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Assessment of Post-harvest Fish Losses and Fish Consumption in Coastal Communities Along San Bernardino Strait and Samar Bays & Channels

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Assessment of Post-harvest Fish Losses and Fish Consumption in Coastal Communities Along San Bernardino Strait and Samar Bays & Channels

FINAL REPORT
Submitted to OCEANA

by

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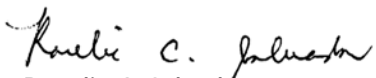

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Executive Summary

Rationale and Approach

Post-harvest fish loss or the measurable reduction in quantity, quality or monetary value of fish and fisheries commodities in the distribution chain, is a major socio-economic concern. It results not only in loss of potential income of players in the fisheries industry, but also jeopardizes food security, particularly in the rural and coastal communities where fish and aquatic commodities are the most affordable and available sources of animal protein and micronutrients.

The traditional daily diet of Filipinos includes fish, thus the demand for fish and fisheries commodities as food is expected to increase over the years as population growth increases. The increase in the demand puts intense pressure on the capture and culture sectors of the fisheries industry, but more so on the resource which are already stressed out due to challenges brought about by climate change and unsustainable anthropogenic activities. It is imperative that catch and harvest from marine and other bodies of water be maximally utilized as food, and wastage or loss be reduced. Initiatives to alleviate food insecurity and malnutrition should not only involve increasing food production and ensuring access to food supply, but should also put in place post-harvest management strategies.

This project was conducted to generate baseline and key information on post-harvest fish losses and fish consumption in selected coastal communities along Samar Sea, particularly along San Bernardino Strait in Northern Samar and along Samar bays and channels in Samar. Samar Sea is one of the richest fishing grounds of the Philippines within Fisheries Management Area (FMA) 7.

Baseline and key information on post-harvest fish losses and fish consumption were gathered using the micro approach, specifically the Informal Fish Loss Assessment Method (IFLAM), wherein primary data were directly collected from stakeholders or players along the fish distribution chain through workshops, focus group discussions (W-FGDs), Key Informant Interviews (KII) and Semi-Structured Interviews (SSI) using pre-tested questionnaires. Available data pertaining to programs on post-harvest and fish consumption at the municipal offices of the Department of Agriculture (DA) and Department of Health (DOH) in the 19 target municipalities were consolidated. Datasets and production reports from the Bureau of Fisheries and Aquatic Resources of Region 8 (BFAR 8), the Philippine Statistics Authority (PSA) and the Department of Science and Technology-Food and Nutrition Research Institute (DOST-FNRI), and published literatures, were also reviewed and analyzed.

Fish consumption and acquisition patterns surveys involved 402 respondents in identified far-flung, 'poblacion' (town) and coastal barangays. Locations of fish landing sites in the target municipalities were identified based on data provided by the DA municipal offices. Status of operation was assessed through interviews with fishers and Agricultural Technologist for Fisheries (AT-Fisheries), and ocular visits to the sites.

Estimation of loss was based on the "food-focused approach" proposed by FAO wherein food or part of food is considered "lost" if these were originally intended for human consumption but were lost or discarded at any point in the distribution chain. Types, characteristics, causes and extent of fish losses were described and quantified using the value chain concept wherein losses are estimated and categorized at each node in the fish distribution chain.

Significant Findings

Fisheries sector profile of target municipalities

Fishing and fish trading are the major sources of income of people residing in the 19 municipalities assessed, particularly in the island towns wherein about 12.09% – 15.91% of the total population are directly involved as fishers, while some others derive income from aquafarming, trading and processing activities. Poverty incidence is relatively high ranging from 23.97% – 37.75% in the municipalities along San Bernardino Strait. In the municipalities along Samar bays and channels, high poverty incidence rates were reported in the island towns of Daram (41.18%), Talalora (37.16%) and Zumarraga (38.87%). The fishing grounds in these areas are one of the richest in the country supplying 45% (Northern Samar 17%, and Samar 28%) of fish and aquatic products in the Eastern Visayas region as per 2018-2022 fish production data provided by BFAR 8.

Types, characteristics, drivers and quantitative estimate of post-harvest fish losses

Three types of post-harvest fish losses were observed occurring throughout the fish distribution chain in the target municipalities, namely physical loss, quality loss and market force losses. Losses were reported to be seasonal and species-specific occurring during the glut season of sardines (May – November), tuna, and anchovy (May – December). Quality loss is the most pronounced and predominant type occurring in the entire fish distribution chain, discernible physically as burst belly, lacerations or physical deformation.

High physical loss (50% - 100%) was reported in aquaculture due to total loss of cultured stocks (milkfish, grouper, tilapia and mussels), when culture units (ponds, pens, cages, culture lines) were damaged during bad weather. During episodes of harmful algal blooms (HAB) or red tides, harvested stocks are totally discarded to avoid harm to consumers.

Generally, losses were observed to be higher in municipalities with multi-tiered trading chain or when fish catch are passed on to several traders (i.e brokers, wholesaler, retailers or peddlers) before reaching the consumers. Losses are negligible (3%-5%) in municipalities with short fish market or distribution chain, when only few traders are involved. When multiple actors are engaged along the fish value chain, the nodes where fish may be lost increases, resulting in increase in percent loss and complexity in measuring loss.

The species with highest volume of loss in the San Bernardino Strait and Samar bays and channels in 2018-2022 are: sardines (*Sardinella lemuru*) (5,417.12 MT), anchovy (4,366.73MT) and slipmouth (4,254.41 MT). These species are the commonly purchased and consumed by low-income groups.

Estimated post-harvest fish losses in the entire distribution chain (i.e. from fishing to marketing stage and processing stages) are 38.39 % and 40.34% in the municipalities along San Bernardino Strait and Samar bays and channels, respectively. The high percentage of loss in a catch oversupply situation is attributable to the cumulative value of all types of fish losses simultaneously occurring, especially when market and post-harvest management systems are not in place, and facilities are lacking.

Post-harvest handling of fish and aquatic commodities in the SaBELANS and ALSBACH municipalities

Fish and other aquatic commodities are sold in open market stalls and booths in all municipalities assessed. The catch are placed in “banyeras”, or styrofoam boxes, or ordinarily displayed in the pavements and tables exposed to flies, air and sun, and are kept seemingly fresh by periodic sprinkling with iced water. These practices result in significant quality loss.

High-value species, such as groupers, mackerels, crabs, squids and cuttlefish, are exported outside of the municipality to other cities and regions, and are unavailable to local consumers. Catch rejected by export traders (either oversized or undersized) are sold at the local markets at 73.3% reduced price and are accounted as quality loss.

There is no commercial large-scale processing centers or fish canning factories in the areas within the jurisdiction of member-municipalities of the two alliances. Majority of processors of fish and fishery products are women. Due to lack of drying facilities, physical loss for dried fish is high (50%-100%) during rainy season due to infestation with maggots.

In far-flung barangays, fish find its way to the food table of the people, which are mostly rural farmers, through the mobile peddlers or vendors. Due to lack of training on proper handling methods, the fish product that are brought to these remote areas may have already been nutritionally compromised.

Locations and status of operation of fish landing centers

There are currently 11 fish landing centers reported in the SaBELANS area and nine are operational, which are actually homes of the traders where transactions and processing for transport are done. In the ALSBACH area there are also 11 fish landing centers and only seven centers are operational. Of the six Community Fish Landing Centers (CFLCs) funded by the government , only three are operational.

Three of the six government-funded CFLCs have been 80% completed but are not operational due to lack of equipment for cold storage and source of power. These are not operational also because fishers find it convenient to sell directly to buyers at sea (unlanded catch), or to brokers and traders at fish ports in the mainland - Victoria and Allen in SaBELANS area and Catbalogan City Port in the ALSBACH area.

Estimated volume and seasonality of fish landings

Catches of municipal fishers from target municipalities consist of small pelagics such as anchovy, sardines and slipmouths. These species are caught all-year round especially in island municipalities. Tuna and wild groupers, the predators of the small pelagics, have been reported to have high fish loss when catch volume is beyond the capacity of the market to absorb. Sardines are highly seasonal with glut seasons during May–November in San Vicente, and November-December in Capul and San Antonio. In coastal municipalities along Samar bays and channels, fisher-respondents identified four species - groupers, slipmouths, anchovy and sardines- with high post-harvest fish losses during peak fishing seasons.

Nutrition status and programs in coastal communities along San Bernardino Strait and Samar bays and channels

Food insecurity incidence rates in Samar and Northern Samar are 70.5% and 75.1% , respectively and are higher by 16.6% and 21.2% than national average (53.9%). National Nutritional Council's 2022 Operation Timbang (OPT) results report incidences of stunting, wastage, and iodine deficiency which may indicate insufficient protein and fish intake on a provincial level for the Preschool Age, School Age, Adolescents, Lactating, and Elderly demographic.

For both provinces, wasting and thinness increases among the 0 to 59 months, 5 to 10-year and >10 to 29-year demographic and is higher within the poor. The 2022 OPT results show a decrease in prevalence of Wasting (2.95% and 1.85%) as well as a decrease in Stunting (15.10% and 16.67%) in comparison to 2021 OPT results, for Northern Samar and Samar, respectively.

Nutrition variables of great concern given its higher results than the national baselines are Stunting (0-59 months), Minimum Acceptable Diet (6-23 months), Wasting or Thinness (0-59 months and 5-10 years old), Iodine Deficiency (6-12 years old and Non-Pregnant/Non-Lactating Women).

Comparing the 2018-2019 data for Samar and Northern Samar to the targets of the Philippine Plan of Action for Nutrition (PPAN) 2022-2028, both provinces are able to meet targets for Overweight, Median Urinary Extraction for School Age Children (6-12 years old), while Northern Samar is able to meet its targets on the Median Urinary Iodine Excretion for Lactating Women (15-49 years old).

Fish consumption patterns in coastal communities along San Bernardino Strait and Samar bays and channels

Results of W-FGDs, KII and SSI show that fish is generally consumed primarily because people perceived it as nutritious (27.8%), delicious (27.53%) , affordable (13.97%) and available (13.95%). Fish and fish products are generally acquired from roving fish vendors (45%) or at the wet market (22%). The average monthly allocation for purchase of fish and fish products is PhP 1,792.92 across all types of communities and between provinces, roughly 36% of the average declared household income. These data are, however, vastly different from provincial estimates based on PSA's Family Income expenditure which places fish consumption at 16% and 15% of the total food budget for Samar and Northern Samar, respectively.

At an average, a serving size of 1.15 palm size or 97.75 g of fish is consumed per meal. For families in fishing communities, about 1000-2000g of catch is set aside for daily consumption or about 100 g of fresh fish per member per meal for a household of five members. Majority (54%) of respondents in far-flung, 'poblacion' and fishing communities consume fish on a weekly basis, at a minimum of 2-3 times a month. Observed average intake or quantity of fish consumed does not vary greatly from recommended intake, but this result does not imply that nutrient requirements are met specially if the fish consumed are of poor quality and the less-nutritious species.

Species of fish and fisheries commodities

For both ALSBACH and SaBELANS- member municipalities, the top species of fish consumed on a daily basis are milkfish (*Chanos chanos*), round scad (*Decapterus* sp.), anchovy (*Stolephorus* sp.), sardines (*Sardinella* sp.), mackerel (R*astrelliger* sp.), rabbitfish (*Siganus* sp.), frigate tuna (*Auxis thazard*), squid (*Loligo* sp.), and green mussel (*Perna viridis*). Dried fish and canned sardines were also reported in the top 20 consumed fish and fisheries products by respondents in SaBeLANS-member municipalities.

Contributions of fish and fish products to energy and nutrient Intake

A meal with an average edible portion of 71.86 g of fish and fish products can provide about 19% protein. Round scad and sardines can provide 17%, rabbitfish 16%, milkfish 22%, and shrimp 20% protein per meal on a daily basis.

Frigate Tuna (*Budlis/Tulingan*) and Anchovy (*Bolinao*) have the potential to supply about ¼ of the recommended nutrient intake in one meal. At the average buying price of PhP125.00 and PhP 135.00 per kilogram respectively, these two species are good candidates for projects aimed at improving macro- and micronutrient intake for communities within Samar and Northern Samar.

Opportunities and Recommendations

On reduction of PHFL

The post-harvest fish loss values in the San Bernardino Strait and Samar bays and channels are higher than those reported in the Philippines. These findings justify the need for interventions to reduce post-harvest fish losses in the assessed municipalities, particularly in municipalities with high poverty and malnutrition rates. Based on the results, the following are recommended:

- Improvement and institutionalization of catch monitoring and reporting systems in coastal municipalities covered by the two alliances. Accurate catch or production data are vital to identify and quantify fish losses.
- Trainings of women and mobile peddlers on post-harvest handling and processing to minimize quality loss, and provision of livelihood support.
- To reduce physical and market force losses, limitation of catch volume of species reported to have high PHFL during peak fishing seasons is recommended.
- An organized marketing system needs to be also instituted to link fishers and aquafarmers to buyers, and to forge upstream and forward market linkages among players in the fish distribution chain.
- A price regulating mechanism that is area and species-specific be set up to ensure availability of reasonably-priced fish and fisheries commodities in the locality without denying the fishers and aquafarmers opportunity to earn fair profits.

- Fish and fisheries commodities are highly perishable commodities, thus establishment of appropriate off-site (i.e. renewable energy-powered cold storage/catch monitoring boat) or on-site cold storage and processing facilities play crucial roles in providing year-round supply of fresh products and reduction of any type of post-harvest fish loss. Alternatively, the existing non-operational CFLCs can be refurbished into multi-purpose establishments, not only for cold storage and trading, but also as processing and tourism facilities.

On fish consumption and mitigation of micronutrient deficiency

- Opportunities identified in the study which can be aligned with PPAN are the inclusion of the fisheries sector in KADIWA* stores, improving market access and storage, as well as processing of high-nutrient fish species, in order to reach far-flung communities whose access to fish is limited to those sold by fish vendors, and who can only purchase and consume fish and fish products at most once a week.

- Improving access, affordability, and production of healthier, community-level processed fish for communities with limited access to fresh fish, most especially during the rainy season where fresh fish is less available across far-flung, 'poblacion', and fishing communities.

- Lastly, utilization of the following readily available fish species in nutritional improvement programs is recommended to address the following challenges on undernutrition and micronutrient deficiencies:

    - Wasting and stunting (among 0-59 months old; 5-10 years old): Frigate tuna, anchovy, milkfish, round scad, rabbitfish, and sardines can provide 16%-26% of the Recommended Energy Intake (REI) of protein per meal, with Frigate tuna potentially contributing the highest at 26%.

    - Vitamin A deficiency: Rabbitfish, milkfish, anchovy, and frigate tuna can provide 10-15% of the Recommended Nutrient Intake (RNI) for retinol with rabbitfish and milkfish potentially providing 15%.

    - Iron Deficiency : Anchovy, sardines, frigate tuna, and milkfish can provide 8-12% of RNI for Iron, with anchovy potentially providing the highest at 12%.

* The KADIWA is an initiative of the Department of Agriculture that is programmed to ensure the availability and affordability of food in areas with high demand and in communities with low-income families. Farmers cooperatives and associations, members of the private sector, and other agricultural stakeholders were tapped to implement a direct and effective food supply distribution system throughout the country.

INTRODUCTION

Fish and other edible aquatic commodities are one of the cheapest sources of protein, essential minerals, vitamins and micronutrients. In the Philippines, about 11.68% of the food intake of each individual consists of fish and fisheries products estimated to be equivalent to 93.90 g/day, which is 63% higher than intake for meat and meat products (BFAR, 2021). Reported consumption of fish is 4.45 MT live weight annually, and the mean capita fish consumption is 34.27 kg per year (Cabral, 2023).

Evidently, Filipinos largely depend on fish and aquatic commodities as one of the major sources of nutrition. Growing demand for fish and fishery commodities as food, brought about by population growth, imposes significant pressure on the fisheries resources and the capture and aquaculture sectors of the industry. Increasing fishing effort to keep up with demand for food puts intense pressure on aquatic resources, which have been already stressed out due to challenges brought about by climate change and destructive anthropogenic activities. Catch and harvests from marine and other bodies of water need to be maximally utilized as food, and wastage or loss in the production, marketing, processing and distribution chain be reduced.

Post-harvest fish loss (PHFL) is the measurable reduction in quantity, quality or monetary value of fish or fisheries commodities in the distribution chain. It is a socio-economic concern which occurs in every step in the value chain or fish distribution chain, and results not only in loss of potential income of fishers, traders and processors, but also jeopardizes food security particularly in rural and coastal communities. Fish and aquatic commodities are highly perishable commodities, with losses and wastage reportedly 50%-60% higher than agricultural commodities (Kerthana et al., 2022), and accounts to 10% of the total production of capture fisheries and aquaculture globally (FAO, 2021). The magnitude of the detrimental impact of food losses on human nutrition has led the United Nations (UN) to include reduction of post-harvest losses as one of the 2030 Sustainable Development Goals (United Nations, 2014).

Alongside sustainable management, reducing post-harvest losses in the various sectors of the fisheries industry should be an important development goal. Fish and fisheries commodities should deserve more attention in food policies owing to its importance in the food baskets of Filipinos and as an income source of those involved in the fish distribution chain. Reducing post-harvest fish losses will result in minimized gap between supply and demand, and ensures that the fish we eat comes to us in the freshest and nutritionally uncompromised state. Fight against food insecurity and malnutrition should not only involve increasing food production and accessibility to food supply, but should also seriously consider improvement of post-harvest management systems with full understanding of local conditions and factors affecting value chains of fish and fisheries products.

This project was conducted to gather key information on post-harvest losses and fish consumption in selected coastal municipalities along Samar Sea, particularly in Northern Samar along San Bernardino Strait, and along Samar Bays and channels, and to generate baseline data for the development of Fish in Nutrition Systems (FINS) campaign of OCEANA in the Philippines.

Specifically, the project aimed to: a) identify the drivers, characteristics, types and quantitative extent of post-harvest fish losses; b) locate and assess the status of fish landing sites in the target municipalities, and gather data on volume, species composition, frequency, seasonality, distribution, and processing of landings; c) gather data on fish consumption and micronutrient deficiencies; and d) determine how people in the target municipalities acquire fish that they consume and what fraction of income is spent on purchase of fish and fisheries products.

METHODS AND APPROACH

1. The assessments sites

Samar Sea is one of the richest fishing grounds in the Philippines covering 3,820 km² surface area. It is connected to the Philippine Sea by San Bernardino Strait, and bordered in the East by several bays, gulfs and channels such as Maqueda and Villareal Bays, covering part of Fisheries Management Area (FMA) 7. The communities along Samar Sea are largely dependent on fisheries for livelihood and fish as staple food. To properly and sustainably manage the fishing ground, local government units organized alliances – the San Bernardino Local Government Alliance of Northern Samar (SaBeLANS) in the North, and the Alliance of Local Government Units along Samar Bays and Channels (ALSBACH) in the eastern borders. In the first quarter of 2022, Samar and Northern Samar recorded the highest volume of fish production from commercial fisheries among provinces in Eastern Visayas contributing 2,165MT (54.95%) and 915 MT (12.8%) respectively, to total production in the region (PSA, 2023).

Baseline data on PHFL and fish consumption were gathered from six SaBELANS-member municipalities along San Bernardino Strait (Allen, San Isidro, Victoria, San Antonio, Capul and San Vicente), and 13 ALSBACH-member municipalities (Catbalogan City, Calbiga, Daram, Hinabangan, Jiabong, Motiong, Paranas, Pinabacdao, San Sebastian, Sta. Rita, Talalora, Villareal and Zumarraga) along Samar bays and channels (Figure 1).

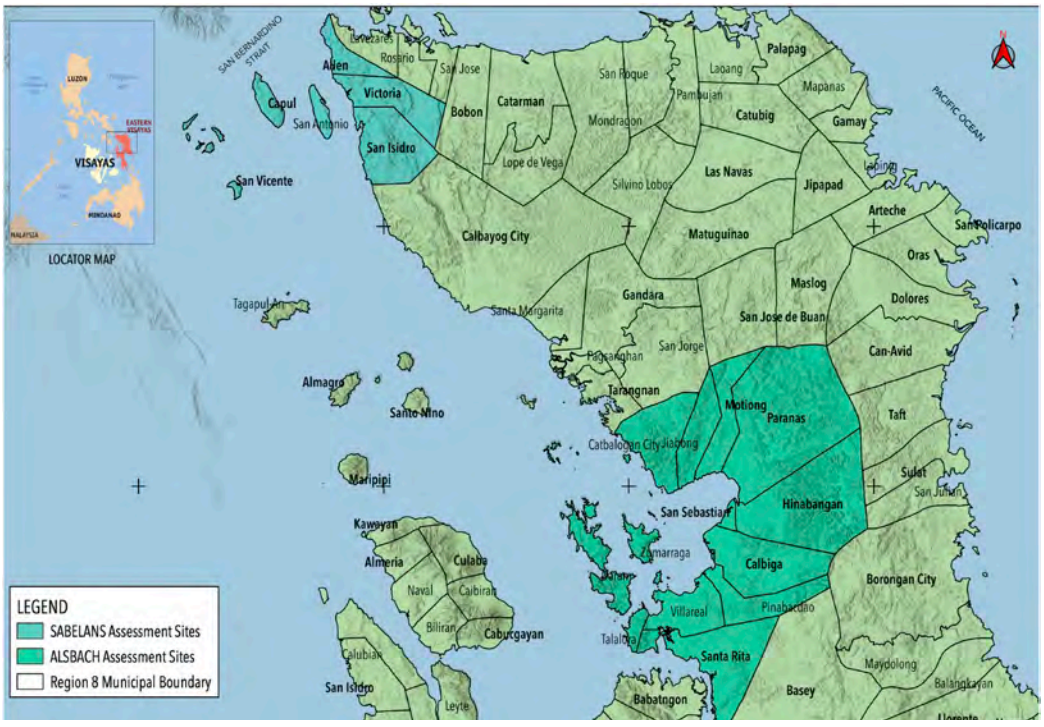


Figure 1. Locations of the 19 assessment sites along San Bernardino Strait and in Samar bays and channels. SaBELANS-member municipalities: Allen, Victoria, San Isidro, San Antonio, Capul, and San Vicente; ALSBACH-member municipalities: Catbalogan City, Jiabong, Motiong, Paranas, Hinabangan, San Sebastian, Calbiga, Pinabacdao, Sta. Rita, Talalora, Villareal, Daram, and Zumarraga.

2. Assessment of post-harvest fish losses

2.1 Review of secondary data

Courtesy calls and meeting-discussions with the Chairpersons and Secretariat of the two alliances were held as preliminary key informant interviews, and consultations to select barangays representing the far-flung, 'poblacion' and coastal communities. Data on the profiles of the fisheries sectors and the stakeholders involved in fish production and distribution were gathered from the DA offices of the target municipalities using PHFL Form 1 (Appendix 1). Datasets and reports on fish production and PHFL were requested from the regional and municipal offices of BFAR 8 and from Local Government Units (LGUs). Information on PHFL globally and locally were also drawn from published reports and literatures, and were incorporated in this report.

2.2 Primary data collection

2.2.1 Workshop-cum-Focus Group Discussions (W-FGD)

Baseline information on PHFL in the 19 target municipalities were gathered by conducting six W-FGD in the municipalities of Allen (covering the municipalities of Allen, San Antonio, San Isidro and Victoria), Capul, San Vicente, Catbalogan City (for Catbalogan City, Jiabong, Motiong, Paranas, and Hinabangan), Calbiga (for the municipalities of Calbiga, Pinabacdao, Sta Rita, San Sebastian and Villareal), and Daram (for Daram, Talalora and Zumarraga). Through these one-day W-FGDs, data on species and monthly volume of landings, seasonality, fish distribution flow, drivers, characteristics, types and quantitative estimates of PHFL in each stage of the chain were generated. The process of how the W-FGDs were conducted is shown in Figure 2. Twelve paticipants, composed of LGU representatives (Municipal Agriculturist and the AT-Fisheries), fishers, traders (wholesalers, mobile vendors or peddlers, and market stall owners), aquafarmers and fish processors, in each municipality were selected by the LGU from the list of registered fishers.

2.2.2 Key Informant Interviews (KII)

Key informants (Presidents or officers of fisheries associations or organizations, LGU representatives, owners of private ports, women's groups, traders and processors) and other stakeholders were interviewed using Semi-structured Questionnaires (Appendices 2-6) to validate the outputs of the workshops. The key informants who were interviewed and participated in the FGDs are listed in Appendix Table 1.

2.2.3 Ocular surveys

Locations of fish landing sites in the target municipalities were identified based on data provided by the DA municipal offices. Status of operation was assessed through interviews with fishers and AT-Fisheries, and ocular visits to the sites. Estimates on the volume, species composition and seasonality of landings were obtained through the W-FGDs and data provided by the LGUs.

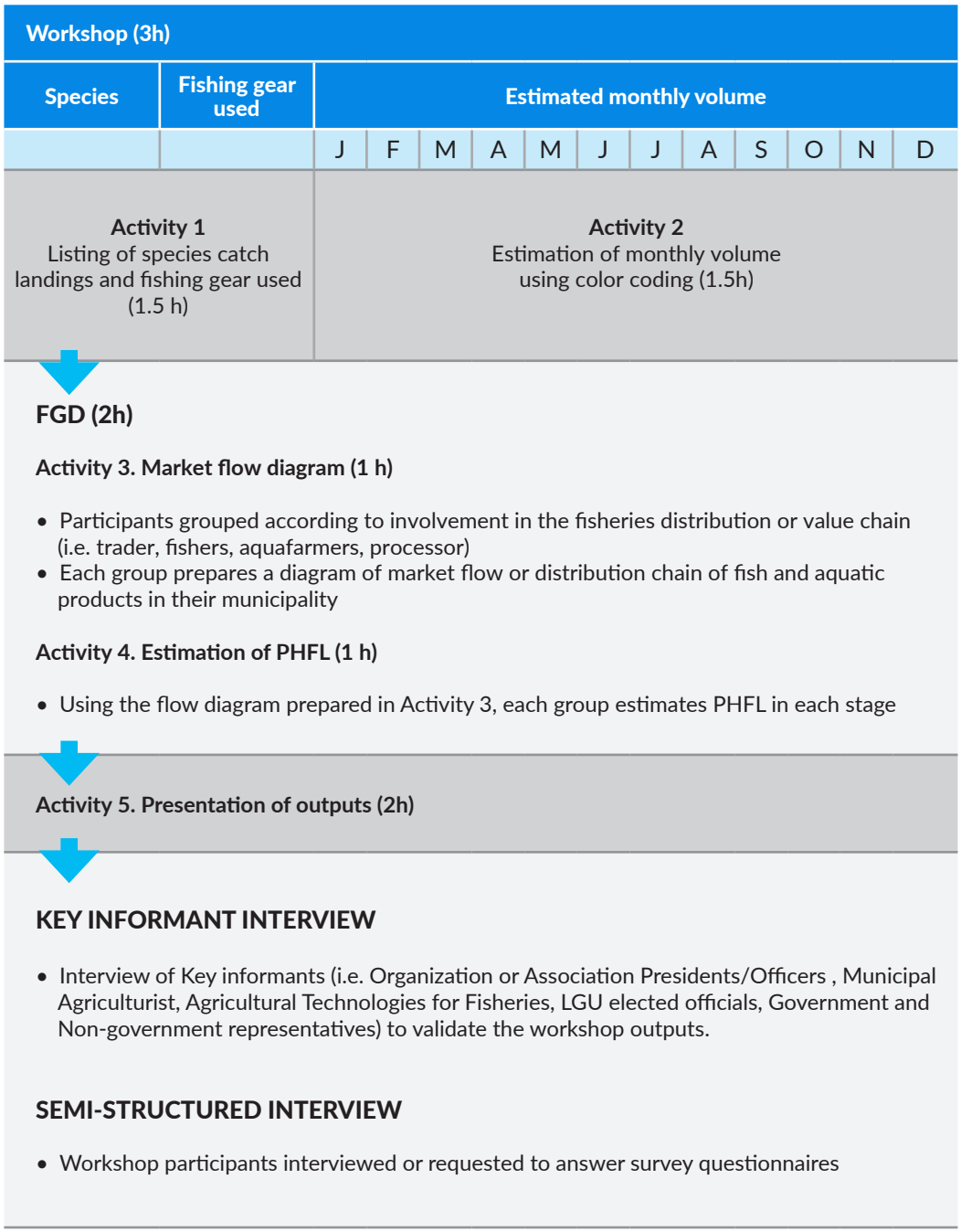


Figure 2. Activity flow of the Workshop-cum-FGD (W-FGD) method and approach employed in gathering data on species landing, estimates of monthly volume and seasonality of catch, fish distribution flow and PHFL in coastal municipalities along San Bernardino Strait and Samar bays and channels.

2.2.4 Estimation of PHFL

Fish losses after harvest or capture were estimated using the micro approach wherein primary data were directly collected from stakeholders or players along the fish distribution chain during the W-FGDs and KIIs. This approach identified where or at what stage in the fish distribution chain losses occurred, and is useful in designing targeted interventions and policies for local action (Schuster and Torero, 2016). In this study, the value chain concept of categorizing loss after Kruijssen et al. (2020) is adapted, wherein losses are estimated at each node of the distribution chain starting from the fish is lifted from the sea onto the boat (for capture fisheries) or harvested (for aquaculture), until the fish reach the consumer.

PHFL values were reported by respondents and participants as percentages of catch or harvested volume. These were then categorized as physical loss, market force loss and quality loss, adapting the definitions of types of losses compiled by Kruijssen et al. (2020). Physical loss occurs when fish or fisheries commodities are entirely removed from the distribution chain, due to spoilage or consumption by insects or other animals. Physical loss can be complete physical loss in which the catch may spoil and completely become inedible (i.e. discards and bycatch), or fish is lost due to inadequate handling and processing (Ames et al., 1991).

Market force loss refers to losses attributable to market dynamics; the product does not change in quality attributes but price decreases below optimum due to market forces, such as oversupply. Quality loss refers to loss caused by decrease in value of fish and fisheries commodities due to changes brought about by spoilage, physical defects or quality deterioration.

Estimated volume (in MT) of post-harvest fish losses for tuna, sardines and other commonly caught species were computed based on the 5-year fish production data (2018-2022) provided by BFAR 8 and the average PHFL values obtained in this study.

3. Assessment of fish consumption and micronutrient deficiency

Secondary data on fish consumption and micronutrient deficiency were obtained from the DOST-FNRI and from the Provincial and municipal health offices. Available information in reports and in published research articles were also analyzed.

KII and SSI using prepared questionnaires were conducted involving respondents from four sample municipalities (two in SaBELANS area and two in ALSBACH area), which were intentionally selected to represent mainland and island municipality consumption. From each selected municipality, four barangays were selected according to their proximity to fish source. Two barangays were selected for their distance from areas

of commerce and fishing communities wherein transport ranged from PhP200.00-PhP300.00 one way, or at least 10 km from the local market. These types of communities are labeled as “farflung”. One barangay each were selected to represent the food consumption for communities nearest the largest public market, referred to as ‘poblacion’ communities, and fishing communities.

