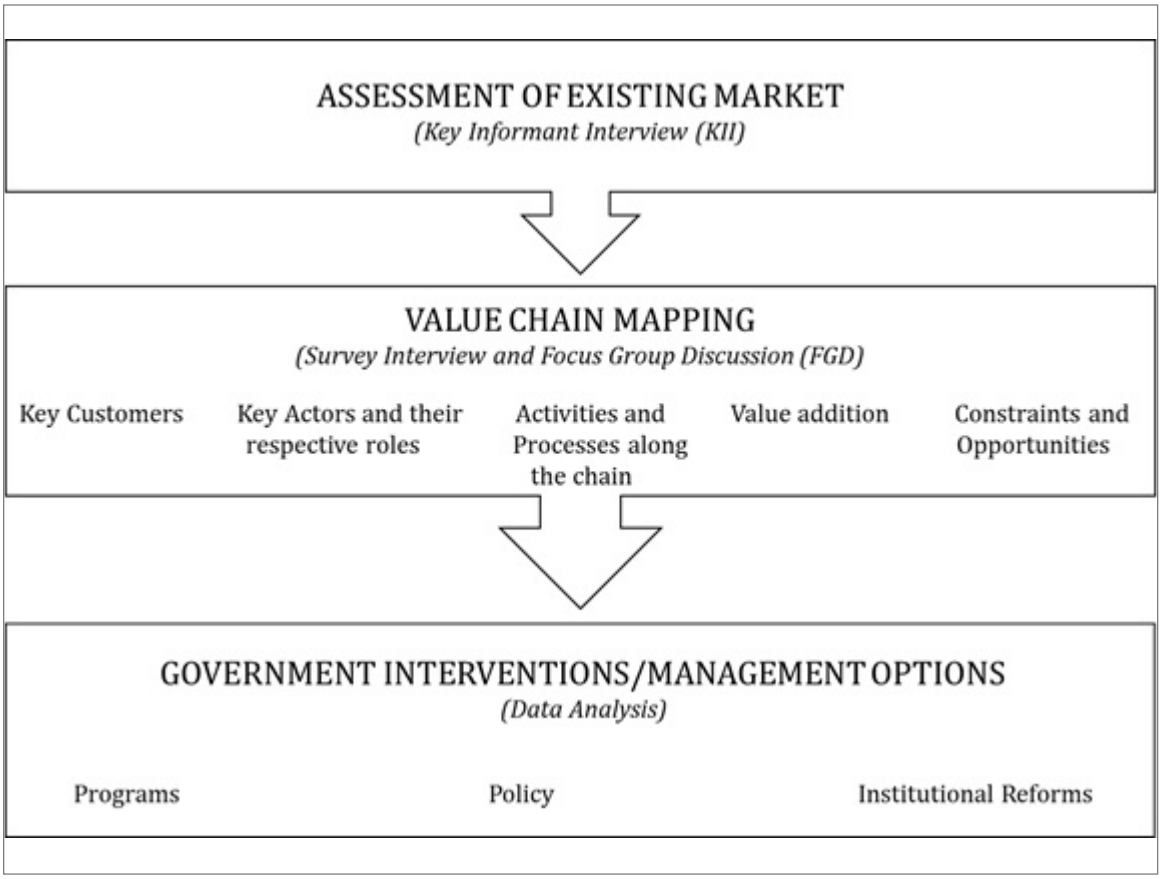

Figure 1. Framework for value chain analysis (Brown et al. 2010)

A value chain analysis was done to identify areas for upgrading the chain, which includes the process, product, and the function, or the overall chain itself. Process upgrading aims to reduce the number of links, friction, and constraints such as cost incurred and travel period to market, which subsequently reduces cost along the chain. It may be achieved by improving the processes within the chain and the efficiency within the business. Product upgrading may be obtained by introducing new products or transforming the existing ones while function upgrading may be achieved by changing the activity procedures. Overall, chain upgrading is when the existing chain is being transformed into new and higher value products. Upgrading may also be achieved through the interventions of external environments such as policy and institutions to improve infrastructure towards enhancing the effectiveness and efficiency of a particular value chain (Brown et al. 2010).

2.2 Study Area

The fisheries production of *Caranx ignobilis* was extracted from the NFRDI-NSAP database. It was a database system created by BFAR-NFRDI to serve as the databank of the landed catch of capture fisheries of the different regions in the country. It also complements the fishery statistics data of the Philippines Statistics Authority.

The top producing regions from the NSAP database were selected as areas of interest for this study, and this includes the following sites from nine regions of the country: Region I (Lapaz in Laoag City, Gabut Norte and Victoria, Curimao and Badoc in Ilocos Norte), II (Buguey and Gonzaga in Cagayan), III (Iba, Candelaria, and Olongapo in Zambales), IVA (Taal Lake and Balayan Bay), IVB (Pola, Victoria, Calapan, Socorro, and Naujan in Oriental Mindoro), V (Calangga and Cabusao in Camarines Sur and Sugod, Bacacay, and Tiwi in Albay), VI (Numancia, Kalibo, and Nabas in Aklan and San Dionisio and Estancia in Iloilo), VII (Tapilon in Daanbantayan and Talisay in Cebu) and XIII (Bislig Bay and Dapa and Placer Port in Surigao del Norte) (Figure 2).

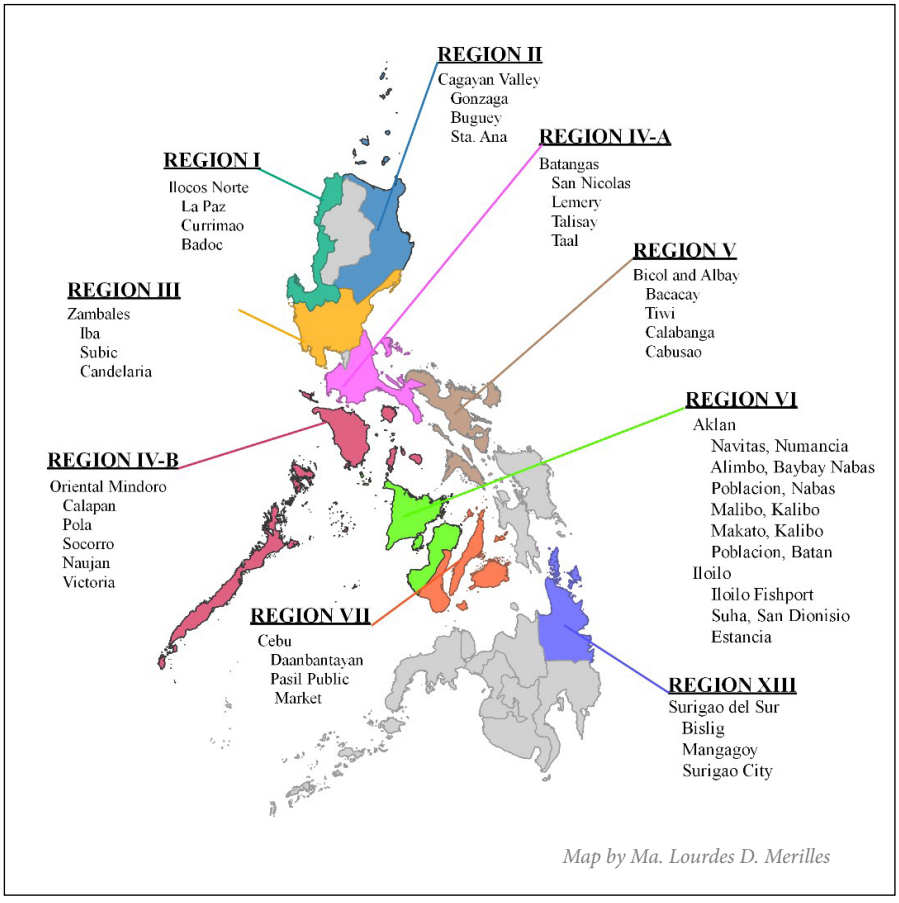

Figure 2. Map showing the study areas in nine regions in the Philippines

In many areas in the Philippines, *C. ignobilis* is an incidental species that is mainly caught using beach seine, bottom set gillnet, drift gillnet, and Danish seine. In Lake Taal, however, *C. ignobilis* is a target species caught by gillnet with mesh sizes 3 and 4 and ring net. The peak season for fishing *C. ignobilis* is from September to October, with a catch ranging from 30 to 33 MT. On the other hand, the lean season was from July to August, with an average catch of 10 MT. Aquaculture production of *C. ignobilis* had been recorded in some regions (i.e., Regions II, III, IVA, VI, and XIII) using fingerlings caught from the wild as seed stock. *C. ignobilis* is a catadromous fish; thus, the study was conducted both in inland and marine fishing grounds in the identified regions.

