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Linking marketing of reef-sourced seafood with tourism: Potential for improving fisheries management

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Market-based strategies have been used to alleviate poverty in developing countries. In the fisheries sector, knowledge on market systems is essential for market development initiatives for small-scale fishers. However, less attention has been given in understanding the dynamics of market systems and value chains. Furthermore, conducting market study on reef fisheries is challenging because of its complexity and multi-species nature. In this study, we assessed the current local marketing system of reef-sourced seafood in Lingayen Gulf, NW Philippines. We used a market analysis approach complemented with semi-structured survey in describing the market flow, in assessing the availability of reef catches, and in determining the demand patterns from the local market. The study explored opportunities that could provide advantage for small-scale fishers while supporting sustainability of reef fisheries. Results showed that different market agents were involved in the marketing of reef catches. Greater varieties of species were sold to local traders mainly because of the high dependency of fishers to *suki* system. A large proportion of reef catches were marketed to the locals but higher incomes were generated through direct selling of high-value species to tourists. However, the opportunity for fishers to directly sell their catch was constrained by *suki* system, reluctance to interact with tourists and inconsistent reef catch. A mutually beneficial partnership among key market agents complemented with government-led interventions is suggested. Potential opportunities in the tourism sector could also be tapped to support sustainable fisheries management programs.

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INTRODUCTION

An estimated 1.9 million registered small-scale fishers in the Philippines directly depend on coastal fisheries for food and income (RARE 2019). With the continuous and increasing utilization of resources, the municipal fisheries sector is confronted with an array of environmental issues (e.g., overfishing, habitat degradation, and water pollution; Muallil et al. 2014; Courtney et al. 2016; Licuanan et al. 2019). Small-scale fishers are considered the poorest among the basic sectors of the society, with poverty incidence at 34% in 2015 (PSA 2017). Low incomes from fishing (~PhP 350/day; Muallil et al. 2013)

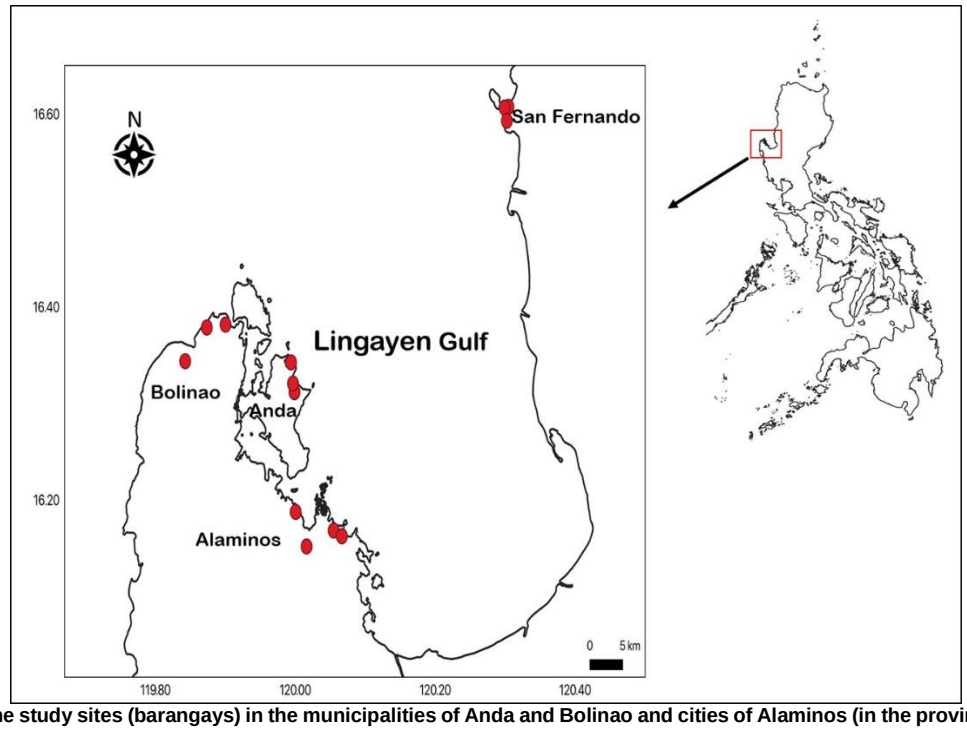

Figure 1: Map of the study sites (barangays) in the municipalities of Anda and Bolinao and cities of Alaminos (in the province of Pangasinan) and San Fernando (in the province of La Union) where fishers were interviewed.

can hardly support the financial needs of a family, especially for fishers without additional income sources. Some non-fishing alternative sources of income of fishers include farming, transportation services (as motorcycle drivers), construction labor, small-scale entrepreneurial business, livestock raising, and, in some cases, local government work (e.g., as barangay officials) (Cruz-Trinidad et al. 2009; Macusi et al. 2020).

