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Trade marketing analysis of glass eel (*Anguilla* spp.) resource in Aparri, Cagayan, Philippines

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Abstract

Trade marketing of Anguillid eels, a highly valued food fish among East Asian countries, has not been given attention in the Philippines. In this study, trade market analysis was conducted to understand the interaction among market players and come up with schemes that will benefit all stakeholders. The study analyzed the marketing strategies and distribution channels of the industry. Two market chains were identified in the study. In one chain, another layer of consolidators called stockers was added in areas that are far from the main consolidator while in the other chain, glass eel gatherers directly sell their catch to the main consolidator. Market destinations include exporters and eel farms from Batangas, Cavite, Laguna, Manila, Pampanga, and Tarlac. The system elucidated the unequal distribution of benefits among the key players placing the fishers on the disadvantage side due to the high price gap from the gatherers to the traders.

Keywords: Market, consolidators, eel fishers, Cagayan River

Introduction

Market analysis is crucial to fisheries management because it provides useful insights on the economic patterns in the fishing sector to aid decision-makers such as stakeholders, managers, and policymakers in coming up with a beneficial program that will equitably distribute the benefits of the resources to everyone included in the value chain. This activity is significant to inform strategic decision-makers, optimize resource allocation, and maximize profitability in a dynamic and competitive market environment. Hence, it will play a vital role in maximizing opportunities for growth and profitability in the glass eel industry.

Anguillid eels (*Anguilla* spp.) hold immense value primarily due to their demand in Asian markets, where they are revered as a culinary delicacy and essential for aquaculture purposes. Understanding the dynamics of the glass eel market is essential to identify the gaps, create opportunities, and staying ahead of the competition by anticipating changes in the industry.

Eels are regarded as delicacies in China, South Korea, and Japan, the major resource markets (Ame *et al.* 2013; Santos *et al.* 2023) ^[2, 23]. Over several decades, temperate eels, including the European, American, Japanese, and Australian eels, which were the preferred species for aquaculture, have experienced a significant decline in both population size and abundance, with overfishing and overexploitation are some of the causes (Åström *et al.* 2007) ^[4].

To meet the demand for tropical eels for aquaculture purposes, these East Asian countries, sourced glass eels from other ASEAN countries and the Philippines was included as the principal sources (Muthmainnah *et al.* 2016) ^[17]. High demand of this resource has led to sustainability problems (Ame *et al.* 2013) ^[2].

Looking at the supply chain, the base market players are the gatherers. In the Philippines, they are the fishers using fyke net in the river mouths, which are secured to the bottom using ballast, anchors, or stakes (Ame *et al.* 2013; Santos *et al.* 2023) ^[2, 23].

Glass eel trade system in Cagayan is divided into two tiers (Ame *et al.* 2013) ^[2]. Catch that comes from the gatherers, who are the fishermen or members of their households, is being sold to municipal consolidators nearby (Ame *et al.* 2013; Santos *et al.* 2023) ^[2, 23]. These municipal consolidators combine all of the local catches prior to bringing it to another consolidator

located in Aparri, Cagayan. These consolidators were concentrated in the municipality of Aparri. However, in Davao, glass eels collected in rivers along the Davao Gulf are sold to consolidators in (1) Hagonoy, Davao del Sur, (2) Mati, Davao Oriental, and (3) Malita, Davao Occidental (Santos *et al.* 2023)^[23].

Trading from the source to its target market starts as soon as the exporters' requisite volume is reached and are moved from Aparri to Manila via land transportation (Ame *et al.* 2013)^[2]. The consolidators subsequently sold glass eels to eel growers, who would raise the fish until it reached the appropriate size for export. Eels of marketable size were sold to exporters directly, either to local institutional markets or to eel processing facilities (Santos *et al.* 2023)^[23].

Despite the high economic contribution of glass eels to the

country, there is inadequate trade analysis of this commodity. Hence, this study was conducted to complement insufficient data and to generate science-based information as input in the formulation of policies for its sustainable utilization.