2.3 Data Collection

2.3.1 Primary Data Gathering

a. Key Informant Interview (KII)

Face-to-face interview with the different local government officials of each study site was conducted to assess the existing market industry of *C. ignobilis*. Information about the supply and product flow, stakeholders involved, and their relationships were gathered.

b. Survey Interview

Tracer survey interview was conducted to target respondents to answer the five key questions to build a detailed value chain map: (a) who are the key customers; (b) who are the key actors in the chain and what are their respective roles; (c) what are the activities and processes along the chain; (d) what are the value additions of each actor in the chain; and (e) what are the constraints and opportunities or areas that need to be developed for value chain upgrading. The survey interview covered all the actors in the chain, including the harvester/fishers, fish cage operators, fish buyers, and processors. Actors in the chain were interviewed using semi-structured questionnaires, which was pre-tested before the actual survey. The questionnaire gathered information on the quantity of harvest, roles and activities, costs, prices, procurement procedures, processes, technologies or practices, grades or standards being employed, and information about their buyers.

c. Focus Group Discussion (FGD)

A Focus Group Discussion (FGD) was conducted in Agoncillo, Batangas, on August 11, 2017. It was participated by 15 fisheries stakeholders composed of fingerlings collectors, fishers, fish buyers, and the Municipal Agriculture Officers, aiming to present, validate, and be verified by the participants the analyzed results based on the interview. The FGD provides the identification of constraints and opportunities and the evaluation of relationships among the key players. In the end, this activity was designed as a tool to determine what elements could lead to the successful participation of the marginalized actors in the chain and reveals which elements can be prospective starting points for government interventions.

2.3.2 Secondary Data Gathering

Secondary data collection was also conducted through a desktop review of the related printed materials, websites relating to supply and value chain, published reports, and peer-reviewed journal articles. The number of *C. ignobilis* fishers was established. A list of fish cage operators, fish buyers, and processors was traced from the interview of the fishers and fish cage operators, respectively. This also provided data needed for the assessment of the existing market of *C. ignobilis*.

2.4 Data Analysis

All primary data gathered from the interview were encoded and tabulated into spreadsheets of Microsoft Excel. Qualitative and quantitative tools were used in mapping and analyzing the chain. The qualitative analysis involved the identification of actors and their respective roles, relationships between them, activities and processes along the chain, and issues and concerns. On the other hand, the quantitative analysis involved exploratory factor analysis and descriptive statistics such as measures of central tendency, frequency, and percentage using Microsoft Excel. Total costs, value-added, and marketing profits were also computed.

Profit and Total Cost of each actor in collecting, culturing, and trading of *C. ignobilis* were computed using the formula:

Profit = (Volume of product * Price) – (Variable Cost + Fixed Cost)

Total Cost = Variable Cost + Fixed Cost

Value-added includes the value of capital, labor, and entrepreneurship used in transforming the product from its original state to its final state when sold to the next actors in the chain.

3. RESULTS AND DISCUSSION

3.1 Assessment of *Maliputo* Fish Industry

Based on the results of this study, *maliputo* (*C. ignobilis*) in the Philippines comes from capture and aquaculture fisheries sectors, both of which are caught and reared in marine and freshwater environment on a widespread distribution from the northernmost part of Luzon in Region 2 (Cagayan) to the southernmost part of Mindanao, specifically in the Autonomous Region in Muslim Mindanao (ARMM).

C. ignobilis is distributed worldwide, particularly in the Indian and Central Pacific Ocean (Abdussamad et al. 2008). There are 18 species of *Caranx* being exploited, particularly its distribution (Froese and Pauly 2017). However, limited information about its value chain is known. *C. ignobilis* is widely harvested commercially and recreationally in wild both in marine and freshwater bodies using hooks, line, spear, traps, and gillnets. This species is traded fresh and dried. In the Philippines, this species is caught using various fishing gears set at the migration route, especially in rivers. It is also cultured in ponds and cages installed in fresh, brackish water, and marine water bodies. Its production in marine capture fisheries increased from 1,569.57 kg in 2007 to 56,178 kg in 2015 (NFRDI 2016).

Currently, *C. ignobilis* is marketed chiefly for the local market with no recorded export trade. From the fishers, its major destinations are fish cage operators, commission agents, local markets, restaurants, and resorts. Market demand for this species is highly seasonal, which rises only during special occasions and celebrations. *C. ignobilis* is deemed a potential species for aquaculture in the Philippines; thus, NFRDI conducted studies to breed this species in captivity in the Philippines (Mutia et al. 2015).

Annual production of *C. ignobilis* in the country by the survey respondents for the duration of the study in 2017 (Table 4) is 188,722 kg valued at PHP 33,752,859.79 with 58.12% of the production coming from the capture fisheries while the aquaculture sector contributes the remaining 41.88%. For capture fisheries production among the regions, the highest production was provided by Region II (Cagayan) with 48.31%, followed by Region VI (Iloilo) with 33.59% and Region IVB (MIMAROPA) with 5.36%. For cultured *C. ignobilis*, the highest production came from Region II (Cagayan) with 55.79%, Region III (Central Luzon) with 16.70%, Region IVA (CALABARZON) with 15.30%, and Region XIII (CARAGA) with 12.21%. In the capture fisheries sector from 2007 to 2015 (Table 5 and Figure 3), high production was recorded from 2013 to 2015 ranging from 37.24 MT to 110.49 MT with the highest catch in 2014. A low catch was recorded from 2007 to 2012, ranging from 1.57 MT to 15.23 MT with the lowest catch in 2011. Between regions, the highest production came from Region II (Cagayan) with 66.2 MT (28.03%) followed by Region