The worsening poverty conditions among small-scale fishers are associated with declining fish catch (Anticamara and Go 2016; Macusi et al. 2020) and few alternative livelihood opportunities (Eder 2012; Muallil et al. 2014). Market and pricing systems are not optimized due to the lack of integration among key players in the production and marketing of fishery products (Jacinto and Pomeroy 2011). Small-scale fishers do not accrue sufficient benefit from fishing because of the low pricing of their catches (Jacinto 2004). Generally, income is unequally distributed among market actors with small-scale fishers receiving the least income (Wamukota et al. 2014; Trond et al. 2014; Purcell et al. 2017). Local market and tourism contribute to income inequalities in seafood trade (Rodrigues and Villasante 2016). Market vendors are usually the main buyers who control the prices of fish, thus lowers the bargaining power of fishers and other traders. On the other hand, restaurant owners who directly cater to tourists have the highest income. Among consumers, tourists pay higher prices than locals and exert high demand for seafood. Tourists prefer certain seafood (Garrod and Gössling 2008) that are locally produced (FARNET 2013) and processed (Wibisono and Rosyidie 2016). The high purchasing power of tourists in combination with the strong demand from the tourism industry increase the seafood prices (Gössling 2003). Potential opportunities from tourism should therefore be explored to determine potential contribution on the improvement of socio-economic conditions of small-scale fishers.

Development of market systems and value chains are market-based approaches that are ultimately aimed for poverty reduction (The Springfield Centre 2015; Norell et al. 2017; Singh and Chudasama 2020). Value chain development provides opportunities (e.g., livelihood, enterprise and market, and policy development, Jacinto 2004; Jacinto and Pomeroy 2011) to enhance economic benefits. However, these development could also potentially pose environmental impacts and result in economic losses. Thus, it is crucial to consider the environment and its sustainability when developing value chains (ILO, 2015). In addition to monetary value, non-financial benefits from value chains are recently recognized for including their importance in fisheries management (see for example Thyresson et al. 2013; Drury O'Neill and Crona 2017; Rosales et al. 2017). However, the dynamics of market systems and value chains in reef fisheries remain poorly understood (Jacinto and Pomeroy 2011; Trond et al. 2014). Comprehensive market analysis of reef fisheries is difficult to pursue because of its complexity (i.e., numerous fishers use different types of fishing gears to catch diverse species; Brewer 2011) and multi-species nature (i.e., aggregating species when examining changes in prices of seafood; Purcell et al. 2017). Hence, this study was conducted to assess the current marketing system of reef-sourced seafood in Lingayen Gulf, Philippines. The study described and assessed the market flow and demand patterns of reef catches. We also explored opportunities from the local market and the possible linkage with the tourism sector that could strengthen sustainable fisheries management.

MATERIALS AND METHODS

Site Description

The study was conducted in four coastal areas in Lingayen Gulf, northwestern Philippines: the municipalities of Anda and Bolinao and city of Alaminos (in the province of Pangasinan) and the city of San Fernando (in the province of La Union; Figure 1). The Lingayen Gulf is one of the major fishing grounds in northern Luzon with intensive aquaculture industry and developed coastal tourism sites (McManus and Chua 1990). The gulf has an extensive reef system but mainly concentrated in the study sites. The fisheries in the gulf is mainly artisanal, where traditional fishing gears and boats are used, and multiple species are targeted (e.g., *Siganus* spp., *Epinephelus* spp., *Scarus* spp., *Lethrinus* spp., and *Caranx* spp.; Campos et al. 1994). Fishing is an important source of livelihood and food for coastal communities. Fishery products are mainly marketed locally but

Table 1: Profile of selected study sites in the Lingayen Gulf.
Y=Presence or N=Absence of fish port/landing sites

Study Sites	Registered Fishers	Fish Port/ Landing Site	Public market (km)	Tourist Spots (km)	Tourist Attractions
Anda					
Cabungan	157	Y	8.7	5.5	Tondol White Sand Beach
Imbo	115	Y	7.0	3.6	Tondol White Sand Beach
Tondol	124	N	8.8	0.7	Tondol White Sand Beach
Bolinao					
Arnedo	247	N	2.4	1.3	Long Beach
Estanza	239	N	7.9	3.6	Ilog Malino Beach
Luciente I	715	Y	0.7	0.4	Bolinao Marine Laboratory
Alaminos					
Lucap	246	Y	4.9	0.3	Hundred Islands National Park
Sabangan	126	N	6.0	4.0	Mangrove Eco Park
Telbang	194	Y	11.0	3.6	Bolo Beach
Victoria	177	Y	12.0	4.2	Bolo Beach
San Fernando					
Canaoay	53	N	4.3	0.65	Sunset Bay Resort
Poro	330	N	5.5	1.6	Poro Point Baywalk
San Agustin	347	N	2.2	2.4	Thunderbird Resort

some are sold in the neighboring municipalities and provinces including Metro Manila. Reef catches are typically sold to middlemen before being brought to the municipal market centers (Campos et al. 1994). In the siganid fishery, the different market actors include small-scale fishers, boat owners, traders, processors, wholesalers, market vendors, and consumers (Rosales et al. 2017).