Materials and Methods

Study site

The study was carried out in the five coastal barangays of Aparri, Cagayan namely Bisagu, Macanaya, Punta, Sanja, and Toran (figure 1). These barangays were the major glass eel collection sites in the municipality according to the local consolidators. The mouth of Cagayan River provides an ideal and crucial waterway for the migration of glass eels as it return to its habitat in the upland, where they grow and mature into adult eels.

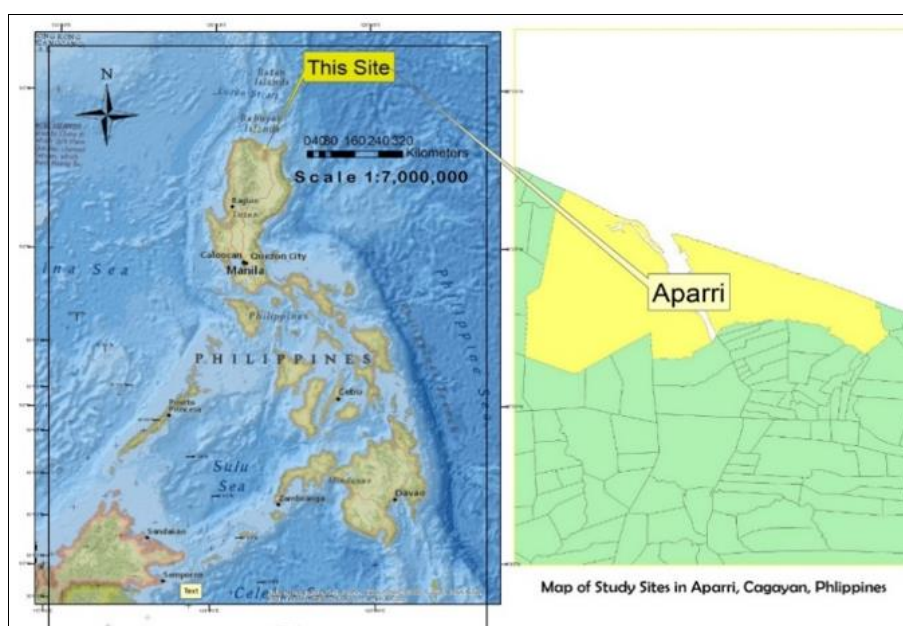


Fig 1: Location Map of Study Site

Selection of respondents

A purposive sampling method was used in determining the respondents in this study focusing on their actual involvement as glass eel gatherers, and marketers. A total of 168 gatherers, two stockers, and three local consolidators with a minimum of five years experience in the industry were interviewed during the conduct of the study.

Data gathering and data analysis

Floating of survey questionnaires and interview were undertaken during the conduct of the study. The socio-demographic data were analyzed using Descriptive Statistics using mean, frequency, percentage, and standard deviation.

Results and Discussion

Socio-demographic profile of the respondents

Results show that glass eel fishery was not exclusively for a male activity alone but also for females (table 1). However, women's participation is still limited due to their gender multiple roles. Women's involvement in *Anguillid* eel fishing became important because of their marketing expertise that enables them to find buyers and sell their goods swiftly. Mostly male respondents are involved in glass eel gathering while females do the trading.

The majority of the workforce in glass eel gathering was

dominated by the age group 31-50 years old (42.77%), followed by 18-30 years old (30.05%) and 51-70 years old (23.70%), respectively. The age range of the glass eel gatherers in the study ranges from 17-74 years old. This age range conforms to the findings of the fisherfolk's normal age group indicating that the middle age group men are mostly involved in the gathering activities in fisheries.

Tattao *et al.* (2021) have cited that fishermen from Aparri at least have a basic education. Around 48.55% attended elementary, 37.57% in secondary (table 1). However, results from the interview show that poverty still remains to be the main reason to forgo their education entirely in favor of economic jobs like fishing despite the risks, dangers, and hard work, to support their family.