Additionally, fish consumption data were also gathered from participants of W-FGDs on PHFL to gather information on fish consumption of households actively participating in the production, processing, and marketing aspects of the fisheries value chain. Responses from W-FGD participants representing the municipalities of Calbiga, Pinabacdao, San Sebastian, Sta. Rita, Talalora, Villareal, and Zumarraga for ALSBACH, and the municipalities of Allen, Capul, and San Vicente for SaBeLANS were included in the analysis as fishing communities. Data were also gathered from residents of the island municipality of San Vicente, Northern Samar due to the importance of the fishing industry of this municipality in the Sardines Industry Value Chain.

The survey questionnaires were reviewed by a technical consultant and pre-tested on selected individuals in the fishing community of Destacado, San Vicente. Consent to partiticipate was solicited from all respondents and they were notified of their option to withdraw from the research in any time during their interviews.

The final questionnaires with inputs from pre-testing, focused on gathering key information on food security such as food access, food availability, and food utilization. Food Frequency Questionnaire (FFQ) that asked respondents to recall and list down in their local dialect the fish and fish products consumed by their household within a one-year duration from the time of survey, was utilized. The survey also included questions on socio-demographic information, household composition disaggregated to age groups and gender, sources of income, estimated fish consumption portion per household member, and household consumption information on frequency of consumption of fishes and fish products, average buying price, fish and fish products preparation and cooking methods, and consumer perception on fish and fish products.

The surveys were administered by local enumerators with backgrounds in nutrition or fisheries and were trained to ensure reliability of data gathered. Scientific names of fish and fish products that were listed in the local dialect were identified using Fishbase (Froese and Pauly, 2023).

4. Assessment of income and expenditures

Data on household income and expenditure, and how the people in target municipalities acquire fish and what fraction of income is spent on purchase of fish were obtained and analyzed using responses from respondents of the fish consumption survey. Secondary data were also obtained from PSA.

5. Data analysis

Data generated from surveys and W-FGDs were encoded, organized into frequencies and percentages, and analyzed. In the fish consumption surveys, the species of fish and aquatic commodities most commonly consumed were derived from the listed fish consumed by each respondent and ranked based on the number of times a given species or fish product occurs within the consolidated list. Weight of fish and fish products consumed per age group was determined by multiplying the average portion palm size consumption per age group by 85 g. Nutrients consumed per listed fish and fish products were determined by multiplying the weight consumed per age group to the edible portions and nutrient content per fish species as listed in the Food Composition Table of DOST-FNRI (DOST-FNRI,1997).

SIGNIFICANT FINDINGS

1. Assessment of post-harvest fish losses

1.1 Fisheries sector profile of target municipalities

Fishing and fish trading are the major sources of income of people residing in the municipalities along San Bernardino Strait and in Samar bays and channels, particularly in the island towns wherein about 12.09 % – 15.91 % of the total population are directly involved as fishers (Table 1), while some others derive income from aquafarming, trading and processing activities (Figures 3-4). Poverty incidence is relatively high ranging from 23.97% – 37.75% in the municipalities along San Bernardino Strait. In the municipalities along Samar bays and channels, poverty incidence is relatively low in Catbalogan City (19.0%) and high in the island towns of Daram (41.18%), Talalora (37.16%) and Zumarraga (38.87%). The fishing grounds in the areas are one of the richest in the country supplying 45% (Northern Samar 17%, and Samar 28%) of fish and aquatic products in the Eastern Visayas region as reflected in the five-year (2018-2022) fish production data of BFAR 8.

1.2 Information on magnitude of fish losses

The available information on post-harvest fish losses at different stages in the fish distribution chain is shown in Table 2. Losses are generally estimated at each node of the chain and expressed as percentage of catch volume or weight loss. In Sri Lanka and the Philippines, physical and quality losses are highest for tuna species. Physical loss is high (31%) during the production or capture stage for all fish and seafoods in Europe, while in South and Southeast Asia, a single value (34%) has been reported for the entire chain.

Measurement of the extent of fish losses has been reported to be challenging due to the lack of uniformity in assessment methods and units of catch volume, in diversity of fish species, types and size of fisheries, and the number of players or stakeholders along the chain (Akande and Diei-Ouadi, 2010). Loss is also influenced by several factors such as the species of fish, perceived value of fish, volume handled and seasonality of catch (Kruijssen et al., 2020). About 35% of the global harvest in fisheries and aquaculture has been reported as either lost or discarded, and in developing nations, PHFL ranges between 20% to 75% depending on the type of fishery and mode of value chain (Keerthana et al., 2022).

In the Philippines, several assessments of losses were conducted recently. Tadifa et al. (2022) assessed market force losses for economically important commodities such as small pelagics, sardines, tilapia, shrimp, mangrove crab and mussel, in the landing centers and wet markets in Regions 3, 4A and 4B. In the assessment of fish losses conducted by Montojo et al. (2020) in the High Seas Pocket 1 (HSP 1) using ice-chilled carrier boats, an estimated 17.25% quality loss was reported.

Municipality	Total Population (2020) [1]	Number of households (2020) [1]	Poverty Incidence (%) as of 2018 [2]	No. of fishers [3]		No. aqua-farmers [3]
				Registered	% of total pop.	
SaBELANS-member municipalities						
Mainland						
Allen	25,228	6,045	23.97	126	0.50	4
San Isidro	27,867	6,158	32.55	2,800*	10.04	0
Victoria	15,361	3,210	33.58	525	3.42	89
Island						
Capul	12,323	2,712	37.75	1,753	14.22	2
San Antonio	8,882	2,507	26.81	1,074	12.09	1
San Vicente	6,928	1,736	37.31	951*	13.73	0
	Total	22,368				
ALSBACH-member municipalities						
Mainland						
Calbiga	23,310	5,589	24.86	1,137	4.90	41
Catbalogan City	106,440	23,107	19.0	5,647*	5.31	62
San Sebastian	8,704	1,968	27.76	ND	–	ND
Paranas	32,374	7,324	26.44	499	1.54	50
Pinabacdao	18,136	4,158	30.41	564	3.10	42
Motiong	15,276	3,591	30.86	465	3.04	133
Jiabong	19,205	4,567	25.65	2,232	11.62	45
Sta. Rita	42,384	9,778	34.41	ND	–	ND
Hinabangan	13,693	3,075	28.32	136	0.99	1
Villareal	27,394	6,242	32.64	ND	–	ND
Island						
Daram	41,608	9,252	41.18	5,069	12.18	11
Talalora	7,856	1,861	37.16	1,250	15.91	11
Zumarraga	16,279	3,606	38.87	ND	–	ND
	Total	84,118				

Table 1. Total population, number of households, poverty incidence (%), and fisheries sector data in coastal municipalities along San Bernardino strait and in Samar bays and channels. Poverty incidence is generally highest in the island municipalities (Capul, San Vicente, Daram, Talalora and Zumarraga) where most residents are fishers.

[1] Census of Population (2020). Region VIII (Eastern Visayas. Total population by Province, City, Municipality and Barangay. Philippine Statistics Agency. Retrieved 21 Feb. 2024 from https://psa.gov.ph

[2] PSA releases the 2018 Municipal and City level poverty estimates. Phil. Statistics Authority. 2021. Retrieved 20 February 2024 from https://psa.gov.ph. Poverty incidence is the number of families or individuals with per capita income below the poverty line (i.e. income required to meet basic needs) relative to total population.

* Number of commercial fishers: San Isidro = 4, San Vicente = 12, Catbalogan = 2
ND = No Data available

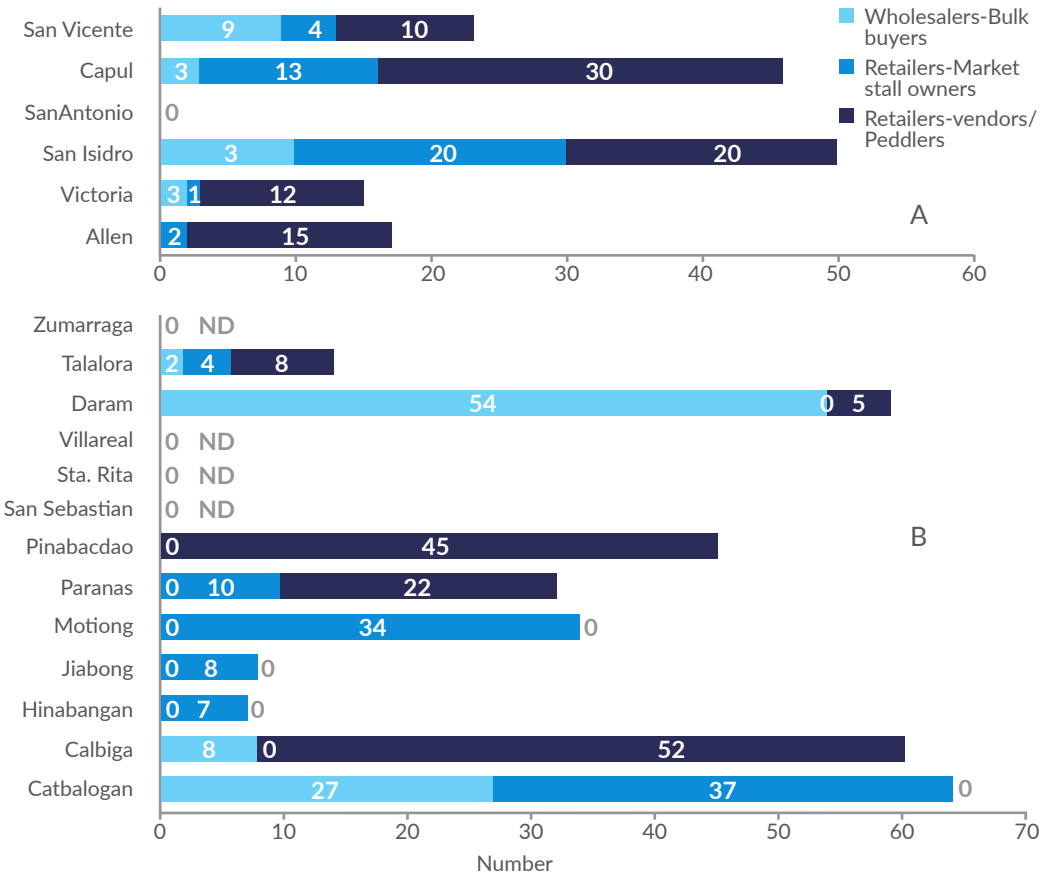


Figure 3. Number of fish traders in the SaBELANS-member municipalities (A), and ALSBACH-member municipalities (B).
ND=No Data available

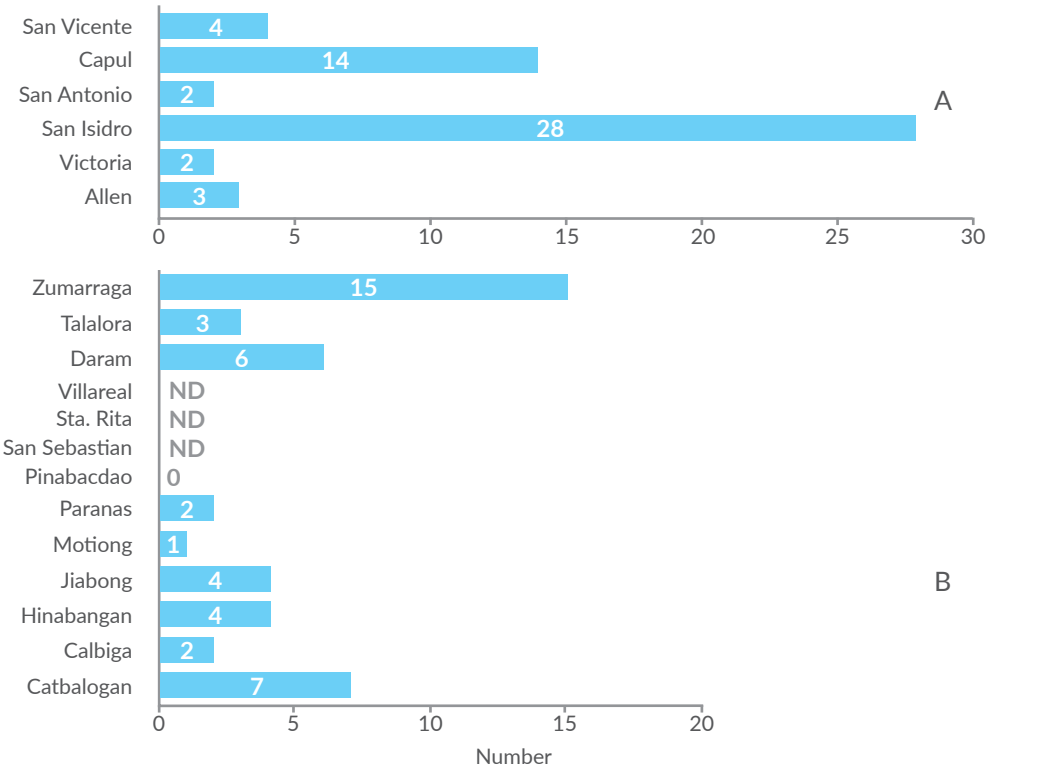


Figure 4. Number of small-scale or household-scale fish processors in the SaBELANS-member (A) and ALSBACH-member municipalities.
ND= No Data available

Stage	Estimated loss (%)	Species	Location	References
Physical loss				
Production	31	All fish, and seafood	World	FAO 2011
	8	Marine fish	Europe	Kelleher (2005)
	16.67	Gill net fishery	Indonesia	Wibowo et al. (2017)
Entire chain	34	All fish and seafood	South/ Southeast Asia	FAO 2011
Landing	10-50%	Tuna (*Katsuwonus pelamis*)	Sri Lanka	Daluwatte and Sivakumar (2018)
Landing	39-51%	Tuna (*Auxis thazard*)	Sri Lanka	Daluwatte and Sivakumar (2018)
Trading	10%	Lobster	Indonesia	Wibowo et al. (2017)
Transport	6.01%	Mini-trawl fishery	Indonesia	Wibowo et al. (2017)
Processing	1.8-4.73%	Small pelagics	Indonesia	Wibowo et al. (2017)
Breakage	61.5%	Mini-species	Zambia	Kaminski and Cole (2017)
Quality loss				
Production	.01%	Gill net fishery	Indonesia	Wibowo et al. (2017)
Trading	4.8%	Small pelagics	Indonesia	Wibowo et al. (2017)
Entire chain	17.25%	Tuna species	Philippines (High Seas Pocket 1)	Montojo et al. (2019)
Market force loss				
Landing	1.84%	Small pelagics	Philippines	Tadifa et al. (2022)
	2.14%	Sardines	Philippines	Tadifa et al. (2022)
Trading (wet market)	0.17%	Small pelagics	Philippines	Tadifa et al. (2022)
	0.27%	Sardines	Philippines	Tadifa et al. (2022)

Table 2. Estimates of post-harvest fish losses in developed and developing countries.

Reduction of fish loss have been reported to result in increased available supply of fish and eventually reduction in price, thereby contributing to food security and sustainability (Rutten, 2013). However, the first step to address the problem of high post-harvest fish losses and to develop effective policies is to measure and identify where in the food system or value chain losses occur (Schuster and Torero, 2016).

1.3 Types, characteristics and drivers of PHFL

Three types of PHFL were observed occurring throughout the fish distribution chain in the target municipalities namely, physical loss, quality loss, and market force loss. The characteristics and drivers or causes of these losses at various stages, from capture or harvest, to distribution or trading, until processing and consumption stages were reported during the W-FGDs, KII and SII (Table 3). In the capture or fishing stage, physical and quality losses were observed, while in the marketing or trading stage, no physical loss but only market force and quality losses often occurred. Quality loss is the most common type occurring in the entire fish distribution chain. This finding concurs with the data reported by Kruijssen et al. (2020) that although fewer studies were conducted to assess quality loss, larger volume and monetary loss as a result of deterioration in quality were reported. Quality loss is more pronounced and predominant in poor countries mainly due to lack of technology, and post-harvest infrastructure and facilities, and poor processing practices (Diei-Ouadi et al., 2015).

Figure 5 shows the estimated post-harvest losses in the six coastal municipalities along San Bernardino Strait. In the fishing stage, quality loss ranged from 3-5% in the six municipalities, attributable to poor handling in fishing boats, inadequate icing and lack of temperature-controlled catch holding containers. Physical loss was reported in Capul (10%) and in San Vicente (75%) which seasonally occurs during the glut season of sardines (May – November), tuna and anchovy (May – December), as reflected in the fish distribution flow diagrams prepared by participants during the W-FGD sessions (Figures 6-11). The relatively low PHFL value in Capul in the marketing stage (Figure 10) is due to the integration of information technology in the trading process. The traders are able to minimize market and quality losses by expediting the transactions and sale process.

	Stage in the fish distribution chain		
Type of loss	**Fishing/Harvesting**	**Marketing**	**Processing**
Physical loss			
Occurs when fish are entirely removed from the distribution chain due to loss of catch at sea during fishing operation, transport to shore, spoilage, or consumption by insects or other animals	**Capture** Discards (proportion of catch returned to the sea either dead, dying, physically damaged or spoiled) **By-catch (incidental/unwanted catch)** Fish falling from nets or traps while hauling **Aquaculture** Loss of stocks due to damage of ponds, cages pens, and other culture units during bad weather **Discards of harvested stocks** (mussels and oysters) during harmful algal blooms (HAB) or red tide episodes	None reported	Breakage of glass bottles (for bottled sardines, mussels and oysters) Whole batch of processed (dried) products discarded due to infestation of maggots and flies during rainy season and bad weather
Market force loss			
Refers to losses attributable to market dynamics; the product does not change in quality attributes, but price decreases below the optimum due to market forces, such as oversupply.	None reported	Reduction in price of fresh fish and fisheries commodities due to : a) oversupply in the market during glut season b) poor market linkages Seasonal and specific for sardines, tuna , anchovy, slipmouth, groupers and scads	Reduction in price of processed products due to oversupply of fresh fish and other processed products in the market
Quality loss			
Refers to loss caused by decrease in monetary value of fish and fisheries commodities due to changes brought about by spoilage, physical defects or quality deterioration	Spoilage or loss of freshness due to : delays in retrieval or hauling from fishing gears poor handling of catch on board/boats inadequate icing and lack of catch holding containers to avoid spoilage	Reduction in price due to : loss of freshness due to delays in bargaining and selling during glut season physical damages due to poor handling during unloading, resulting in burst belly, skin lacerations or wounds poor handling practices and storage of products during selling, exposing to sun, rain and flies in open air markets or pavements Oversized or undersized catch for export loss of freshness Loss of freshness due to lack of cold-storage facilities and equipment	Reduction in price of processed products due to poor quality Poor quality of processed products due to lack of processing and cold storage facilities and equipment

Table 3. Types, characteristics, and drivers of post-harvest fish losses observed in the different stages of the fish distribution chain in the coastal communities along San Bernardino Strait and Samar bays and channels. Quality loss is the predominant type of loss in the entire chain.

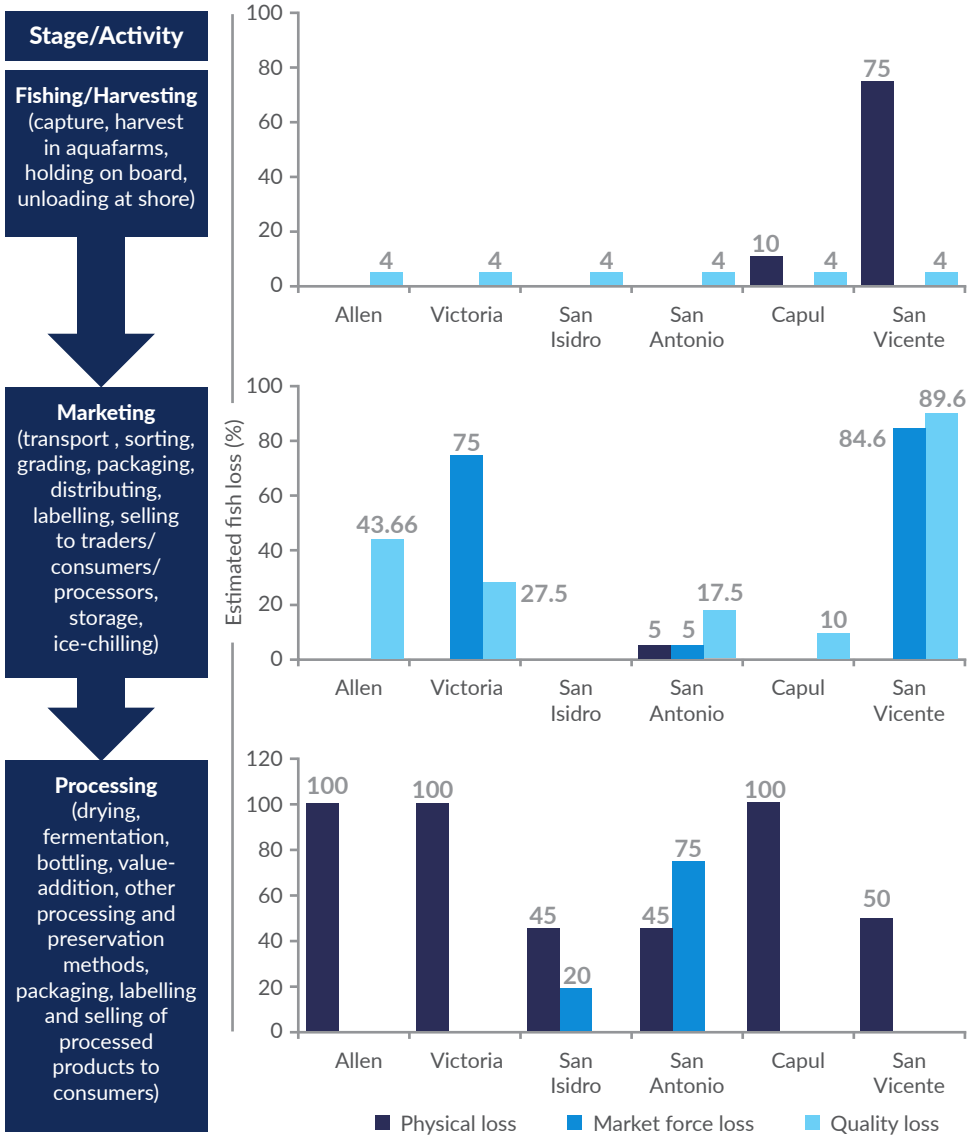


Figure 5 . Estimated post-harvest fish losses (%) in six coastal communities in Northern Samar along San Bernardino Strait. Physical loss is high in San Vicente during the fishing stage, and in all municipalities in the processing node due to lack of cold storage facilities.

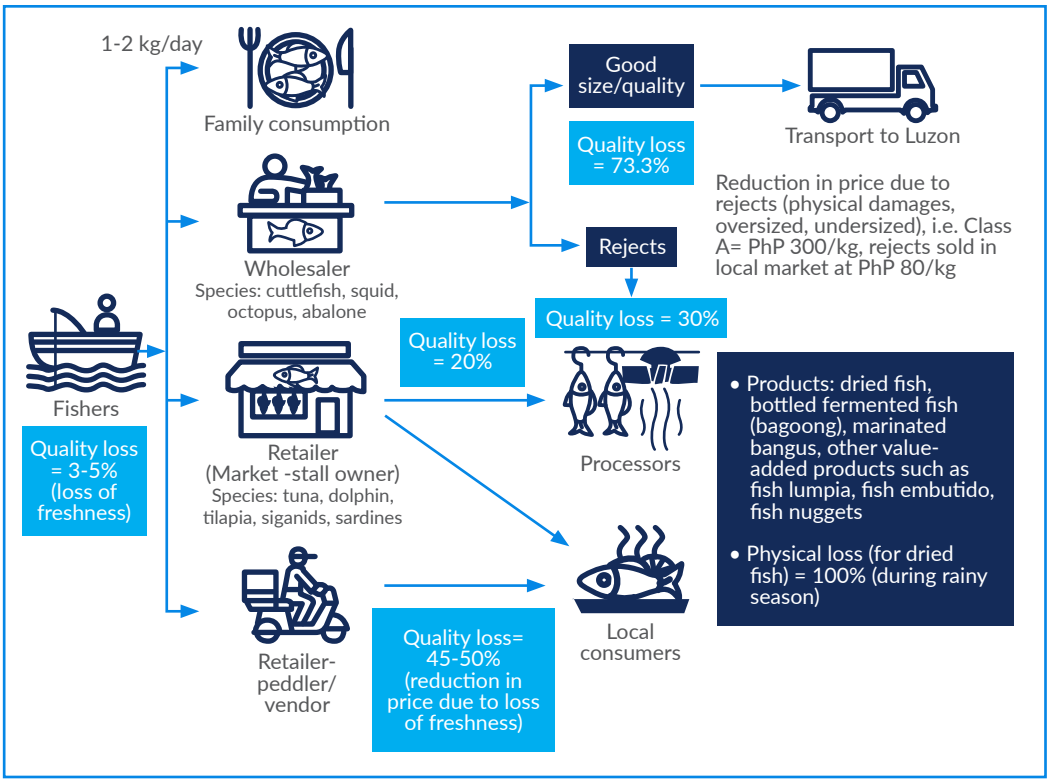


Figure 6. Fish distribution chain in Allen, Northern Samar. Predominant type of post-harvest fish loss in the entire chain is quality loss or reduction in price due to loss of freshness, physical damage or substandard size (oversized/undersized) for the export market.

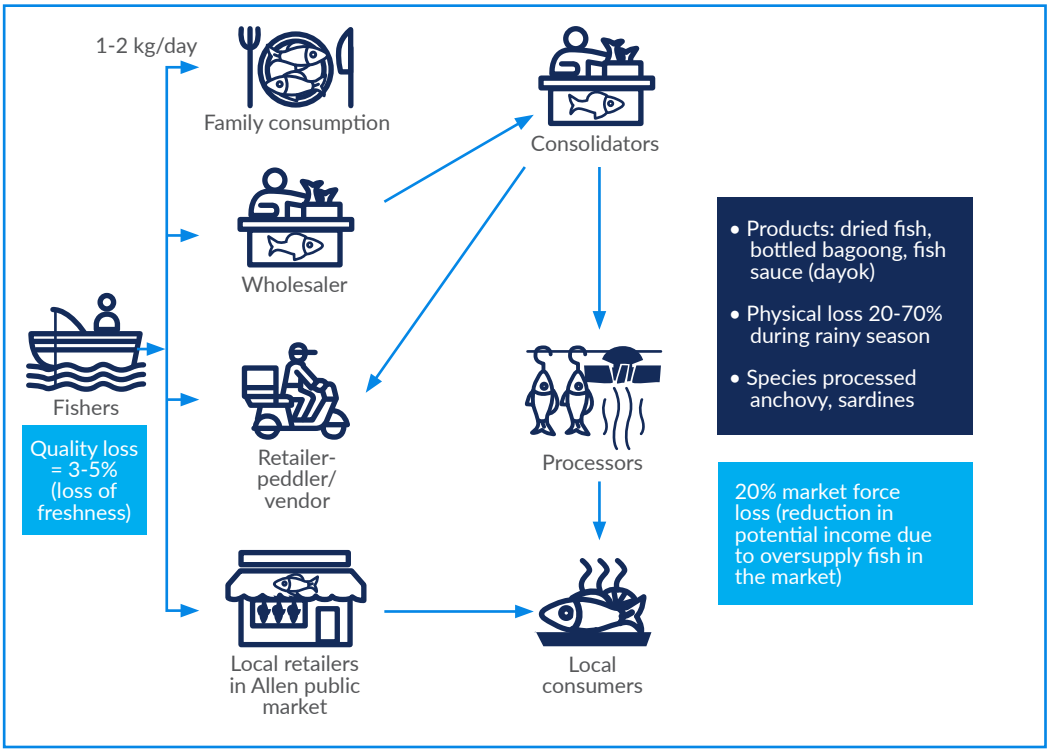


Figure 7. Fish distribution chain in San Isidro, Northern Samar. Except in the processing node wherein high physical loss has been reported, reported post-harvest fish losses are relatively minimal presumably due to the short trading chain. Noteworthy is the presence of consolidators or persons that buy and consolidate all catch from local fishers and harvest from aquafarms and offer them for sale to traders and buyers in neighboring municipalities and cities.

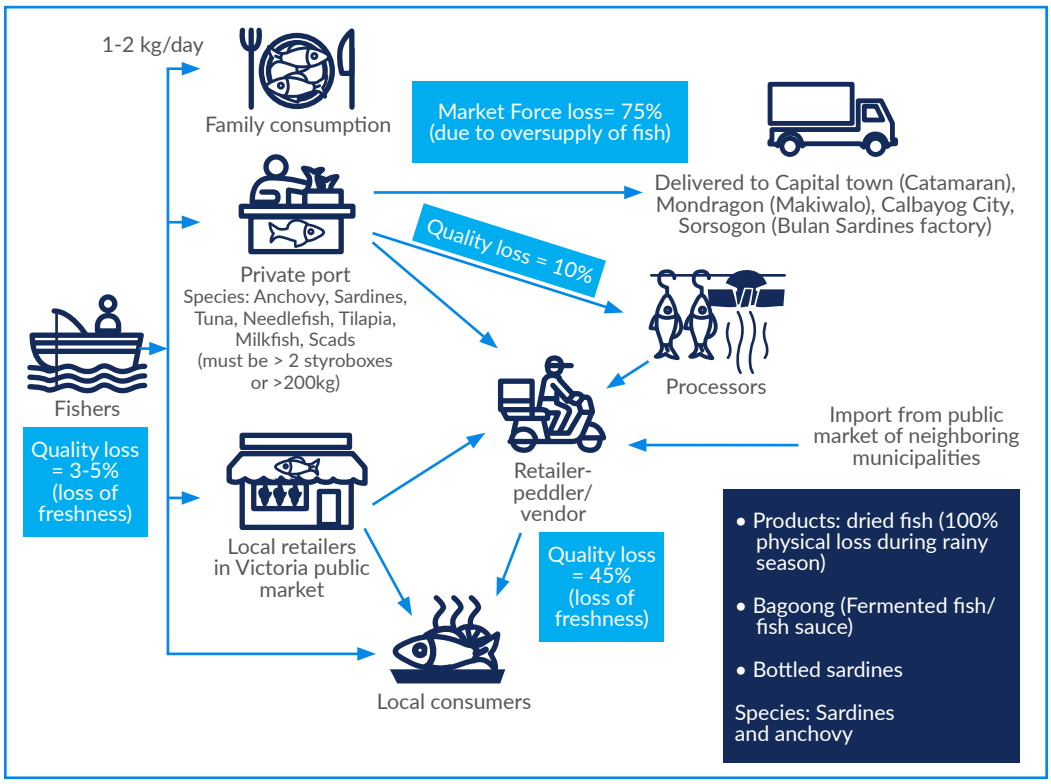


Figure 8. Fish distribution chain in Victoria, Northern Samar. Bulk of the fish catch of local fishers is transported outside the municipality to the capital town and Luzon through a wholesaler who owns a private fishport. Market force loss is highest (75%) during the glut season of anchovy, sardines and tuna. There was no physical loss reported in the fishing and marketing stages, because unsold catch are processed into bottled sardines and fermented fish.