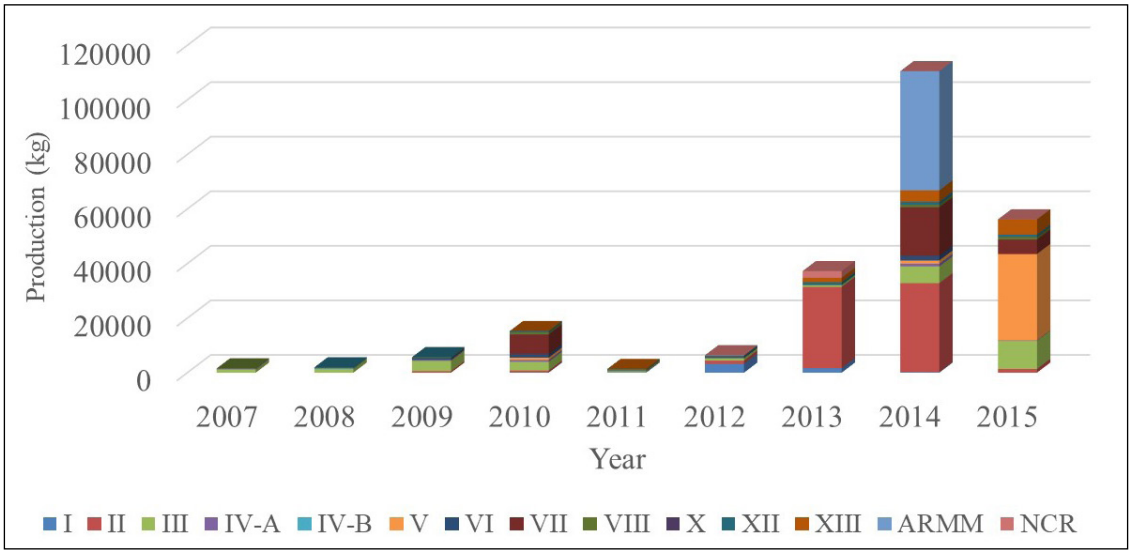

Figure 3. Production of *C. ignobilis* by region in marine waters (NFRDI-2016)

ARRM, V (Bicol), VII (Central Visayas), and III (Central Luzon) with 43.68 MT (18.50%), 33.85 MT (14.34%), 30.37 MT (12.87%), and 27.66 MT (11.72%), respectively. Probably the main reason for the high volume of *C. ignobilis* in these regions is the presence of *C. ignobilis* in the area, as indicated by the national distribution of this species in FishBase (2018). *C. ignobilis* is a schooling fish and could be caught in a large volume if appropriate fishing gear is available. However, based on the survey interview of this study, no fishing gear is specific for this species; thus, the low fish catch.

Table 4. Average volume traded and prices offered per actor per kilogram of *Caranx ignobilis* in various regions in the Philippines, from March to September 2017

Region	Capture				Aquaculture				Capture/Aquaculture		
	Annual Volume (kg)	Price/kg (PhP)	Annual Value (Php)	Percentage per Region (%)	Annual Volume (kg)	Price/kg (PhP)	Annual Value (Php)	Percentage per Region (%)	Annual Volume (kg)	Annual Value (PhP)	Percentage per Region (%)
I	5,446.80	182.67	994,966.96	4.97					5,446.80	994,966.96	2.89
II	52,980.48	129.52	6,862,031.77	48.31	44,100.00	205.83	9,077,103.00	55.79	97080	15,939,134.77	51.44
III	2,102.76	186.00	391,113.36	1.92	13,200.00	190.00	2,508,000.00	16.70	15303	2,899,113.36	8.11
IVA	2,100.00	372.50	782,250.00	1.91	12,096.00	292.50	3,538,080.00	15.30	14196	4,320,330.00	7.52
IVB	5,882.40	170.63	1,003,713.91	5.36					5882	1,003,713.91	3.12
V	2,285.28	135.56	309,792.56	2.08					2285	309,792.56	1.21
VI	36,840.24	160.00	5,894,438.40	33.59					36840	5,894,438.40	19.52
VII	168.12	150.00	25,218.00	0.15					168	25,218.00	0.09
XIII	1,872.00	164.50	307,944.00	1.71	9,648.00	213.33	2,058,207.84	12.21	11520	2,366,151.84	6.10
TOTAL	**109,678.08**		**16,571,468.95**		**79,044.00**		**17,181,390.84**		**188722**	**33,752,859.79**	
Percentage	**58.12**				**41.88**						

Table 5. Annual Production of *C. ignobilis* (NFRDI-2016)

Year	Regions														Total (kg)	Total (mt)	%
	I	II	III	IV-A	IV-B	V	VI	VII	VIII	X	XII	XIII	ARMM	NCR			
2007			1214.70	254.15		4.87			95.85						**1569.57**	**1.57**	**0.66**
2008			1315.40	161.35	166.87				177.46		125.68				**1946.76**	**1.95**	**0.82**
2009		541.26	3779.40	305.46	1.97	73.60	651.00		261.08		62.16				**5675.92**	**5.68**	**2.40**
2010	86.49	678.81	3220.60	660.26	0.56	856.08	1265.70	7254.60	663.84		513.95	30.25			**15231.13**	**15.23**	**6.45**
2011	29.00		215.38	223.74	149.95	52.65			489.72		156.15	50.46			**1367.04**	**1.37**	**0.58**
2012	3240.60	1201.10	823.29	15.77	5.16	42.96	374.05		105.68		431.06			147.26	**6386.92**	**6.39**	**2.71**
2013	1636.00	29779.00	673.61						19.56		1043.92	1642.30		2442.30	**37236.69**	**37.24**	**15.77**
2014	201.98	32617.00	6127.40	994.99		1171.30	1695.50	17810.00	862.95	23.80	1128.64	4173.10	43683.00	0.25	**110489.91**	**110.49**	**46.80**
2015		1365.40	10289.00	181.09		31653.00		5309.90	930.13	121.53	736.38	5588.00		2.66	**56177.09**	**56.18**	**23.80**
Total (kg)	**5,194.07**	**66,182.57**	**27,658.78**	**2,796.81**	**324.51**	**33,854.45**	**3,986.25**	**30,374.50**	**3,606.28**	**145.33**	**4,197.94**	**11,484.10**	**43,683.00**	**2,592.47**	**236,081.05**	**236.08**	
Total (mt)	**5.19**	**66.18**	**27.66**	**2.80**	**0.32**	**33.85**	**3.99**	**30.37**	**3.61**	**0.15**	**4.20**	**11.48**	**43.68**	**2.59**			
%	**2.20**	**28.03**	**11.72**	**1.18**	**0.14**	**14.34**	**1.69**	**12.87**	**1.53**	**0.06**	**1.78**	**4.86**	**18.50**	**1.10**			

3.2 Value chain mapping

3.2.1 Key Customers and Product requirements

Table 1 shows the respondents in the survey areas of the study. Based on the survey interview, the highest number of stakeholders for *C. ignobilis* fisheries is found in Region I (Ilocos), Region II (Cagayan), Region IVB (MIMAROPA), Region XIII (Caraga) and Region V (Bicol) with 19.20%, 17.41%, 13.39%, 13.39, and 11.61%, respectively. Regions I (Ilocos) and II (Cagayan) have the highest number of fishers and small-scale fish buyer traders. In contrast, Regions VI (Western Visayas) and XIII (Caraga) have the highest number of large-scale fish buyer traders. The number of stakeholder respondents for the survey is also reflective of the number of fisherfolk in the country. Based on the national fisherfolk registry (BFAR 2018), the number of fisherfolk is among the highest in these regions except for Region I (Ilocos). For the aquaculture sector, Region II (Cagayan) and IVA (CALABARZON) have the highest number of fish cage operators. *C. ignobilis* is a highly valued fish in Region IVA (CALABARZON), and several fish farmers are producing the species in cages, particularly in Taal Lake. The culture of the species in Region II (Cagayan) has also become an emerging culture species due to high market price and demand and the presence of wild fingerlings as seed stock in the area. Meanwhile, processors are found in Region IVA (CALABARZON) and IVB (MIMAROPA) but are not present in other regions during the survey period.