Aside from dependent on fishing as their primary source of income, 68.21% stated that they supplement their income either from farming, hired labor, and tricycle driving. Their average monthly income of the respondents is Php 3, 063 per month or Php 36,756 annually, which was remarkably far lower than the Cagayan Valley monthly poverty threshold of five family members in 2018 at PHP 10,300 or Php 123,600 annually (PSA 2020). The high annual income variation is a common problem in all occupations dependent on natural resources.

Table 1: Socio-Demographic Profile of Respondents

Characteristics	Description	f	%
Gender	Male	168	97.10
	Female	5	2.89
Mean	86.50		
+SD	115.26		
Civil Status	Single	48	27.74
	Married	123	71.10
	Widowed	2	1.16
Mean	57.67		
+SD	61.08		
Age	< 18 yrs old	2	1.16
	18-30 yrs old	52	30.05
	31-50 yrs old	74	42.77
	51-70 yrs old	41	23.70
	> 70 yrs old	4	2.31
Mean	38.47		
+SD	14.03		
Educational Attainment	Elem Level/ Graduate	84	48.55
	High School Level/ Graduate	65	37.57
	Vocational	2	1.16
	College Level/ Graduate	22	12.71
Mean	43.25		
+SD	38.80		
Source of income	Fishing	55	3.79
	Fishing and farming	60	34.68
	Fishing and others	58	33.53
Mean	57.67		
+SD	2.52		
Household Monthly Income (Php)	2,000-5,000	154	89.01
	5,000-10,000	17	9.82
	> 10,000	2	1.15
Mean	5,234.29		
+SD	9,204.94		
Total		173	

Trade marketing analysis of glass eel trade in Aparri, Cagayan

Supply chain

Gathering areas

The barangays of Bisagu, Macanaya, Punta, Sanja and Toran were the five major collecting areas of glass eels in Aparri, Cagayan. However, the municipalities of Abulug, Baggao (Valley Cove), Buguey, Claveria, Gattaran (Bolos Point) and Gonzaga, Lal-lo, Sta. Ana, Sta. Teresita were also the additional glass eel collection sites in Cagayan. Fishers are crucial in providing the glass eels since production in captivity is still inadequate to meet the demand from eel farmers for young eels (Mahi *et al.* 2018; Nieves *et al.* 2021) [16, 20].

Local production

The mean catch of the gatherers in the study ranges from 0.05-0.2 kg during lean season while 0.1-0.25 kg during peak season per fishing operation. These findings is far lower than the recorded annual mean catch in Cagayan River, which ranged from 2.7 kg in 2009 to 15.2 kg in 2012 (Ame *et al.* 2013) [2]. This could be attributed by irregular frequency of orders from the local consolidators and high cost of fuel during the conduct of the study.

Glass eel seasonality in the area: Gatherers identified the

glass eel lean season from March to July while peaked season was in August until February. Glass eel are available all year round but the wet season is when glass eels are most abundant (Santos *et al.* 2021) [22]. In the study conducted by Mutmainah (2016), the peak season were during October to March. This seasonality difference could be one of the effects of continuing climate change in the fisheries sector.

Packing

Packed straight from fishing, glass eel gatherers from mainland Aparri (Macanaya, Toran, and Punta) sell their catch directly to the local consolidator and gatherers from isolated barangays like Bisagu and Sanja sell their catch to the stockers located in Sanja.

Glass eel is being place in a plastic bag with a weight of 2,500 grams and put it in a styrobox. Each styro box (jumbo size) composes of 2 kilograms, preferably 8 plastic bags with an ice being placed in the center to maintain the temperature of 18°C and below. There were no treatments given to the collected glass eels aside from filling the plastic bag with water, ice, and oxygenation as part of the pre-conditioning process.

Storing

Gatherers do not store their glass eel catch in their custody for a long time, considering that fishers do not have the facilities and life support system to keep the glass eels (Aralar *et al.* 2019) [9]. They directly sell their catch to the local consolidators or stockers who have the support facilities.

