Local Establishments In Taal, Batangas: A Study On The Use Of *Sardinella Tawilis* (Freshwater Sardines) In Their Menu And Its Strategic Measures For Its Sustaibality

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ABSTRACT
This study focused on knowing the current strategic measures used by the local food establishments in Taal Batangas concerning their preparation and sustainability of *tawilis* dishes. 100 respondents were selected using convenience sampling technique. The study employed a descriptive research design. The Likert scale and mean were used to measure the agreement and frequency of the response based on the statement indicated in the questionnaire.
The findings of the study revealed a significant level of strategic implementation by local food establishments in Taal, Batangas concerning *tawilis* dish preparation and sustainability. However, using different preservation methods is not their main focus. The study also identified several challenges in implementing sustainable practices concerning the use of *tawilis*. As a recommendation, the study suggested that local food establishments in Taal Batangas, prioritize staff education and knowledge building around sustainable practices concerning *tawilis*, consider partnering with government agencies, and promote their sustainable practices to their customers.
KEYWORDS: food establishments, strategic measures, sustainability, *tawilis*

INTRODUCTION

Sardinella tawilis (freshwater sardines) are among the many fish species across the globe that is considered endangered and nearly facing extinction. They are known to be an endemic species that can only be found in Taal Lake, Batangas, Philippines. Currently, the *tawilis* is the only known member of the genus Sardinella that dwells exclusively in freshwater which makes it unique.
Limnologist Rey Donne Papa (2021) also called it the icon of freshwater biology as well as one of the main stars of Philippine biodiversity. *Tawilis* supply management has ceased its operations ever since the International Union for Conservation of Nature's (IUCN) assessment on February 28, 2017, which classified the species as endangered. The IUCN cites overfishing, pollution, the use of illegal fishing gear, competition from imported species, and predation as the main causes of the *tawilis'* declining population. Among all of the factors, overfishing is said to be the leading cause of endangerment for *tawilis* (Dr. Guerero, 2019). Many fishermen and locals who reside close to Taal Lake depend on fishing for their sustenance and livelihood. *Tawilis* is also used to make indigenous items like "daing," or dried and salted fish, smoked fish, sardines packed in oil, and other Batangeno seafood cuisines (slowfood, 2019). In Filipino cuisine, they can also be prepared in a variety of ways such as skewered, boiled, or fried. Products and dishes that use the *tawilis* can are considered seasonal products, wherein these products are only available in the marketplace during a specific period or season in a year. In the case of seasonal production of *tawilis*, the spawning of *tawilis* all year round has the highest gravid samples during the months of March to May and November to December

(SEAFDEC/AQD, 2013).

Due to the supply of *tawilis* being limited throughout the year, food establishments strategize on how to maintain the sustainability of *tawilis* dishes to provide them during the open and closed seasons.

This includes how it is produced seasonally, the proper storage, and the proper preservation methods of the *tawilis*. Food establishments that handle seasonal products also develop their strategies in purchasing and supply plans. Different factors, such as perishables like the *tawilis* and non-perishable products become catalysts on how the plans are going to be made. Different methods of purchasing will also depend on the frequency of requirement of the product, the quantity needed for purchase, and the market situation. These purchase methods include open market purchases and purchasing by contract. Although none of the methods is the best for purchasing, it all depends on the situation of the food establishment conducting it (Himanshu Rajak, January 2020). Though, implementing sustainable practices can also be challenging due to several factors. One common challenge is the lack of awareness and knowledge about sustainable practices. High initial costs and resistance to change can also hinder the adoption of sustainable practices. Measuring the impact of sustainability efforts can also be difficult. Additionally, there may be a lack of incentives, limited availability of sustainable resources and technologies, regulatory and policy gaps, and competing priorities that make it challenging to implement sustainable practices effectively. Local food establishments in Taal, Batangas play a crucial role in promoting the consumption of *tawilis* and their sustainability. These establishments can help raise awareness about the importance of conserving *tawilis* and its habitat and implement measures to ensure its continued availability.