Table 1. Number of interviewed *Caranx ignobilis* fisheries stakeholders from nine regions in the

Region	Fishers		Fish Buyers		Fish cage operators	Processors	Total	%
	Fresh	Marine	Small-scale	Large-scale				
I		30	13				**43**	**19.20**
II		21	12		6		**39**	**17.41**
III		11	4	1	1		**17**	**7.59**
IVA	3	3	4	2	4	3	**19**	**8.48**
IVB	17	3	8			2	**30**	**13.39**
V		18	8				**26**	**11.61**
VI		6	3	4	2		**15**	**6.70**
VII		3	2				**5**	**2.23**
XIII		12	9	6	3		**30**	**13.39**
TOTAL	**20**	**107**	**63**	**13**	**16**	**5**	**224**	

Landed catch production of *C. ignobilis* based on the NSAP database (NFRDI 2016) is shown in Table 5 and Figure 3. Fish production of *C. ignobilis* is relatively small, with an increasing production recorded from 2013 to 2015. *C. ignobilis* is caught in almost all regions except Region 9 and 11. In each specific year, however, not all of these regions catch *C. ignobilis* except in 2014 when nearly all of the regions caught the species except region 4B (MIMAROPA). Across regions, only Region 3 (Central Luzon), IVA (CALABARZON), VIII (Eastern Visayas), and XII (Davao) had recorded fish catch in almost all of the duration period from 2007 to 2015. It should be noted that this production mainly captures fisheries in marine waters, which is the area covered by NSAP. This low volume of the harvest was due to the fact that *C. ignobilis* is an incidental catch, which means that there is no specific gear that targets this species. This species is only caught when the fishers chance upon them during their fishing activity but is not the target species for their operation. On the contrary, *C. ignobilis* is a target species and caught yearly in Taal Lake from 2006 to 2016, as recorded in the landed catch survey by Mutia and Muyot (unpublished, 2016). For the aquaculture sector, cultured *C. ignobilis* is recorded in Region II (Cagayan), III (Central Luzon), IVA (CALABARZON), and XIII (Caraga) (Table 4).

Fish harvested by the fishers in percent by volume were sold through the different market outlets (Figure 4). Based on survey interviews, most fishers (92.68%) marketed their catch through various marketing channels while the remaining 7.32% of the fishers retained their catch for home consumption. The fish buyers (small-scale and large-scale fish buyers) were found to be the most contacted and used channel by the fishers for selling their fish (60.16% and 22.76%, respectively). Within this level in the chain, the fish buyers trade among themselves before the fish is transferred to the next users. The remaining 4.07 and 5.69 percent were sold directly to consumers and fish cage operators, respectively. As the product moves from the fishers to the different actors in the chain, it adds extra costs with the buying price as part of their profit.

C. ignobilis is a commercial commodity traded within the Philippines only with local people and tourists as its key customers. It is eaten grilled, fried, or "*sinigang*." Size and quality are the primary product requirements. Size grades include small (more than 10 pcs/kg), good size (4-5 pcs or 6-7 pcs/kg) and large or slice (5 kg up). Prices vary relative to their sizes and season.

3.2.2 Key Actors

There are four main actors identified in the value chain of *C. ignobilis*, namely: (1) fishers, (2) fish cage operators, (3) fish buyers - which are further classified into large-scale fish buyers (commissioners, wholesalers) and small-scale fish buyers (retailers and peddlers); and (4) processors (restaurants and resorts). Each of these actors is described in Table 2 and 3.

Fishers. The fishers are the first link in the chain. *Maliputo* is caught by fishers in municipal waters employing various gears such as gillnet, fish corral, hook and line, beach seine, and fish traps using less than three gross tonnage (GT) fishing vessel. On the other hand, *maliputo* is caught by commercial

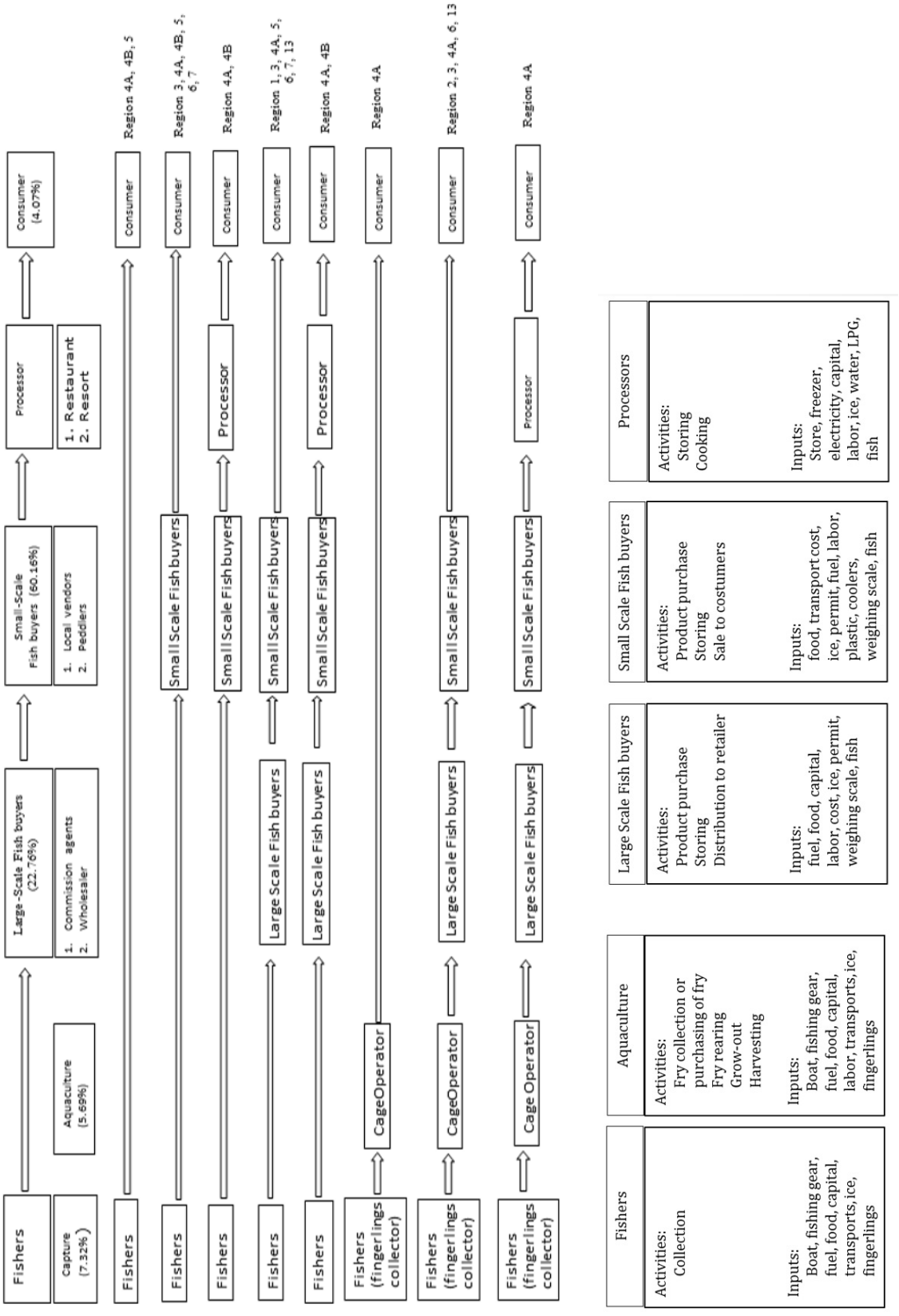

Figure 4. Value Chain Map, Marketing channel of *Caranx ignobilis* in the Philippines

fisheries using purse seine, trawl, otoshi ami, and danish seine, which operate with more than 150 GT fishing vessels in commercial fisheries waters. In most regions, *maliputo* is a by-catch or non-target species. However, some fishers in Taal Lake (Region IVA) were full-time *maliputo* fishers that use specific gears (i.e., ring net and gillnet) for the said species. Most of the fishers are male (95%), and only 5% are female (Table 2). Young fishers are in the range of <20 years of age while older fishers are ≥70 years old. Most are married (84%) and reached only primary education (54%). Only 6% had finished the tertiary level. Average fishing experience ranged from 21 to 40 years. Most fishers (72%) have no income source other than fishing and spend 9-12 hours of fishing every day throughout the year. Most of them own their fishing gear and boat (83%) while the rest serve as crew members only (17%). About 49% of the fishers are not members of a fisher's organization in their municipality, and 61% have not received any form of extension services from the government, NGOs, or private sectors.