The Lingayen Gulf has been a recipient of several national Coastal Resource Management (CRM) programs. Through CRM efforts, there have been some success stories towards achieving sustainable fisheries. Some of these programs include control of commercial fishers, establishment of marine protected areas (MPAs), reduction of destructive fishing activities, and institutionalization of co-management approach (Cruz-Trinidad et al. 2009). The Lingayen Gulf has become a key learning destination for resource management initiatives because of its exemplary models of community-based environmental efforts.

The coastal tourism in the gulf is rapidly increasing. The selected sites are popular tourist destinations in the northern Philippines. Among the famous attractions are the Hundred Islands National Park (HINP) in Alaminos, Tondol White Sand Beach in Anda, Giant Clam Ocean Nursery in Bolinao, and Thunderbird Beach Resort in San Fernando. About 759,000 domestic and foreign tourist arrivals were recorded in the province of Pangasinan in 2017 (Pangasinan Provincial Tourism Office, 2017). The HINP is one of the most famous tourist destinations in Lingayen Gulf. The average daily arrival of tourists in 2017 to 2018 ranged from 2,300–3,600 during high peak season, 772–1,000 during low peak season, and 345–441 during off-peak season (Tourism Office of Alaminos City). Ecotourism-related activities have been initiated in the city. An example is the *Paraw* (sailboat*)* Festival which highlights the *Paraw* Sports Fishing, Green Island Adventure Tours, hook and line fishing and seafood culinary activities. The event aims to promote tourism in the city and enhance the livelihood of the people especially the small-scale fishers. Similarly, in Bolinao, the *Mangunguna* Festival (Fishermen's Festival) is held annually to celebrate the bountiful harvest from the sea. This event highlights water sports activities and the unique dining experience locally known as *Pidudungo* featuring fresh and quality seafood.

Data Collection

We used a descriptive approach in the analysis of market flow of reef catches and identification of involved market actors. The descriptive approach is commonly used for commodity flow and marketing studies (see for example Smith 1981; Jacinto and Pomeroy 2011).

Data were collected from November–December 2017 (Christmas holidays) and April–May 2018 (summer holidays) to document the composition of traded reef catches during peak season. A purposive sampling approach was applied in the selection of the study sites (barangays or villages): three barangays each in Anda, Bolinao, and San Fernando and four barangays in Alaminos. The Local Government Units (LGUs) through the City/Municipal Agriculture Officers were requested to suggest sites based on the estimated number of registered fishers, presence of coral reefs, presence of landing sites or fishing ports, and proximity to public markets and tourist attractions (Table 1). The proximity of study sites from public markets and tourist attractions (in km) were estimated from Google Maps. There is one official community fish landing center (CFLC) in Luciente I, Bolinao and in Lucap, Alaminos. The CFLC in Anda is located in Poblacion and Ilocanos Sur in San Fernando; both of these locations were excluded as study sites. These CFLCs were one of the recent projects of the Bureau of Fisheries and Aquatic Resources (DA-BFAR) aimed to reduce post-harvest losses and generate economic transformation in the fishery sector.

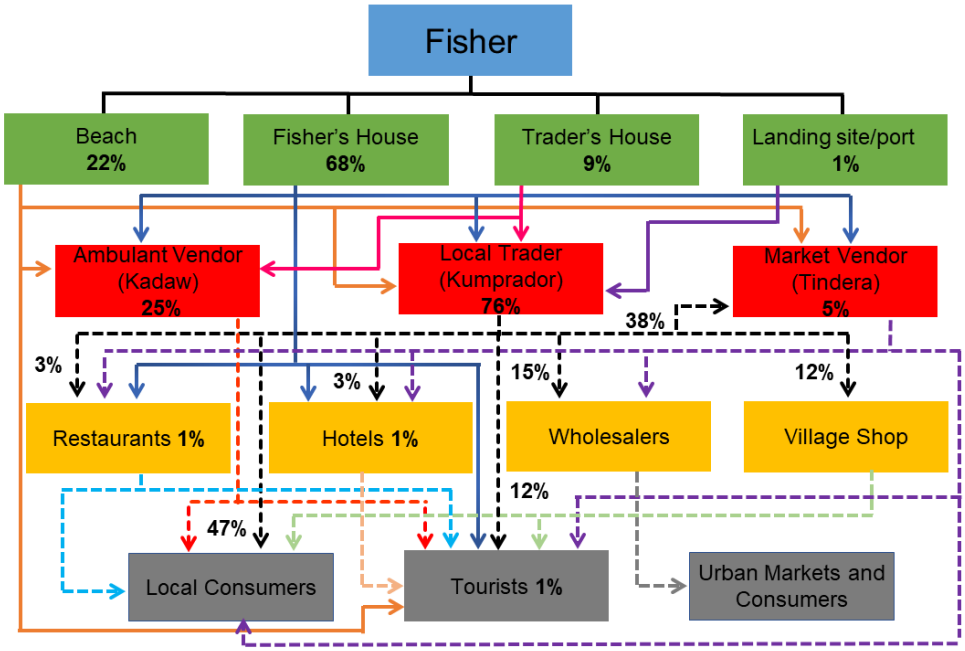

Figure 2: Market flow of reef-sourced seafood in the Lingayen Gulf. Solid lines lead to boxes representing primary market agents and broken arrows lead to boxes representing secondary market agents and final consumers.