STATEMENT OF THE PROBLEM

This study explores the use of *Sardinella tawilis* in the menu offerings of local food establishments in Taal, Batangas. It aims to examine the demographic profile of establishment owners or staff, identify the strategic measures used in the preparation and sustainability of tawilis dishes, and assess the challenges encountered in implementing these practices. The research will gather data from local food establishments to provide insights that can benefit the food industry, local communities, eco-tourism, and future researchers by promoting sustainable practices for the conservation of this endemic species.

LITERATURE REVIEW

Tawilis (*Sardinella tawilis)* is a freshwater sardine that is endemic to Taal Lake, which is located in Batangas, Philippines. It is a significant fish species for the local economy and a cultural symbol of Batangas. However, the conservation status of *tawilis* is currently a concern due to the increasing pressure of overfishing, habitat degradation, and climate change. The conservation status of *tawilis* is classified as "Endangered" by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. According to a study by Palomares et al. (2018), the population of *tawilis* has declined by more than 50% in the past decade due to overfishing, habitat degradation, and the introduction of non-native fish species. The study also reported that the average size of *tawilis* has decreased, indicating a decline in the reproductive capacity of the species. Overfishing is one of the significant threats to the *tawilis* population. Fishermen in Taal Lake use different fishing gears, including gillnet, fish traps, and hook and line, to catch *tawilis* (Tayaban et al., 2017). Excessive fishing pressure and the use of destructive fishing practices, such as fine-meshed gillnets, can result in the capture of juvenile *tawilis*, which

can lead to reduced recruitment and overexploitation of the population (Magsino, 2014). Habitat degradation is another significant threat to *tawilis*. The increasing human population around Taal Lake has led to deforestation, land-use changes, and pollution, which have degraded the lake's water quality and aquatic habitats (Palomares et al., 2018). Moreover, the introduction of non-native fish species, such as the janitor fish (Pterygoplichthys spp.), has altered the lake's ecosystem and reduced the availability of food for *tawilis* (Tayaban et al., 2017). To address the conservation concerns of *tawilis*, various conservation measures have been implemented. The Philippine government has implemented regulations to manage the fishing of *tawilis*, such as the closed fishing season from March to April and the minimum size limit of 7.5 cm for *tawilis* caught in gillnets (BFAR, 2021). Moreover, community-based management approaches, such as the establishment of fish sanctuaries, have been implemented by local communities to conserve the *tawilis* population (Tayaban et al., 2017). The conservation status of *tawilis* is currently a concern due to the increasing pressure of overfishing, habitat degradation, and climate change. The decline in the population of *tawilis* could have significant ecological and socio-economic consequences for the local communities in Batangas. To address these concerns, various conservation measures, including regulatory and community-based approaches, have been implemented to conserve the *tawilis* population. However, continuous efforts and monitoring are necessary to ensure the long-term sustainability of *tawilis* and the ecological and socio-economic benefits it provides to the local communities. This section provides the studies and literature related to the research topic. The discussion of studies includes those that establish the interrelationship of the studies that are reviewed. A synthesis of the various studies, including research gaps, should be identified in this study. Theoretical or conceptual framework may be included, relating to the topic itself.

Preparation of tawilis dishes in a food establishmnets

Due to its limited distribution and vulnerability to overfishing, it is important to ensure sustainable practices in its production and preparation. This includes the implementation of strategies through seasonal production, storage handling, and preservation of dishes in food establishments (Waddington, 2018). Seasonal production is a key factor in maintaining the sustainability of *tawilis*. The species has a natural breeding season from November to March, during which fishing is restricted by the Philippine Bureau of Fisheries and Aquatic Resources (BFAR) to allow for population replenishment. Outside of this season, *tawilis* may be caught but only through the use of sustainable fishing methods, such as the use of smaller mesh sizes in nets to avoid catching juvenile fish. In terms of the preparation and production of *tawilis*, strategies such as using only locally sourced *tawilis*, implementing a closed season, promoting the use of smaller *tawilis*, waste reduction, and minimizing serving portions are ways to maintain the sustainability of *tawilis* dishes. Using locally sourced *tawilis* helps support local fishermen and ensures that the fish are harvested sustainably. By sourcing fish locally, fishermen are supported, which helps to create jobs and sustain local economies. Additionally, it ensures that the fish are not being overfished, which can lead to depleted populations and economic instability (FAO, 2021). Using locally sourced ingredients in the food industry has been found to have economic, social, and environmental benefits (Sonesson et al., 2012; Hossain & Moyle, 2018). Food establishments can choose to only serve *tawilis* during the open fishing season to allow for the fish population to replenish during the closed season. The implementation of a closed season is an effective method of managing fish populations and preventing overfishing (Alcala et al., 2008). This practice helps to ensure that there will be a sustainable supply of *tawilis* in the future. By using smaller-sized *tawilis* in their dishes, food

establishments can promote sustainability by allowing the larger fish to mature and reproduce. This will help to maintain healthy fish populations and support sustainable fishing practices (FAO, 2021).