Size of *maliputo* caught by fishers is mostly within the size range of 85-100 grams per piece (48%), followed by >300 grams (39%) and 250-300 grams (13%) size range. The average volume of catch per fisher depends on the season. During peak season in March-July, the average catch is 108.97 ± 98.44 kg. At the lean season, from January to February and from August to December, the average volume of catch is 3.74 ± 50.74 kg, and the average price is 183.49 ± 37.66 (Table 6). Region VI recorded the highest average volume of catch, whether in lean or peak season, with 225.83 ± 239.38 kg and 511.67 ± 287.78 kg catch per day, respectively. On the contrary, the region adjacent to it, Region VII (Central Visayas), recorded the lowest average volume of catch. During peak season, Region VII averages only a 4.67 ± 0.58 kg catch per day, and fishers in this region even experienced having no catch at all during the lean season. In terms of price, Region IVA has the highest selling price of captured *maliputo*. Some fishers in selected regions also collect *maliputo* fingerlings from the wild and sell them to fish cage operators who culture them.

Fish cage operators or growers. Fish cage operators and growers are the second link of the chain and belong to the aquaculture sector of the *maliputo* fisheries. They purchase *maliputo* fingerlings caught from the wild by *maliputo* fingerlings collectors/ fishers and grow them in fish cages installed in marine, brackish, or freshwater bodies for 4-8 months. Most of the fish cage operators are male (88%) and aged between 50-59 years old (38%) (Table 2). Most of them are married (94%). The majority have reached secondary education (38%) and primary education (44%) while one of the respondents has a Master's degree.

Among the regions covered by the study, Regions II, III, IVA, VI, and XIII are practicing aquaculture of *maliputo*. The average volume of harvest in a fish cage is 127.5 ± 110.30 kg, with an average selling price of 225.42 ± 21.34 per kg of fish (Table 6). Region II has the highest average volume of harvest (175 ± 160.84 kg), while Region IVA has the highest selling price of cage-cultured *maliputo* (292.5 ± 39.69 kg).

Fish Buyers. Fish buyers are either the second or third link in the chain. They purchase *maliputo* from fishers and fish cage operators and play a significant role in supplying fresh *maliputo* to the consumers and the processors. There are two major types of fish buyers: (1) large-scale fish buyer, who trades >20 kg of *maliputo*, and (2) small-scale fish buyer, which trades <20 kg *maliputo*. The large scale fish buyer is further classified into (a) commissioner or broker and (b) wholesaler, while the small-scale fish buyer is categorized into (a) retailer and (b) peddler. Brokers or casa are the ones who directly negotiate and finance the operations of a group of fishers that operates within the municipal waters. They are usually located at fish ports or main landing centers. They earn by receiving a commission of 6-10% of the total sales of each fisher. Brokers or casa are found in Region III (Central Luzon) and XIII (Caraga). Wholesalers are the ones who purchase *maliputo* from fishers and cage operators in large volume (20 kg and above) and sell them to the retailers for resale. On the other hand, retailers sell fresh *maliputo* to the public in smaller quantities for their consumption and not for resale. Retailers include sidewalk vendors and vendors at local markets. Lastly, peddlers are the ones who sell the newly landed catch *maliputo* to the local community through the use of a pedicab, tricycle, or by walking. Most of the peddlers are wives of the fishers who sell their catch when it is small enough in volume to be sold to other fish buyers.

Most of the small-scale fish buyers are females (69%), while large-scale fish buyers are dominated by males (83%) (Table 2). Older fish buyers are aged 50 to 59 years old, while young traders are between 20-29 years old. Most of them are married (82% and 83%, respectively). The highest educational attainment obtained is college graduate (11% and 25%, respectively) followed by college level (14% and 8%, respectively) and dominated by secondary education by almost half (44% and 42%, respectively).

Processors. The processors are the ones who process and cook the fish for the consumers. They are mainly restaurant and resort owners. Most of them are male (60%), aged 30-39 (40%) and 40-49 (60%). All of them are married. The highest educational attainment is college level (80%), while 20% are undergraduate (Table 2). Only two regions, Region IVA and IVB, were recorded to have processors for *maliputo*. They sell *maliputo* in slice (per gram) and cooked as sinigang and grilled. Due to processing costs, the processor has the highest selling price among the other actors (PHP 1281.67 ± 416.11) per kg of fish.

In all five key actors, the head of the household is mostly male (Table 3). Household size is in the range of 4-6 members. Among the key actors, large-scale fish buyers have the highest monthly income of more than PHP 31,856.00/month, followed by the fish cage operators with PHP 15,315.00/month, small-scale fish buyers over PHP 12,703.00/month while the fishers have the lowest income of PHP 10,986.00/month.

Table 2. Socio-economic profile of *Caranx ignobilis* stakeholders from nine regions in the Philippines

Characteristics		Percentage (%)				
		Fishers (n=127)	Fish Cage Operators (n=16)	Small-scale Fish Buyers (n=63)	Large-scale Fish Buyers (n=13)	Processors (5)
Sex	M	95	88	31	83	60
	F	5	13	69	17	40
Age	<20	1	0	0	0	
	20-29	10	6	0	17	
	30-39	20	31	17	33	40
	40-49	28	19	42	17	60
	50-59	25	38	32	33	
	60-69	13	6	8	0	
	≥70	2	0	2	0	
Marital Status	Single	12	0	14	17	
	Married	84	94	82	83	100
	Separated	0	0	0	0	
	Widowed	4	6	5	0	
Educational Attainment	Elementary Level	54	44	31	25	
	High School	33	38	44	42	
	College Level (Undergraduate)	7	6	14	8	20
	College Level	6	6	11	25	80
	Others (MSc & PhD)	0	6	0	0	

Table 3. Household profile of *Caranx ignobilis* stakeholders from nine regions in the Philippines

Characteristics		**Percentage (%)**				
		Fishers (n=127)	**Fish Cage Operators (n=16)**	**Small-scale Fish Buyers (n=63)**	**Large-scale Fish Buyers (n=13)**	**Processors (5)**
Head of Household	Self/Respondents	83	88	40	82	
	Mother	4	6	5	0	
	Father	7	6	2	9	100
	Son	0	0	0	0	
	Daughter	0	0	0	0	
	Others	6	0	54	9	

Characteristics		Percentage (%)				
		Fishers (n=127)	Fish Cage Operators (n=16)	Small-scale Fish Buyers (n=63)	Large-scale Fish Buyers (n=13)	Processors (5)
Household Size	1-3	23	13	34	0	
	4-6	50	69	43	75	
	7-9	23	13	15	25	
	≥10	5	6	8	0	
Ave. Household Income (per month)		**10,986**	**15,315**	**12,703**	**31,856**	

It is apparent that the large-scale fish buyers traded a higher mean volume (99.65 ± 60.20 kg) and mean price (PHP 216.71 ± 58.57 per kg) of *maliputo* compared to the small-scale fish buyers (15.17 ± 12.47 kg and mean price PHP 222.5 ± 61.30 per kg) (Table 6). Large scale fish buyers are recorded in Region III (Central Luzon), IVA (CALABARZON), IVB (MIMAROPA), VI (Western Visayas), and XIII (Caraga). Region VI recorded the highest volume of *maliputo* purchased by large-scale fish buyers at an average of 360 ± 171 kg per day. This region has the highest volume of capture fishery of *maliputo*. Small-scale fish buyers are prevalent in all regions. Region III is recorded to have the highest volume of *maliputo* purchases by small-scale fish buyers among the regions.