A survey questionnaire was developed to elicit information on market flow, catch disposition, traded reef catches' composition and prices from key respondents. The respondents were composed of fishers, local traders, market vendors, and hotel and restaurant employees. The fishers use common fishing gears (i.e., spear, gillnet and lines) and target multiple species. The local traders referred to in this study were small-scale traders with minimal capital investments. Most of them reside within the fishing communities while some were from other villages and neighboring towns. Market vendors, mostly women, rent stalls at the public markets. All questions were written in English but were translated in the local dialect during the interviews. The aims of the study were explained to the respondents prior to the interview. A total of 138 fisher respondents were interviewed from Bolinao (25), Anda (42), Alaminos (42), and San Fernando (29). The number of respondents correspond to 2.1%, 5.7%, 10.6% and 6.5% of the registered fishers in the barangays, respectively. The number of fisher respondents (n=25 to 42) was within the optimal recommended sample size for case studies (see for example Ritchie et al. 2003; Marshall et al. 2013). Fishers were mostly interviewed in their houses or at landing areas.

The interviewed local traders, hotel and restaurant employees were selected based on the responses of the fishers as being involved in the marketing of their catch. The respondents were included in the interviews to triangulate the data gathered from the fishers. Local trader respondents (n=34) were interviewed through snowball sampling (i.e., existing respondent recruits another respondent). Some local traders suggested relatives or neighbors who are also traders living within the same community. Local traders were interviewed at their houses, at landing sites, or in their designated stalls at the public market. The regular interaction of fishers and traders was observed during landing of catch. Hotel and restaurant employees (n=13), mostly high-end, were randomly selected and interviewed in their respective facilities.

Interview results were complemented with field observations (at landing sites and public markets) and focused group discussions (FGD) in each municipality and city with participants from the City/Municipal Agriculture Offices, barangay councils, fisherfolk organizations, fishers and local traders (Bolinao =5; Anda = 6; Alaminos =7; San Fernando. =14). The FGDs were held in the municipal or city halls. The study objectives, overview and flow of the FGD were explained prior to the discussion. Participants were mainly asked regarding the market routes and the commonly marketed reef catches. Market flows were described by the participants through diagrams. Highlights from the discussions such as issues and problems faced by the fishers and local traders in marketing reef catches were recorded using a phone recorder which were later transcribed.

Data Analyses

The information gathered from the survey was summarized to illustrate the typical market flow of reef catches. The market distribution (including its relative contribution, expressed in %) of reef catches was described starting from the landing points to the different agent categories down to the final consumers. The local names of reef catches were translated to common English and scientific family names with the assistance of an experienced local researcher.

Percentages of fish and invertebrates were cross-tabulated with different agent categories. Descriptive analyses were used to identify reef catches commonly marketed by local traders and purchased by hotels. A two-way analysis of variance (ANOVA) was performed to determine the influence of the major fish and invertebrates and agent category on the average prices obtained from the local traders. Tukey's post hoc test was used to examine the differences in prices and agent category. All data gathered from interviews were encoded and statistically analyzed using SPSS 16.0.

RESULTS AND DISCUSSION

Market flow of reef catches

The market route of reef catches starts from the small-scale fishers then to landing points and passes through multiple local agent categories. Different market agents then bring the seafood to the final consumers (Figure 2).

Sixty eight percent of the fishers interviewed land all their catch in their own houses. Some fishers land their catch in the beach mostly in boat docking areas within their communities (22%) or in the trader's house (9%). Only 1% opted to sell their catch in designated fish ports or landing sites. Traditionally, most of the

Table 2: Common reef catches traded by fishers to different agent category.
En=English name; Av=Ambulant vendor; Lt=Local trader; Mv=Market vendor; T= Tourist; H=Hotel; R=Restaurant.

Family	En	Av	Lt	Mv	T	H	R
Nemipteridae	Bream	22%	78%	0%	0%	0%	0%
Portunidae	Blue Crab	15%	85%	0%	0%	0%	0%
Lethrinidae	Emperor fish	27%	64%	9%	0%	0%	0%
Exocoetidae	Flying fish	0%	67%	33%	0%	0%	0%
Serranidae	Grouper	23%	77%	0%	0%	0%	0%
Scombridae	Mackerel	20%	80%	0%	0%	0%	0%
Mugilidae	Mullet	67%	33%	0%	0%	0%	0%
Belonidae	Needlefish	40%	60%	0%	0%	0%	0%
Octopodidae	Octopus	29%	57%	0%	14%	0%	0%
Scaridae	Parrotfish	25%	58%	8%	8%	0%	0%
Carangidae	Bigeye scad	22%	72%	6%	0%	0%	0%
Penaeidae	Shrimp	13%	63%	25%	0%	0%	0%
Siganidae	Rabbitfish (1)	38%	60%	2%	0%	0%	0%
Siganidae	Rabbitfish (2)	17%	76%	3%	3%	0%	0%
Lutjanidae	Snapper	29%	68%	0%	0%	4%	0%
Loliginidae	Squid	31%	62%	8%	0%	0%	0%
Carangidae	Trevally	0%	92%	8%	0%	0%	0%
Acanthuridae	Unicorn fish	22%	78%	0%	0%	0%	0%
Labridae	Wrasse	43%	43%	0%	0%	14%	0%
	Mixed species	80%	0%	15%	0%	0%	5%