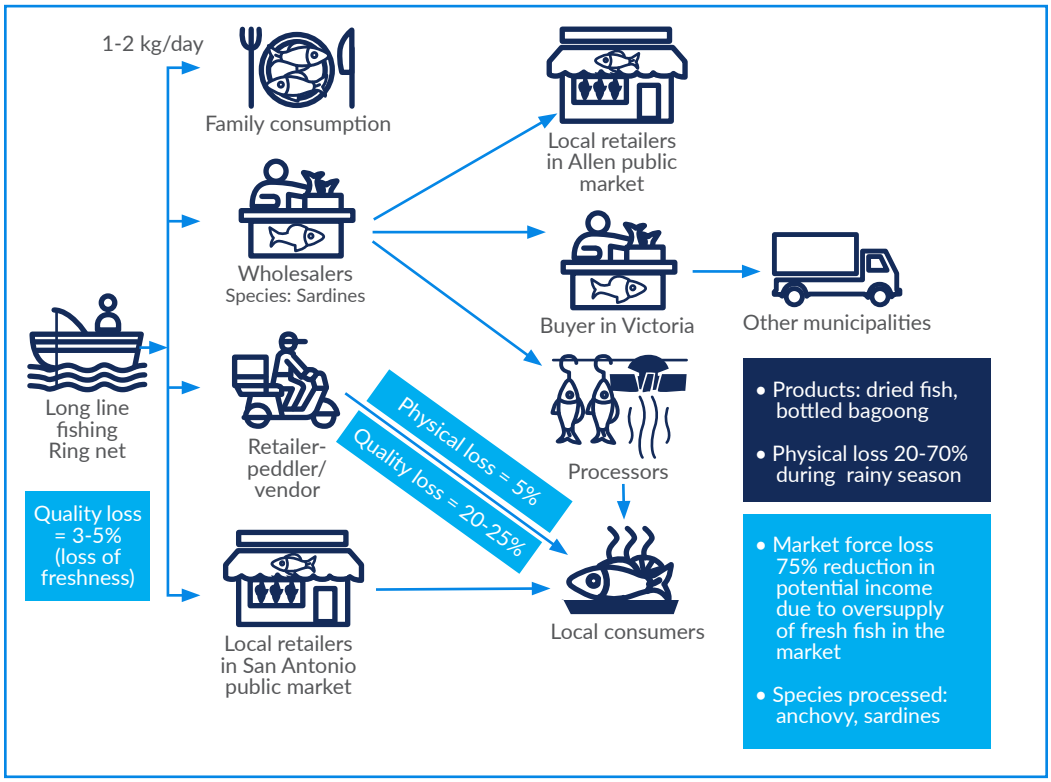


Figure 9. Fish distribution chain in San Antonio, Northern Samar. Catch of local fishers, particularly the high-valued species, are transported and sold to buyers in Victoria and Allen. Predominant types of PHFL are quality and market force losses in the entire chain. Physical loss is high in the processing node during glut season.

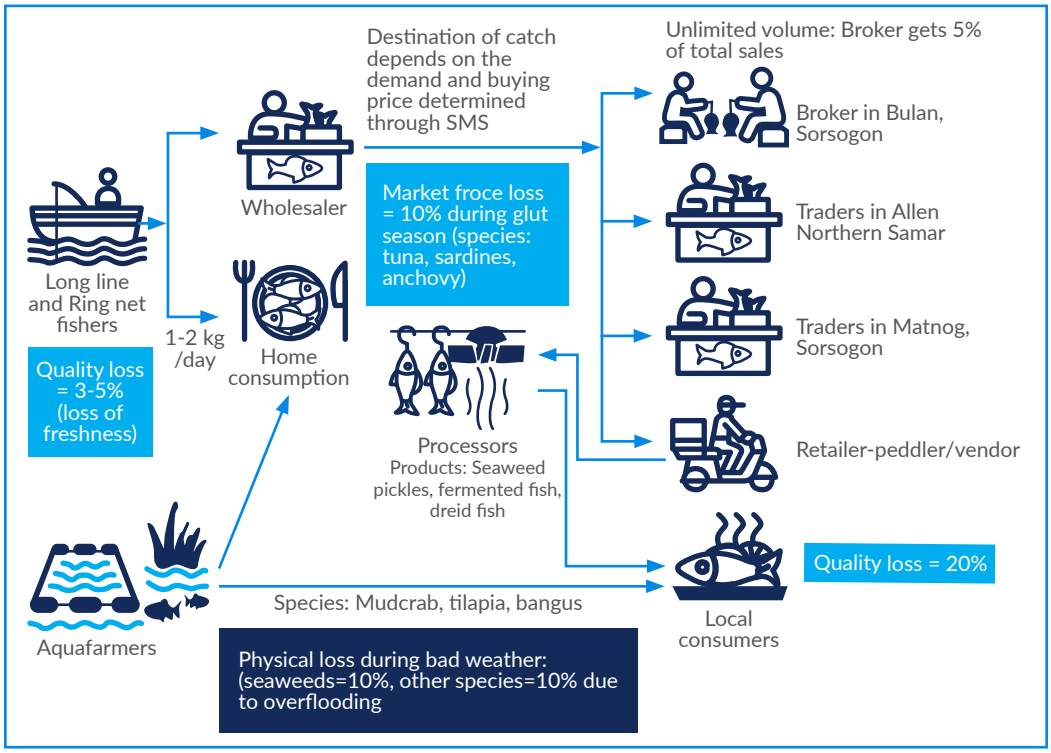


Figure 10. Fish distribution chain in Capul, Northern Samar. Reported PHFL values are relatively lower compared to other municipalities assessed due to adoption of information technology (i.e. SMS) in trading of fish catch, and few players involved in the trading process. Fish catch are directly sold to wholesalers which supply local vendors and traders in Allen and Luzon (Bulan and Matnog, Sorsogon). Noteworthy is the involvement of brokers (or persons who facilitate the sale of fish for a fee on commission basis) in the trading stage. Capul has no public market, local residents purchase fish and fisheries products from mobile vendors or directly from aquafarms.

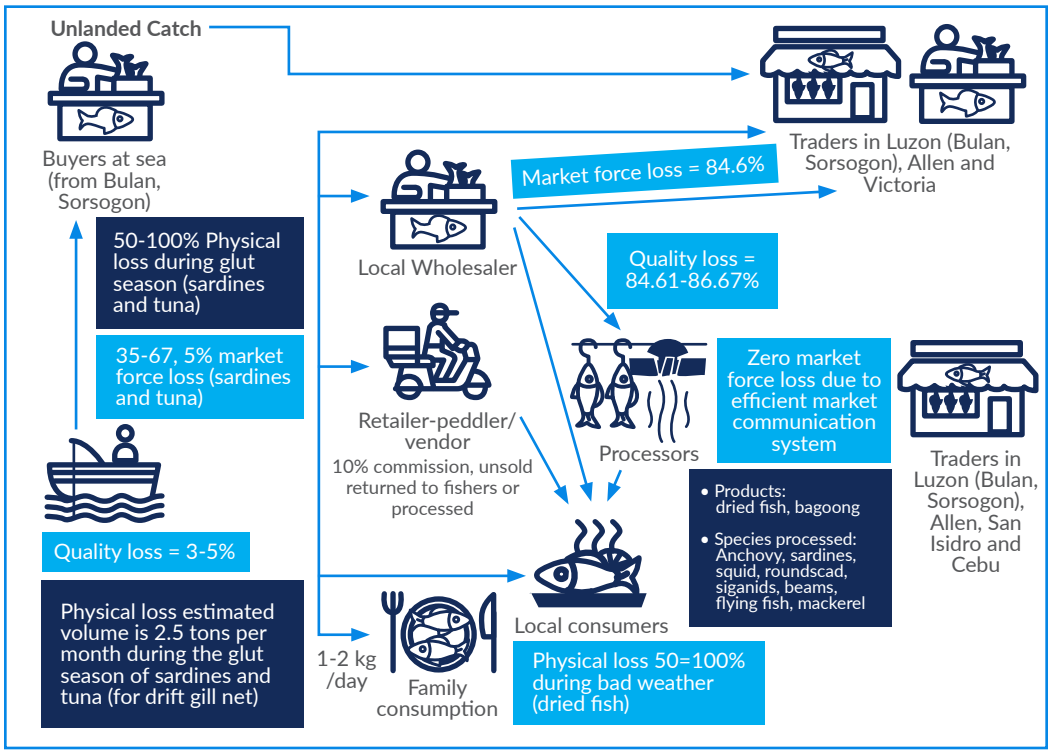


Figure 11. Fish distribution chain in San Vicente, Northern Samar. Of the six municipalities assessed, fishers in San Vicente reported the highest physical loss in the fishing stage during the glut season of sardines and tuna. Unreported volume of catch is unlanded or not brought to shore or landing center in San Vicente, but trading transaction is done at sea between local fishers and buyers from Luzon (Bulan, Sorsogon). Market force loss is highest in the fisher-wholesaler-trader chain, but zero loss in the processing node due to efficient market communication system between processors and buyers in Cebu City. Quality loss is notably high (>85%) due to lack of cold storage and processing facilities.

In the 13 municipalities along Samar bays and channels, high physical loss was reported during the fishing, capture or harvesting stages due to total loss of cultured stocks (milkfish, grouper, tilapia and mussels), when culture units (ponds, pens, cages, culture lines) were damaged during bad weather (Figure 12). During episodes of harmful algal blooms (HAB) or red tides, harvested stocks are totally discarded to avoid harm to consumers. Quality and market force losses predominate during the marketing and processing stages in the distribution chain (Figures 13-25), particularly in the inland municipalities of Pinabacdao (Figure 19) and Sta. Rita (Figure 20), and in the island of Daram (Figure 23). The high percentage of loss in a catch oversupply situation is attributable to the cumulative value of all types of fish losses simultaneously occurring, especially when market and post-harvest management systems are not in place, and facilities are lacking.

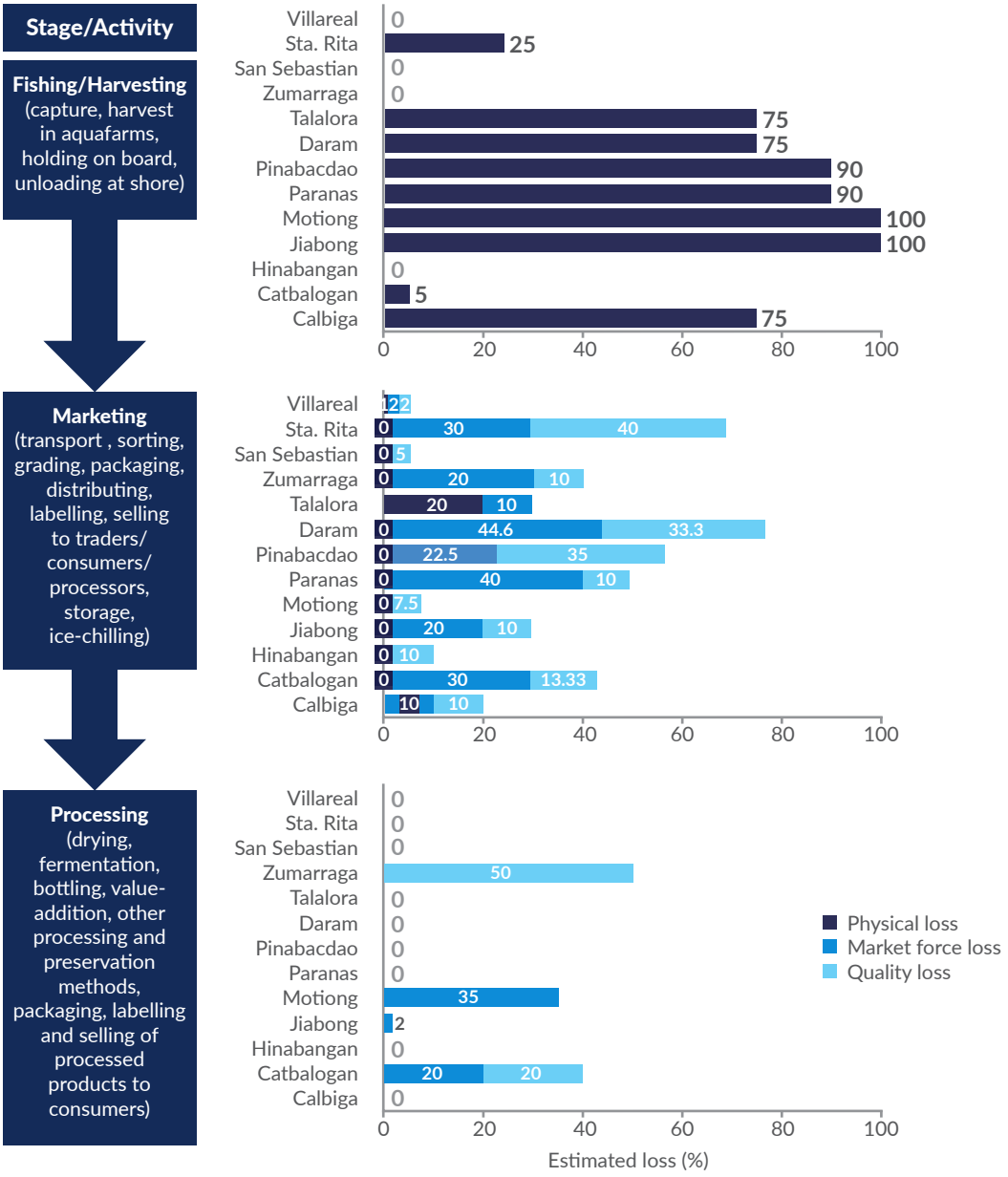


Figure 12. Estimated post-harvest fish losses (%) in 13 coastal communities along Samar bays and channels. Physical loss is high in fishing/harvesting stage in municipalities with aquafarming activities.

Generally, losses were observed to be higher in municipalities with multi-tiered trading chain or when fish catch are passed on to several traders (i.e brokers, wholesaler, retailers or peddlers) before reaching the consumers. Losses are low or none in municipalities with short fish market or distribution chain, when only few traders are involved such as in the inland municipalities of Hinabangan and San Sebastian (Figures 15 and 21). When multiple actors are engaged along the fish value chain, the nodes where fish may be lost increases, resulting in increase in percent loss and complexity in measuring loss.

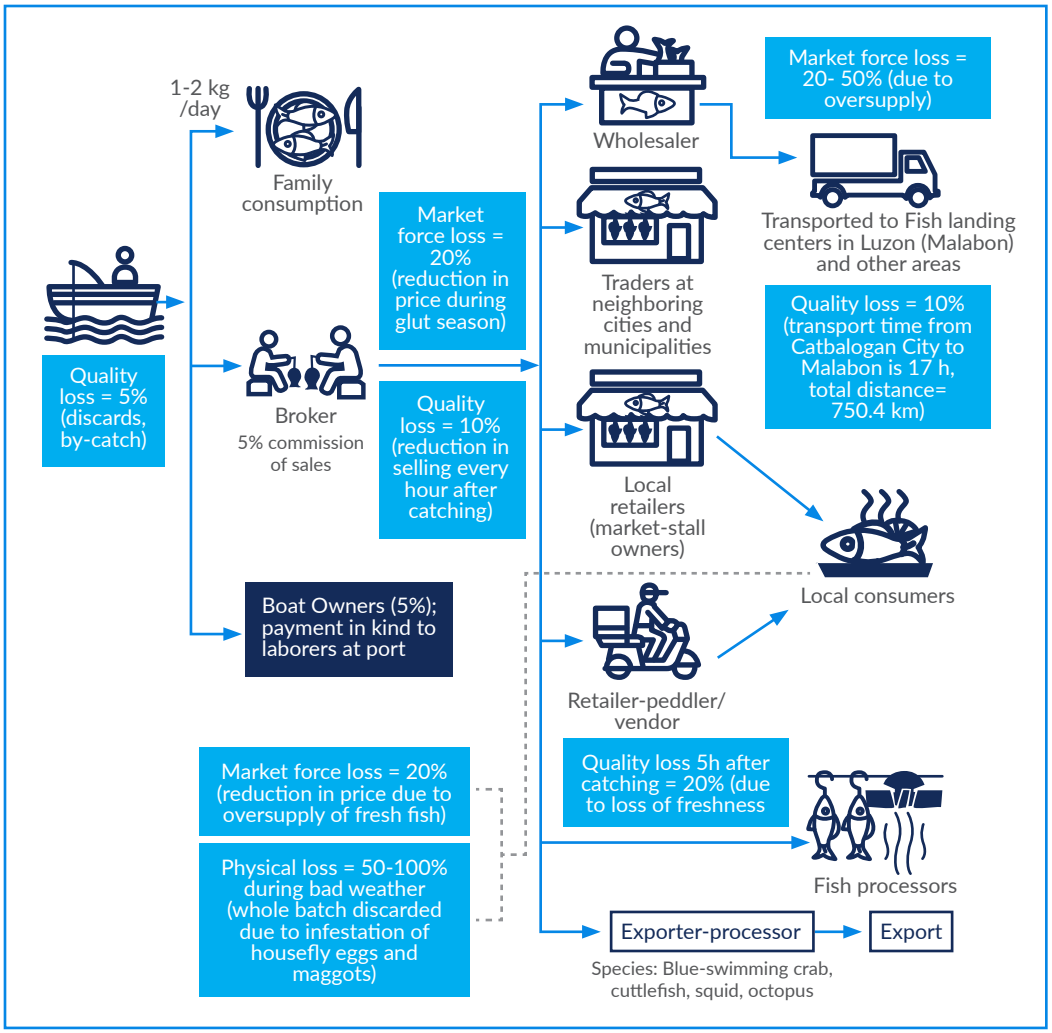


Figure 13. Fish distribution chain in Catbalogan City. The major player in the chain is the broker or a person who facilitates the sale of fish and fisheries commodities for a fee on commission basis. Noteworthy is the physical loss during fishing due to discards and bycatch. Quality loss is relatively lower compared to other municipalities assessed due to presence of cold storage facilities.

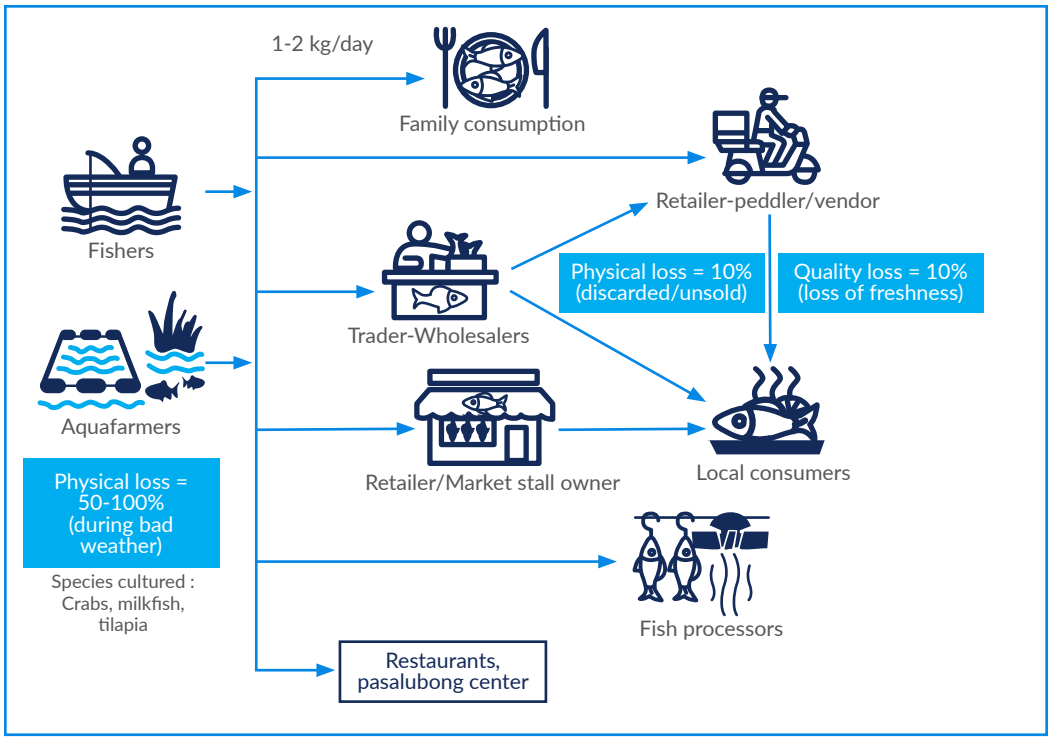


Figure 14. Fish distribution chain of Calbiga, Samar. Reported losses are low due to the simple trading system of fish catch and other fisheries commodities. Sources of fish are capture fisheries and aquaculture. Catch from local fisheries are not transported outside the municipality and sold in the locality.

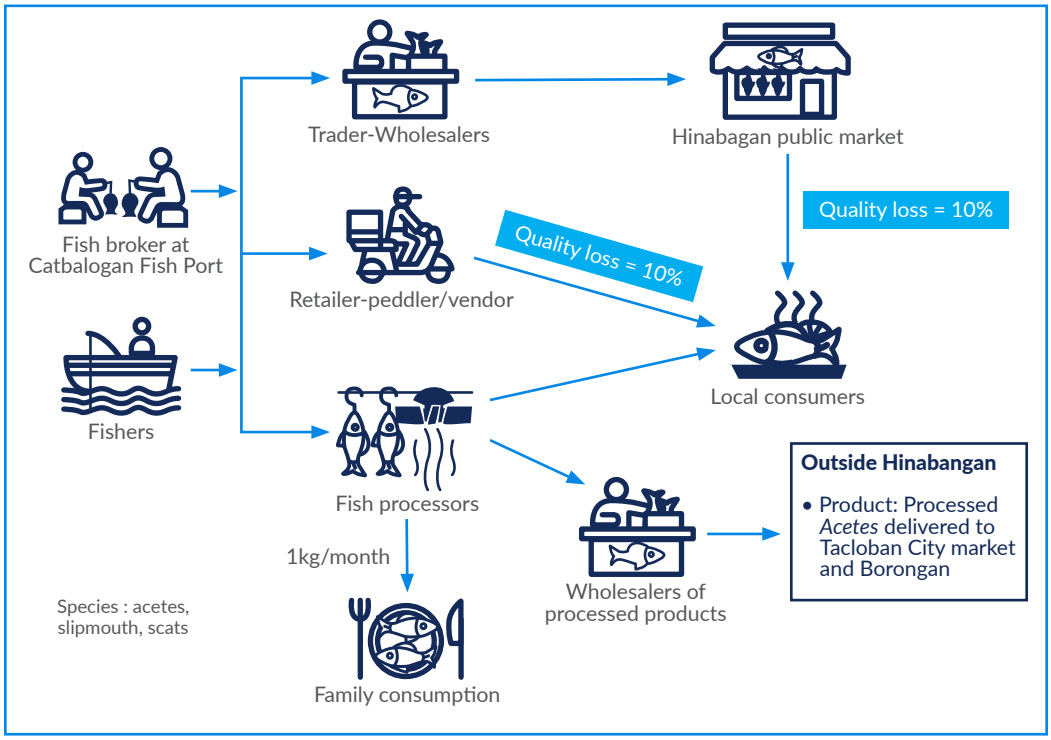


Figure 15. Fish distribution chain in Hinabangan, Samar. Fish and fisheries commodities traded within Hinabangan are sourced from brokers in Catbalogan city. Being an inland municipality, main catch of local fishers is *Acetes* sp, which is processed and sold to other municipalities and cities. No market force and physical losses were reported, and quality loss is minimal.

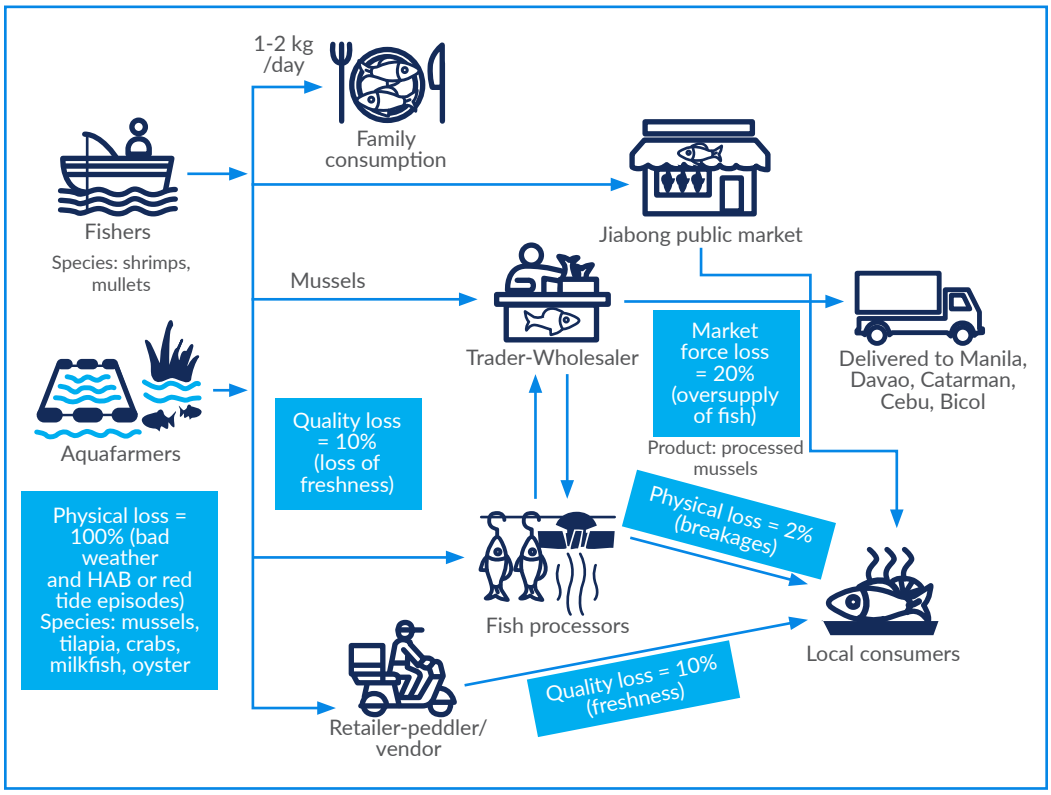


Figure 16. Fish distribution chain in Jiabong, Samar. Jiabong is an aquafarming municipality. Major species cultured are milkfish, mussels, crabs and oysters which are transported to other cities in processed and fresh forms. Physical loss is high (100%) during bad weather due to total damage of culture units and during red tide episodes.

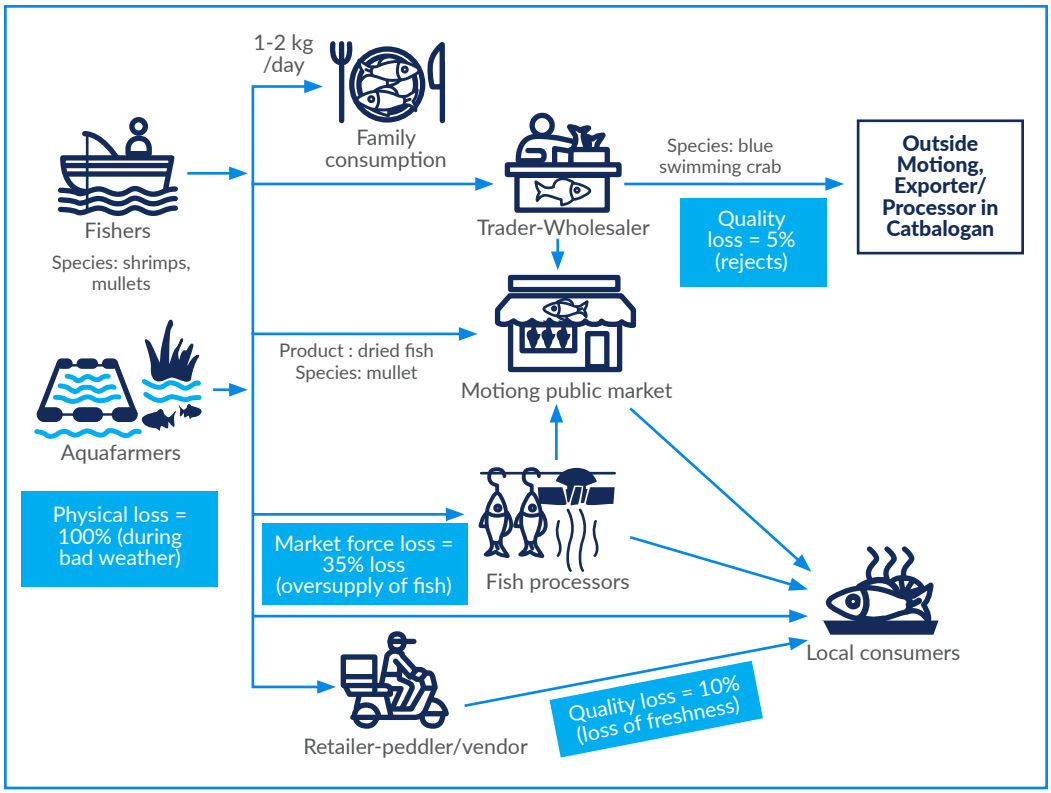


Figure 17. Fish distribution chain in Motiong, Samar. Motiong is also an aquafarming municipality. Major catch of local fishers is the blue swimming crab which is sold to exporter/ processor in Catbalogan City. Physical loss is high during bad weather. Market force loss is also relatively high during oversupply of fresh fish in the fisher to processor node.

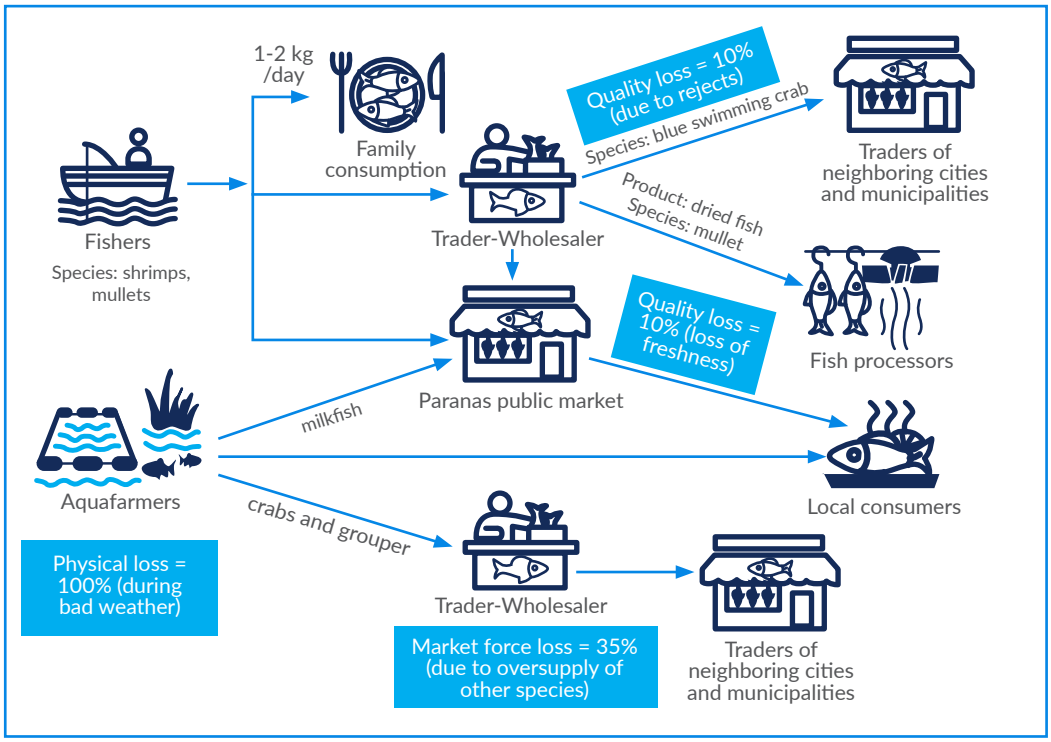


Figure 18. Fish distribution chain in Paranas, Samar. The major catch from capture fisheries is the blue swimming crab which is sold to traders outside the municipality through a trader-wholesaler. Reported market force loss is high (40%) when there is oversupply of marine species in the destination.