3.2.3 Marketing Channels Used by the Key Actors

Fish harvested by fishers were sold through different marketing channels such as fish cage operators, commission agents, wholesalers, local vendors, peddlers, and restaurants (Figure 4). The fish value chain shown in the figure is a general illustration and describes the overall flow of products from the supply through the different intermediaries to the consumers. The specific supply chain in which the regions were indicated was recorded during the study. In the aquaculture sector, the marketing channel involved the participation of both the large-scale and small-scale fish buyer traders as the key actors, as observed in Region II, III, IVA, VI, and XIII. The producer mainly prefers this supply chain because it involves large production demand and may entail only a few harvests to sell all the produced *maliputo* fully. A longer chain is noted in Region IVA with the addition of the processors, mainly restaurants that cater to local tourists near Batangas and Tagaytay areas. The shortest chain has been recorded in Region IVA, where the cultured *maliputo* is sold directly to consumers, which posted a relatively higher market price among the channels. However, this marketing channel is rarely done because of the low volume of demand from direct consumers. Considering that *C. ignobilis* caters only to a specific market, the means of disposing of is by "order and pick-up" from the production site (Alaira and Rebancos 2014). For harvested *maliputo* from capture fisheries, the large-scale and small-scale fish buyer traders are also involved in all of the fishers' marketing channels in Region I, III, IVA, IVB, V, VI, VII, and XIII. For Region IVA, IVB, and V, the fishers were noted to sell directly to the consumers. This direct selling to consumers had a relatively higher market price and more net income for the fishers. All of the large scale fish buyer's trade is passed on to the small scale fish buyer, recorded in Region I, III, IVA, IVB, V, VI, VII, and XIII. The small scale fish buyer, on the other hand, may pass on their trade to the processors (Regions IVA, IVB) or directly to the consumers (Region I, III, IVA, IVB, V, VI, VII and XIII). Processors, mainly restaurants, are present in Region IVA (Batangas and Tagaytay) and IVB (Mindoro), catering to local tourist consumers.

3.3 Cost Distribution and Value Addition

3.3.1 Activities, processes and the associated costs of each actor

The total costs incurred in the processes and equipment used by each actor to deliver their product are shown in Table 8b. Among actors, production cost per kg of *maliputo* is highest with the processor at PHP 531.96 and lowest with fishers at PHP 66.91. At the same time, cage operators (aquaculture), large-scale fish buyers, and small-scale fish buyers have PHP 89.77, PHP 193.13, and PHP 147.46, respectively. The highest expenditure by the processor, small and large-scale fish buyers, is mainly due to the procurement of fish, representing 88.52% to 93.9% of all production

Table 6. Average volume traded and prices offered per actor per kilogram of *Caranx ignobilis* in various regions in the Philippines, from March to September 2017

Region	Fishers (Capture)			Fishers (Aquaculture)		Large-Scale Fish buyers		Small-Scale Fish buyers		Processor	
	Quantity during Peak Season (kg)	Quantity during Lean Season (kg)	Price (PhP/kg)	Quantity (kg)	Price (PhP/kg)	Quantity (kg)	Price (PhP/kg)	Quantity (kg)	Price (PhP/kg)	Quantity per day	Price (PhP/kg)
I	15.13±10.59	4.60±3.74	182.67±34.26					16.15±16.17	219.23±32.52		
II	210.24±312.25	56.85±153.19	129.52±25.78	175±160.84	205.83±34.12			11±7.95	182.5±34.94		
III	15.93±14.19	1.45±2.24	186±69.99	100±0	190±0	10±0	150±0	29.75±26.68	182.5±66.52		
IVA	175±169.44	32.33±42.53	372.50±84.48	168±248.31	292.5±39.69	32.17±36.42	368.33±88.08	11.33±5.68	358.33±69.11	32.17±21.03	2,023.33±372.22
IVB	24.51±73.98	2.75±6.77	170.63±67.97			67.5±74.24	167.5±116.67	15.75±8.45	222.5±40.27	67.50±52.50	540±460.00
V	10.58±8.23	3.17±4.68	135.56±31.29					16.63±8.30	211.25±39.35		
VI	511.67±287.78	225.83±239.38	160±10.95			360±171	192±57.62	19±22.63	200±28.28		
VII	4.67±0.58	0.00±0.00	150±0.00					17.5±3.54	220±0		
XIII	13±8.93	3.70±4.08	164.50±14.23	67±32.05	213.33±11.55	28.57±19.30	205.71±30.47	13.11±10.73	223.33±38.73		
Average	**108.97±98.44**	**3.74±50.74**	**183.49±37.66**	**127.5±110.30**	**225.42±21.34**	**99.65±60.20**	**216.71±58.57**	**15.17±12.47**	**222.5±61.30**	**36±36.77**	**1281.67±416.11**

costs. The same actors also entailed relatively high production costs on labor, freight, and preservation. For the fishers, the main expenses incurred are related to boat and fishing gear used in the operations, collectively comprised of 88.01% of all operational costs. Similarly, for cage operators, the main costs are related to cage and nets used in the rearing of fish estimated at 55.67%. Procuring permits also entailed high cost for cage operators, representing about 7.54% of production cost. Processes and expenses incurred by the actors in *maliputo* production and processing are shown in Table 7 and 8. The size of marketed *maliputo* varies with the type of fishing gear used and fishing ground (i.e., marine or freshwater). Costs are categorized into fixed and intermediate expenses. Fixed costs of fishers (capture) and fish cage operators involve boat & engine, fishing gear, and containers. The average cost spent per trip by fishers in capture fishery of *C. ignobilis* was PHP 621.00 with labor, food, diesel, and hook as the major cost items (Table 7). An average of five persons was involved in capturing the species, which cost fishers PHP 230 per trip. The cost of fuel for the boat is around PHP 100 per trip on average for fishers need to travel long distances from island to island since *maliputo* is found near the coral reef areas. *Maliputo* are sorted based on their size upon arrival or right after the hauling process inside the boat and placed into a holding container with or without the addition of ice for preservation. Fish buyers usually wait at the shore, fish ports, or landing centers to purchase *maliputo* directly from the fishers. However, in other areas, these fish buyers are not present in these areas, and thus, other fishers incur additional transport costs to deliver their catch to them. If the catch is quite low, wives of fishers or the fishers themselves sell their catch to their neighbors or the local community.

On the other hand, the average cost obtained by fish cage operators per harvesting of *maliputo* is PHP 13,825. The highest input cost is the cost of fingerlings caught from the wild, estimated to be PHP 3,990.40 per fish culture operation. Ice, which is used during harvesting to maintain the quality of harvested *maliputo*, is also a major cost for this actor. The operation in aquaculture is different from capture fishery in terms of harvesting, which is done every six months (two croppings per year). The primary resources needed are the construction materials for the fish pens, such as the frame, nets, and drums, among others. It can be observed that this species' culture is limited only to five regions and limited to selected individuals due to lack of knowledge on the culture of this species. It was shown that Region III has the highest operating cost because of the number of fish cages maintained. The equipment used are more advanced and expensive compared to other regions (Table 7 and 8a).