Note: Based on fishers' responses (no. of fishers=138, no. of responses=325) on how species are sold per market agent category. The percentages in each cell represent the portion of fishers selling a specific species to a particular market category. Rabbitfish (1) = locally known as barangen (*Siganus fuscescens*); Rabbitfish (2) =locally known as malaga (e.g., *Siganus guttatus* and *Siganus vermiculatus*); Mixed species = locally known as *sari-sari*.

fishers' catches are landed and sold on the beach (Hopkins and McCoy 1976). Despite the presence of municipal fish ports, most are underutilized because of limited post-harvest facilities and declining fish catch (Israel and Roque 2000). In this study, it was observed that fishers prefer landing their catch in their own houses or at traders' houses instead of traveling and spending more time to go to designated fishing ports or landing sites. Thus, the catch landing preference of fishers is mainly for convenience and is possibly the reason why municipal fishing ports and landing sites are underutilized. This might also have an implication on the reliability of monitoring data on fish catch landings.

The landed reef catches are primarily sold to three market agents: local traders (locally known as *kumprador*), ambulant vendors (locally known as *kadaw*), and market vendors (locally known as *tindera*). Ambulant vendors are mainly wives or family members of fishers and locals who peddle small quantities of fish from house to house within the community. Most fishers sell their catch to local traders (76%); fewer fishers sell to ambulant vendors (25%), and market vendors (5%). Very few fishers sell their catch to tourism-associated markets, such as hotels (1%), restaurants (1%), and directly to tourists (2%). The percentage values do not exactly sum up to 100% because some fishers (8%) sell to more than one market agent. Most fishers (76%) predominantly sell their catch to local traders because they are bound by the *suki* system, a patron-client relationship. The concept of the suki system between fisher and trader is widely known and studied in the Philippines (Pomeroy 1992; Jacinto and Pomeroy 2011; Drury O'Neill 2019), as well as in other developing countries (Merlijn 1989; Crona et al. 2010; Ferrol-Schulte 2014). In general, traders provide capital for fishing expenses (e.g., gasoline, gears, and boats) and in return, fishers must solely sell all their catch to the trader. Participants from the FGD confirmed the prevalence of the suki system in all study sites. They explained the advantages of fishers' engagement to suki system. In cases of fish oversupply, traders are obliged to buy fisher's catch due to their limited access to markets. Local traders, having wider market networks and adequate capital, can trade the reef catches to other neighboring towns and cities. Moreover, local traders are mostly willing to accept payments in installment basis from co-traders, which fishers cannot do because they usually need immediate cash. Additionally, fishers can easily access loans from local traders when they cannot go out fishing due to seasonal weather conditions and during financial emergencies (e.g., medical expenses and gear or boat repairs). The reliance of fishers to traders is considered debt of gratitude, a cultural Filipino trait.

Among the three primary market agents, the local traders have the widest market network. They sell to several market agents, namely: the town market, local consumers, village shops, other local traders, restaurants, tourists, and hotels. Ambulant vendors typically sell to local consumers (from house to house) and sometimes to tourists within the community to avoid expenses such as transportation cost, and market rental fees. Market vendors sell to multiple market agents in general (e.g., local consumers, wholesalers, hotels, restaurants and tourists). The local traders mostly sell to local consumers (47%) and market vendors (38%). They travel and sell to local consumers either by foot or by tricycle, which is a common means of transportation in local communities. Some local traders sell to wholesalers (15%), who then sell to neighboring towns. Other local traders sell to village retail shops (12%) and directly to tourists (12%). Though less frequent, they also sell to hotels (3%) and restaurants (3%). Like fishers, the percentage values do not exactly sum up to 100% because local traders sell to multiple markets agents. The multitude of market actors in reef fisheries has been observed in several coastal municipalities in the Philippines (Rosales et al. 2017) and other developing countries (Alam et al. 2012; Thyresson et al. 2013; Wamukota et al. 2015).