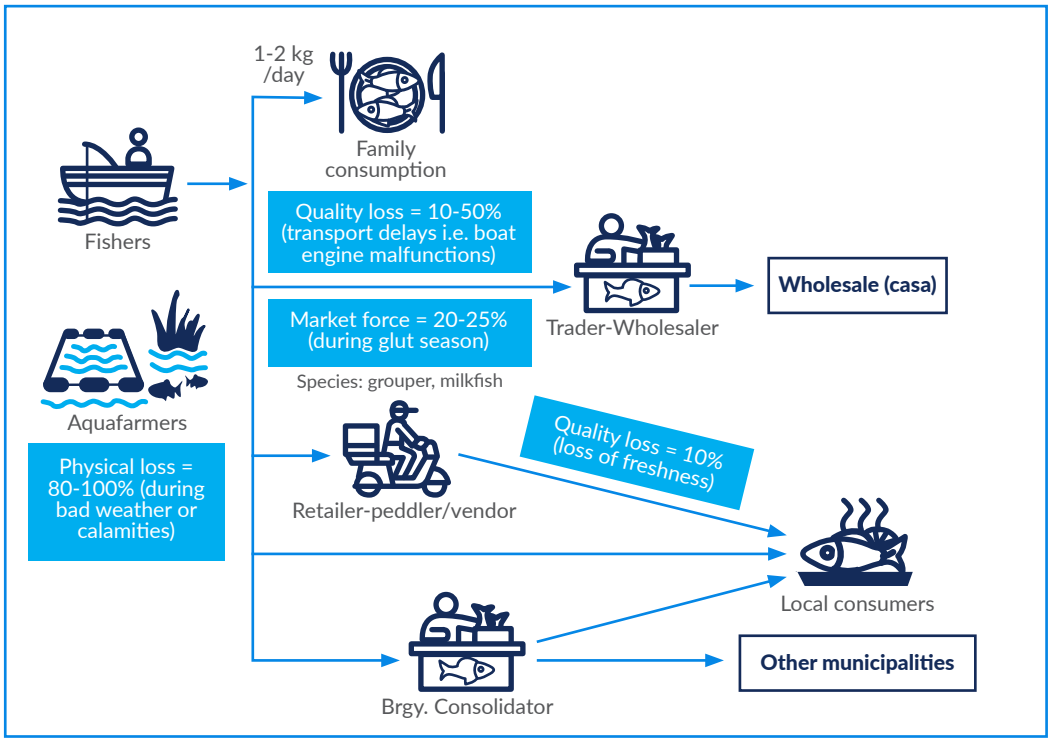


Figure 19. Distribution chain of fish and edible fisheries commodities in Pinabacdao, Samar. The major players in the trading chain are the trader-wholesaler (for trading of cultured grouper and milkfish), mobile vendors and the barangay consolidator (for trading of mussels). Physical loss is highest (100%) during bad weather due to damage of culture units and loss of stocks. Market force and quality losses were reportedly high in the fisher to trader nodes.

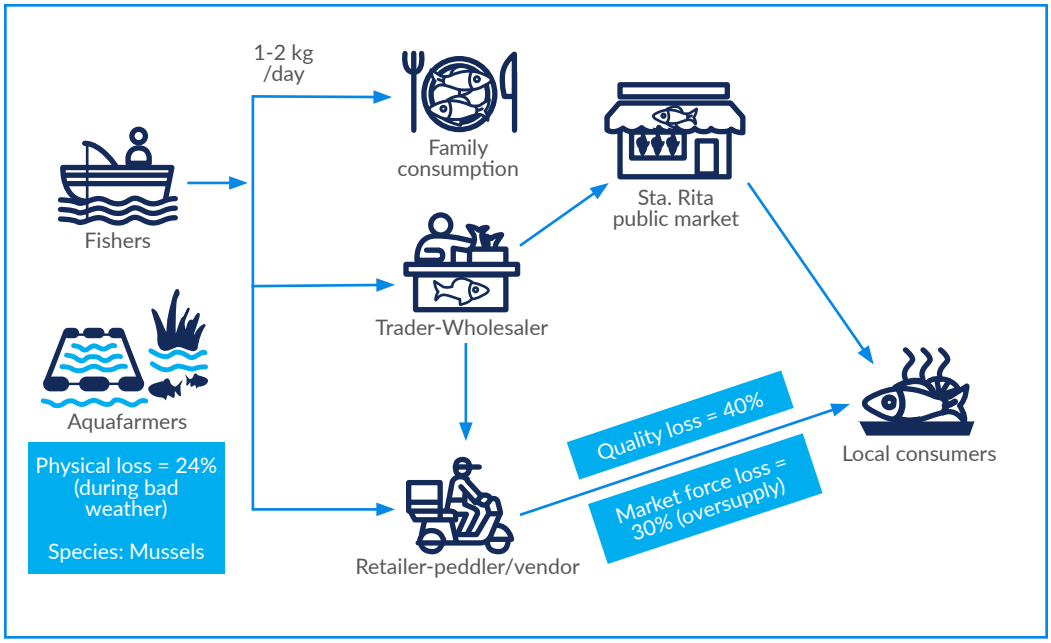


Figure 20. The distribution chain of fish and edible fisheries commodities in Sta. Rita, Samar is uncomplicated and short involving two major players – the trader-wholesaler and the mobile vendors. The high market force and quality losses in the peddler/mobile vendor to local consumer nodes when there is oversupply of fish and fisheries commodities is presumably due to poor handling practices.

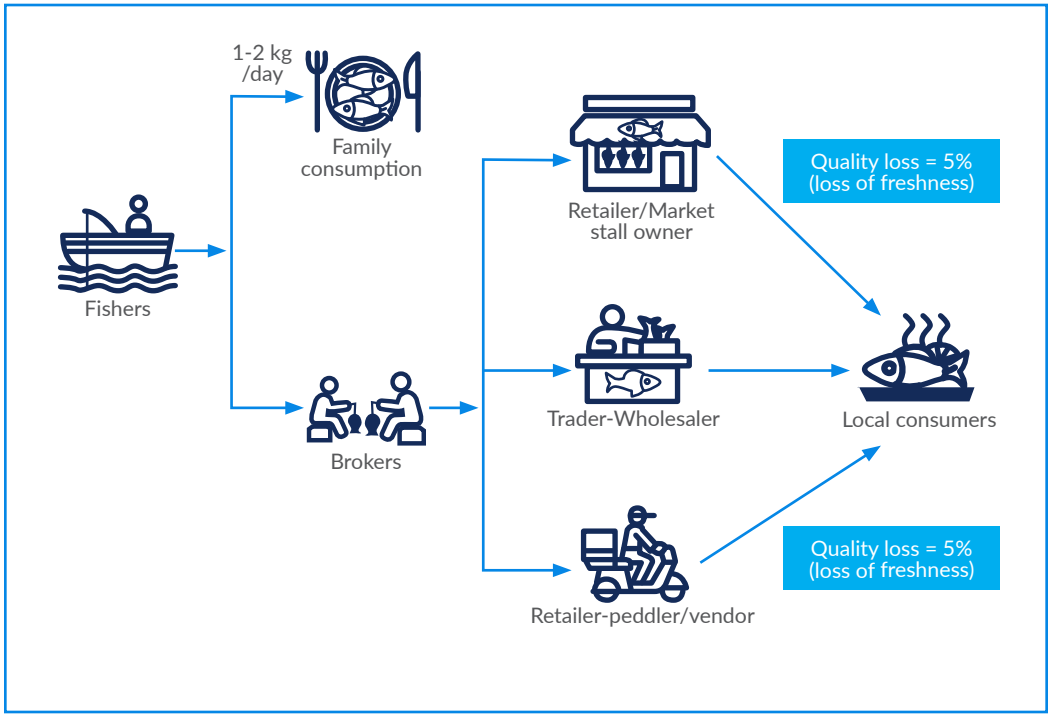


Figure 21. Fish distribution chain in San Sebastian, Samar. Major player in the chain is the broker, which links the fishers to retailers and wholesalers. Reported type of loss is quality loss due to poor handling practices.

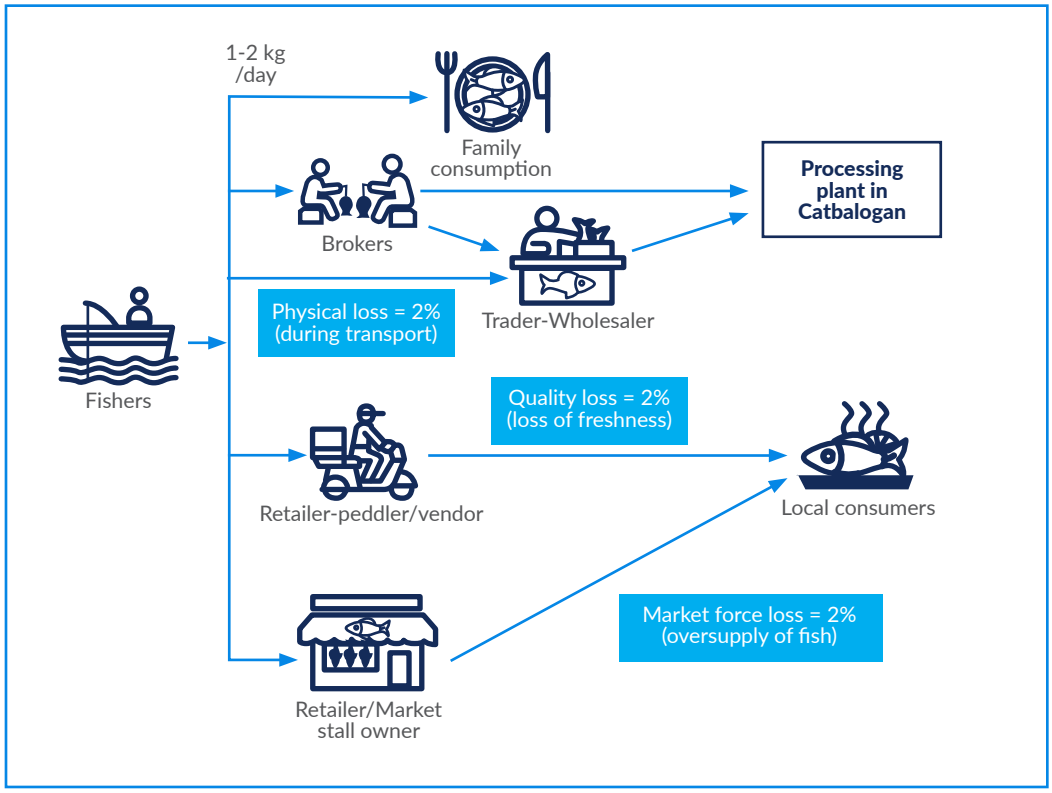


Figure 22. Fish distribution chain in Villareal, Samar. Reported post-harvest fish losses were low. Noteworthy is the absence of processors in the chain. Local catch are traded by brokers and wholesalers in Catbalogan City.

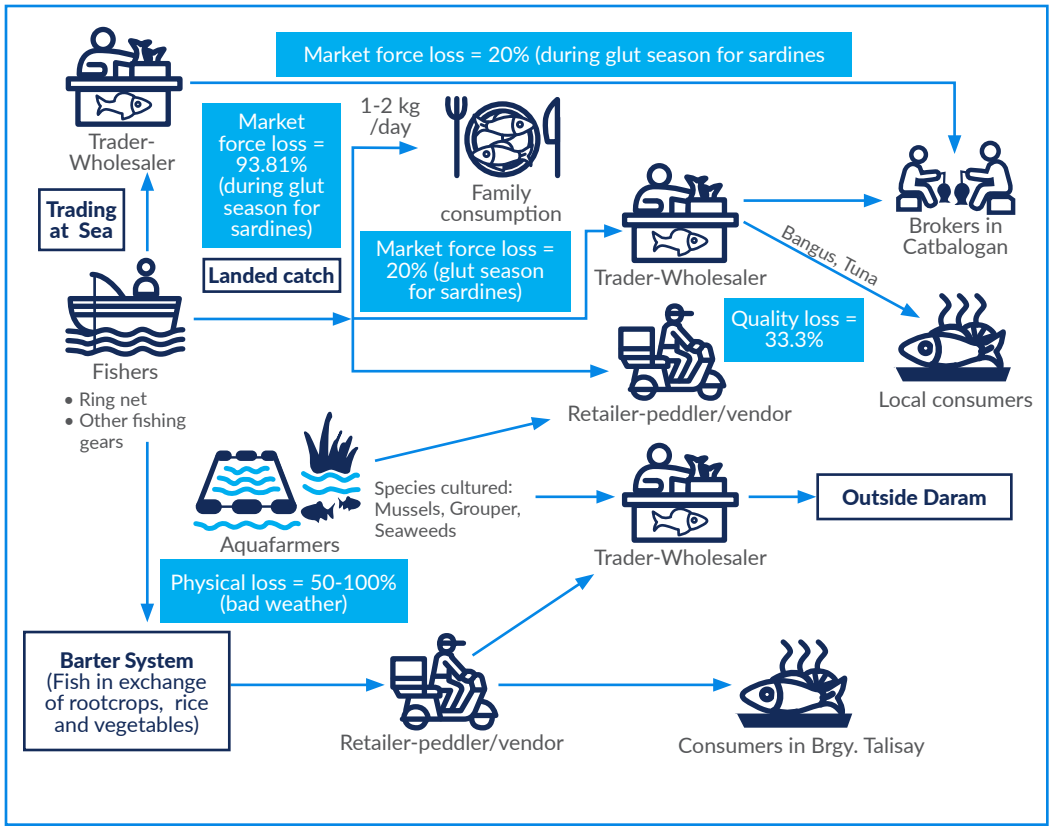


Figure 23. Distribution of fish and edible fisheries commodities in the island municipality of Daram, Samar. An unaccounted volume of catch is unlanded or traded while at sea between local fishers and brokers from Catbalogan City. A barter system of fisheries and agriculture commodities between enterprising farmers from far-flung barangays and local ring net fishers is practiced. Market force loss is high during glut season of sardines. Quality loss is high as well due to lack of cold storage and processing facilities.

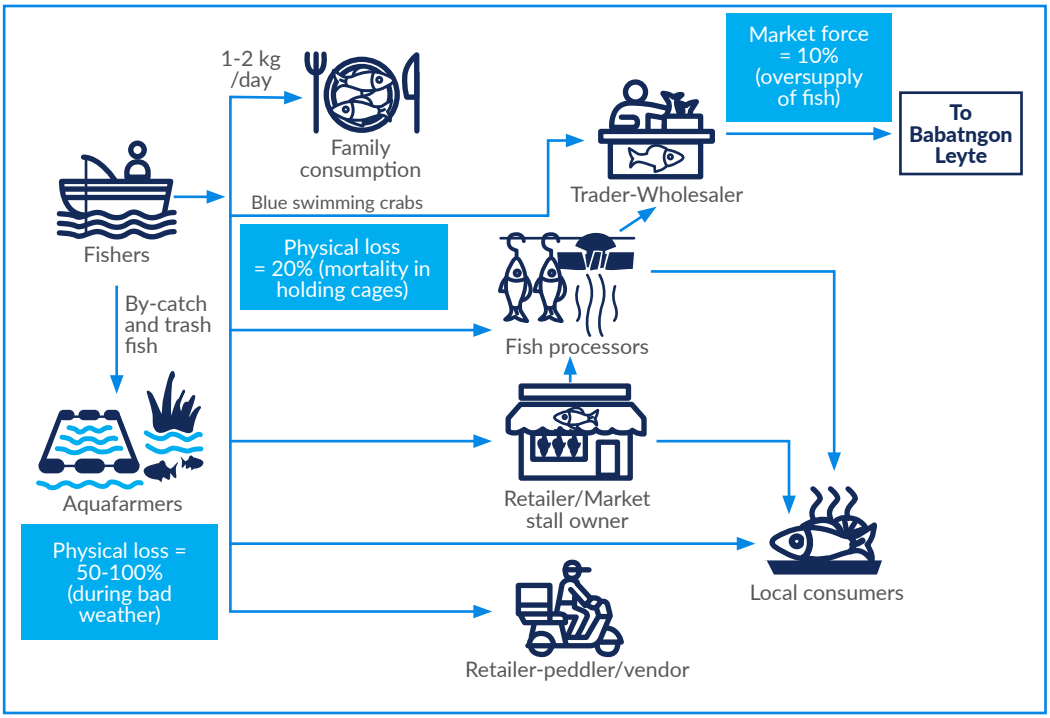


Figure 24. Fish distribution chain in the island municipality of Talalora, Samar. Reported post-harvest losses are due to mortalities in holding cages and loss of stocks during bad weather (physical loss), and oversupply of fish (market force loss). Major species traded and transported to other municipalities and cities is the blue swimming crab.

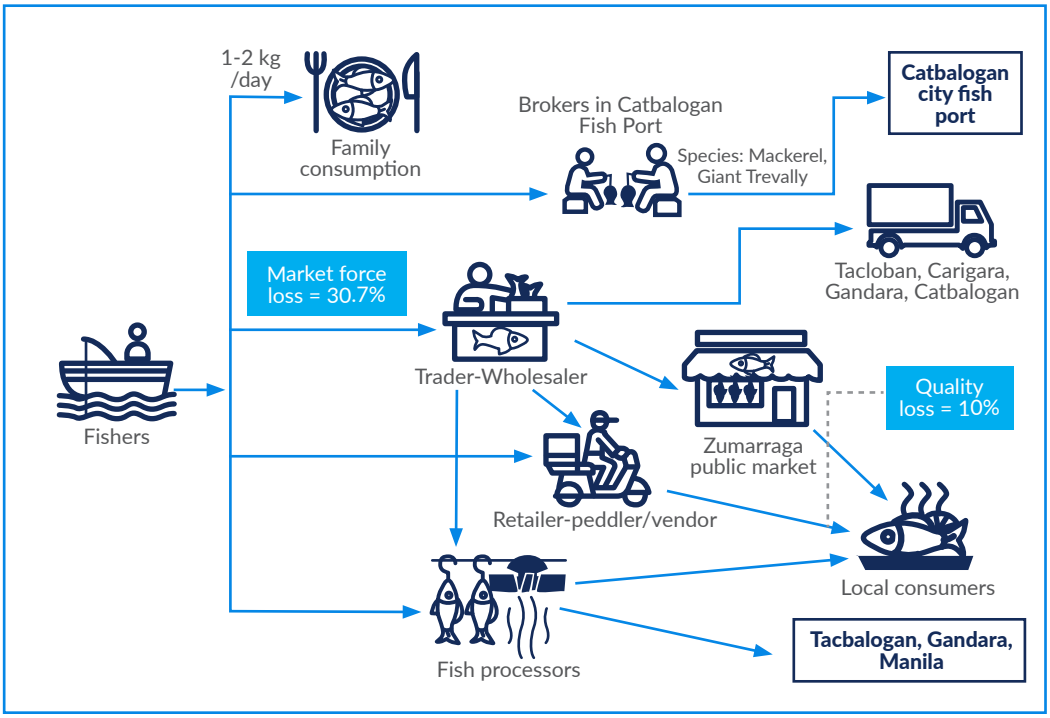


Figure 25. Distribution of fish and edible fisheries commodities in the island municipality of Zumarraga, Samar. Catch of local fishers are sold away from the locality to cities and municipalities within Eastern Visayas. Noteworthy is the high quality loss in the trader-wholesaler to processor nodes presumably due to poor handling practices and lack of processing facilities.

1.4 Post-harvest handling of fish and aquatic commodities in the SaBELANS and ALSBACH municipalities

Fish and other aquatic commodities are sold in open market stalls and booths in all municipalities assessed (Figure 26). The catch are placed in “banyeras”, or styrofoam boxes, or ordinarily displayed in the pavements and tables exposed to flies, air and sun. The products are kept seemingly fresh by periodic sprinkling with iced water. These practices result in significant quality loss.

Figure 26. Practices of post-harvest handling of fish and aquatic commodities in coastal communities along San Bernardino Strait and in Samar bays and channels. Catch for sale are displayed in pavements (A-D) or in open market stalls (E), placed in ‘banyeras’(F), exposed to sun, air and flies. These practices result in quality loss and market force loss.

Figure 27 shows how fish catch for transport to Luzon (Malabon) are processed at the Catbalogan City fish port. High-value species, such as groupers, mackerels, crabs, squids and cuttlefish, are exported outside of the municipality to other cities and regions, and are unavailable to local consumers. Catch rejected by export traders (either oversized or undersized) are sold at the local markets at 73.3% and 10% reduced price in SaBELANS area (Figure 6) and in the ALSBACH municipalities (Figure 18), respectively .

Figure 27. Processing of catch for transport to Luzon, other cities and exporters: A) Blue-swimming crab (*Portunus pelagicus*) ready for sorting and grading; B) sorting and grading of blue swimming crab at the broker's booth; C) packing of tuna in plastic bags with ice and placed in styrofoam boxes; D) loading of packed fish and fisheries commodities in unrefrigerated trucks and transported for about 17 h to Luzon.

There are no commercial or large-scale processing centers or fish canning factories in the areas within the jurisdiction of municipalities assessed. Buyers of blue swimming crabs, cutlefish and squid, semi-process the products at processing plants in Catbalogan City, and transport the products to main processing and export plants in Cebu or Manila.

Majority of processors of fish and fishery products are women. Processed products are dried fish, fermented fish, shrimp or shellfish (bagoong, hipon, patis), dried squid, shucked mussels, and value-added products (fish embutido, fish nuggets, fish relleno and fish lumpia), produced in household scale by individual women-members of processing organizations (Figure 28). Due to lack of drying facilities, physical loss for dried fish is high (50%-100%) during rainy season due to infestation with maggots.

Figure 28. Processors of fish and fisheries commodities are mostly women. Products of smallscale processing are : A) fermented fish (bagoong , and B and C) dried fish. Processed products are packed in recycled bottles and plastic bags and sacks (D-F). Physical loss is high at the processing stage especially during bad weather and rainy season due to lack of drying and fish processing facilities.

In far-flung barangays, fish find its way to the food table of the people, which are mostly rural farmers, through the mobile peddlers or vendors (Figure 29). Due to lack of training on proper handling methods, the fish product that are brought to these areas may have already been nutritionally compromised.

Figure 29. Mobile fish vendors or peddlers in work mode: a styrofoam box loaded in an improvised motorcycle with side car and a megaphone (A) or a motorcyle and an improvised container (B). They sell and deliver fish and aquatic commodities to homes in the towns and the remotest barangays.

1.5 Locations and status of operation of fish landing centers

Table 4 shows the locations and status of the fish landing centers in the SaBELANS and ALSBACH-member municipalities. There are currently 11 fish landing centers reported in the SaBELANS area and nine are operational, which are actually homes of the traders where transactions and processing for transport are done. In the ALSBACH area there are also 11 fish landing centers and only seven centers are operational. Of the six CFLCs funded by the government, only three are operational.

Three out of six CFLC have been 80% completed but are not operational due to lack of equipment needed for trading and cold storage. These are not operational also because fishers do not bring their catch to the CFLC but sell directly to buyers at sea (unlanded catch), or to brokers and traders at fish ports in the mainland (Victoria and Allen in SaBELANS area), and Catbalogan City Port in the ALSBACH area. Unsold catches are dried in solar dryers and improvised drying platforms (Figure 30).

Location	Status
SaBELANS-member municipalities	
Capul-Landusan	Operational
Capul – Oson	Operational
Capul-Sawang	Operational
San Antonio-Burabud	Operational
San Antonio – Dalupirit	Operational
San Antonio – San Nicolas	Operational
San Antonio-Vinisitahan	Operational
San Isidro	Not Operational
San Vicente- Ternate	Operational
San Vicente-Poblacion *	Not Operational
Victoria-Buenos Aires	Operational
ALSBACH-member municipalities	
Calbiga-Barobaybay	Operational
Calbiga- Calingonan*	Not Operationall
Catbalogan- Pier 1 *	Operational
Catbalogan- Silanga	Not Operational
Daram-Poblacion*	Not Operational
Jiabong- Alejandrea	Operational
Motiong-Poblacion 1A	Operational
Paranas-Poblacion 5	Not Operational
Pinabacdao- Poblacion	Operational
Talalora- Poblacion 1*	Operational
Zumarraga- Poblacion*	Operational

* Community Fish Landing Centers (CFLC) /Fish port funded by the Phil. government

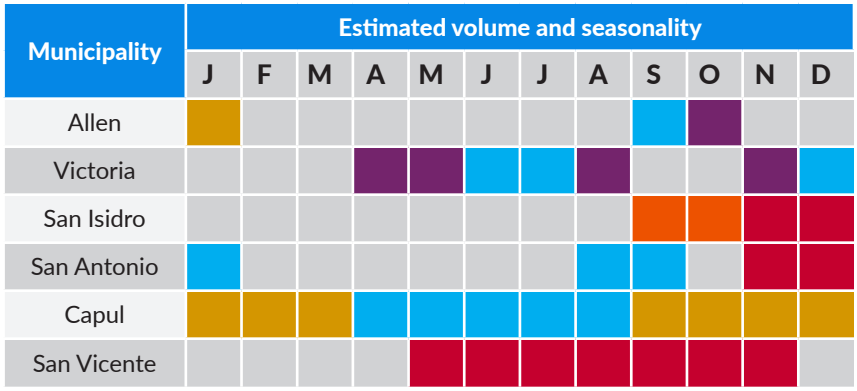
Table 4. Locations of fish landing centers in coastal municipalities along San Bernardino Strait and Samar bays and channels. Most fish landing centers are privately-owned where trading is done. There are 11 fish landing centers in SaBELANS area, nine are operational; and 11 in the ALSBACH area, seven centers are operational. Of the six CFLCs funded by the government, only three are operational.

Figure 30. Fish trading and processing facililes in the ALSBACH area. A) Fish catch in the Samar bays and channels are traded in Catbalogan fish port. B) In Calbiga a marine trading port for small-scale fishers has been established for trading of catches from fish corrals, fish traps and gleaning. C) Solar dryer funded by the government was destroyed by a typhoon and has not been repaired. Unsold catches are dried in solar dryers and improvised drying plaforms and trays (D).

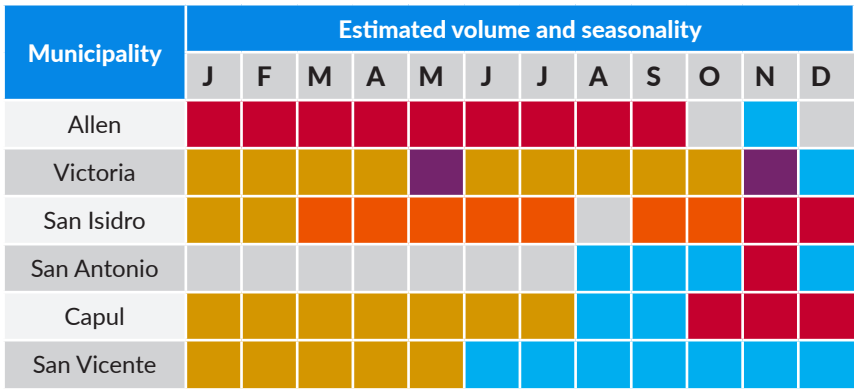
1.6 Estimated volume and seasonality of fish landings

Catches of municipal fishers from target municipalities consist of small pelagics such as anchovy, sardines and slipmouths. These species are caught all-year round especially in island municipalities. Tuna and wild groupers, the predators of the small pelagics, are also caught in abundance. These species have been reported by fishers to have high PHFL during glut seasons, (deep red boxes), when catch reach volumes beyond the capacity of the market to absorb (Table 5). Sardines are highly seasonal with glut seasons during May –Nov in San Vicente and Nov-Dec. in Capul and San Antonio. Catch volume of anchovy is relatively high in San Bernardino Strait compared to the catch volume in the Samar bays and channels.

A
Sardines species (*Amblygaster clupeoides, Sardinella spp.*)



B
Tuna species (*Auxis* sp., *Euthynnus affinis, Thunnus albacares, Katsuwonus pelamis*)



C
Anchovy (*Stolephorus* sp.)

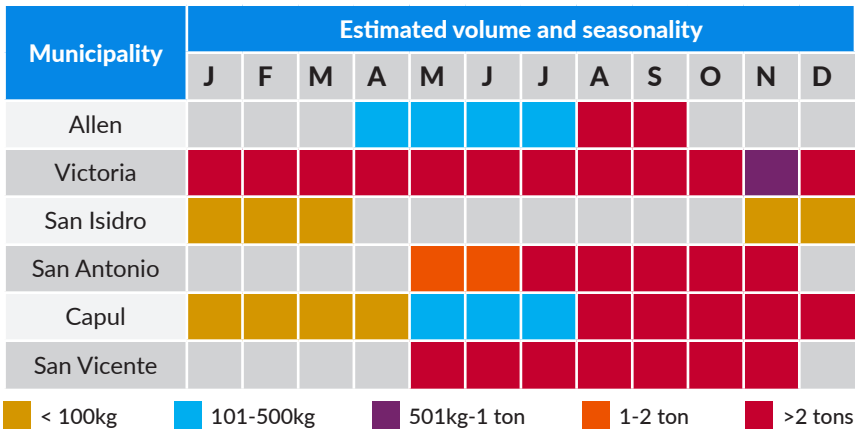


Table 5. Estimated volume (kg/ton) and seasonality of three fish species with high PHFL during glut season in SaBELANS-member municipalities.

In coastal municipalities along Samar bays and channels, fisher-respondents identified groupers, slipmouths, anchovy and sardines (Table 6) as species with high PHFL during seasonal gluts. Estimated volume, and seasonality of landed fish and other aquatic commodities per target municipality are shown in Appendix Tables 2-19.

Groupers (*Epinephelus* spp.)

Slipmouth (*Leiognathus* sp.)

Anchovy (*Stolephorus* sp.)

Sardines (*Sardinella* spp.)