Most fishers sell their catch mainly to the waiting wholesalers at ports and retailers at the local markets while a small number sells them directly to consumers. Processes and cost incurred in trading *maliputo* are shown in Table 8. The average cost per trip incurred by small-scale fish buyers is PHP 6,636, while commercial fish buyers incurred an average cost per trip of PHP 23,562. A fish buyer's primary expense, whether small or large-scale, is the procurement cost of harvested or caught *maliputo* purchased from the fish cage operator or fishers. An average of PHP 5,874 and PHP 21,504 worth of fish is bought per trip by small-scale and large-scale fish buyers, respectively (Table 7). Other materials needed by small fish buyers are ice, plastic, and transportation costs, particularly for local entrepreneurs serving at local markets. For large-scale fish buyers, the primary resources needed are labor, ice, gasoline (during purchasing), and transportation costs.

Most of the fishers sell their catch to small-scale fish buyers. Moreover, small fish buyers need to transport their fish from one area to another, thereby requiring additional hired labor costs or transport costs to add to their major expenses (Figure 4). The cost incurred by small-scale fish buyers is consistently highest in all regions compared to the cost of other key actors.

The largest value-added is created at the level of processors followed by the fish cage operators, fishers, small-scale fish buyers, and lowest at the large-scale fish buyers. This large value-added is mainly due to several costs, such as capital (depreciation and intermediate inputs), market fees, and management, which are the most significant contributor to value added at this stage.

Kaplinsky and Morris (2000) defined the value chain as a full range of activities that brought a product or service from conception through the different phases of production up to the final consumption. Figure 4 shows a value chain map and marketing channel of *C. ignobilis*, which extends from harvest through the intermediaries' different links. Percentage distribution was indicated inside the parenthesis per actor. It showed that small-scale fish buyers have the highest percent distribution, while cage operators had the lowest.

3.3.2 Cost distribution and value addition

Table 8b presents the annual cost distribution, value addition, and net returns per individual actor based on total production and trade. Among actors, large-scale fish buyers incurred the highest expenditures on production with PHP 282,746.28 followed by processors, small-scale fish buyers, cage operators, and lowest in fishers with PHP 178,737.36, PHP 79,629.36, PHP 20,737.80, and PHP 14,452.20, respectively. However, production cost per kg of *C. ignobilis* is higher in processor than the large-scale fish buyers due to the larger amount of incurred costs of the relative to the volume of fish being produced. Among these costs, the purchase of fish and ice, labor, and transport costs are the major expenditures of the large-scale fish buyers, which constituted about 50.48% of all production costs. For the processor, the main expenses are the purchase of fish and labor, representing 38.62% of all production costs.

Profit and total cost of each actor were computed on a per-trip basis except for cage operators, where harvesting is done two times a year (Table 8a). In terms of volume, cage operators in aquaculture (154 kg) had higher contributions per actor than fishers in capture (18 kg), while large-scale fish buyers had a higher volume of trade with 122 kg than small fish buyers with 45 kg. The processor had an average volume of 28 kg. The price of fish per kilo was also higher in cage operators (PHP 225.42 than fishers in capture (PHP 183.49) due to the rarity of the species and high market demand. For the fish buyers, the volume of fish was higher in large-scale fish buyers but entailed higher variable costs. Small-scale fish buyers gained higher profit due to lower overhead costs. Processors and aquaculture recorded

the highest income among the actors, although processors have high-value addition in the product made. Meanwhile, cage operators buy *maliputo* fingerlings, which had a low price then sell it after five months of rearing at a much higher price since adult *maliputo* has high commercial value.

Table 7. Processes, equipment, or materials per actor in the *maliputo* industry

Actors	Process	Materials/ Equipment Needed	Qty.	Price per Unit (PhP)	Variable Cost per operation	Economic Life	Annual Depreciation Cost
Fishers (Capture)	Collecting	Hook	15	25		1	375
		Bait	2	21	42		
		Accessories	4	17		1	68
		Food	3	41	123		
		Labor	5	46	230		
		Gasoline	1	50	50		
		Boat & Engine	1	51,835		10	5183.5
		Net	2	12,483		10	2496.6
		Spear	2	500		2	500
		Flippers	2	100		2	100
		Compressor	1	15,000		20	750
		Petromax	1	216		3	72
		Battery	1	336		3	112
	Sorting	Ice	6	5	30		
		Plastic	2	8	16		
		Styro box	3	150		3	150
		Cooler	2	102		5	40.8
	Transporting	Fare	2	40	80		
		Gasoline	1	50	50		
	TOTAL				**621**		**9847.9**
Fish Cage Operators	Fish Culture	Fingerlings	928	4.3	3,990.40		
		Feeds	4	65.63	262.52		
		Labor	2	225	450		
		Permit	1	1,625		1	1625
		Frame	8	3,599		5	5,758.40
		Net	2	9,413		7	2,689.43
		Sinker	14	12		2.5	67.2
		Boat & Engine	1	19,500		15	1300
		Anchor and Buoy	4	466		5	372.8
		Drum	11	986		6	1807.67
	Harvesting	Labor	2	200	400		
		Ice	15	56.63	849.45		
		Gasoline	3	50	150		

Actors	Process	Materials/ Equipment Needed	Qty.	Price per Unit (PhP)	Variable Cost per operation	Economic Life	Annual Depreciation Cost
	Harvesting	Container	15	608.3		5	1824.9
	TOTAL				**6,102**		**15,445.40**
Small-scale Fish buyers	Purchasing	Fish	33	178	5,874		
		Labor	1	42	42		
		Gasoline	1	50	50		
		Ticket	1	16	16		
		Fare	1	29	29		
		Ice	20	6	120		
		Plastic	4	26	104		
		Food	1	66	66		
		Water	1	180	180		
		Stall	1	386		1	386
		Tickets	1	207		0.1	2070
		Cooler*	5	762		5	762
		Freezer*	1	5,167		15	344.47
		Weighing Scale*	2	1,548		3	1032
	Transporting	Labor	1	155	155		
		Fare/Trucking	1	79	79		
		Gasoline	1	50	50		
	TOTAL				**6,765**		**4594.47**
Large-scale Fish buyers	Purchasing	Fish	128	168	21,504		
		Labor	4	123	492		
		Gasoline	2	50	100		
		Permit*	1	16,998		12	1416.5
		Fare	1	65	65		
		Ice	25	22	550		
		Plastic	3	20	60		
		Food	1	43	43		
	Stocking	Water	1	83		12	6.92
		Ticket	4	9	36		
		Electricity	1	257			11.68
		Cooler*	5	217		5	217
		Freezer*	1	2,125		3	708.33
		Weighing Scale*	2	1,500		4	750
	Transporting	Labor	4	50	200		
		Fare/Trucking	2	188	376		
		Gasoline	1	50	50		
	TOTAL				**23,476**		**3110.43**

Depreciation Cost = Quantity * Price / Economic Life

Actors	Process	Materials/ Equipment Needed	Qty.	Price per Unit (PhP)	Variable Cost per operation	Economic Life	Annual Depreciation Cost
Processor	Purchasing	Fish	35	400	14,000		
		Fare	1	75	75		
		Plastic	1	12	12		
	Processing	LPG	1	925		2	462.5
		Water	1	500		2	250
		Electricity	1	690		2	345
		Labor	3	235	705		
		Cooler*	1	433		1	433
		Freezer*	1	19,833		15	1322.2
	TOTAL				**14,792**		**2812.7**

Depreciation Cost = Quantity * Price / Economic Life

Table 8a. Monthly cost distribution and value addition per individual stakeholder per month in the surveyed areas with *Caranx ignobilis* production

