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## Utilization of Marine Fishes (Indian Mackerel (*Rastrelliger kanagurta*), Mackerel Scad (*Decaoterus macarellus*), and Surgeonfish (*Acanthuridae*) for Fish *Longganisa*

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**Abstract:** Though *longganisa* did not originate in the Philippines, Filipinos had developed quite an interest to the dish and developed a variety of flavors for it depending on what town it will come from. For this study, the researcher's general objective was to utilize three varieties of marine fishes namely; Indian mackerel, mackerel scad, and surgeonfish, as an alternative filling for *longganisa*. Specifically, this study aimed to determine the consumer's preference for the formulated fish *longganisa*; determine the most accepted formulation of these three fishes in terms of their sensory attributes; know the cost of direct materials for each formulated product; and determine the shelf life of the formulated products. The study underwent four phases. *Phase 1* was the formulation of the products utilizing marine fishes for *longganisa*; *Phase 2* determined the consumer's most preferred and most accepted formulation using Ranking method and nine-point Hedonic scale; *Phase 3* determined the possible shelf life of the product; and *Phase 4* determined the cost of direct materials of each formulation. For the general acceptability, flavor and aftertaste liking, the control sample and Formulation 1 has no significant difference but they are significantly different in terms of appearance and texture liking. The control sample, Formulation 2 and Formulation 3 have a significant difference in all criteria except for texture liking. For the fish formulations, Formulation 1, Formulation 2 and Formulation 3 has no significant difference in terms of general acceptability, flavor and aftertaste liking and significantly different in terms of texture liking. Among the formulated products, Formulation 1 is the most preferred sample. The formulated products lasted for nine days after preparation. In cost of direct materials, Formulation 2 has the lowest amount with 56 grams per serving.

**Key Words:** marine fishes; *longganisa*.

### 1. INTRODUCTION

*Longganiza* or *longganisa* are *chorizos* that originated from Spain and a type of sausage that is flavored depending on the local spices used in the region. It is considered as a popular cuisine for Mexicans and Latin Americans as well as for Filipinos that had adopted some of their culture (Henares, 2009).

Though *longganisa* did not originate in the Philippines, Filipinos had developed quite an interest to the dish and developed a variety of flavors for it depending on what town it will come from. According to Belen (2011), in Vigan in Ilocos Sur, *Longganisang Vigan* is marinated in garlic and *basi*; *Longganisang Lucban*, from Lucban, Quezon, is made with oregano; while the



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*longganisa* in Pampanga are sweet and intensely garlic-flavored. Traditionally, *longganisa* is made from ground pork and diced pork fat but version of chicken and beef and sometimes seafood like tuna and milkfish can be found in some places in the Philippines.

This study will be a significant endeavor in promoting more nutritional option to the consumers by using marine fishes in *longganisa*. The researchers believe that the outcome of this study will not only give consumer a different variety of flavor but also version of a *longganisa* with lesser fat.

The researchers used three different types of fishes: Indian mackerel or *kabayan* as recognized in Biñan, Laguna or *alumahan* as known in General Mariano Alvarez, Cavite; mackerel scad or *galunggong*; and surgeonfish or *labahita*.

Indian mackerel is widespread in southeastern Asia. There is no information on population or general abundance. This species is targeted in commercial and artisanal fisheries throughout its range, but landings are primarily reported in combination with mixed *Rastrelliger* species. Reported worldwide, landings for *Rastrelliger* species have steadily increased since 1950 to over 800,000 tons, but no effort information is available. Given that effort is assumed to be increasing and that there some evidence of localized declines, it is not known how this species population is affected by current and historical fishing pressure. This species is listed as Data Deficient. Given the absence of an international management body, further monitoring of this species is needed on the national level, in addition to species-specific data on landings, effort and population status (Collette, et.al, 2011). The prices for Indian mackerel, locally known as *alumahan* (General Marino Alvarez, Cavite) or *kabayan* (Biñan, Laguna), is PhP 150.00/kilogram  $\pm$  PhP 50.00 as of February 2016 in Biñan Public Market.

Mackerel scad is a commonly found in tropical countries around the world in huge school either inshore or in the open ocean. They are the staple food for Hawaii and are often use to catch larger fish such as marlin and tuna. They are classified as “coastal pelagic” fish and can grow up to 18 inches. Mackerel

scad aggregate when spawning, whereby they spawn pelagic eggs that hatch into pelagic larvae. Traditional system for managing fisheries banned mackerel scad fishing from March through July during its spawning period (Fish base, 2013). The mackerel scad or *galunggong* ranges from PhP 100.00/kilo  $\pm$  PhP 50.00 as of February 2016 in Biñan Public Market.