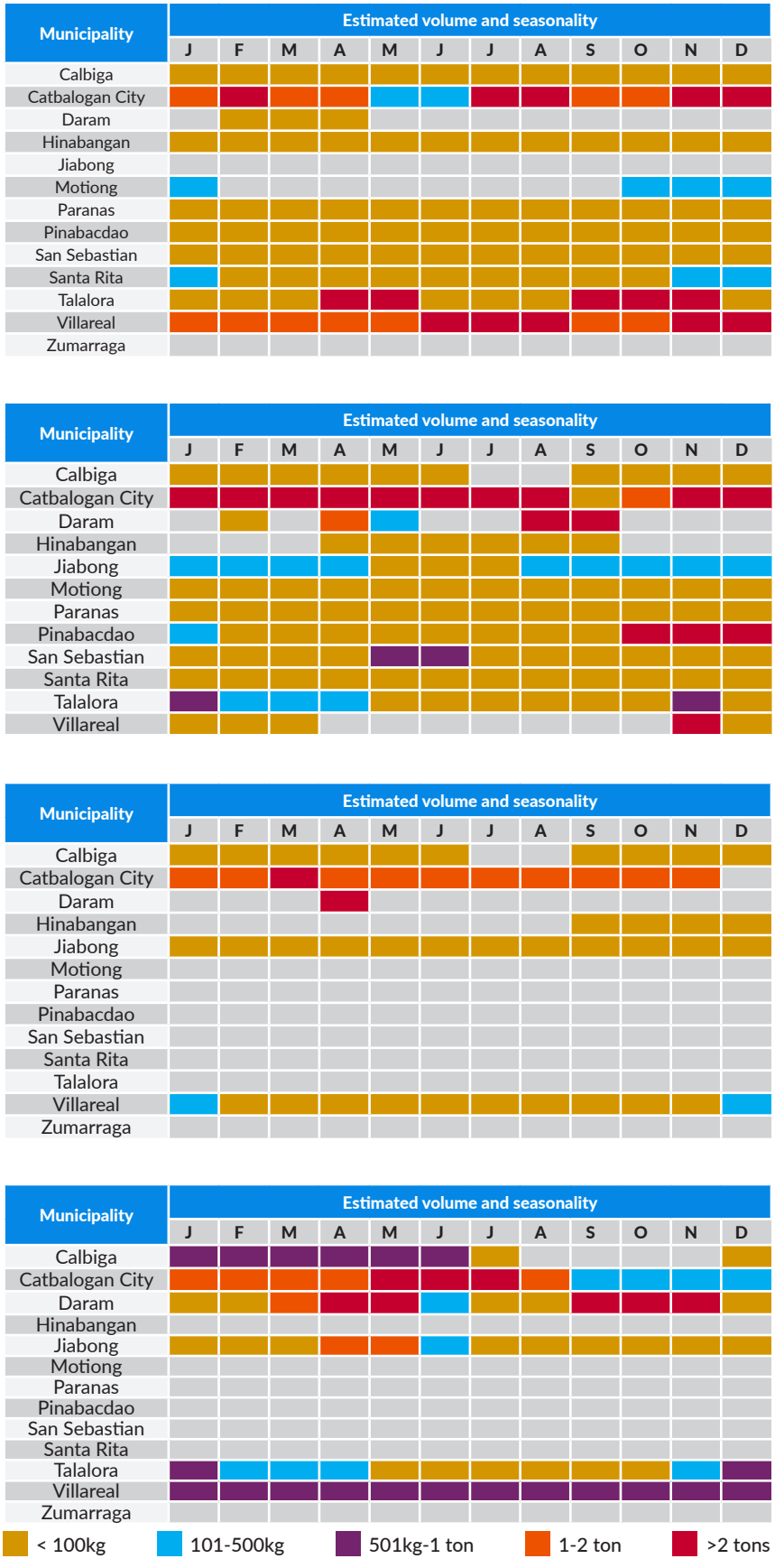


Table 6. Estimated volume and seasonality of four fish species with high PHFL during the glut season in the coastal municipalities along Samar bays and channels.

1.7 Quantitative extent of PHFL in San Bernardino Strait and Samar bays and channels.

The estimated volume of PHFL from 2018-2022 is shown in Table 7. Due to lack of records of catch at the LGUs and municipal offices, these values were estimated based on the annual fish production data of BFAR Region 8 from 2018-2022, and the average PHFL percentage value obtained in this study. Estimated PHFL value from fishing to marketing stages is 38.39 % and 40.34% in the San Bernardino Strait and Samar bays and channels, respectively. These values were obtained by getting the sum of the average physical, market force and quality losses from capture or harvest until the marketing stage only. Losses in the processing stage were not accounted because the data used were reported production data of fresh fish.

The species with highest volume of loss in the San Bernardino Strait and Samar bays and channels are: sardines (*Sardinella lemuru*) (5,417.12 MT), anchovy (4,366.73MT) and slipmouth (4,254.41 MT). These species are the commonly purchased and consumed by low-income groups.

Species	Total reported production 2018-2022 (in MT) [1]	Estimated PHFL (in MT) [2]
Fimbriated Sardines (Tunsoy) (*Sardinella fimbriata*)		
Northern Samar (SaBELANS)	6,450.76	2,508.70
Samar (ALSBACH)	2,844.40	1,147.43
Bali Sardines (Tamban) (*Sardinella lemuru*)		
Northern Samar (SaBELANS)	2,455.80	955.06
Samar (ALSBACH)	11,061.13	4,462.06
Yellow fin Tuna (*Thunnus albacares*)		
Northern Samar (SaBELANS)	5,269.27	2,049.22
Samar (ALSBACH)	277.30	111.86
Big eye tuna (*Thunnus obesus*)		
Northern Samar (SaBELANS)	2,223.62	864.76
Samar (ALSBACH)	388.23	156.61
Eastern little tuna (*Euthynnus affinis*)		
Northern Samar (SaBELANS)	1,656.86	644.35
Samar (ALSBACH)	660.44	266.42
Frigate Tuna (*Auxis thazard*)		
Northern Samar (SaBELANS)	5,753.33	2,237.47
Samar (ALSBACH)	1,764.05	711.62

Table 7. Estimated volume of post-harvest fish losses in San Bernardino Strait (Northern Samar) and in Samar bays and channels (Samar) in 2018-2022.

Table 7 Continuation.

Species	Total reported production 2018-2022 (in MT) [1]	Estimated PHFL (in MT) [2]
Anchovy (*Stolephorus* sp.)		
Northern Samar (SaBELANS)	6,079.59	2,364.35
Samar (ALSBACH)	4,963.77	2,002.38
Grouper (*Epinephelus* sp.)		
Northern Samar (SaBELANS)	2,252.82	876.12
Samar (ALSBACH)	4,313.43	1,740.04
Slipmouth (*Leiognathus* sp.)		
Northern Samar (SaBELANS)	2,834.50	1,102.33
Samar (ALSBACH)	7,813.78	3,152.08

[1] Source : BFAR 8 Annual Fish Production Data (2018-2022)
[2] PHFL estimates: San Bernardino Strait municipalities = 38.39%;
Samar bays and channels municipalities = 40.34%

2. Assessment of fish consumption and micronutrient deficiency

2.1 Secondary data on fish consumption and micronutrient deficiency

Nutrition status and programs

The Philippine DOST-FNRI has been collecting food consumption data of the Philippine population every five years, the last having been conducted last 2018. However, as a response to the need of LGUs for more localized data, an Expanded National Nutrition Survey (ENNS) was conducted from 2018-2019 comprising of data collected from 1,387 households and 5,778 individuals as well as 1,441 households and 6,763 individuals for the province of Samar and Northern Samar, respectively. Results from the study show that more than 70% of households of both provinces report food insecurity wherein there was limited or uncertain availability of nutritionally adequate and safe foods, or limited or uncertain ability to acquire acceptable foods in socially acceptable ways (Anderson 1990). Both provinces demonstrate higher food insecurity in comparison to national estimates (Table 8).

Variable	Philippines	Samar	Northern Samar
	Percent (%)		
Food Secure	46.1	29.5	24.9
Food Insecure	53.9	70.5	75.1
Mildly Food Insecure	12.3	11.5	16.7
Moderately Food Insecure	28.8	41.7	43.4
Severely Food Insecure	12.8	17.2	15.3

Table 8. Percentage of households by food security status in the Philippines, Samar and Northern Samar: ENNS, 2018.

Similar to FNRI's data collection, the National Nutrition Council, in cooperation with Nutrition Offices in all municipalities and cities, take yearly weight measurements of Preschool-Aged individuals from 0-59 months in the barangay level through the OPT Plus. Detailed information of fish and fish product consumption as well as nutrient and micronutrient deficiencies for Region 8 and its provinces are not available. However, FNRI's expanded monograph series as well as the National Nutritional Council's 2022 OPT results report incidence of stunting, wastage, and iodine deficiency which may indicate insufficient protein and fish intake on a provincial level for the Preschool Age, School Age, Adolescents, Lactating, and Elderly demographic.

Wasting and stunting

Wasting is a significant loss of body weight and muscle mass and is an immediate indicator of illnesses and acute nutritional deficiencies, including inadequate protein intake. Stunting, on the other hand, is an indicator of chronic malnutrition and ofen represents that an individual has not received adequate nutrition over an extended period, affecting overall growth. Both wasting and stunting can be caused by protein deficiency among other factors, but they manifest differently in terms of the timing and severity of malnutrition. Additionally, these conditions can coexist in populations facing severe nutritional challenges.

Proteins are essential for the growth, development, and repair of issues, including muscle tissue. When the body lacks an adequate amount of protein, it can result in muscle wasting and weight loss. While protein is crucial for both indicators, we must note that it is often the result of a complex form of malnutrition, which can encompass a lack of various nutrients including not just protein but also essential vitamins and minerals, contraction of illnesses, as well as other environmental and socio-economic factors.

For both provinces, wasting and thinness increases between the 0 to 59 months, 5 to 10-year and >10 to 29-year demographic and is higher within the poor (FNRI, 2018). The 2022 OPT results show a decrease in prevalence of Wasting 2.95% and 1.85% as well as a decrease in Stunting 15.10% and 16.67% in comparison to 2021 OPT results for Northern Samar and Samar, respectively (Table 9).

Life Stage	Variable	Samar	Northern Samar	ENNS National Baselines	PPAN 2023-2028 Targets
Preschool Age (0-59 months)	Moderate and Severe Stunting	16.67%	15.10%		
	Moderate and Severe Wasting	1.85%	2.95%		
	Stunting	42.0%	32.2%	26.7%	17.9%
	Wasting or Thinness	4.8%	6.8%	5.5%	4.3%
	Overweight	2.7%	2.9%	3.9%	3.5%
Preschool Age (0-6 months)	Exclusive Breastfeeding	63.5%	83.1%	60.1%	84.3%
Preschool Age (6-23 months)	Dietary Diversity	15.0%	12.8%	13.8%	90.0%
	Acceptable Diet	10.4%	8.4%	13.3%	25.0%
School Age (5-10 years old)	Wasting or Thinness	8.8%	11.6%	6.9%	2.9%
	Overweight & Obese	5.0%	4.0%	14.0%	0.6%
School Age (6-12 years old)	Iodine Deficiency	17.8%	13.2%	12.4%	4.9%
	Median Urinary Iodine Excretion	141ug/L	155ug/L	174ug/L	174-199ug/L
Adolescents (>10-19 years old)	Overweight & Obese	5.9%	5.2%	13.0%	0.2%
Reproductive Age Women (15-49 years old)					
Non-Pregnant/ Non-Lactating	Iodine Deficiency	13.2%	11.6%	10.7%	4.0%
Lactating	Median Urinary Iodine Excretion	83ug/L	135ug/L	99ug/L	100-199ug/L

Table 9. Comparison of Samar and Northern Samar Nutrition Data to the FNRI National Baseline and the Philippine Plan of Action in Nutrition 2023-2028 Targets.

Iodine Deficiency

Iodine, can also be an indicator of fish consumption as fish and fish products are excellent sources of iodine. Some types of fish and seafood contain significant amounts of iodine, especially saltwater fish. Like stunting and wasting however, iodine deficiency is complex and cannot be attributed to lack of fish consumption alone. The 2018 ENNS results show that school age (5-10) as well as women reproductive age (15-49) are well within the acceptable urinary iodine concentration thresholds for both Samar and Northern

Samar. However, the Lactating and Elderly demographic demonstrate mild deficiency. For the lactating women of Samar, 40% are below 50µg/L urinary iodine concentration, while 29.5% as well as 25.5% of the Elderly are below the threshold for urinary iodine for Samar and Northern Samar, respectively.

Comparing the 2018-2019 data for Samar and Northern Samar to the targets of the Philippine Plan of Action for Nutrition 2022-2028 (PPAN 2022-2028), both provinces are able to meet targets for Overweight, Median Urinary Extraction for School Age Children (6-12 years old) while Northern Samar is able to meet its targets on the Median Urinary Iodine Excretion for Lactating Women (15-49 years old).

Nutrition variables of great concern given its higher results than the national baselines are Stunting (0-59 months), Minimum Acceptable Diet (6-23 months), Wasting or Thinness (0-59 months and 5-10 years old), and Iodine Deficiency (6-12 years old and Non-Pregnant/Non-Lactating Women).

Nutrition Programs within ALSBACH and SaBeLANS Municipalities

Solving the problem of nutrition is seen as a multi-faceted approach that is undertaken by multiple departments within LGUs, each department addressing a certain life stage (Table 10). Nutrition Offices as well as Health Offices focus on the First 1000 days as well as prenatal care given that early child development contributes greatly to the health and brain development of an individual in later stages in life. The First 1,000 Days Program covers an individual's conception until its second birthday. This period is considered a "golden window of opportunity" where rapid brain growth and development occur and serves as a strong foundation for a child's physical growth, mental development, health, nutrition, and future economic productivity (Martorell, 2018).

The Barangays and Social Welfare offices then address nutritional needs of Daycare-age children; however, the Social Welfare office focuses mostly on the 4Ps demographic than the demographic of nutritionally at-risk individuals as identified by Operation Timbang and School-Weighing Reports. Nutritionally At-Risk School-age children are under the care of the Department of Education (DepEd) and although the Parents – Teachers Association (PTA) as well as the schools work together to provide for at-risk individuals, funding is limited. As a result, the nutrition office as well as schools tap the Social Welfare, Agriculture, and DILG for additional funding for various nutrition related projects such as backyard gardening or DILGs Halina't Magtanim ng Prutas at Gulay (HAPAG) Project – although helpful, this however also has its limitation as beneficiaries are often their mandated target demographic. Additionally, Nutrition Offices also collaborate with Youth Offices as well as the Public Employment Services (PESO) of the Department of Labor and Employment (DOLE) to fund awareness programs for demographic not covered by other departments.

Table 10. Nutrition programs across departments in the City and Municipal levels in the Philippines.

Department				
Municipal Nutrilon Office (MNO)	**Municipal Social Welfare and Development Office (MSWDO) + Barangay LGU**	**Department of Education (DepED) + Parent-Teachers Associalons (PTA)**	**Municipal Agriculture Office (MAO) and DILG**	**Youth Development Offices (YDO) & Public Employment Service Office (PESO)**
Programs				
- First 1000 days Program - Mother classes - OPT and monthly monitoring - IEC (Pinggang Pinoy) distribution and Fortified Foods Promotion - Micronutrient supplementation - RUTF (Ready-to-Use Therapeutic Food) for Severe Acute Malnutrition (SAM)	- Supplemental Feeding programs for Moderate Acute Malnutrition (MAM) - School weighing report - Deworming activities (parasites prevent absorption of nutrients) - Micronutrient supplementation for Female		Backyard Gardening and Animal Dispersal, Backyard Garden Contest HAPAG[1] Program	Nutrition Summit, Various Projects
Demographic				
Pregnant and Lactating Infant 0 Month to 2 years of age	Daycare, Livelihood 4Ps families	School Age Children	4Ps[2], farmers, women's	Youth groups and out of school
Challenges				
- Mandanas devolution increases (budget constraints) - Other departments do not prioritize HH with malnourished individuals - Feeding programs are only successful for 1st week due to challenges in transportation				

[1] The HAPAG Project was implemented by the Department of Interior and Local Government (DILG) as a means of enhancing the nation's food security by diversifying and localizing the source of the nation's food supplies. Accessed at: https://dilg,gov.ph/issuances/mc/implementation-of-the Halina't Magtanim-ng-Prutas-at Gulay-HAPAG-sa-Barangay-Project/3662.

[2] The Pantawid Pamilyang Pilipino Program (4Ps) is a human development measure of the national government that provides conditional cash grants to the poorest of the poor, to improve the health, nutrition, and the education of children aged 0-18 years old. Accessed at https://www.dswd.gov.ph.

2.2 Primary data from KII, SII and W-FGDs

The primary respondents for each selected barangay were individuals from each household who oversaw the purchase and preparation of fish and fish products. A total of 402 respondents participated in the surveys where 149 individuals were respondents for far-flung communities, 46 respondents for Poblacion communities, and 92 respondents for fishing communities (Table 11) . Additionally, 49 respondents were participants of the PHFL focus group discussions while 66 respondents came from San Vicente, Northern Samar. Of these respondents, 72% are female, 38% are unemployed, 75% have no regular income or a household monthly income of PhP 5,000.00 and below as shown in Table 12.

Fish is generally consumed primarily because it is nutritious (28%), and delicious (28%), followed by its affordability (14%) and availability (14%) (Table 13). Fish and fish products are generally accessed through roving fish vendors (43%) and from wet market (22%). The average monthly allocation for purchase of fish and fish products is at PhP 1,723.61 across all types of communities and between provinces. This is roughly 36% of the average declared household income of all 402 respondents. These data are, however, vastly different from provincial estimates based on PSA's Family Income expenditure which places fish consumption at 16% and 15% of the total food budget for Samar and Northern Samar, respectively. This disparity could be accounted to an underreporting of household income or an overreporting of budget allocated for fish and fish product alone.

The portion size for meat and fish products as recommended by FNRI's Pinggang Pinoy vary per age group. For the Filipino adult, the recommended portion is two pieces of small-size fish or two slices of large-size fish. However, for ease of data gathering, "palm size" or roughly 85 g of fish was used as a more visual reference for portion size per meal. At an average, a serving size of 1.15 palm size or 97.75 g of fish is consumed per meal as shown in Figure 31. This finding is corroborated by interviews stating that households will normally buy, or in the case of fishing communities, set aside, 1-2 kg of fish to be consumed within a day which would allot around 100 g of fresh fish per member per meal for a household of five.

Between provinces, respondents from SaBeLANS consume larger portions of fish across all age groups as compared to respondents from ALSBACH. This data could possibly be the cause of differences in types of municipalities between provinces as 75% of respondents from SaBeLANS are from island municipalities where other types of meat products are scarce, whereas 71% of respondents from ALSBACH are living within the mainland, having greater access to other sources of protein products.

For frequency of consumption, 21% of respondents reported consuming fish once a day, 54% of respondents reported that fish is most commonly consumed on a weekly basis for all types of communities and between both alliances at a frequency of once per week, 22% of respondents reported a monthly consumption at 2-3 times a month (Table 14).

Alliance/Municipality	Community Category		
	Far-flung	Poblacion	Fishing
SaBELANS			
Allen (Mainland)	Brgy. Frederick, Brgy. Alejandro	Kinabranan 2	Cabacungan
Capul (Island)	Brgy 5	Brgy. 3	Brgy. Sawang, Brgy. Oson
San Vicente			Brgy. Mongolbongol Brgy. Destacado Brgy. Ternate Brgy. Punta
ALSBACH			
Calbiga (Mainland)	Brgy. Literon, Brgy. Antol	Brgy. 4 Brgy. 5	Brgy. Pasigay Brgy. Barobaybay Brgy. Malabal Brgy. Patong Brgy. Rawis Brgy. Tinago Brgy. Polangi
Daram (Island)	Brgy Talisay	Brgy. Astorga	Brgy. 1, Brgy. 2
W-FGD participants			San Sebastian
			Pinabacdao
			Sta. Rita
			Talalora
			Villareal
			Zumarraga

Table 11. Municipalities and barangays selected for the semi-structured interviews and surveys on fish consumption in coastal communities along San Bernardino Strait and Samar bays and channels.

Respondent Type	Total Respondents	Male	Female	Under 18 years old	19-34 years old	35-50 years old	51-65 years old	65 and older	Employed	Self Employed	Unemployed	No Regular Income	5,000 and below	5,0001-15,000	15,001-25,000	25,001 and above
		Percentage (%)														
All Community Types	402	28	72	2	33	36	23	6	25	37	38	16	59	18	3	5
Farflung	149	14	86	1	47	33	13	5	20	30	50	15	71	9	5	1
Poblacion	46	30	70	4	30	41	17	7	37	37	26	11	54	26	2	7
Fishing		40	60	1	23	33	37	6	18	45	37	21	52	19	1	7
By Alliance																
ALSBACH	200	32	68	0	38	36	24	3	19	35	47	12	71	13	1	4
SaBeLANS	202	26	74	3	28	33	28	8	24	42	34	24	47	19	5	5

Table 12. Socio-economic profile of respondents for surveys on fish consumption and micronutrient deficiency in coastal communities along San Bernardino Strait and Samar bays and channels.

Respondent	Average monthly budget for purchase of fish	Fish Sources (%)							Reasons for Consumption (%)						
		Wet Market	Talipapa	Roving Vendor	Own Harvest	Given by neighbor	Fish landing/Port	Grocery/Store	Delicious	Nutritious	Cheap	Readily available	HH member favorite	For special occasions	Not applicable
All Community Types	₱1,723.61	22	3	43	15	11	2	4	28	28	14	14	13	3	1
Farflung	₱1,301.91	20	1	58	10	7	0	4	32	31	16	9	11	1	1
Poblacion	₱1,733.89	37	4	34	15	7	1	0	24	25	8	22	18	2	2
Fishing	₱2,135.02	9	3	36	21	19	3	9	27	28	18	11	10	6	0
By Alliance															
ALSBACH	₱1,965.54	18	3	38	20	10	3	8	28	27	16	13	13	3	1
SaBeLANS	₱1,753.37	13	2	50	12	19	1	4	29	31	17	10	9	4	0

Table 13. Average monthly budget for purchase of fish, fish sources and reason for consumption in selected coastal municipalities along San Bernardino Strait and Samar bays and channels.

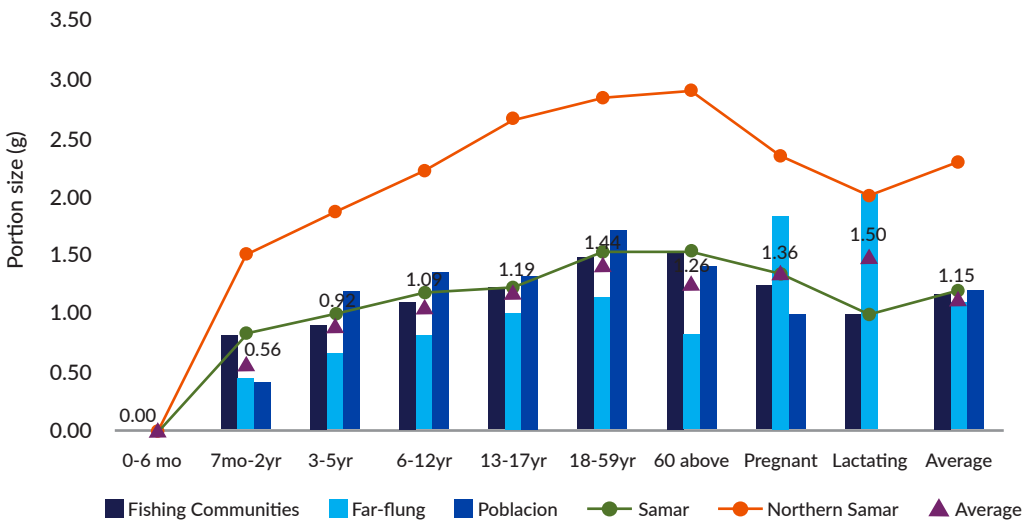


Figure 31. Average fish consumption (as average portion size) per age group in selected coastal municipalities along San Bernardino Strait and Samar bays and channels.

Community Type	6+ per day	4-5 per day	2-3 per day	1 per day	Ave. Daily	5-7 per week	2-4 per week	1 per week	Ave. Weekly	1 per month	2-3 per month	Ave. Monthly	Occasionally	Ave. Occasionally
	Percentage (%)													
All	0	1	6	14	21	3	18	31	54	1	22	23	3	3
Farflung	0	1	12	19	27	3	17	27	48	1	17	22	3	2
Poblacion	0	2	2	7	10	1	16	39	57	0	30	30	3	3
Fishing	1	1	6	16	24	6	21	28	55	1	18	17	2	3
ALSBACH	0	2	9	18	26	4	17	32	55	1	15	15	2	3
SaBeLANS	1	1	6	14	17	5	22	27	52	1	22	28	3	3

Table14. Frequency of fish consumption, by type of community, in selected coastal municipalities in San Bernardino Strait and Samar bays and channels.

Far-flung and fishing communities have higher fish consumption on a daily basis in comparison to respondents living nearer the 'poblacion' which could be attributed to the choice availability as well as buying capacity for other types of protein sources. Average daily intake or quantity of fish consumed observed does not vary greatly from recommended intake, but nutrient requirements may not be met due to poor quality of fish consumed.

Variety of fish and fish products

The variety of most commonly consumed fish and fishery commodities are derived from the listed fish consumed by each respondent and ranked based on the number of times a given species or fish products occurs within the consolidated list. Four types of processed fish products as well as 160 unique local names for fish, seafoods, seashells and seaweeds were gathered for all study sites. Respondents in representative municipalities along San Bernardino Strait reported 109 species, while respondents in municipalities along Samar bays and channels reported 84 species regularly consumed.

For both ALSBACH and SaBeLANS municipalities, the top species of fish commonly consumed on a daily basis are milkfish (*Chanos chanos*), round scad (*Decapterus* sp.), anchovy (*Stolephorus* sp.), sardines (Sardinella sp.), mackerel (Rastrelliger sp.), rabbitfish (*Siganus* sp.), frigate tuna (*Auxis thazard*), squid (*Loligo* sp.), and green mussel (*Perna viridis*) as shown in Table 15.

Although fish is more commonly consumed on a once a week basis for all respondents, it is worth noting that fish and fish products consumed on a daily basis for both ALSBACH and SaBeLANS are mostly wild-caught. It is also worth mentioning that Parrotfish (*Scarus* sp.), a coral-reef species, was the 3rd most mentioned species consumed , while 'Lawayan' (*Alectis indica*) was the 10th mostly mentioned. These however, were omitted from the ranking as its consumption only occurs for respondents from either Northern Samar and Samar, respectively.

In terms of variety of fish consumed per community type, the five most commonly consumed fish whether on a daily or weekly basis are listed in Table 16 in no particular order.

Rank	English Name	Local Name	Scientific Name	Source	Average Php/Kg
1	Round Scad	Galunggong	*Decapterus sp.*	Wild-caught	158.30
2	Rabbitfish	Danggit	*Siganus sp.*	Wild-caught	160.00
3	Sardines	Tamban	*Sardinella sp.*	Wild-caught	112.50
4	Milkfish	Bangus	*Chanos chanos*	Farmed	216.60
5	Shrimp	Pasayan	*Litopenaeus sp*	Wild-caught/ Farmed	206.25
6	Anchovy	Bolinao	*Stolephorus sp.*	Wild-caught	125.00
7	Frigate Tuna	Budlis	*Auxis thazard*	Wild-caught	135.00
8	Sardines	Turay	*Amblygaster clupeoides*	Wild-caught	91.60
9	Ponyfish	Sap-sap	*Leiognathus sp.*	Wild-caught	106.25
10	Sardines (can)	Sardinas (can)	*Sardinella spp.*	Store-bought	28.00/can

Table 15. Top ten fish and fishery commodities consumed on a daily basis by selected coastal communities along San Bernardino Strait and Samar bays and channels.

Far-flung	Poblacion	Fishing
Milkfish *(Chanos chanos)*	Round scad *(Decapterus sp.)*	Round scad *(Decapterus sp.)*
Sardinas (canned) *(Sardinella sp.)*	Milkfish *(Chanos chanos)*	Sardines *(Amblygaster clupeoides)*
Tilapia *(Oreochromis niloticus)*	Frigate tuna *(Auxis thazard)*	Milkfish *(Chanos chanos)*
Round scad *(Decapterus sp.)*	Shrimp *(Litopenaeus sp)*	Sardinas (can) *(Sardinella sp.)*
Frigate tuna *(Auxis thazard)*	Sardines *(Amblygaster clupeoides)*	Frigate tuna *(Auxis thazard)*

Table 16 . Five most consumed fish and fishery commodities per community type in coastal communities along San Bernardino strait and Samar bays and channels.

The top 20 most consumed fish and fish products per alliance on a weekly basis are listed in Table 17. Weekly frequencies were chosen to determine the top species given the larger number of fish and fish products listed in comparison to other consumption frequencies. Of these, 2% of fish consumed in ALSBACH are sourced from local aquafarms while in SaBELANS only 1% of fish consumed are farmed fish.

Dried fish and canned sardines are also included in the top 20 consumed fish and fish products within SaBeLANS due to the fact that there are more survey respondents from island communities (146) compared to mainland communities (56). Island communities are at a disadvantage when it comes to accessing fish food sources given limited production within the island especially during inclement weather.

Additionally, fish caught in island municipalities are often unlanded and shipped off-island by consolidators, limiting supply of fresh fish in the locality. There are also a fewer number of roving vendors to provide access to fresh fish for non-fishing communities within the island. Thus, residents have a tendency to rely more on processed (i.e. canned) food.