All local traders respondents are engaged in the *suki* system with the fishers. Having small financial assets, traders emphasized

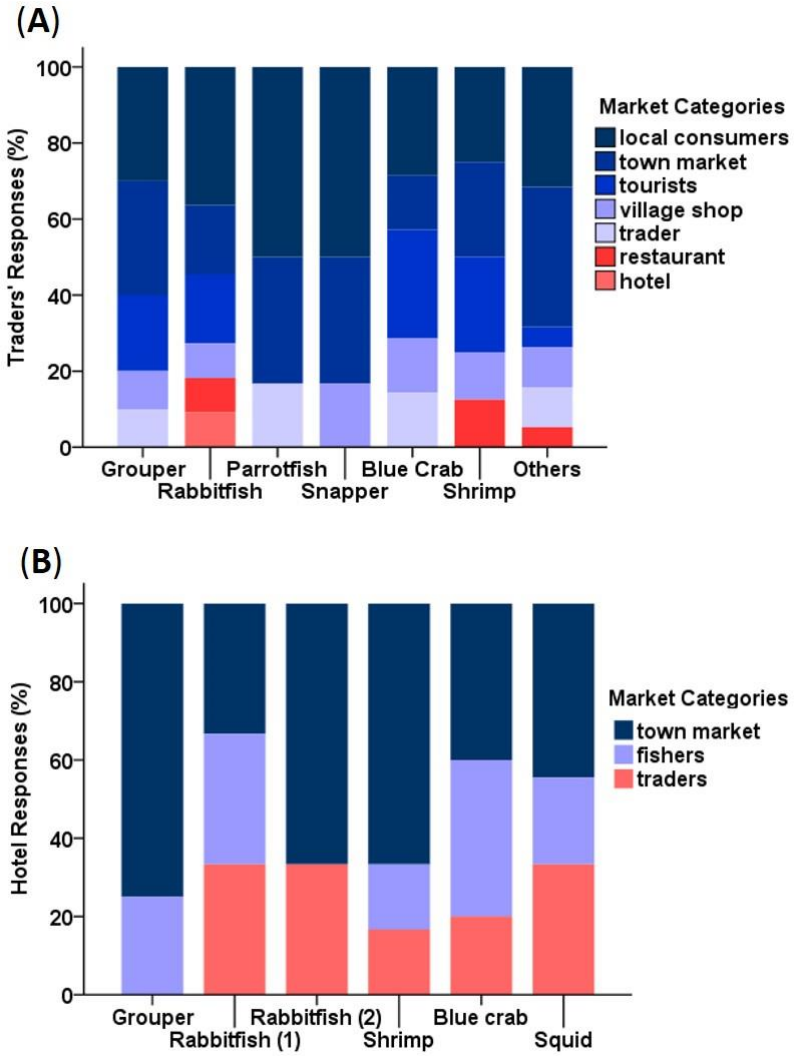

Figure 3: Preferences (%) of local traders (A, n=34) to where they sell seafood and preferences of hotel employees (B, n =13) where they buy seafood.
*Rabbitfish (1) = locally known as barangen (*Siganus fuscescens*); Rabbitfish (2) = locally known as malaga (e.g., *S. guttatus* and *S. vermiculatus*).
*Color gradients represents the highest (darkest) to lowest (lightest) value of traders' and hotel employees' preferences. Local traders have several options to sell their catches but restaurants and hotels are less preferred. Hotel employees prefer to buy from town markets because fishers and traders often cannot meet the quantity of seafood demand.

that providing loans to fishers entails risks because of the fishers' difficulty in settling their loans on time. Most local traders are involved in informal credit systems to continuously provide loans for the fishers. A similar case was observed by Drury O'Neil et al. (2019) in Iloilo, central Philippines, wherein local traders are involved in the so-called "5-6" lending scheme to keep fishers loyal to them for continuous supply of fish. Most local traders and market vendors avail loans from moneylenders such as Tulay sa Pag-unlad Incorporated (TSPI), Center for Agriculture and Rural Development (CARD) Incorporated, Pagasa, and Filipino/Indian '5-6'. Based on the results of FGDs, many local residents obtain loans from micro-finance and informal money lenders rather from government lending institutions. The main difficulties are in completing documentary requirements and submitting collaterals. Although more convenient, these informal lenders usually charge higher interest rate, thus, most local traders and market vendors struggles to settle their loans.

Composition of traded reef catches

Fishers sell a diverse composition of reef catches. The major fish and invertebrates commonly caught and traded are the following: rabbitfish (*Siganus fuscescens*, 12.9%), rabbitfish (e.g., *S. guttatus* and *S. vermiculatus*, 8.9%), snapper (e.g., *Lutjanus* sp. and *Lethrinus* sp., 8.6%), grouper (*Epinephelus* sp. and *Cephalopholis* sp., 8.0%), parrotfish (e.g., *Scarus* sp., 7.4%), blue crab (*Portunus pelagicus*, 6.2%), scads (e.g., *Selar crumenopththalmus* and *Selaroides leptolepis*, 4%), trevally (*Caranx* sp., 4%), squid (*Loligo* sp., 4%), and emperor fish (*Lethrinus* sp., 3.4%). A total of 17 families, composed of 14 fishes and four invertebrates are sold to different market agents (Table 2). A greater variety of fish and invertebrates are sold to local traders and ambulant vendors than those sold to market vendors, hotels and tourists. The most common fishes sold are groupers (Serranidae), rabbitfishes (Siganidae), snappers (Lutjanidae), and parrotfishes (Scaridae). These fishes including invertebrates such as blue crabs (Portunidae), shrimps (Penaeidae), and squids (Loligonidae) are highly sought by local residents and tourists. Mixed species (locally known as *sari-sari*), commonly composed of parrotfishes, groupers, and snappers are weighed and sold altogether to local traders, ambulant vendors, and local restaurants. Mixed species are often sold undersized and low-priced.