Surgeonfish are found in all the tropical seas of the world, with the exception of the Mediterranean. Most are found in shallow waters, especially where the water is clear and the rock, rubble, or dead coral is exposed to good sunlight providing good algae growth. Species that inhabit the open ocean water are fewer, but are found in larger number. Most of these surgeonfish get quite large with some species reaching up to almost 40 inches (Animal-World, 2012). Nutritional facts of a steamed surgeonfish are 81 grams, a total of 19 grams of carbohydrates, 6 grams of sugar, and a gram of protein. The surgeon fish or *labahita* is PhP 200.00/kilo  $\pm$  PhP 50.00 as of February 2016 in Biñan Public Market, and the price range of pork in the market is PhP 200.00  $\pm$  PhP 50.00.

The general objective of this study was to utilize three varieties of marine fishes namely; Indian mackerel, mackerel scad, and surgeonfish, as an alternative filling for *longganisa*.

Specifically, this study aimed to determine the consumer preference for the formulated fish *longganisa*; determine the most accepted formulation of these three fishes in terms of their sensory attributes; know the cost of direct materials for each formulated product; and determine the shelf life of the formulated products.

The formulated products did not undergo marketing feasibility. The determination of its nutritional attribute, microbiological analysis, and histamine level analysis were not also included in this study.

## 2. METHODOLOGY

The study underwent four phases. Phase 1 dealt on the product formulation utilizing marine fishes as a substitute filling for *longganisa*. The researchers adopted the recipe used by Sydney Hamilton of Yum na Yum Home for Great Recipes however, it was modified based on the need of the study. The formulations were as follows: *Formulation 1* was Indian mackerel; *Formulation 2* was mackerel scad; and *Formulation 3* was surgeon fish. Phase 2 determined the consumer acceptance and consumer preference. The researchers surveyed 60 healthy consumer-type panel from Sunshine Square Center, Biñan, Laguna with an age that ranges between 18 years old to 61 years old. The respondents were asked to evaluate fish *longganisa* based on general acceptability, appearance, texture, flavor, and aftertaste. They were also asked to rank the products based on their preference with 1 as the most preferred and 4 as the least preferred. Differences was tested using One-way Analysis of Variance and Tukey test as *ad hoc* for consumer acceptance; and Baskers table for consumer preference. Products were presented using three-digit code to avoid biases. Phase 3 dealt with the shelf life study of the formulated products. The products were stored in a freezing temperature and observed in daily basis. Lastly, Phase 4 determined the cost of direct materials of each formulated product. The cost of direct materials was based on the current market price of Biñan Public Market on the time the research was made. Figure 1 shows the process lay-out of the fish *longganisa*.

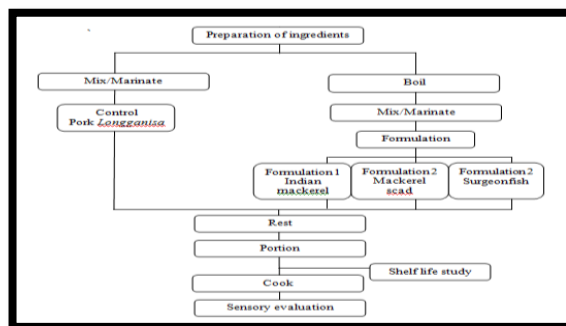


Figure 1. Process Lay-out of Fish *longganisa*.

## 3. RESULTS AND DISCUSSION

### 3.1 Product Formulation

The researchers formulated three different types of *longganisa*. Pork *longganisa* served as the control sample and three different kinds of marine fishes as its substitute. They used the same amount of ingredients for the three types of marine fishes but adjusted the amount of salt and sugar for the control formulation. Formulation 1 had Indian mackerel as filling; Formulation 2 used mackerel scad; and Formulation 3 had surgeonfish. Figure 2 shows a picture of the formulated products.



Figure 2. Formulated Products. Control sample (217), Formulation 1 (919), Formulation 2 (512), and Formulation 3 (616).



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### 3.2 Sensory Evaluation

Tables 1 and 2 shows the summary of consumer acceptance and consumer preference of the formulated products.

Table 1. Summary of Consumer Acceptance\*

Attributes	217	919	512	616
General				
Acceptability	8.17 <sup>a</sup>	7.58 <sup>ad</sup>	7.07 <sup>bde</sup>	7.02 <sup>cde</sup>
Appearance	8.13 <sup>a</sup>	7.40 <sup>b</sup>	7.10 <sup>bc</sup>	6.93 <sup>bc</sup>
Texture	8.18 <sup>a</sup>	7.55 <sup>b</sup>	7.72 <sup>abc</sup>	7.07 <sup>bc</sup>
Flavor	8.16 <sup>a</sup>	7.60 <sup>ab</sup>	7.03 <sup>bd</sup>	6.93 <sup>cd</sup>
After Taste	8.00 <sup>a</sup>	7.42 <sup>ac</sup>	6.85 <sup>acd</sup>	6.52 <sup>bd</sup>

\*@ 95% level of confidence. Critical Value (CV) = 2.64. Mean sums not sharing the same letter are significantly different. 217 (Control), 919 (Formulation 1), 512 (Formulation 2), and 616 (Formulation 3).