ALSBACH				SaBeLANS			
Local Name	Scientific Name	Source	Php/Kg	Local Name	Scientific Name	Source	Php/Kg
Bangus	*Chanos chanos*	Farmed	225.00	**Galunggong**	*Decapterus sp.*	Wild-caught	141.60
Masag	*Portunus pelagicus*	Wild-caught	166.60	**Turay**	*Amblygaster clupeoides*	Wild-caught	91.60
Pasayan	*Litopenaeus sp.*	Farmed	168.75	**Bangus**	*Chanos chanos*	Farmed	200.00
Danggit	*Siganus sp.*	Wild-caught	135.70	**Bolinao**	*Stolephorus sp.*	Wild-caught	125 .00
Sap-sap	*Leiognathus sp.*	Wild-caught	112.50	**Buraw**	*Rastrelliger sp.*	Wild-caught	200.00
Tahong	*Perna viridis*	Farmed	108.30	**Mol-mol**	*Scarus sp.*	Wild-caught	150.00
Galunggong	*Decapterus sp.*	Wild-caught	175.00	**Budlis**	*Auxis thazard*	Wild-caught	150.00
Lapu-lapu	*Epinephelus sp.*	Farmed	266.60	**Mamsa**	*Caranx sp.*	Wild-caught	225.00
Oso-os	*Sillago sp.*	Wild-caught	181.25	**Matambaka**	*Selar crumenophthalmus*	Wild-caught	175.00
Sagision	*Nemiperus sp.*	Wild-caught	187.50	**Danggit**	*Siganus sp.*	Wild-caught	250.00
Tamban	*Sardinella sp.*	Wild-caught	112.50	**Gangis**	*Naso sp.*	Wild-caught	137.50
Balanak	*Mugil cephalus*	Wild-caught	137.50	**Sardinas (can)**	*Sardinella spp. (canned)*	Store-bought	28.00 /can
Buraw	*Rastrelliger sp.*	Wild-caught	262.50	**Tamban**	*Sardinella sp.*	Wild-caught	87.50
Hipon	*Litopenaeus sp.*	Wild-caught	125.00	**Tubo**	*Aulostomus chinensis*	Wild-caught	125.00
Lawayan	*Alectis indica*	Wild-caught	125.00	**Balo**	*Tylosurus crocodilus*	Wild-caught	100.00
Nocos	*Loligo sp.*	Wild-caught	125.00	**Bat-og**	*Sphyraena sp.*	Wild-caught	100.00
Bolinao	*Stolephorus sp.*	Wild-caught	125.00	**Bulad**	*Dried Fish (various)*	Store-bought	125.00
Budlis	*Auxis thazard*	Wild-caught	175.00	**Nocos**	*Loligo sp.*	Wild-caught	200.00
Lambiyaw	*Selariodes sp.*	Wild-caught	--	**Tahong**	*Perna viridis*	Farmed	100.00
Lapis	*Scomberiodes tala*	Wild-caught	262.50	**Tangige**	*Scomberomorus commerson*	Wild-caught	275.00

Table 17. Top 20 fish and fishery commodities consumed in selected coastal communities along San Bernardino Strait and Samar bays and channels.

Contributions of fish and fishery commodities to energy and nutrient intake

In terms of species of fish consumed per age group, it was determined by multiplying the average portion palm size consumption per age group by 85 g. Nutrients consumed per listed fish and fish products were determined by multiplying the weight consumed per age group to edible portions and nutrient content per fish species as listed in the consumption table by the DOST-FNRI (DOST-FNRI, 1997). In cases that an exact match to scientific names are not found, data from the same family or common name were utilized. The results of nutrient content multiplied by average edible portions were then compared against the average Recommended Energy Intake and Nutrient Intakes (REI/RNI) for males aged 19-59 years old as set by the Philippines Dietary Reference Intakes of 2015. Table 18 shows the percent REI/RNI contribution for the ten most commonly consumed species for ALSBACH and SaBeLANS.

A meal with an average edible portion of 71.86 g of fish for the ten fish and fishery commodities most commonly consumed can provide about 19% of the recommended protein intake per day. For the top five fish species, round scad and sardines can potentially provide 17%, rabbitfish 16%, milkfish at 22%, and shrimp at 20 % of protein per meal on a daily basis.

REI/RNI (M, 19-59)			Water (g)	Energy (kcal)	Protein (g)	Total Fat (g)	Fiber, total dietary (g)	Sugars, total (g)	Calcium Ca (mg)	Phosphorus, P (mg)	Iron, Fe (mg)	Potassium, K (mg)	Sodium, Na (mg)	Zinc. Zn (mg)	Retinol, Vitamin A (ug)	Thiamin, Vitamin B1 (mg)	Riboflavin, Vitamin B2 (mg)	Niacin (mg)	Ascorbic Acid, Vitamin C (mg)
			2457	2457	71	4.73	25	61	750	700	12	2000	500	6.5	700	1.2	1.3	16	70
Rank	**English Name**	**Edible Portion (g)**	**Percent (%) Contribution to REI/RNI**																
1	Round scad	60.02	2	2	17	27	0	0	5	18	6	0	11	0	5	7	8	29	0
2	Rabbit-fish	56.35	2	2	16	13	0	0	3	11	2	0	7	0	15	8	7	16	0
3 & 8	Sardines	63.70	2	3	17	63	0	0	10	26	8	0	9	0	3	1	8	32	0
4	Milkfish	79.62	2	4	22	108	0	0	5	22	8	0	11	0	15	1	6	39	0
5	Shrimp	75.95	2	3	20	13	0	0	15	23	9	0	19	0	5	4	2	15	0
6	Anchovy	122.50	4	3	24	36	0	0	123	84	12	0	29	0	11	0	11	15	0
7	Frigate tuna	75.95	2	4	26	42	0	0	4	27	8	0	11	0	10	16	14	70	0
9	Ponyfish	49.0	2	2	13	21	0	0	4	10	1	0	16	3	1	3	6	0	2
10	Sardines (canned)	122.5	4	4	17	111	2	1	56	27	24	15	76	105	1	4	28	0	4
	All top 10	**78.40**	**2**	**3**	**19**	**48**	**0**	**0**	**25**	**28**	**9**	**2**	**21**	**19**	**4**	**7**	**28**	**0**	**2**

Table 18. Percent nutrient contribution to Recommended Energy/ Nutrient Intake (REI/RNI) of top five and average top ten fish and fishery commodities consumed by coastal communities along San Bernardino Strait and Samar bays and channels. Data source : Consumption Table of DOST-FNRI (DOST-FNRI,1997).

Notable of the ten species most commonly consumed are frigate tuna (Budlis/Tulingan) and anchovy (Bolinao) which can potentially provide ¼ of the RNI in one meal. At the average buying price of PhP 125.00 and PhP 135.00 per kg respectively, these two species are good candidates for projects aimed at improving macro and micronutrient intake for communities within Samar and Northern Samar.

2.3 Nutrition program challenges

Apart from disconnects between target demographics between departments, major challenges across all programs is the longevity and stickiness of the programs as fresh-cooked feeding programs have a tendency to cater only to households living near barangay centers and cannot reach isolated barangays. Additionally, dried food packs distributed to households are often not consumed by the target demographic because of challenges in taste, water availability, and knowledge in cooking.

With the devolution as mandated by the Mandanas Law, programs are also at risk to losing more funding as a large part of their programs are funded by National and Regional agencies given the small budget allocation in the City and Municipal level.

Opportunities and Recommendations

On reduction of PHFL

The PHFL values obtained in this study are higher than those reported in the Philippines by Tadifa et al. (2022) and Montojo et al. (2020). These findings provide justification for the need for interventions to reduce PHFL in the assessed municipalities, particularly in municipalities with high poverty and malnutrition rates. Reduction of losses will not only increase availability of affordable fish species but will also minimize fishing pressure in San Bernardino Strait and Samar bays and channels.

Considering the importance of accurate catch or production data in identifying and quantifying fish losses, it is recommended that the catch reporting and monitoring systems in coastal municipalities covered by the two alliances be improved and institutionalized. Accurate information on quantity, type and stage where losses occur are crucial in devising appropriate and timely reduction strategies.

To minimize quality loss: Women, processors, and traders, particularly the mobile vendors need to be trained on post-harvest handling and preservation, and be provided livelihood support. As the only suppliers of fish and aquatic products to the remotest barangays and homes, the mobile vendors, or peddlers play crucial roles in the fight against hunger and malnutrition in far-flung areas.

To reduce physical and market force loss, limitation of catch volume of species reported to have high PHFL during peak fishing seasons is recommended. An organized marketing system needs to be also instituted to link fishers and aquafarmers to buyers, and to forge upstream and forward market linkages among players in the fish distribution chain. In addition, a price regulating mechanism that is area and species-specific be set up to ensure availability of reasonably priced fish and fisheries commodities in the locality without denying the fishers and aquafarmers the opportunity to earn fair profits.

Fish and fisheries commodities are highly perishable commodities, thus establishment of appropriate off-site (i.e. renewable energy-powered cold storage/catch monitoring boat) or on-site cold storage and processing facilities play crucial roles in providing year-round supply of fresh products and reduction of any type of PHFL. Integration of these infrastructures in post-harvest loss reduction initiatives have been reported to be implemented successfully in both developed and developing countries, in partnership with government and private sectors. Alternatively, the existing non-operational CFLCs can be refurbished into multi-purpose establishments not only for cold storage and trading, but also as processing and tourism facilities.

On fish consumption and mitigation of micronutrient deficiency

The PPAN 2023-2028 aims for a life stage approach through healthier diets and better improved access through a multi-sectoral approach. This approach is slowly being implemented on the ground with multiple departments playing crucial roles in nutrition through various life stages from the promotion and implementation of various projects under the First 1000 Days Program, family development sessions, establishing vegetable gardens and animal dispersals to partnerships in order to influence behavioral change.

Opportunities identified in the study which can be aligned with PPAN are: improvement of market access and storage, as well as processing of high-nutrient fish species, in order to reach far-flung communities whose access to fish is limited to those sold by fish vendors, and those who can only purchase and consume fish and fish products at most once a week; and inclusion of the fisheries sector in KADIWA stores. KADIWA is a marketing strategy of the government which directly connects food producers (farmers and upstarts) to consumers, thereby reducing the cost of products up to 20% from those at the market.

Improvement in access, affordability, and production of healthier, community-level processed fish will benefit the communities with limited access to fresh fish, most especially during the rainy season where fresh fish is less available across far-flung, 'poblacion', and fishing communities.

Lastly, utilization of the following readily available fish species in nutritional improvement programs is recommended to address the following challenges on undernutrition and micronutrient deficiencies:

- Wasting and stunting: frigate tuna, anchovy, milkfish, round scad, rabbitfish, and sardines can provide 16-26% of the REI of protein per meal.
- Vitamin A deficiency: rabbitfish, milkfish, anchovy, and frigate tuna can provide 10-15% of the RNI for retinol with rabbitfish and milkfish potentially providing 15%.
- Iron Deficiency: anchovy, sardines, frigate tuna, and milkfish can provide 8-12% of RNI for Iron, with anchovy potentially providing the highest at 12%.

References

Akande G. and Y. Diei-Ouadi 2010. Post-harvest losses in small-scale fisheries: Case studies in five sub-saharan African countries. FAO Fisheries and Aquaculture Technical Paper No. 550. FAO, Rome. http://www.fao.org/docrep/013/i1798e/i11798e00.htm.

Ames, G., I. Glucas and S. Paul, 1991. Post-harvest losses of fish in the tropics. Natural Resources Institute, Chatham, UK.

Anderson,S.A. 1990. Core Indicators of Nutritional Status for DiUicult-to-Sample Populations.
The Journal of Nutrition 120 (suppl).1559-1600.
Retrieved from https://www.sciepub.com on February 2024.

BFAR. 2021. Philippine Fisheries Profile 2021. ISSN:2704-3355

Cabral, R., R.C. Geronimo, A.S. Mamauag,, J.A. Silva, R.H. Mancao and M.P. Atrigenio. 2023. Ensuring aquatic food security in the Philippines. The Philippine Journal of Fisheries 30(2): in press. DOI: 10.31.398/tpjf/30.2.2022-0031.

Daluwatte,D. and S.S. Sivakumar. 2018. Economic loss of fisheries due to the post-harvest quality loss and assessment of quality lossin fish. Global Scientific J. 6(9):115-124.

Diei-Ouadi Y., K. Sodoke, B. Quedraogo, Y. Adjoa Oduro, F. Bokobosso and K. Rosenthal. 2015. Strengthening the performance of post-harvest systems and regional trade in small-scale fisheries : Case study of post-harvest loss reduction in the Volta Basin riparian countries. FAO Fisheries and Aquaculture Circular No. 1105. FAO, Rome.

Department of Science and Technology - Food and Nutrition Research Institute (DOST-FNRI). 1997. The Philippine Food Composition Tables. Current Status and Needs.
Accessed at: https://www.scribd.com/document on February 2024.

Department of Science and Technology - Food and Nutrition Research Institute (DOST-FNRI). 2020. 2018 Expanded National Nutrition Survey Monograph Series: The food, health and nutrition situation of Northern Samar and Samar.

Department of Science and Technology - Food and Nutrition Research Institute (DOST-FNRI). 2018. EENS Survey results presented during the 2019 National Nutritio summit.
Retrieved from https://fnri.dost.gov.ph on January 2024.

Diei-Ouadi, Y. and Y.I. Mgawe. 2011. Post-harvest fish loss assessment in small-scale fisheries: A guide for the extension oUicer. FAO Fisheries and Aquaculture Technical Paper. No. 559. Rome, FAO. 93 p.

FAO.2011. Global Food Losses and Food Waste: Extent, Causes and Prevention. FAO, Rome.

Froese, R. and D. Pauly. Editors. 2023, Fishbase. World Wide Web electronic publication. www.fishbase.org.version (10/2023)

Garcia, Y.T., M.M. Dey and S.M.M. Navarez, 2005. Demand for fish in the Philippines: A disaggregated analysis. Aquaculture Economics and Management 9:141-168.
https:/doi.org?10.1080/13657300591001810.

Kaminski, A. and s. Cole. 2017. Building a case for using participatory and gender-aware approaches in postharvest fish loss assessment and fishery value chain development interventions. In: FAO.2018. Report and Papers presented at the Fourth Meeting of Professionals/Experts in support of Fish Safety, Technology and marketing in Africa, Elmina, Ghana, 14-16 November 2017.

Keerthana, P.S., S. Gopan, R. Rajabudeen, R. Fathima, K. Shibbu, R. Nisha, P. Udayan, T. Elvis, T. Gifty, N.H. Arun Das, K. Dinesh, M.P. Safeena and G.B. Sreekanth. 2022. Post-harvest losses in the fisheries sector-facts, figures, challenges and strategies. International Journal of Fisheries and Aquatic Studies. 10(4): 101-108.

Kelleher, K. 2005. Discards in the World's Marine Fisheries- an update. FAO, Rome.

Kruijssen F, I. Tedesco, A. Ward, L.Pincus, D. Love, A.L. Thorne-Lyman. 2020. Loss and waste in fish value chains: A review of the evidence from low and middle-income countries. Global Food Security 26. Doi. org/10.1016/j.gfs.2020.100434.

Martorell, R. 2018. Improved Nutrition in the First 1000 days and Adult Human Capital and Health. Am.J Hum.Bio 29(2):10.1002/ajhb.22952. doi: 10.1002/ajhb.22952.

Montojo, U.M., V.H. Delos Santos, C.M. Narida, I.Y. Febrero, D.M. Peralta, R.J.S. Banicod and O.M. Sabal. 2020. Estimation of postharvest losses of fish transported using ice-chilled carrier boats from High Seas Pocket 1. The Philippine Journal of Fisheries 27(1): 82-91. DOI:10.31398/tpj/27.1.2019A0018.

National Nutrition Council. 2022 EV Nutrition Situation Report, www.nnc.gov.ph/downloads/category/106-region-8-facts-and-figures?download=3640:2022-eastern-visayas-nutrition-situation.

Philippine Statistics Authority. 2021. Family Income and Expenditure Survey 2021. psada.psa.gov.ph/themes/nada/png/zip_file.png.

Philippine Statistics Authority. 2023. Eastern Visayas Fishery Production 2022. rsso08. psa.gov.ph

Rutten, M. 2013. What economic theory tells us about impacts of reducing food losses and/or waste: implications for research, policy and practice. Agric. Food Secur. 2(13) https://doi.org/10.1186/2048-7010-2-13.

Schuster, M. and M. Torero. 2016. Towards a sustainable food system: reducing food loss and waste. In: 2016 Global Policy Report. International Food Policy Research Institute (IFPRI), Washington , DC. pp. 22-31 (Chapter 3).

Tadifa G.C., R.J.G. Batilod, D.M. Peralta, C.A.M. Ramos and U.M. Montojo. 2022. A study on post-harvest losses in fisheries owing to changes in market supply and demand in the Philippines. The Philippine Journal of Fisheries 29(2): 97-114.

United Nations. 2014. Open Working Group Proposal for Sustainable Development Goals. United Nations, New York City.

Ward, A. and D. Signa. 2021. Reducing post-harvest fish losses for improved food security. FAO publication. Smart Fiche 17.

Ward, A.R. and D.R. JeUries. 2000. A Manual for Assessing Post-harvest Fisheries Losses. Natural Resources Institute. Chatham, UK.

Wibowo, S., B.S.B. Utomo, A.R. Ward, Y. Diei-Ouadi, S. Susana and P. Suuronen.2017. Case studies on fish loss assessment of small-scale fisheries in Indonesia. FAO Fish. Aquacult. Circ. 1-114.c1129.

Appendices

PHFL FORM 01
Questionnaire for LGU/GA

Name of Data Provider: _____
Position/Designation: _____
Agency: _____
Municipality : _____

Number of fishers: total : _____ (registered: _____ not registered: _____)
Commercial: _____ Municipal: _____

Number of fish traders : total : _____
wholesalers: _____ retailers: _____ vendors: _____

Fish landing sites : Number _____

Location	Status	Remarks

Number of fish processors : _____
Fish processing sites:

Location	Status	Remarks

Number of aquafarmers: _____ cage: _____ pen: _____ pond: _____
Aquafarming sites:

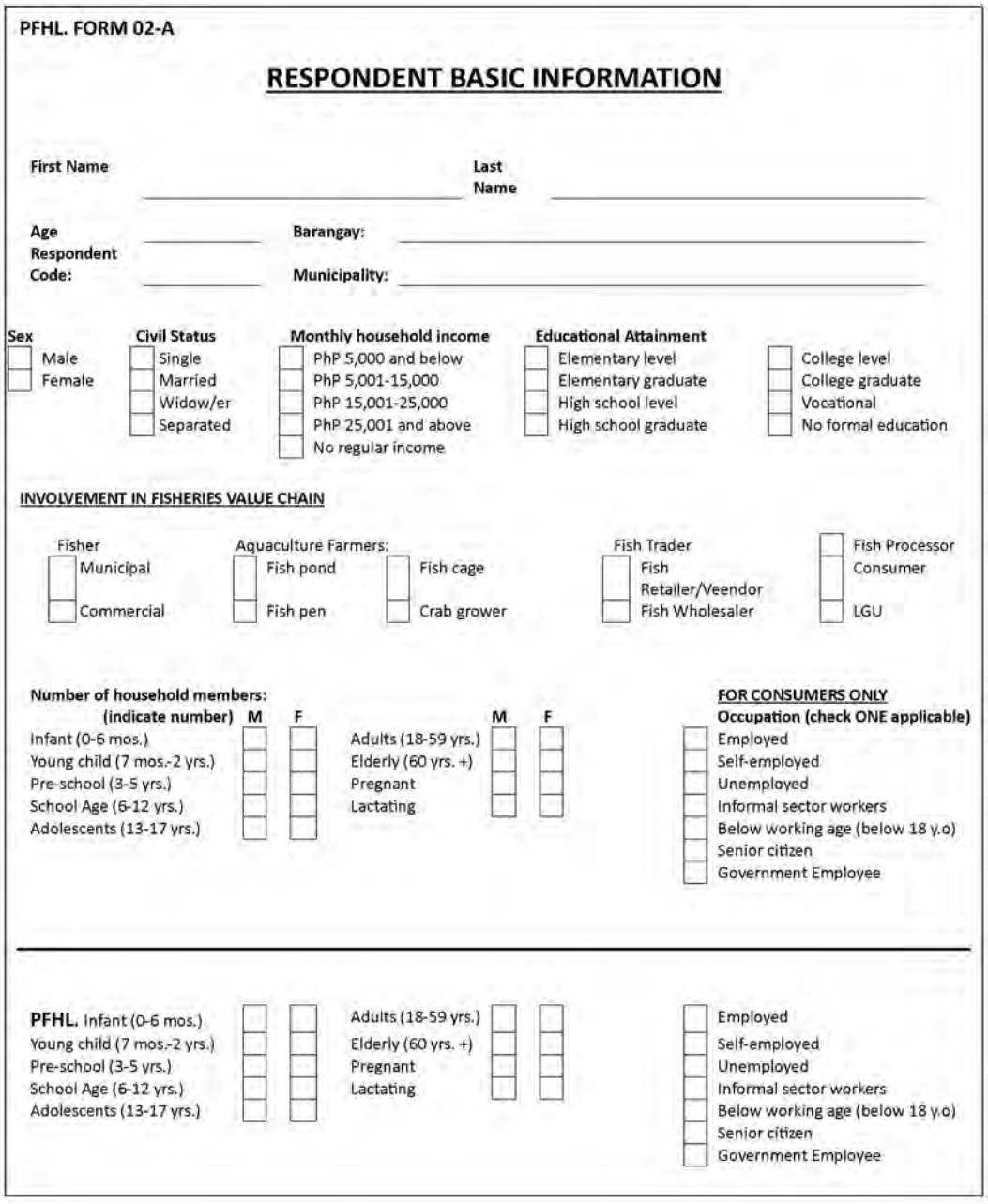
Location	Status	Type

Government Programs/Projects on Postharvest Fish Losses and Fish Consumption:

Name of program/project	Imlementing Agency	Status

Note: use additional sheets if needed

Appendix 1. Survey questionnaire to gather information on fisheries sector profiles of SaBELANS and ALSBACH- member municipalities.



PFHL. FORM 02-A

RESPONDENT BASIC INFORMATION

First Name _____ Last Name _____

Age _____ Barangay: _____

Respondent Code: _____ Municipality: _____

Sex
- ☐ Male
- ☐ Female

Civil Status
- ☐ Single
- ☐ Married
- ☐ Widow/er
- ☐ Separated

Monthly household income
- ☐ PhP 5,000 and below
- ☐ PhP 5,001-15,000
- ☐ PhP 15,001-25,000
- ☐ PhP 25,001 and above
- ☐ No regular income

Educational Attainment
- ☐ Elementary level
- ☐ Elementary graduate
- ☐ High school level
- ☐ High school graduate
- ☐ College level
- ☐ College graduate
- ☐ Vocational
- ☐ No formal education

INVOLVEMENT IN FISHERIES VALUE CHAIN

Fisher
- ☐ Municipal
- ☐ Commercial

Aquaculture Farmers:
- ☐ Fish pond
- ☐ Fish pen
- ☐ Fish cage
- ☐ Crab grower

Fish Trader
- ☐ Fish Retailer/Veendor
- ☐ Fish Wholesaler

- ☐ Fish Processor
- ☐ Consumer
- ☐ LGU

Number of household members:

(indicate number)	M	F		M	F
Infant (0-6 mos.)	☐	☐	Adults (18-59 yrs.)	☐	☐
Young child (7 mos.-2 yrs.)	☐	☐	Elderly (60 yrs. +)	☐	☐
Pre-school (3-5 yrs.)	☐	☐	Pregnant	☐	☐
School Age (6-12 yrs.)	☐	☐	Lactating	☐	☐
Adolescents (13-17 yrs.)	☐	☐			

FOR CONSUMERS ONLY

Occupation (check ONE applicable)
- ☐ Employed
- ☐ Self-employed
- ☐ Unemployed
- ☐ Informal sector workers
- ☐ Below working age (below 18 y.o)
- ☐ Senior citizen
- ☐ Government Employee

PFHL.

Infant (0-6 mos.)	☐	☐	Adults (18-59 yrs.)	☐	☐
Young child (7 mos.-2 yrs.)	☐	☐	Elderly (60 yrs. +)	☐	☐
Pre-school (3-5 yrs.)	☐	☐	Pregnant	☐	☐
School Age (6-12 yrs.)	☐	☐	Lactating	☐	☐
Adolescents (13-17 yrs.)	☐	☐			

- ☐ Employed
- ☐ Self-employed
- ☐ Unemployed
- ☐ Informal sector workers
- ☐ Below working age (below 18 y.o)
- ☐ Senior citizen
- ☐ Government Employee

Appendix 2. Interview questionnaire to gather information about the respondents for assessment of post-harvest fish losses and fish consumption in coastal communities along San Bernardino Strait and Samar bays and channels.

FORM 02-B1 Respondent

Code: FP-____

FISHERFOLK QUESTIONNAIRE

Name: _____ Barangay: _____

Age: _____ Municipality: _____

FISH CAPTURE METHOD

☐ Municipal
Type of boat: _____ (motorized/ non motorized

☐ Commercial:
Vessel Classification: ☐ Small ☐ Medium ☐ Large
Type/s of gear used: _____
Location of fishing ground: _____

Market Type:
☐ Local: _____ ☐ Export: _____

RESPONDENT INCOME

Income from Fishing	Monthly Income (PHP)	Remarks (ex. months engaged, by whom, etc.)
Alternate Source/s of HH Income	**Monthly Income (PHP)**	**Remarks** (ex. months engaged, by whom, etc.)

POST-HARVEST HANDLING

Preservation method: With ice, no ice, others, please describe: _____

Storage Method: _____

Storage Method: _____

Appendix 3. Interview questionnaire for fisherfolk to assess post-harvest fish losses and fish consumption in coastal communities along San Bernardino Strait and Samar bays and channels.

Appendix 3. Continued

PHFL FORM 02-B2 Group Code/ Respondent Code: FP-____

FISHERFOLK QUESTIONNAIRE

Name: _____ Barangay: _____
Age: _____ Municipality: _____

PRODUCTION ALLOCATION

% Estimated Fish Sold: _____ % For Home Consumption: _____ % Given away _____ % Total Estimated Lost: _____

VOLUME OF PRODUCTION / YEAR

Month	Number of Fishing Trips per week	Fishing Hours per trip	Species Caught	Volume of Catch per trip	Monthly volume of catch (estimated by researcher)	Remarks

PRODUCTION LOSSES

Month	Description of Fish Losses (Respondent)	% Estimated Loss (of Total Loss)	Type of Loss (answered by researcher)			Remarks (perceived causes and impacts)
			Physical	Quality	Market	

PHFL FORM 02-C

Group Code/ Respondent Code: FP-_____

FISH PROCESSOR QUESTIONNAIRE

TYPE OF PROCESSOR

☐ Small Scale ☐ Commercial

Type/s of equipment used: ____________________

VOLUME OF PRODUCTION

Month	Fish Species	Volume of Raw Material (kg, tons)	Buying Price of Raw Material	Source of Fish Supply/Raw Materials (choose applicable, place name)		Type of Processed Product	Product Produced			Market (choose applicable, place name)				Remarks
				Municipal	Commercial		Total Volume	% Sold	% Consumed	Local	Selling Price	Export	Selling Price	

PRODUCT HANDLING

Preservation method: ____________________

Storage Method: ____________________

Others: ____________________

PRODUCTION LOSSES

Month	Description of Losses (Respondent)	% Estimated Loss (of Total Loss)	Type of Loss (answered by researcher)			Remarks
			Physical	Quality	Market	

Appendix 4. Interview questionnaire for fish processors to assess post-harvest fish losses in coastal communities along San Bernardino Strait and Samar bays and channels.

PHFL FORM 2D Respondent Code: T-____

TRADER QUESTIONNAIRE

Name: _____ Barangay: _____
Age: _____ Municipality: _____

TYPE OF TRADERR

☐ Wholesale/Bulk Buyer ☐ Retailer – Market Stall ☐ Retailer – vendor peddler

VOLUME TRADED

Month	Fish Species	Fresh/Raw	Processed	Volume of Supply (kg, tons)	Source of Fish Supply (choose applicable, place name)		Market (choose applicable, place name)		Remarks
					Municipal	Commercial	Local (within municipality)	Other destination	

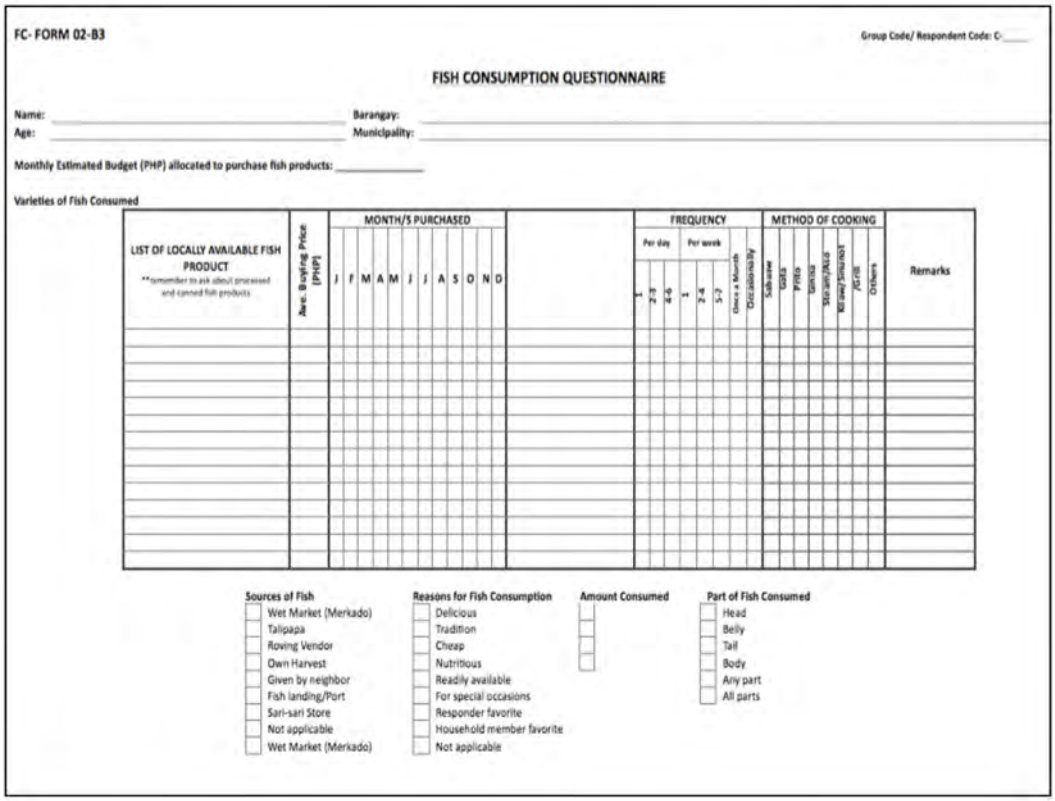
PRODUCT HANDLING PRACTICES

Preservation method: _____
Storage Method: _____
Others: _____

TRADING LOSSES

Month	Description of Trading Losses (Respondent)	% Estimated Loss (of Total Loss)	Type of Loss (answered by researcher)			Remarks (perceived causes and impacts)
			Physical	Quality	Market	

Appendix 5. Survey questionnaire for fish trader to assess post-harvest fish losses in coastal communities along San Bernardino Strait and Samar bays and channels.



FC- FORM 02-B3

Group Code/ Respondent Code: C-____

FISH CONSUMPTION QUESTIONNAIRE

Name: _____ Barangay: _____

Age: _____ Municipality: _____

Monthly Estimated Budget (PHP) allocated to purchase fish products: _____

Varieties of Fish Consumed

LIST OF LOCALLY AVAILABLE FISH PRODUCT **remember to ask about processed and canned fish products	Ave. Buying Price (PHP)	MONTH/S PURCHASED J F M A M J J A S O N D		FREQUENCY: Per day (1; 2-3; 4-6); Per week (1; 2-4; 5-7); Once a Month; Occasionally	METHOD OF COOKING: Sabaw; Gata; Prito; Ginisa; Sigang/Asado; Kilawin/Inihaw; Grill; Others	Remarks

Sources of Fish
- ☐ Wet Market (Merkado)
- ☐ Talipapa
- ☐ Roving Vendor
- ☐ Own Harvest
- ☐ Given by neighbor
- ☐ Fish landing/Port
- ☐ Sari-sari Store
- ☐ Not applicable
- ☐ Wet Market (Merkado)

Reasons for Fish Consumption
- ☐ Delicious
- ☐ Tradition
- ☐ Cheap
- ☐ Nutritious
- ☐ Readily available
- ☐ For special occasions
- ☐ Responder favorite
- ☐ Household member favorite
- ☐ Not applicable

Amount Consumed
- ☐
- ☐
- ☐
- ☐

Part of Fish Consumed
- ☐ Head
- ☐ Belly
- ☐ Tail
- ☐ Body
- ☐ Any part
- ☐ All parts

Appendix 6. Survey questionnaire for assessment of fish consumption in coastal communities along San Bernardino Strait and Samar bays and channels.