Stockers will store the consolidated catch with an average of four storing days then deliver the consolidated catch to the local consolidator located in mainland Aparri. Every day, they changed the water inside the plastic bag then oxygenate. They tend to do the activity until big volume is consolidated from the gatherers. This finding is in consonance to the study of Nielsen and Prouzet (2008) [19] where unsold glass eels are kept for about two to four days depending on the health status, transport availability and market.

During storing at the local consolidator's level, they store glass eels for 3-5 days but with daily water changing using tap water, and re-oxygenation twice or thrice a day. Weak and wounded glass eels are culled daily (Nieves *et al.* 2021) [20]. Adding of 5-6 packs of ice per container is performed to maintain the 16-18°C temperature during storing.

Glass eel transport and market destination

Once the required volume of the buyer is reached, glass eels are conditioned and packed in plastic bags filled with water, oxygen, and bags of ice. One plastic bag contains 200 g (approximately 1000 pieces) of glass eel. In between, these plastic bags are filled with 2-3 pieces ice per Styrofoam box. In order to reduce temperature shock and stress during transportation, the water temperature in the holding tanks is lowered before being transported down to 18°C (Baliao *et al.* 1998) [5].

A van-type car or thru cargo busses was used to travel 8-14 hours from Aparri, Cagayan to Manila or eel farms in Batangas, Cavite, Laguna, Manila, Pampanga, and Tarlac. To keep glass eels alive and fresh, they require particular care, packing, shipping, and high-quality shelter (Mahi *et al.* 2018) [16].

Orders are delivered to eel farms for 12-14 hours from Cagayan heading to eel farms outside the region.

Market chain: Glass eel trading is market-driven. It is

dynamic and it is solely dependent on the presence of buyers from Manila and eel farm buyers.

There are two marketing chains identified in the study before reaching the buyer outside the region (figure 2). These are (1) gatherer-local consolidator-buyer, and (2) gatherer-stocker-local consolidator-buyer.

Market Chain 1

The first marketing chain is the trading system of caught glass eel in mainland Aparri, Cagayan. Glass eel fishers from barangays Macanaya, Punta and Toran sell their catch directly to the local consolidator in mainland Aparri. Just after sorting and cleaning, live and healthy glass eels were outright delivered to the local consolidators from Punta or Toran where it is stored until the required volume is reached.

Market Chain 2

In the other layer of marketing chain, glass eel fishers from barangays Bisagu and Sanja sell their catch to the stocker from barangay Sanja. However, prior to acceptance of catch from the gatherers in these isolated barangays, the stockers will verify the presence of orders from the local consolidator in mainland Aparri. The great demand or a lucrative price for glass eels initiates household members, including spouses and even children, are involved in the gathering (Aralar *et al.* 2019) [9]. This verification system is to prevent the stocker from holding glass eel catch for a long period, which may cause deterioration like blackening and weight loss among glass eel stocks.

The stocker will then sell the community’s catch to the sole local consolidators in Cagayan province located in mainland Aparri. This marketing system is in contrary to the study Santos *et al* (2021) [22] where stockers will trade their associated catch to consolidators across Davao region, General Santos City and Sarangani, and Cotabato and Maguindanao.

stakeholders were involved in the glass eel industry namely: gatherer, stocker, and local consolidator. The findings also identified the following important key players' roles.

Gatherer: Typically gathers glass eel in the Cagayan River and its tributaries and sells the catch directly to the local consolidators or the stockers. They are registered under the Fish Registration (Fish R) system of the Bureau of Fisheries and Aquatic Resources, which is being implemented by the Local Government Units.

Stickers: Does the purchasing and consolidation of all caught glass eels in the isolated barangays of Bisagu and Sanja, Aparri, Cagayan and stock them for average of four (4) days before they sell it to the main consolidator. They do initial storing, packing, and selling of the consolidated catch located at mainland Aparri.

Main Consolidators: Responsible for the consolidation of all caught glass eels in the province of Cagayan from stockers and gatherers within Aparri, Cagayan, and nearby municipalities. They perform purchasing, storing, packing, and transportation of live glass eels to the Manila and eel farm buyers using provincial busses and or private utility vans. Usually they provide the paraphernalia to the gatherers and stockers such as plastic bags, fishing nets, and oxygen tanks.