Particulars	Fishers		Fish buyers		Processors
	Capture	Aquaculture	Small-Scale	Large-Scale	
Quantity traded (kg)	18	154	45	122	28
Value traded (PhP)	3,302.82	34,714.68	10,012.5	26,438.62	35,886.76
Ave. value per kg (PhP)	183.49	225.42	222.50	216.71	1,281.67
Total production cost (PhP)	1,204.35	13,825.20	6,635.78	23,562.19	14,894.78
Cost per kg (PhP)	66.91	89.77	147.46	193.13	531.96
Value added (PhP)	116.58	135.65	75.04	23.58	749.71
Net return (PhP)	2,098.47	20,889.48	3,376.72	2,876.43	20,991.98

Table 8b. Annual cost distribution and value addition per individual stakeholder in the surveyed areas with *Caranx ignobilis* production

Particulars	Fishers		Fish buyers		Processors
	Capture	Aquaculture	Small-Scale	Large-Scale	
Quantity traded (kg)	216	231	540	1,464	336
Value traded (PhP)	39,633.84	52,072.02	120,150.00	317,263.44	430,641.12
Ave. value per kg (PhP)	183.49	225.42	222.50	216.71	1,281.67
Total production cost (PhP)	14,452.20	20,737.80	79,629.36	282,746.28	178,737.36
Cost per kg (PhP)	66.91	89.77	147.46	193.13	531.96
Value added (PhP)	116.58	135.65	75.04	23.58	749.71
Net return (PhP)	25,181.64	31,334.22	40,520.64	34,517.16	251,903.76

3.4 Issues and Concerns

Among the problems encountered by fishers during fishing operations, bad weather is the most common concern. Fishers cannot go out fishing during extreme weather conditions. Another matter is the low volume of catch. Throughout the regions, the catch volume of *C. ignobilis* is low due to difficulty in venturing into the sea during these specific periods. Fishers seldom catch this species and only happens for a few months in a year at a low volume. Fishers experience difficulty in capturing this species because of the lack of specific gear for fishing. Other problems encountered are illegal fishers, no capital, pollution, and physical problems. Most fishers have no problems with their buyers because most of them are related by kinship to the fish buyers. Others are indebted to the fish buyers, particularly brokers or casa, who finance the operational inputs in the fishing operations.

Fish cage operators, culturing *C. ignobilis*, are confronted by weather problems, which causes the low volume of production due to the sudden change in water quality (i.e., high temperature, low dissolved oxygen, and the influx of freshwater) that may result to mortality. Mortality is also caused by handling and stress during transportation and over-crowding of fish when stocked into smaller compartments. The most critical concerns of the fish cage operators are the limited source of fingerlings and the very expensive feeds. Presently, there is no commercially available artificial diet for *C. ignobilis*; thus, fish cage operators are still dependent on trash fishes caught in the wild as feeds for their fish, which is expensive and supply is unsustainable. As a result, the profit margin of fish cage operators is low, similar to Alaira and Rebancos (2014) findings. To support this concern, NFRDI-FFRDC conducted a study on feed formulation, which showed positive response and acceptance of artificial feeds in the form of a moist diet by cultured *C. ignobilis* (Mutia et al. 2014, unpublished). However, the availability of commercial feeds in the market is needed to resolve this particular issue finally.

The primary concerns for the fish buyers are the marketing of *maliputo*, late payment of buyers, weather, and post-harvest losses. Other issues are the low volume of fish being traded, capital, low quality of fish, low price, and competition with other fish buyers. In certain months of the year, the demand for *C. ignobilis* is low, resulting in spoilage of fish that were not sold for a long period.

4. CONCLUSION AND RECOMMENDATIONS

Mapping of *C. ignobilis* value chain originates from capture fishers and fish cage operators to traders to restaurant operators and then finally to consumers. Marketing showed a traditional system that is limited to local market channels. Moreover, despite being a high-value and specialty commodity, it is merely an incidental catch and depends on catch from the wild and season-dependent industry. Two types of fish buyers (small-scale and large-scale) have been identified in the chain. The more there are levels of actors in the chain, the more potential for the bottlenecks, cost, and time before the product is offered for sale. Furthermore, the longer the chain, the higher the addition of cost. This caused the decreased quality of fish due to the more extended transport period and lower income among fishers due to the increased overhead cost.

Several upgrading strategies may be suggested to improve and develop the market industry of *C. ignobilis* in the country. These processes, functions, products, and whole chain upgrading are as follows (see also Table 9).

Process upgrading. The activities undertaken by the stakeholders along the chain are straightforward. Though in the part of fish cage operators, complications like mortality rates, feeding issues, and source of fingerlings face significant concerns due to lack of advanced knowledge in culture practices. It is recommended to carry on the study of *maliputo* culture from breeding to grow-out and its technology transfer to meet the demands of the market and supply growers with enough fingerlings. For capture fisheries, there is a need to promote the use of selective gear for *maliputo* to increase the catch.

Function upgrading: The wide range of intermediaries has been identified in the chain. The only direct link was from the fishers and fish cage operators to consumers, which is the single essential function for an efficient chain. Programs that conduct market matching among the stakeholders must be developed to make a more streamlined chain.

Product upgrading. *C. ignobilis* is considered a highly prized food and high-value species, yet most of the stakeholders are not aware of it. The government should strongly intensify programs that increase awareness of other stakeholders in their region that this fish is a high-value species. *Maliputo* is often

Table 9. Recommendations, interventions, and actions for specific regions in the Philippines to maximize the market potential and value chain of *Caranx ignobilis*

Recommendations	Interventions and Actions	Region
Process Upgrading	Aquaculture • Improve culture and feeding practices thru trainings and technology transfer • Ensure supply of fingerlings through hatchery technology Capture • Introduce selective gear for catching *C. ignobilis* (e.g. long line) for efficient fishing and increased catch	2, 3, 4A, 6, 13 1, 2, 3, 4B, 5, 6, 7, 13

Function Upgrading	• Mechanism to effectively link fishers and fish cage operators to traders and consumers
	• Market matching:
	  • Local- direct linkage between cooperative and fish buyers
	  • Restaurants- linkage between producers and/or traders with restaurant owners
	  • Export-linkage between traders and potential exporters
		2, 3, 4A, 6, 13
		
		1, 2, 3, 4A, 4B, 5, 6, 7, 13

Product Upgrading	• Awareness campaign to promote *C. ignobilis* as a potential high value species • Identify possible export market to make market of *C. ignobilis* • Improve value addition: live, fresh, frozen or chilled form products	1, 2, 3, 4B, 5, 6, 7, 13 1, 2, 3, 4A, 4B, 5, 6, 7, 13 1, 2, 3, 4A, 4B, 5, 6, 7, 13
Whole Chain Upgrading	• Promote aquaculture of *C. ignobilis* for sustainable supply • Continued R&D studies on aquaculture and its technology transfer and promotion	1, 4B, 5, 7 1, 2, 3, 4A, 4B, 5, 6, 7, 13

processed traditionally by restaurants as *sinigang* and grilled. Moreover, there is no export market for this species, the stakeholders can market this species in live, frozen, or chilled form products abroad to increase value-added and make its market industry globally competitive considering identification of possible export market.

Whole chain upgrading. The value chain map is a useful analytical tool that provides opportunities to identify measures that can be realized to achieve whole chain upgrading. This requires the role of players outside the chain. Important areas that need to be developed are the following:

1. Increasing fishing efficiency through the use of selective gear (e.g., long line) for catching *maliputo*;

2. *Promotion* of *C. ignobilis* culture especially to regions where it has not been introduced yet;

3. Increase the production through continuous refinement on breeding and hatchery technology; and

4. Identification of possible export market.

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