Name	Position	Municipality/City/Alliance
Hon. Ferdinand C. Avila	Municipal Mayor & Council Chairman, SaBELANS	San Isidro, Northern Samar/SaBELANS
Dr. Glen Calipus	Municipal Agriculturist (MA) & Manager, SaBELANS Mgt. Board	
Mr. Sunday B. Ombrog	Chairperson, Municipal Fisheries and Aquatic Resources Management Council (MFARMC)	
Dr. Mary Ann S. Baena	MA 1	Victoria, Northern Samar/SaBELANS
Gerry Picasa	President, Fisherfolk Association	
Mylene Villaortes	Fish broker/Processor	
Ms. Lea Guita	Agricultural Technologist (AT)	
Ms. Nenita Hingpit	Vice Pres., Allen Women Fish Processors	Allen, Northern Samar/ SaBELANS
Mr. Ronie G. Abuyog	President, Kinaguitman Fishers Association	
Ms. Judy P. Morada	Municipal Agriculture Officer (MAO)	
Mr. Pablito Sodial Jr.	President, Jubasan Fisherfolk Association	
Mr. Renz Cajandab	MAO-staff	
Ms. Yolanda Cabatingan	MAO	Capul, Northern Samar/SaBELANS
Mr. Eric S. Cabili	AT	
Dr. Vicente Catucod	Retired MAO & Fishpond Owner	
Hon. Arnulfo Abayon	Punong barangay/fish trader	
Mr. Richard Flores	AT	
Ms. Merlyn Masdo	MAO	San Vicente, Northern Samar/SaBELANS
Mr. Ricardo Collamar	Former MFARMC Chairperson	
Mr. Samuel S. Ostia	MAO	San Antonio, Northern Samar/SaBELANS
Ms. Jona O. Gordo	MAO-staff	
Hon. Gary Lavin	Municipal Mayor	
Dr. Rommel Francisco	Provincial Health Officer, DOH	Northern Samar
Mr. Juan Miniano Jr.	Provincial Fisheries Officer, Provincial Local Govt Unit (PLGU)- Samar & Secretariat Head, ALSBACH	Catbalogan City/ ALSBACH
Mr. Melboy P. Hechanova	Fish broker/Chair, Provincial Fisheries and Aquatic Resources Management Council (PFARMC) -Samar and Regional Fisheries Director, Region 8	
Mr. Ronaldo Umpad	AT-Fisheries	

Appendix Table 1. List of Key Informants who were interviewed to validate the outputs from the FGDs for the assessment of PHFL and fish consumption in coastal communities along San Bernardino Strait and Samar bays and channels.

Appendix Table 1.
Continued

Name	Position	Municipality/City/Alliance
Ms. Jessica C Bacdao	OIC, MA	Hinabangan, Samar/ALSBACH
Mr. Lucio Abarracosi	Agricultural Technologist	
Mr. Arvin D. Jabegnero	AT-Fisheries	Jiabong, Samar/ ALSBACH
Mr. Glicerio P. Meniano	OIC-MA	
Ms. Felicisima Labraguer	Fish Vendor/Processor	
Mr. Apolinario N. Limpin	MA	Sta. Rita, Samar/ ALSBACH
Mr. Marlito S. Lamban	AT	
Mr. Cirilo Mabansay	Chairman, MFARMC	San Sebastian, Samar/ALSBACH
Agapita M. Seballos	MA	
Mr. Jerold A. Del Pilar	AT	Talalora, Samar/ ALSBACH
Mr. Cesario C. Sabinada	AT	
Mr. Oscar M. Lim Jr.	OIC MA- Fisheries Sector, Department of Agriculture	Daram, Samar/ ALSBACH
Mr. Raul T. Bulan	AT-Fisheries	
Hon. Philip Martin L. Astorga	Municipal Mayor	
Mr. Hermenegildo Lotoc	President, Fisherfolk Association	
Mr. Dante O. Gabatbat	MA	Pinabacdao, Samar/ALSBACH
Ms. Raquel G. Nieva	AT	
Mr. Arnie A. Nuñez	President, BMMUA	Calbiga, Samar/ALSBACH
Mr. Jose T. Quilapio	President, MFARMC	
Ms. Evelyn Jabonete	Municipal Nutritionist	
Dr. Juan Paulo Cabueñas	MA	
Ms. Marilou Sampayan	AT	
Ms. Catalina Saises	MA	Motiong, Samar/ALSBACH
Ely J. Nacional	MA	Villareal, Samar/ ALSBACH
Trinidad Zamora	AT-Fisheries	
Punong barangay	Brgy. San isidro	Zumarraga, Samar/ALSBACH
DA staff	AT-Livestock	

A

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Acanthurus sp.	Surgeon fish	**Indangan**												
Alepis djebaba	Scad	Salaybato												
Chanos chanos	Milkfiish	**Bangus**												
Coryphaena hippurus	Dolphin fish	**Lamadang**												
Mugil cephalus	Mullet	Balanak												
Oreachromis niloticus	Nile tilapia	**Tilapia**												
Siganus guttatus	spinefoot/siganid	**Manlalara**												
Sphyraena sphyraena	Barracuda	**Rompi**												
Tylosurus crocodilus	Needlefish	**Balo**												
Chiton sp.	Chiton	Tarokog												
Lunella smaragda	Cat's eye shell	Taktakon												
Mercenaria mercenaria	Mud clam	**Tuway**												
Octopus joubini	Small octopus	**Tamala**												
Perna viridis	Green mussel	**Tahong**												

B

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Amblygaster sp.	smoothbelly sardinella	Turay												
Caranx sp.	Bigeye trevally	Mamsa												
Caesio cuning	Redbelly yellowtail fusilier	Sulid												
Carangoides armatus	Longfin trevally	Salmingan												
Epinephelus lanceolatus	Grouper	Baraka												
Euthynnus affinis	Eastern little tuna	Turingan												
Hipposcarus longiceps	Pacific longnose parrotfish	Angol												
Plotosus lineatus	Catfish	Iito												
Sardinella melanura	Blacktip sardinella	Tabagak												
Selar sp.	Big eyed scad	Matambaka												
Siganus fuscescens	Mottled spinefoot	Balawis												
Siganus punctatissimus	Rabbit fish	Toros												
Stolephorus sp.	Anchovy	Bolinaw												
Thunnus albacares	Yellow fin tuna	Yellow fin tuna												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

Appendix Table 2. Estimated volume and seasonality of food fishes and edible aquatic products landed all year-round (A) and seasonal (B) in Allen, Northern Samar.

A

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Euthynnus affinis	Eastern little tuna	Turingan												
Gymnocranius griseus	Grey large-eye bream	Pututan												
Laevistrombus canarium	Dog conch	sikad sikad												
Lethrinus mahsena	Sky emperor	Kirawan												
Metapenaeus sp.	shrimp	Shrimp, Pasay												
Sardinella melanura	Blacktip sardinella	Tabagak												
Selar crumenophthalmus	Bigeyed scad	Matambaka												
Siganus guttatus	Orange-spotted spinefoot	Manlalara												
Stolephorus sp.	anchovy	Bolinaw												
Sepioteuthis sepioidea	Squid	Squid												

B

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Amblygaster clupeoides	smoothbelly sardinella	Turay												
Caranx sexfasciatus	Bigeye trevally	Mamsa												
Chanos chanos	Milkfish	Bangus												
Epinephelus lanceolatus	Grouper	Baraka												
Leiognathus splendens	Splendid ponyfish	sap-sap												
Oreochromis niloticus	Nile tilapia	Tilapia												
Siganus canaliculatus	Rabbitfish	Kuyog												
Penaeus monodon	giant tiger prawn	Sugpo												
Scylla serrata	Mangrove crab	Crab												

Fishes = 7 species Invertebratwa = 2 species 2

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

Appendix Table 3. Estimated volume and seasonality of food fishes and edible aquatic products landed all year-round (A) and seasonal (B) in Victoria, Northern Samar.

A

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Caranx sexfasciatus	Bigeyed trevally	Mamsa												
Decapterus punctatus	Round scad	Galonggong												
Epinephelus lanceolatus	Grouper	Baraka												
Euthynnus affinis	Eastern little tuna	Turingan												
Euthynnus alletteratus	Little tunny	Tuna												
Hemiramphus far	Blackbarred halfbeak	Sirbasid												
Hipposcarus longiceps	Pacific longnose parrot fish	Molmol												
Mugil cephalus	Sea mullet	Balanak												
Oreochromis niloticus	Nile tilapia	Tilapia												
Rastrelliger brachyoma	Short bodied mackerel	Buraw												
Scomberomorus commerson	Spanish mackerel	Tangigue												
Sepioteuthis sepioidea	Squid	Pusit												
Selar crumenophthalmus	Big eyed scad	Matambaka												
Tylosurus crocodilus	Needlefish	Balu												

B

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Amblygaster clupeoides	Bleeker smooth belly sardinella	turay												
Chanos chanos	Milk fish	bangus												
Dentex filamentosus	Whiptail breams	Lagaw/bisugo												
Lutjanus gibbus	Snappers	maya maya												
Siganus canaliculatus	Rabbit fish	Kuyog												
Siganus punctatissimus	Rabbit fish	Danggit												
Stolephorus sp.	Bucaneer anchovy	bulinaw												
Trichurus leptorus	Hairtail	Lahing												
Diadema setosum	Long-spined sea urchin	tayom												
Terebralia terebrali	Snail	dalu-dalu												
Telecopium telescopium	Telescope snails	bagungon												
	Freshwater Snail	susu												
Tripneustes gratilla	Sea urchin	suwaki												
Octopus vulgaris	Octopus	octopus												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

Appendix Table 4. Estimated volume and seasonality of food fishes and edible aquatic products landed all year-round (A) and seasonal (B) in San Isidro, Northern Samar.

A

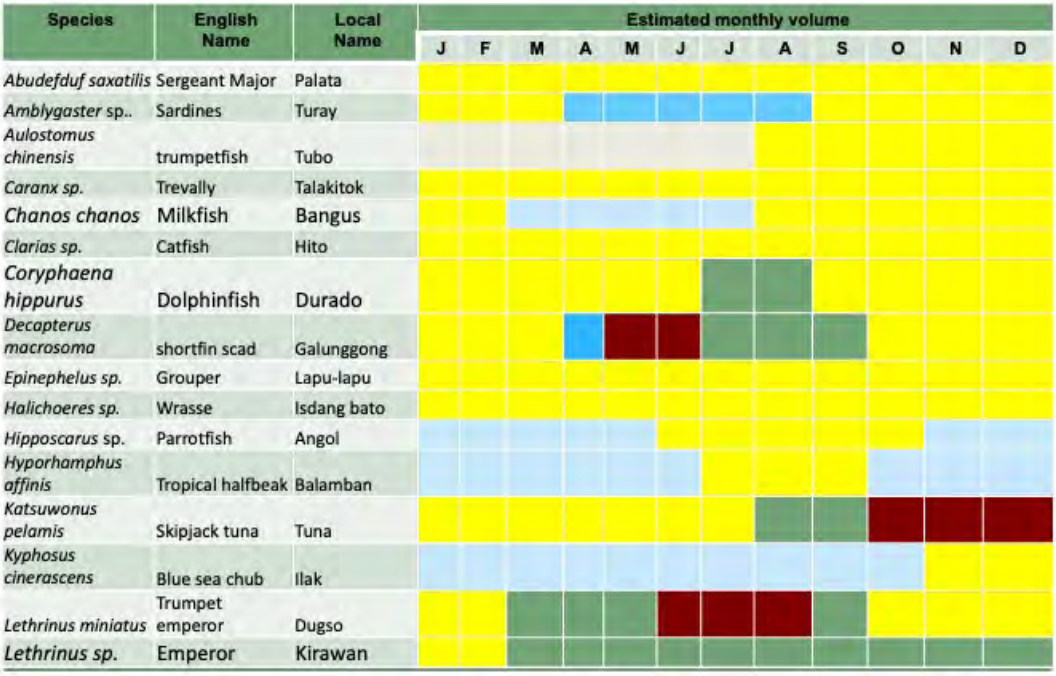
Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Caesio cuning	Redbelly yellow tail fusilier	Solid												
Caranx sexfasciatus	Bigeye trevally	Mamsa												
Ephinephelus coioides	Green Grouper	Lapu-lapu												
Hipposcarus longiceps	parrotfish	Molmol												
Kyhosus vaigensis	Brassy chub	Danoy												
Makaira nigricans	Blue marlin	Malasugi												
Oeochromis niloticus	Nile tilapia	Tilapya												
Parupeneus sp.	Goatfish	Timbungan												
Sparus sp.	Seabream	Gapas-gapas												
Siganus sp.	Rabbitfish	Turos												
Tylosurus crocodilus	Needlefish	Balo												
Conus imperialis	Imperial cone	Liswi												
Diadema setosum	Long spined sea urchin	Tuyom												

B

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Haliotis asinina	Donkey abalone	Abalone												
Lambis sp	Spider conch	Sahang												
Metapenaeus sp.	Shrimp	Shrimp												
Panulirus sp.	Lobster	Lobster												
Perna viridis	Mussell	Native tahong												
Scylla serrata	Mangrove crab	Alimango												
Tripneustes gratilla	Sea urchin	Suwaki												
Abudefduf sp.	Sergeant major	Kapal												
Amblygaster clupeoides	Bleeker sooth belly	Turay												
Auxis thazard	Frigate tuna	Tulingan												
Chanos chanos	Milkfish	Bangus												
Elagatis bipinnulata	Rainbow runne	Salmonon												
Gymnocranius griseus	Grey large eye bream	Putotan												
Nemipterus marginatus	Threadfin bream	Kurisan												
Scarus sp.	Parrotfish	Angol												
Sphyraena sphyraena	Barracuda	Lusod												
Stolephorus sp.	Anchovy	Bolinaw												
Tylosurus crocodilus	Needle fish	Balo												
Xiphias gladius	Swordfish	Dugso												
Caulerpa lentillifera	Sea grapes	Lato												
Kappaphycus alvarezii	Red algae	Guso												
Laevistrombus canarium	Dog conch	Sikad sikad												
Octopus vulgaris	Octopus	Octopus												
Sepia officinalis	Cuttlefish	Cuttle fish												
Sepioteuthis sepioidea	Squid	squid												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

Appendix Table 5. Estimated volume and seasonality of food fishes and edible products landed all year-round (A) and seasonal (B) in San Antonio, Northern Samar.



Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Abudefduf saxatilis	Sergeant Major	Palata												
Amblygaster sp..	Sardines	Turay												
Aulostomus chinensis	trumpetfish	Tubo												
Caranx sp.	Trevally	Talakitok												
Chanos chanos	Milkfish	Bangus												
Clarias sp.	Catfish	Hito												
Coryphaena hippurus	Dolphinfish	Durado												
Decapterus macrosoma	shortfin scad	Galunggong												
Epinephelus sp.	Grouper	Lapu-lapu												
Halichoeres sp.	Wrasse	Isdang bato												
Hipposcarus sp.	Parrotfish	Angol												
Hyporhamphus affinis	Tropical halfbeak	Balamban												
Katsuwonus pelamis	Skipjack tuna	Tuna												
Kyphosus cinerascens	Blue sea chub	Ilak												
Lethrinus miniatus	Trumpet emperor	Dugso												
Lethrinus sp.	Emperor	Kirawan												

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Lutjanus sp.	Snapper	Ahaan												
Lutjanus sp.	Snapper	Maya-maya												
Lutjanus sp.	Snapper	Mangagat												
Makaira nigricans	Blue marlin	Malasugi												
Mugil cephalus	Sea mullet	Balanak												
Naso sp.	Unicornfish	Gangis												
Nemipterus sp.	Bream	Sagisihon												
Rastrelliger sp.	Mackerel	Buraw												
Sardinella sp.	Sardines	Manamsi												
Scomber sp.	Mackerel	Salmon												
Scomberomorus commerson	Spanish mackerel	Tangigue												
Siganus sp.	Rabbitfish	Balawis												
Sphyraena sphyraena	Barracuda	Baracuda												
Sphyraena sp.	Barracuda	Bat-og												

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Loligo sp.	Squid	Noos												
Panulirus sp.	Lobster	Banagan												
Sepia sp.	Cuttlefish	Bagulan												
Stolephorus sp.	Anchovy	Bulinao												
Thunnus albacares	Yellow fin tuna	Yellow fin												
Thunnus sp.	Big eyed tuna	Balirison												
Tylosurus crocodilus	Needlefish	Balo												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

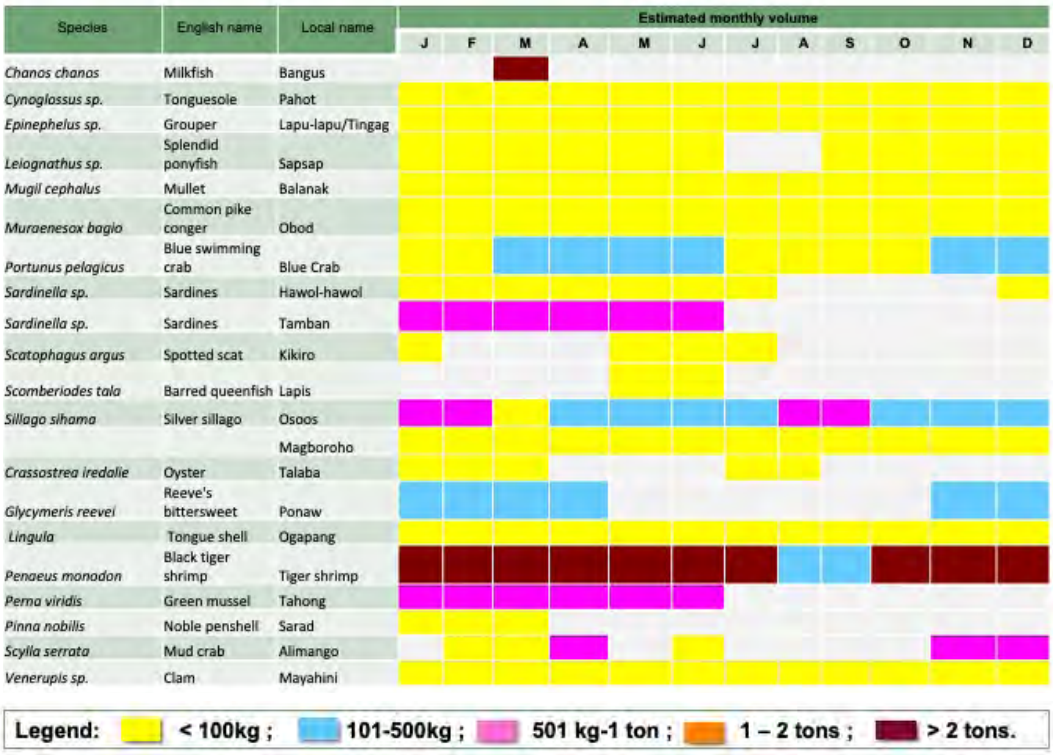
Appendix Table 6. Estimated volume and seasonality of food fishes and edible aquatic products landed in Capul, Northern Samar.

Appendix Table 7. Estimated volume and seasonality of food fishes and edible aquatic products landed in San Vicente, Northern Samar.

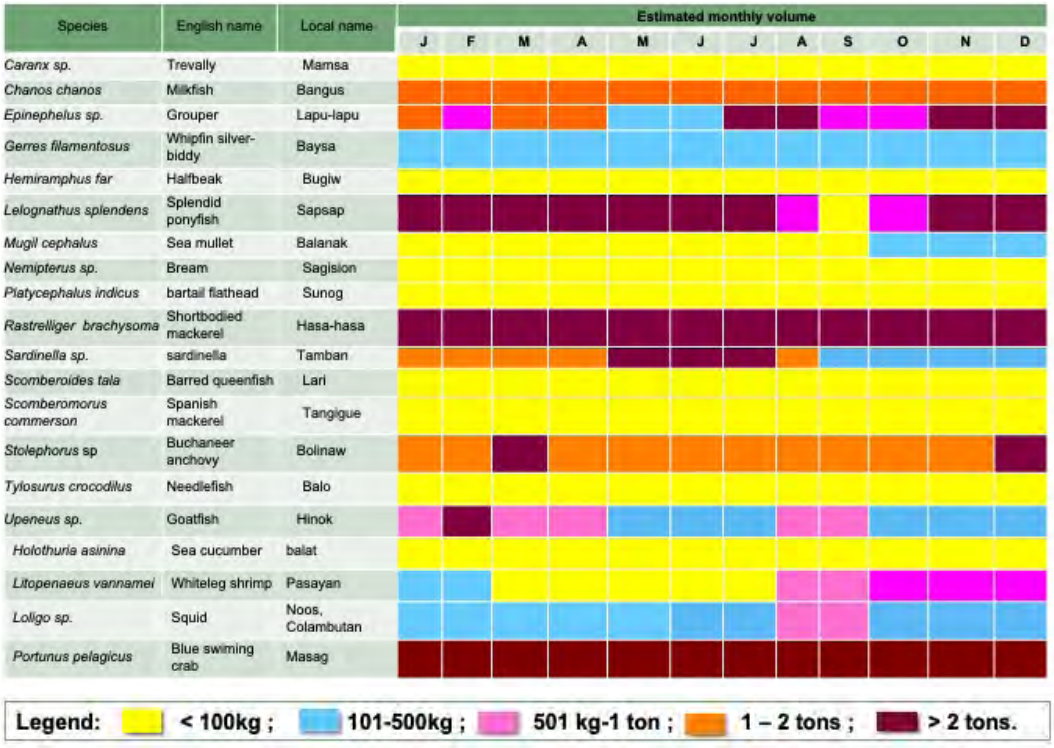
Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Abudefduf sp.	Sergeant major	kapal												
Acanthurus sp.	Surgeon fish	Pata												
Auxis thazard	Frigate tuna	Bolis												
Caesio sp.	Fusilier	Solid												
Caranx sexfasciatus.	Trevally	Mamsa												
Coryphaena hippurus	Dolphin fish	Durado												
Decapterus sp.	Scad	Galunggong/Sibo bog												
Decapterus sp.	Scad	Malimno												
Gymnosarda unicolor	Dogtooth tuna	Tindocon												
Holocentrus sp.	Squirelfish	Baga												
Hyporhamphus affinis	Tropical halfbeak	Balanban												
Lethrinus mahsena	Sky emperor	Kilawan												
Lutjanus sp.	Snapper	Agahon												
Lutjanus sp.	Red snapper	Pulahan												
Makaira sp.	Blue marlin	Malasugi												
Mene maculata	Moonfish	Tabas												
Nemipterus sp.	Threadfin bream	Lawian												
Neotrygon kuhlii	Blue-spotted stingray	Pagi												
Pinjalo pinjalo	Pinjalo	Bilason												

Species	English Name	Local Name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Plotosus lineatus	Stiped eel catfish	Ito												
Rastrelliger sp.	Mackerel	Buraw												
Sardinella sp.	Sardines	Lawlaw												
Scarus sp.	Parrotfish	Molmol												
Scomberomorus commerson.	Spanish mackerel	tangigi												
Selar crumenophthalmus	Big-eyed scad	Gutob												
Seriola dumerili	Greater amberjack	Tonto												
Siganus sp.	Rabbitfish	Danggit												
Sphyraena sp.	Barracuda	Bat-og												
Sphyraena sp.	Barracuda	Pangalwan												
Stolephorus sp.	Anchovy	Borabid												
Diadema setosum	Sea urchin	Tuyom												
Haliotis asinina	Abalone	Lapas												
Loligo sp.	Squid	Nocos												
Octopus vulgaris	Octopus	Kogita												
Sepia sp.	Cuttlefish	Kulambutan												
Tylosurus crocodilus	Needlefish	Balo												

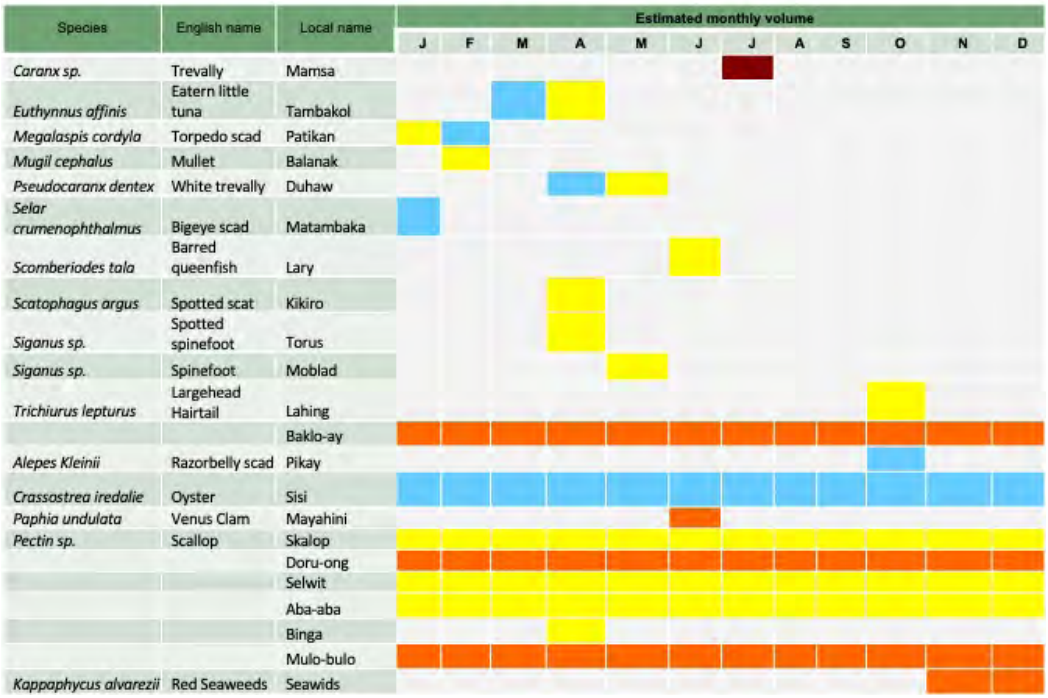
Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

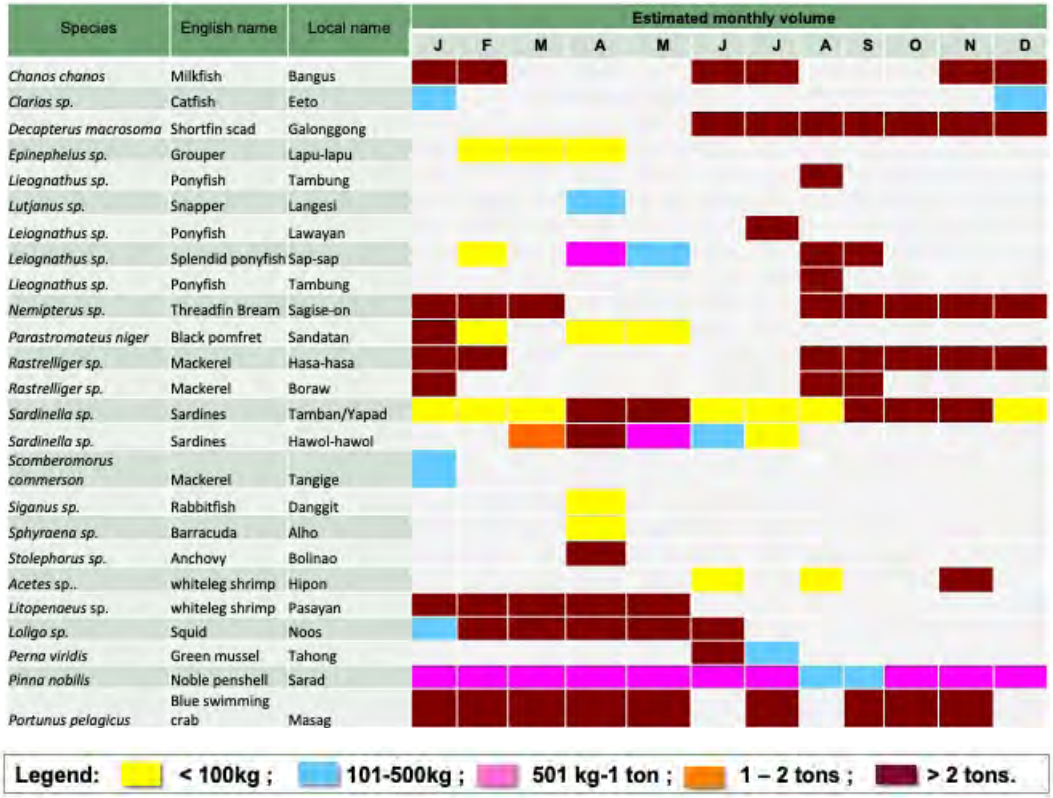


Appendix Table 8. Estimated volume and seasonality of food fishes and edible aquatic products landed in Calbiga, Samar.

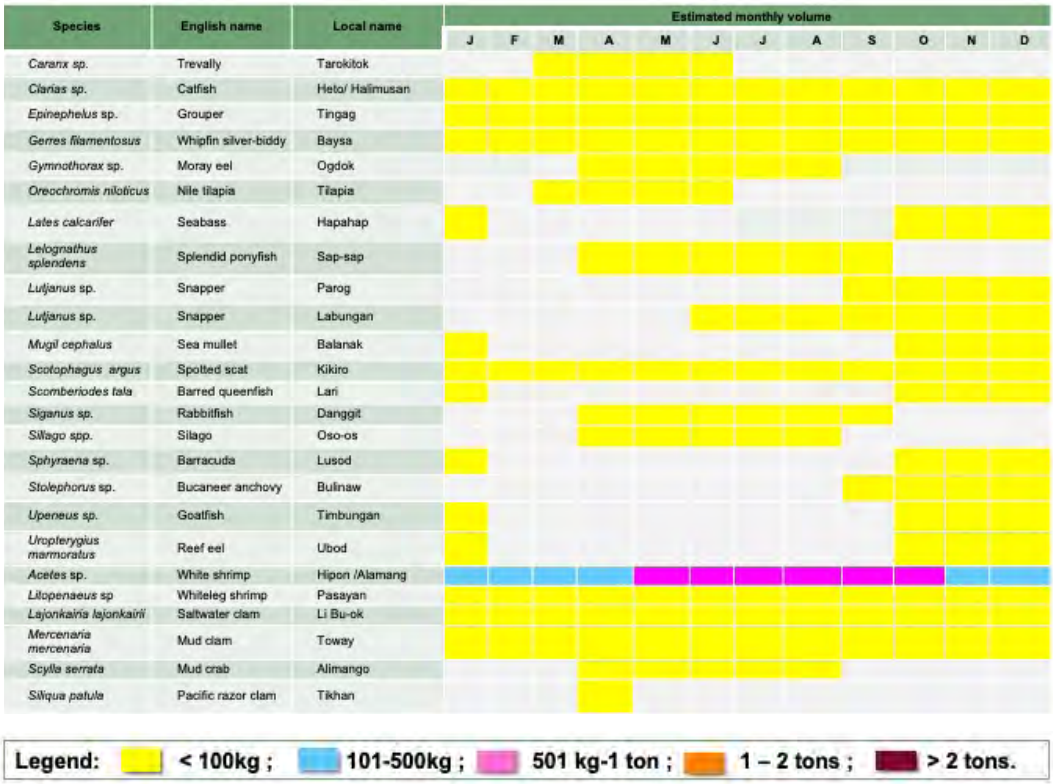


Appendix Table 9. Estimated volume and seasonality of food fishes and edible aquatic products landed in Catbalogan City, Samar.