Price structure of glass eel in Aparri, Cagayan

The table below shows the different prices of glass eels from each key player before reaching the buyers outside the region.

Table 2: Market analysis of glass eel

Key players	Price/kg (₱)		
	Lean Season	Peak Season	-
Gatherers	500-700	1,500-300	-
Stickers	500-700	1,500-300	-
Local Consolidators	-	-	3,500-5,000

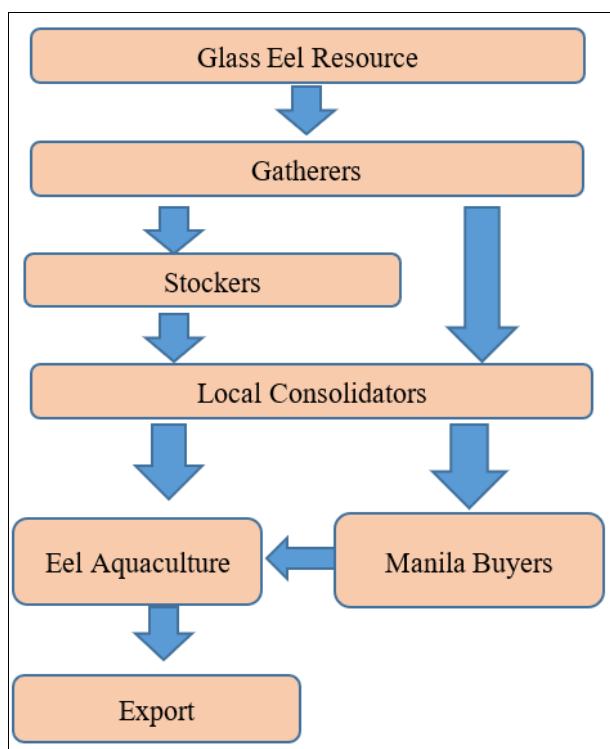


Fig 2: Market Chain of Glass Eel Resource in Aparri, Cagayan

Key players: In the study, results revealed that three

Results revealed that the local consolidators commonly determined the price of glass eels in the municipality. This system is consistent with the study of Santos *et al* (2021) [22] where buyers usually set the price for glass eels and young eels (kuroko).

Respondents revealed that before the fishing operation, local consolidators provided fishing paraphernalia such as fishing nets, oxygen tanks, plastic bags, and money amounting to Php 300-500 per operation.

This compels the gatherers to sell their glass eel catch to whoever local consolidator provided the fishing input but at a lower price. Glass eel fishers are deprived of the chance to bargain for a better price with other local consolidators in the area.

Local consolidator buys the glass eel catch from the gatherers from Php 500-Php700/kg during the lean season and Php1,500-Php3,000/kg during the peak season. Stockers also sell their consolidated catch to the local consolidators at the same price as the gatherers’ but add Php500 from the total cost of the delivered catch to the local consolidator and pay Php50.00 for the one-way traveling expense of the stocker. Local consolidators then trade the consolidated catch outside the region buyers from Php3,500 to Php5,000/kg. This price is far lower than in the study of Nieves *et al* (2021) [20] where the glass eel price is Php 2,000/kg during peak and Php 10,000/kg during the lean season.

Conclusion

Glass eel gathering and trading is considered an important economic activity in Aparri, Cagayan. Two layers of glass eel marketing system were identified in the industry involving the gatherers, stockers and local consolidators.

From the results of the study, it can be concluded that the absence of a policy on glass eel pricing in the municipality gives the local consolidators the power to control the price of this commodity; hence, affecting the stability of supply and income of the glass eel gatherers and stockers.

This suggest that sustainable management practices are essential to ensure the continued sustainability while safeguarding the natural resources and livelihoods dependent on it. Interventions like price setting, provision of technical skills on post-harvest handling of glass eel, and closed season may improve the catch, profit and income particularly the gatherers, who are greatly affected by the fluctuating price.

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