The most common reef catches sold by local traders include parrotfishes, rabbitfishes, snappers, blue crabs and shrimps. Local traders mostly prefer to sell the majority of these fish and

Figure 4: Average prices of four major reef catches when sold from fisher to local trader and to tourist. The selling prices varied among major reef catches ($F_{3, 82}$=15.20; P<0.05) and among agent category ($F_{2, 82}$=6.02; P<0.05) but there was no significant interaction between species and agent category ($F_{5, 82}$=0.20; P>0.05).

invertebrates to local consumers, town markets and tourists than to restaurants and hotels (Figure 3A). Two popular species of rabbitfish are commonly marketed, *S. guttatus* (locally known as malaga) and *S. fuscescens* (locally known as barangen). *S. guttatus* is commonly traded fresh while *S. fuscescens* is dried and salted and mostly sold to local consumers and tourists. Parrotfishes and snappers are mostly sold to local consumers and town markets. Blue crabs are traded mostly to local residents, town markets, and tourists. In some cases, local traders personally deliver selected high value seafood (e.g., groupers, shrimps, and blue crabs) to middle- or upper-class local consumers during special occasions and to consumers who have dietary preferences (e.g., pescatarian). A large portion of reef catches are marketed to local consumers, proving seafood is regarded as an important part of diet in the local communities. Consumer preferences are typically based on local eating habits and availability of seafood (Baluyut 1989).

Hotels mostly purchase fish and invertebrates from town markets (46%) and less frequently from fishers (30%) and traders (24%; Figure 3B). Groupers and the rabbitfish locally known as malaga are mostly purchased from town markets and less frequently from fishers and traders. While the rabbitfish locally known as barangen are usually purchased from fishers, local traders and town markets. Similarly, shrimps, blue crabs and squids are frequently purchased from the town markets. Fishers and local traders occasionally sell larger high-quality catches directly to hotels and restaurants. Smaller sizes are usually sold to local consumers while unsold catches are often brought for home consumption. This observation implies that the market flow of reef catches may depend on the size and quality of species being caught and sold. Similar findings were reported by Crona et al. (2010) and Thyresson et al. (2013) in Kenya and Zanzibar. Results of this study indicates a good opportunity for fishers and local traders to improve their income as they may charge higher prices for a good selection of high-quality seafood. Furthermore, catching high-value seafood at optimum marketable sizes will not only increase income for fishers and other market actors, but also provide ecological benefits. In principle, fish and most seafood in general, when captured at optimum sizes allow them to reproduce (Green et al. 2003) and maintain a balanced ecosystem. Hence, it is equally important to consider the significant ecological functions of reef-associated species (e.g., groupers, trevally, parrotfish). Hotels, restaurants as well as tourists could play part and support fisheries resources management by purchasing sustainably caught seafood. In 2016, the first Sustainable Seafood Week was held in Manila with the aim of promoting sustainable seafood in the country. The event was participated by various stakeholders, including government and non-government organizations, seafood companies, high-end hotels, and restaurants (Lahteenkorva 2017).

Market prices of high-valued fish and invertebrates

The average prices of the four major reef catches varied with different market agents (Figure 4). Among the major fish and invertebrates, groupers were consistently highly-valued, followed by rabbitfishes (e.g., *S. guttatus* and *S. vermiculatus*), blue crabs, and parrotfishes. Initial selling prices (fisher's price) of all major fish and invertebrates were apparently the lowest. Regular retail price (local trader price) was generally higher when sold to regular consumers and highest when sold to tourists. The average market prices were not significantly influenced by types of fish and invertebrate sold by various market agents ($F_{5, 82}$=0.20; P>0.05). However, the average market price (in PhP) significantly varied among all four major catches ($F_{3, 82}$=15.20; P < 0.05): parrotfish (95 ± 57), blue crab (152 ± 44), rabbitfish (200 ± 43), and grouper (211 ± 73). There was no significant difference in prices between grouper and rabbitfish (Tukey's test; P > 0.05). Similarly, average market prices significantly differed among the three market agents ($F_{2, 82}$=6.02; P < 0.05): fishers (158 ± 64), local traders (182 ± 72), and tourists (243 ± 47). There was a significant difference between fisher price and tourist price, as well as between local trader price and tourist price (P < 0.05), but there was no significant difference between the fisher price and local trader price (P > 0.05). The market prices were highest when sold to tourists. However, fishers rarely perform direct selling to tourists. The insignificant price differences observed when major reef catches are sold from fishers to local traders imply that fishers may not be gaining a

significant amount of income from selling to local traders. This observation could support testimonies of small-scale fishers that they do not accrue economic benefits from trading their catch (Jacinto 2004). Prices of the major reef catches are even higher when cooked from hotel and restaurants and served directly to tourists. Tourists, as expected, can afford to pay more for fresh seafood. Hence, hotels and restaurants, having direct access to tourists have the highest income in seafood trade compared with other markets. Similar findings were found in Cape Verde in Africa wherein restaurants, being closer to tourist consumers, generate higher incomes than other market actors (Rodrigues and Villasante 2016).