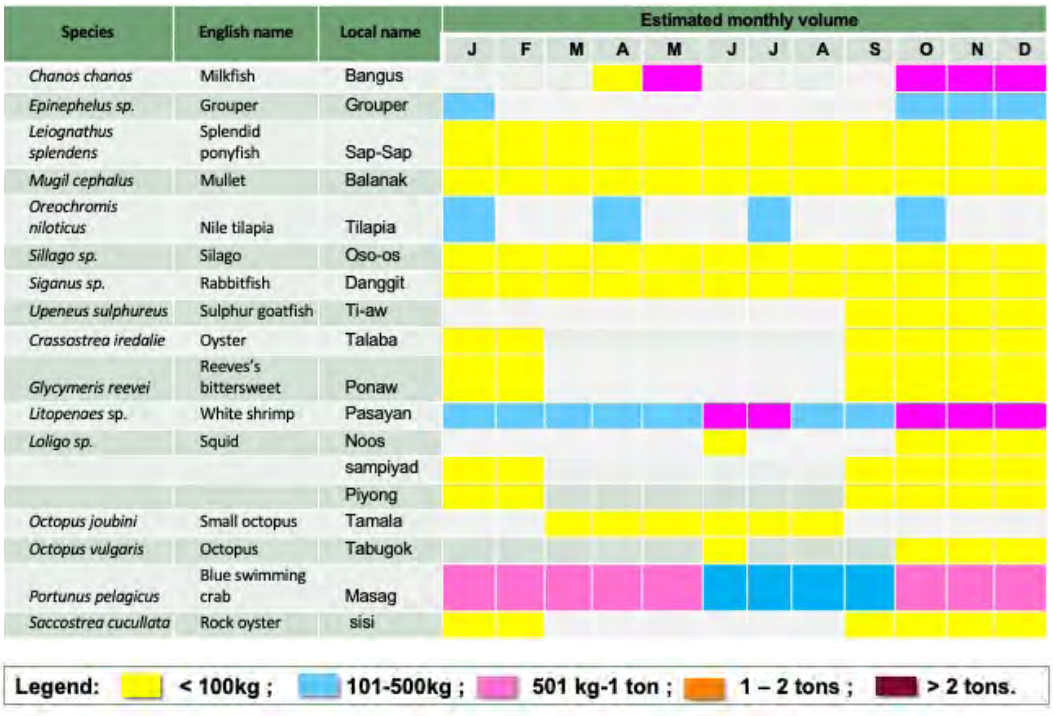
Appendix Table 10. Estimated volume and seasonality of food fishes and edible aquatic products landed in Daram, Samar.



Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Caranx sp.	Trevally	Tarokitok												
Clarias sp.	Catfish	Heto/ Halimusan												
Epinephelus sp.	Grouper	Tingag												
Gerres filamentosus	Whipfin silver-biddy	Baysa												
Gymnothorax sp.	Moray eel	Ogdok												
Oreochromis niloticus	Nile tilapia	Tilapia												
Lates calcarifer	Seabass	Hapahap												
Leiognathus splendens	Splendid ponyfish	Sap-sap												
Lutjanus sp.	Snapper	Parog												
Lutjanus sp.	Snapper	Labungan												
Mugil cephalus	Sea mullet	Balanak												
Scotophagus argus	Spotted scat	Kikiro												
Scomberiodes tala	Barred queenfish	Lari												
Siganus sp.	Rabbitfish	Danggit												
Sillago spp.	Silago	Oso-os												
Sphyraena sp.	Barracuda	Lusod												
Stolephorus sp.	Bucaneer anchovy	Bulinaw												
Upeneus sp.	Goatfish	Timbungan												
Uropterygius marmoratus	Reef eel	Ubod												
Acetes sp.	White shrimp	Hipon /Alamang												
Litopenaeus sp	Whiteleg shrimp	Pasayan												
Lajonkairia lajonkairii	Saltwater clam	Li Bu-ok												
Mercenaria mercenaria	Mud clam	Toway												
Scylla serrata	Mud crab	Alimango												
Siliqua patula	Pacific razor clam	Tikhan												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

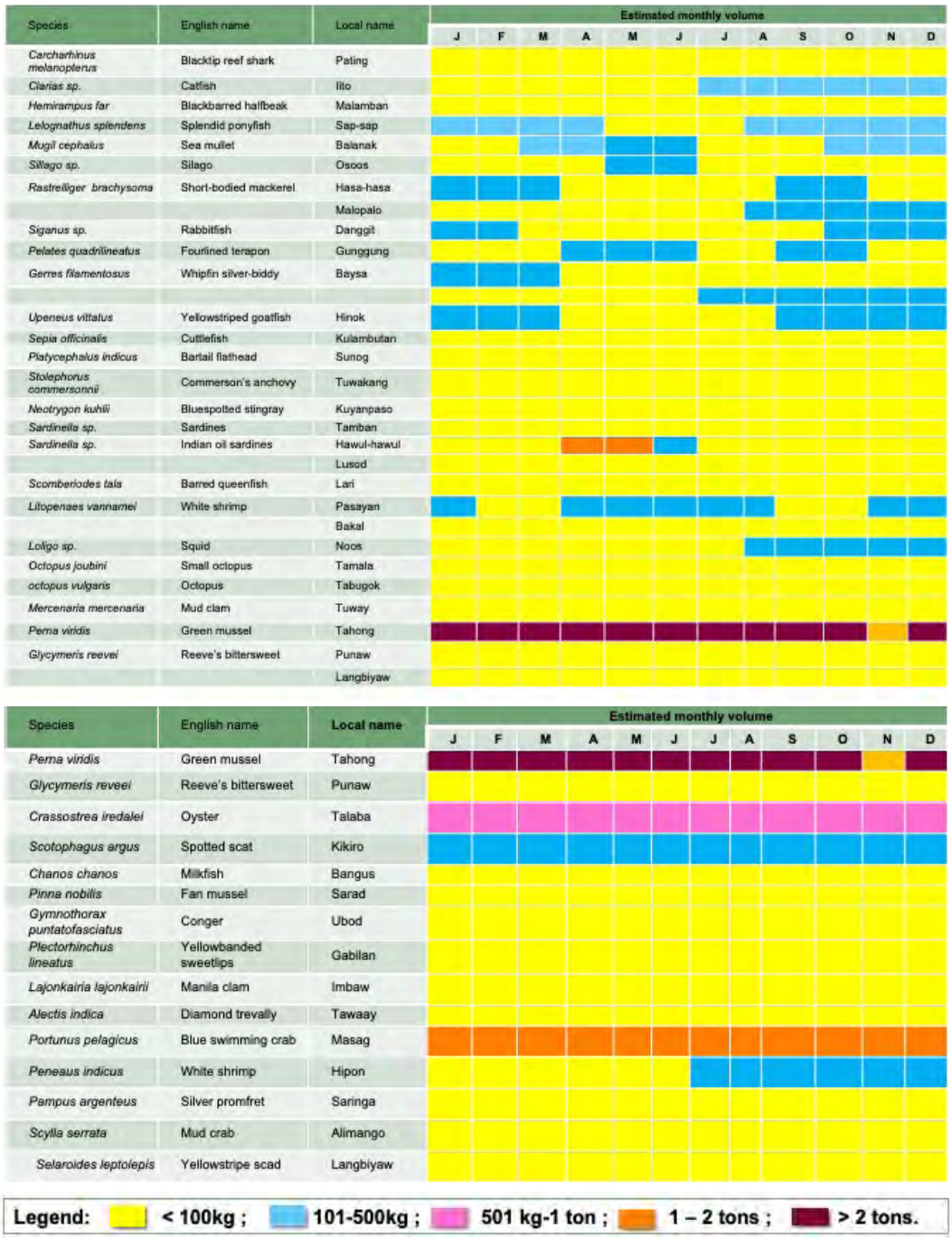
Appendix Table 11. Estimated volume and seasonality of food fishes and edible aquatic products landed in Hinabangan, Samar.



Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Chanos chanos	Milkfish	Bangus												
Epinephelus sp.	Grouper	Grouper												
Leiognathus splendens	Splendid ponyfish	Sap-Sap												
Mugil cephalus	Mullet	Balanak												
Oreochromis niloticus	Nile tilapia	Tilapia												
Sillago sp.	Silago	Oso-os												
Siganus sp.	Rabbitfish	Danggit												
Upeneus sulphureus	Sulphur goatfish	Ti-aw												
Crassostrea iredalie	Oyster	Talaba												
Glycymeris reevei	Reeves's bittersweet	Ponaw												
Litopenaes sp.	White shrimp	Pasayan												
Loligo sp.	Squid	Noos												
		sampiyad												
		Piyong												
Octopus joubini	Small octopus	Tamala												
Octopus vulgaris	Octopus	Tabugok												
Portunus pelagicus	Blue swimming crab	Masag												
Saccostrea cucullata	Rock oyster	sisi												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

Appendix Table 12. Estimated volume and seasonality of food fishes and edible aquatic products landed in Motiong, Samar.



Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Carcharhinus melanopterus	Blacktip reef shark	Pating												
Clarias sp.	Catfish	Iito												
Hemirampus far	Blackbarred halfbeak	Malamban												
Lelognathus splendens	Splendid ponyfish	Sap-sap												
Mugil cephalus	Sea mullet	Balanak												
Sillago sp.	Silago	Osoos												
Rastrelliger brachysoma	Short-bodied mackerel	Hasa-hasa												
		Malopalo												
Siganus sp.	Rabbitfish	Danggit												
Pelates quadrilineatus	Fourlined terapon	Gunggung												
Gerres filamentosus	Whipfin silver-biddy	Baysa												
Upeneus vittatus	Yellowstriped goatfish	Hinok												
Sepia officinalis	Cuttlefish	Kulambutan												
Platycephalus indicus	Bartail flathead	Sunog												
Stolephorus commersonnii	Commerson's anchovy	Tuwakang												
Neotrygon kuhlii	Bluespotted stingray	Kuyanpaso												
Sardinella sp.	Sardines	Tamban												
Sardinella sp.	Indian oil sardines	Hawul-hawul												
		Lusod												
Scomberiodes tala	Barred queenfish	Lari												
Litopenaes vannamei	White shrimp	Pasayan												
		Bakal												
Loligo sp.	Squid	Noos												
Octopus joubini	Small octopus	Tamala												
octopus vulgaris	Octopus	Tabugok												
Mercenaria mercenaria	Mud clam	Tuway												
Perna viridis	Green mussel	Tahong												
Glycymeris reevei	Reeve's bittersweet	Punaw												
		Langbiyaw												

Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Perna viridis	Green mussel	Tahong												
Glycymeris reveei	Reeve's bittersweet	Punaw												
Crassostrea iredalei	Oyster	Talaba												
Scotophagus argus	Spotted scat	Kikiro												
Chanos chanos	Milkfish	Bangus												
Pinna nobilis	Fan mussel	Sarad												
Gymnothorax puntatofasciatus	Conger	Ubod												
Plectorhinchus lineatus	Yellowbanded sweetlips	Gabilan												
Lajonkairia lajonkairii	Manila clam	Imbaw												
Alectis indica	Diamond trevally	Tawaay												
Portunus pelagicus	Blue swimming crab	Masag												
Peneaus indicus	White shrimp	Hipon												
Pampus argenteus	Silver promfret	Saringa												
Scylla serrata	Mud crab	Alimango												
Selaroides leptolepis	Yellowstripe scad	Langbiyaw												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

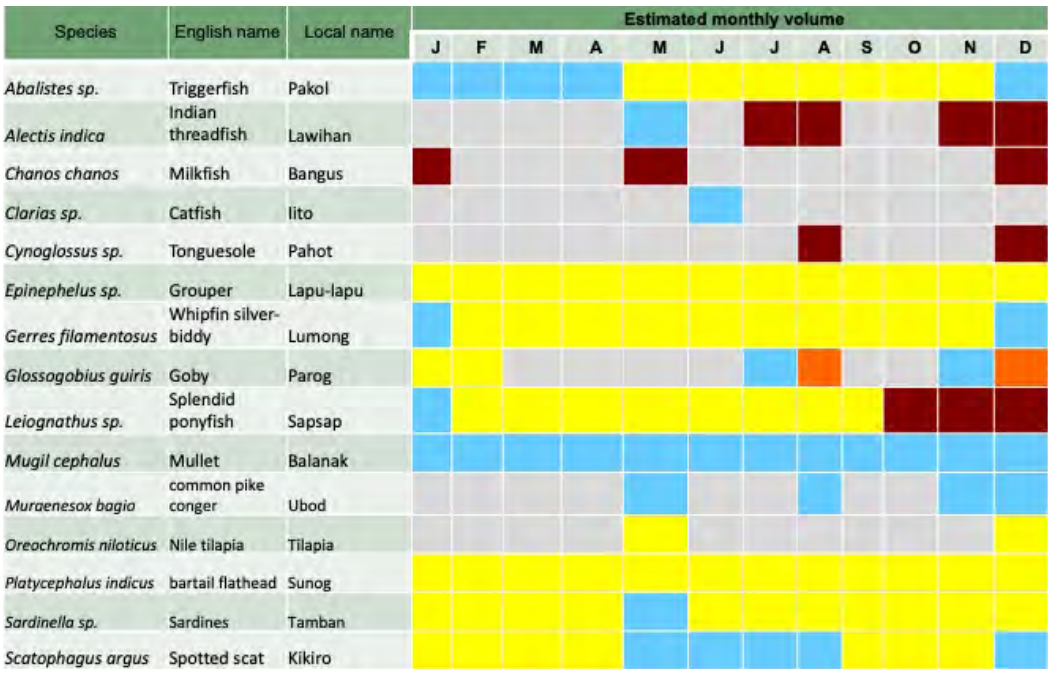
Appendix Table 13. Estimated volume and seasonality of food fishes and edible aquatic products landed in Jiabong, Samar.

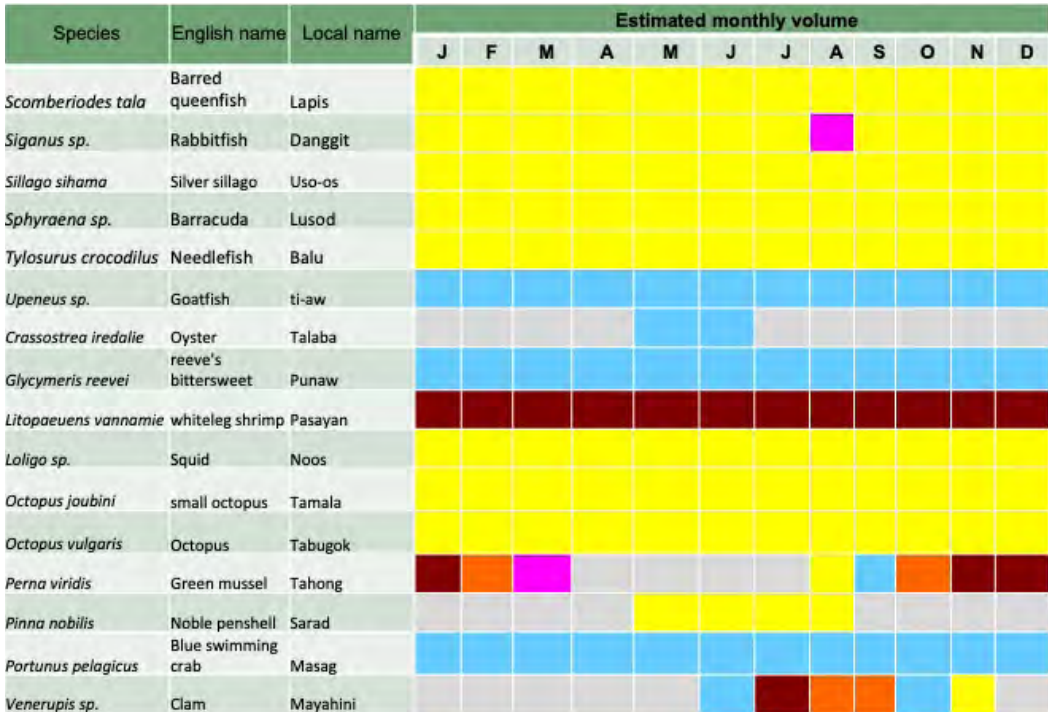
Appendix Table 14. Estimated volume and seasonality of food fishes and edible aquatic products landed in Paranas, Samar.

Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Ablennes hians	Flat needlefish	sambilawan												
Alepis vari	Herring scad	Pikay												
Chanos chanos	Milkfish	Bangus												
Cestraeus goldiei	River mullet	Sawog												
Epinephelus sp.	Grouper	Lapu-lapu												
Lelognathus splendens	Splendid ponyfish	Sap-sap												
Mugil cephalus	Sea mullet	Balanak												
Oreochromis niloticus	Nile tilapia	Tilapia												
Platycephalus indicus	Bartail flathead	Sunog												
Scotophagus argus	Spotted scat	kikiro												
Scomberoides tala	Barred queenfish	Lari												
Siganus sp.	Rabbitfish	Danggit												
Sillago sp.	silago	Oso-os												
Sphyraena obtusata	Barracuda	Lusod												
Tylosuros crocodilus	Needlefish	Balo												
		Bakbakan												
		Pahot												
		Saliwsiwan												
		Baluyan												

Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Crassostrea iredalie	Oyster	Talaba												
Glycymeris reevei	Reeve's bittersweet	Ponaw												
Laevistrombos canarium	Dog conch	Bokawil												
Litopenaes sp.	White shrimp	Pasayan												
Perna viridis	Green mussel	Tahong												
Pinna nobilis	Fan mussel	Sarad												
Portunus pelagicus	Blue swimming crab	Masag												
Scylla serrata	Mudcrab	Mudcrab												
Siliqua patula	Pacific razor clam	Tikhan												
		Sabulod												
		Bakbakan												
		Saliwsiwan												
		Sampiyad												
		Boranday												
		Baluyan												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.



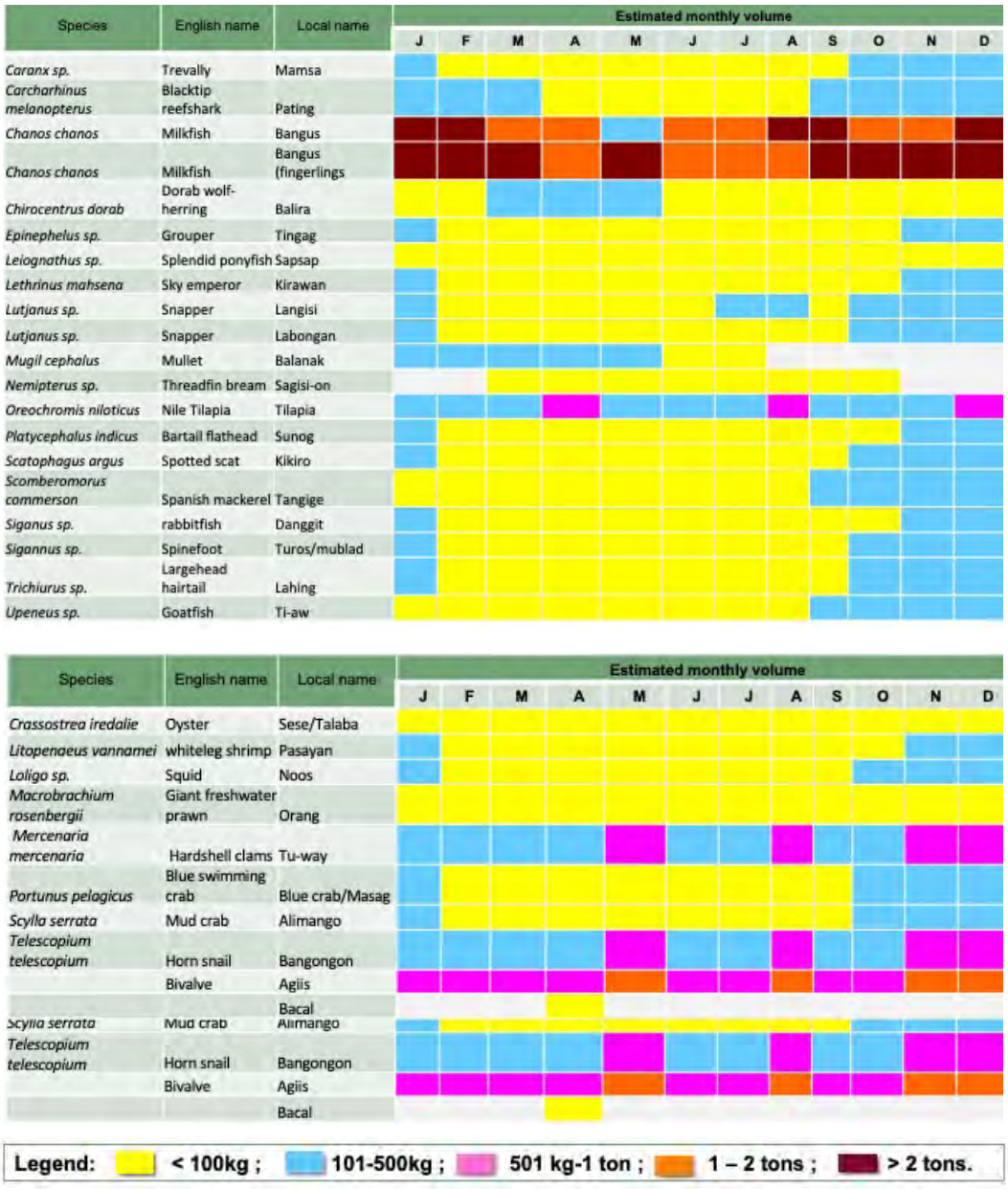


Appendix Table 15. Estimated volume and seasonality of food fishes and edible aquatic products landed in Pinabacdao , Samar.

Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Chanos chanos	Milkfish	Bangus												
Epinephelus sp.	Grouper	Lapu-lapu												
Glossogobius guiris	Goby	Parog												
Leiognathus sp.	Splendid ponyfish	Sapsap												
Lutjanus sp.	Snapper	Langise												
Mugil cephalus	mullet	Balanak												
Muraenesox bagio	common pike conger	Obod												
Oreochromis niloticus	Nile tilapia	Tilapia												
Scatophagus argus	Spotted scat	Kekiro												
Sillago sihama	Silver sillago	Uso-os												
Acetes sp.	Sergestids	Alamang												
Crassostrea iradalie	Oyster	Talaba												
Glycymeris reevei	Reeve's bittersweet	Punaw												
Litopenaeus sp.	whiteleg shrimp	Pasayan												
Loligo sp.	Squid	Noos												
Octopus vulgaris	Octopus	Octopus												
Octopus vulgaris	Octopus	Tabogok												
Perna viridis	Green mussel	Tahong												
Portunus pelagicus	Blue swimming crab	Masag												
Scylla serrata	Mud crab	Alimango												
Siganus sp.	rabbitfish	Danggit												
		Baluyan												
		Hamurok												
		Moblad												
		Moyo-poyo												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

Appendix Table 16. Estimated volume and seasonality of food fishes and edible aquatic products landed in San Sebastian , Samar.

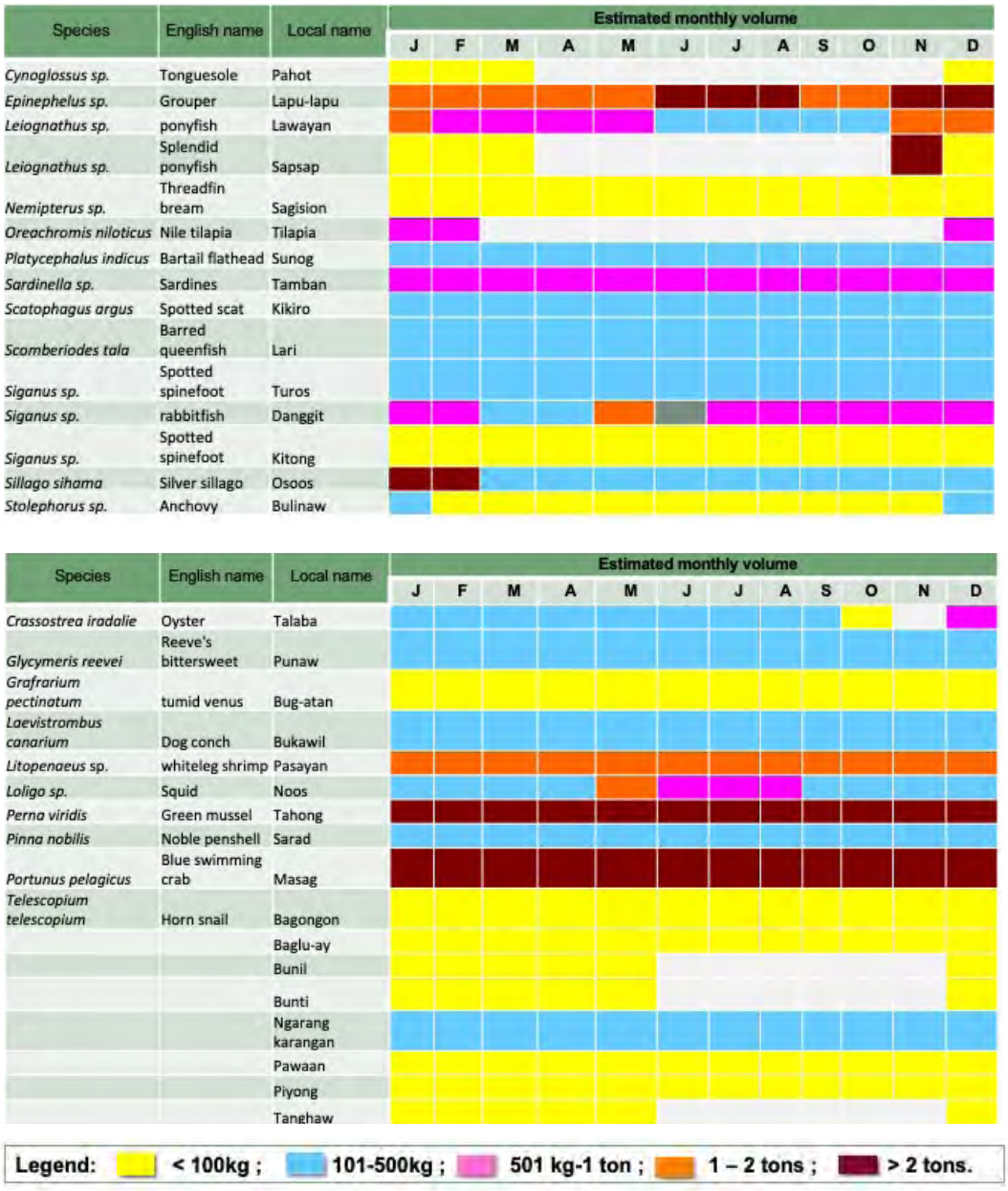


Appendix Table 17. Estimated volume and seasonality of food fishes and edible aquatic products landed in Sta Rita , Samar.

Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Epinephelus sp.	Grouper	Lapo-lapo												
Gerres filamentosus	Whipfin silver-biddy	Baysa												
Leiognathus equulus	common ponyfish	Tambong												
Leiognathus sp.	Ponyfish	Lawayan												
Lethrinus mahsena	Sky emperor	Kirawan												
Mugil cephalus	Mullet	Balanak												
Nemipterus sp.	Threadfin bream	Sagision												
Portunus pelagicus	Blue swimming crab	Masag												
Rastrelliger sp.	Mackerel	Buraw												
Sardinella sp.	Sardines	Tamban												
Scomberoides tala	Barred queenfish	Lapis												
Scomberomorus commerson	Spanish mackerel	Tangigi												
Selar crumenophthalmus	Big-eye scad	Matambaka												
Selaroides leptolepis	Yellowstripe scad	Lambiyaw												
Siganus sp.	Spotted spinefoot	Kitang												
Thunnus albacares	Yellow fin tuna	Yellowfin												
Tylosurus crocodilus	Needlefish	Balo												
Upeneus sp.	Goatfish	Ti-aw												
		Hilus-hilus												
		Panapsapan												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

Appendix Table 18. Estimated volume and seasonality of food fishes and edible aquatic products landed in Talalora , Samar.



Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Cynoglossus sp.	Tonguesole	Pahot												
Epinephelus sp.	Grouper	Lapu-lapu												
Leiognathus sp.	ponyfish	Lawayan												
Leiognathus sp.	Splendid ponyfish	Sapsap												
Nemipterus sp.	Threadfin bream	Sagision												
Oreochromis niloticus	Nile tilapia	Tilapia												
Platycephalus indicus	Bartail flathead	Sunog												
Sardinella sp.	Sardines	Tamban												
Scatophagus argus	Spotted scat	Kikiro												
Scomberiodes tala	Barred queenfish	Lari												
Siganus sp.	Spotted spinefoot	Turos												
Siganus sp.	rabbitfish	Danggit												
Siganus sp.	Spotted spinefoot	Kitong												
Sillago sihama	Silver sillago	Osoos												
Stolephorus sp.	Anchovy	Bulinaw												

Species	English name	Local name	Estimated monthly volume											
			J	F	M	A	M	J	J	A	S	O	N	D
Crassostrea iradalie	Oyster	Talaba												
Glycymeris reevei	Reeve's bittersweet	Punaw												
Grafrarium pectinatum	tumid venus	Bug-atan												
Laevistrombus canarium	Dog conch	Bukawil												
Litopenaeus sp.	whiteleg shrimp	Pasayan												
Loligo sp.	Squid	Noos												
Perna viridis	Green mussel	Tahong												
Pinna nobilis	Noble penshell	Sarad												
Portunus pelagicus	Blue swimming crab	Masag												
Telescopium telescopium	Horn snail	Bagongon												
		Baglu-ay												
		Bunil												
		Bunti												
		Ngarang karangan												
		Pawaan												
		Piyong												
		Tanghaw												

Legend: < 100kg ; 101-500kg ; 501 kg-1 ton ; 1 – 2 tons ; > 2 tons.

Appendix Table 19. Estimated volume and seasonality of food fishes and edible aquatic products landed in Villareal , Samar.

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