Table 2. Summary of Consumer Preference\*

Formulation	Total*	Rank
217	102 <sup>a</sup>	1
919	139 <sup>b</sup>	2
512	173 <sup>b</sup>	3
616	183 <sup>b</sup>	4

\* @ 95% level of confidence. CV= 36.3. Rank sums not sharing the same letter are significantly different. A lower rank sum indicates higher preference. 217 (Control), 919 (Formulation 1), 512 (Formulation 2), and 616 (Formulation 3).

**General acceptability.** Based on the gathered data, *longganisa* with Indian mackerel filling was the most accepted formulation among the three formulations with a mean score of 7.58 while *longganisa* with surgeonfish was the least accepted with the mean score of 6.75. In terms of consumer preference ranking, the three formulations are not significantly different. Formulation 1 was the most preferred among fish *longganisa* products.

**Appearance liking.** Respondents were asked to evaluate the product based on its color, size, and shape of the product. Based on the gathered data, Formulation 1 is the most accepted fish *longganisa* with a mean score of 7.40 while Formulation 3 appears to be the least accepted with the mean score of 6.93. Formulations 1, 2, and 3 has no significant difference with each other.

According to Waltermann (2010), fishes that never stop swimming, like mackerel, has the richest brown muscles, to the extent that there is no really white flesh to eat. Based on the observations made by the researchers, the brown flesh of both Formulation 1 and Formulation 2 had a major contribution they appear to be more like *longganisa*.

**Texture liking.** Fish has a different texture than other animal foods because fish have their muscle fibers arranged, their muscles are short, typically less than one inch, and arranged in sheets called myotomes. This arrangement causes fish flesh to flake. Moreover, fish muscles have lower amount of collagen than the muscles of a land animals. The amount of collagen in meat determines, in large part, its texture. Meat with more collagen will be less tender than the meat with less collagen, making fish muscles to be tenderer than other meats. Also, this collagen breaks down more easily and turns to a gelatin-like substance, making for a much softer texture when eaten. The texture of this fishes was categorized as delicate, medium firm, and firm. Mackerel falls under the medium firm category (Troy, 2015).

The study stated above proved the result of this research. Formulation 2 was the most acceptable formulation for the respondents in terms of texture liking among the fish formulations while Formulation 3 scored the least. Formulations shows no significant differences.

**Flavor liking.** The respondents evaluated the sensory impression to the taste and aroma of the formulated products. Based on the gathered data, Formulation 1 appears to be the most accepted formulation in terms of flavor liking with the mean of



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7.60 while Formulation 3 appears to be the least accepted with the mean score of 6.93.

According to fishchoice.com (2011), an online buying guide for fishes, the flesh of mackerel is firm, has a high oil content, and a strong savory taste. Mackerel are an excellent substitution for fish with high oil content and is a good source of omega-3 fatty acids, selenium, niacin, vitamin B6 and vitamin B12.

**Aftertaste liking.** For the after taste liking, Formulation 1 was the most accepted formulation with the mean score of 7.42 while Formulation 3 was the least accepted with the mean score of 6.56. Mackerel has a strong total aroma and flavor impact, with a highly aromatic distinctive gamey, fresh fish, fish oil character. The intensity and heaviness of the fish characteristic is typical of fresh mackerel and not indication of aged fish. The aftertaste is strong and persistent (Culbertson, 2012).

### 3.3 Shelf-life Study

The uncooked control sample lasted for 7 days after the date of manufacturing while the fish formulations lasted two weeks after the formulation. All formulations were stored in the freezer with temperature of -18° C. The researchers noticed that the pork formulation lost its color faster than the fish formulations and also the fish formulations became saltier as the time it is being stored.

### 3.3 Cost of Direct Materials

The cost of direct materials was based on the current price of the ingredients on the time of the study. The ingredients were brought in Biñan Public Market on August 2016. The cost of direct materials of the formulated product varies from PhP 223.94 – PhP 323.94. All formulations yielded of 25 pieces with 56 grams per piece. Among the formulations, Formulation 3 had the highest cost of direct materials while Formulation 2 had the least amount. Table 3 shows the summary of cost of direct material used to formulate the products.

Table 3. Summary of Cost of Direct Materials\*

Formulations	Total Cost (PhP)	Yield
Control	363.82	25 pieces
Formulation 1	283.94	25 pieces
Formulation 2	223.94	25 pieces
Formulation 3	323.94	25 pieces

\*based on the current market price in the time of the study.

## 4. CONCLUSIONS

With the aim to utilize marine fishes to be a substitute filling for *longganisa*, the researchers had concluded the following based on the results of the study they had gathered. The most preferred and most accepted formulation of fish *longganisa* is Formulation 1 based on the gathered responses on sensory evaluation. However, in terms of texture liking, Formulation 2 was the most accepted. There are no significant differences exist among the formulated products in terms of general acceptability, appearance, and texture. In flavor liking and aftertaste liking, significant differences exist between Formulation 1 and Formulation 3. The shelf life of the formulated products lasted for two weeks and became saltier in the duration of its storage. Formulation 3 had the highest cost of direct materials among the formulated products while Formulation 2 is the most inexpensive fish *longganisa*.

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