Opportunities and challenges in linking marketing of reef catches and tourism

Result of this study shows potential opportunity in marketing reef-sourced seafood to tourism-associated markets. Small-scale fishers and local traders could obtain higher income when reef catches (especially the qood quality) are sold to tourism-associated markets and tourists. Prices of seafood, in general are high during the peak season. The ecotourism programs initiated in Lingayen Gulf opens an opportunity to promote small-scale fisheries products including fresh seafood. Moreover, tourism-related livelihoods (e.g., transport, tour guides) could be developed in which small-scale fishers could easily participate (Cruz-Trinidad et al. 2009). Experiential activities to showcase fishing culture could also be introduced. In some cases, local tourists from the cities and those residing abroad who are visiting or returning to the Philippines prefer buying seafood directly from the beach for personalized experiences such as untangling catch (e.g., fish and crabs) from fishers' nets, bamboo rafting and picking shells. The appealing features of the coastal areas, popular reef-tourism activities including diving, snorkeling, boating and fresh seafood attracts tourists (Huttche et al. 2002; Spalding et al. 2017). These extraordinary experiences especially attract the younger generations, who are often engaged in various social media platforms. In the rise of digital technology, social media is becoming popular as a tool to promote tourism by sharing travel experiences (Venkatesh and Suresh 2016). In Europe, the demand for seafood is often associated with the seasonal arrival of tourists (CRFM 2016) and during holidays (FARNET 2013). For example, in Sardinia, Italy, tourists spend their holidays in pesca-tourism activities, wherein they can participate in traditional fishing with the local fishers and enjoy their catch with the local community. Fishery-related tourism such as this promotes economic benefits for fishers (Meneghello and Mingotto 2016).

While marketing of reef catches could generate higher income, there are challenges especially for the small-scale fishers. Ideally, the closer the fishers to tourists, the greater the opportunity of generating higher income. Direct marketing of seafood from fishers to the final consumers is the ultimate form of short chain distribution. In this way, fishers could increase their opportunities to add value to their catches (FARNET Guide, 2014). However, direct selling to tourists is currently limited as fishers and trading agents are predominately tied to each other. Engagement in the *suki* system may entail drawbacks, such as possible conflicts with the local trader if fishers conduct direct selling.

Though some fishers and local traders can perform direct selling to hotels and restaurants, these tourism-associated markets prefer buying seafood from the public market because of the inconsistency of supply from fishers. Similar study in Western Visayas showed that majority of seafood supply for resorts are purchased from the local market because of the good quality, consistency, availability, and efficiency of supply (Lahteenkorva 2017). Additionally, some fishers were reluctant to interact with tourists. This observation could be due their minimal appreciation and understanding of tourism and the benefits it could offer (Porter and Orams 2014; Wibisono and Rosyidie 2016).

Due to the increasing demand for seafood, even hotels and restaurants are also competing with local residents for seafood availability. In such cases, prices of seafood become more expensive especially for local residents. Anecdotal reports indicate that local residents prefer buying meat products over seafood especially during peak season due to excessively high prices. Social Weather Stations (2018) also reported the perception of local consumers that fish in the market are becoming more expensive.

CONCLUSION

Reef-sourced seafood in Lingayen Gulf are largely marketed to local consumers and there is also a potential market from the tourism sector. Higher prices of high-valued fish and invertebrates obtained from tourists could be an opportunity for fishers and small-scale traders to improve their income. However, most fishers have limited access to markets due to their engagement to *suki* system. Hence, a stronger and mutually beneficial partnership among market players is suggested. It is important to have an effective financial assistance system for small-scale fishers, especially during bad weather conditions and natural calamities, when they are most vulnerable. The high demand for seafood especially during the holiday season could lead to issues such as excessive resource extraction and seafood overpricing. A comprehensive monitoring of catch sizes, volume and market prices of major fish and invertebrates especially during peak season, should be conducted. It is important to note the unmonitored landing sites (e.g., fishers' and traders' houses) when planning for fish catch monitoring activities. For future research, knowledge on tourists' motivations regarding their seafood preferences, including information on how much they are willing to pay for beach holiday trips and personalized experiences should be considered. This could provide a better understanding on the extent and trends of the demand for seafood and tourism. Such information could be useful for local government authorities to implement stronger management regulations for ecologically important reef species, design appropriate seafood pricing policies and plan for marketing strategies to enhance fishers' incomes.

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CONFLICT OF INTEREST

None.

CONTRIBUTIONS OF THE AUTHORS

SPMilan and OBaba conceptualized the study. SPMilan wrote the main parts of the manuscript. SSalmo contributed to the methods of the study and in writing the manuscript.

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