Input: Information on the demographic profile of respondents, the use of *Sardinella tawilis* in menus, sustainability strategies, and challenges faced by food establishments.

Process: Collection of data using research instruments such as surveys or interviews, followed by data analysis to identify trends, strategies, and issues related to tawilis use and sustainability.

Output: Suggested strategies to enhance sustainability practices in local food establishments, along with countermeasures to address the challenges identified in the study.

METHODOLOGY

This study utilizes a quantitative research design, focusing on the collection and analysis of numerical data to examine the use of *Sardinella tawilis* in the menus of local food establishments in Taal, Batangas. Through structured surveys of 100 respondents, the research aims to identify patterns and relationships related to sustainability practices, with statistical methods used to interpret the findings. Under the probability sampling methods, the researchers used a convenience sampling technique. This sampling technique allows researchers to conclude a population based on the data gathered from respondents that are selected based on their availability and willingness to participate in the study. This technique involves selecting the most easily accessible respondents, rather than randomly selecting from a population. The sampling technique is often used in situations where it is difficult or impractical to obtain a random sample, such as when time and resources are limited.

Collection and analysis of data, Instruments and Data Gathering Procedures

To gather the necessary data for analysis, the researchers asked the selected respondents who have general and professional knowledge related to the research topic to participate in a survey. After collecting the data, the researchers will review and verify the answers provided by the respondents. The survey's data will be classified as quantitative data, will be analyzed and computed to find its mean and standard deviation to determine its verbal interpretation.

The researchers used a survey questionnaire as the instrument of the study. A survey questionnaire will be used to collect data from local food establishments in Taal, Batangas, on their current use of the *Sardinella tawilis* in their menu and their implementation of sustainability measures. The sample questionnaire will consist of demographic questions and the Likert scale questions for them to rate. The use of the Likert scale involves the inclusion of questions that have predetermined response options, enabling the collection of quantitative data. The questions would ask the respondents to give either a 5-point scale of agreement or a 5 - point scale of frequency as a response based on the statement indicated in the questions

The survey was administered through both face-to-face interactions and online using Google Forms, ensuring convenience for both the researchers and the respondents. All completed questionnaires were treated with strict confidentiality and securely stored for future reference, should the researchers need to verify any specific information. The following steps were undertaken by the researchers to carry out the study:

1. A questionnaire was developed using Likert scale items to assess the level of agreement and frequency of strategies used by local food establishments in Taal, Batangas, for

preparing tawilis dishes, promoting sustainability, and addressing related challenges.
2. The questionnaire was distributed to the selected respondents to collect relevant data for the study.
3. The responses were analyzed to form a basis for recommendations aimed at enhancing current strategic measures for tawilis preparation and sustainability, as well as proposing solutions to overcome challenges in implementing sustainable practices.

RESULTS

This chapter includes the information that was gathered and analyzed, along with interpretation of the issues outlined in the study. The purpose of the study is to determine what strategic measures concerning the sustainability of *tawilis* dishes the local food establishments in Taal, Batangas implement and practice especially due to the current conservation status of the *Sardinella tawilis*. The findings and analysis of the survey will be presented in this chapter. All of the questions were answered by 100 respondents, all of whom represent the local food establishments in Taal, Batangas.
All tables should be numbered with Arabic numerals (e.g. Table 1; Table 2; ….). The table headings should be placed above the tables with 11 points, Times New Roman, Centered, Line and Paragraph Spacing-1. The table content should be 11 points, Times New Roman, Line and Paragraph Spacing-1. Leave 2 lines with Line and Paragraph Spacing-1 between the paragraphs and the table.

Table 1. Seasonal Production

No.	**Statements**	**Mean**	**Interpretation**
1	Usage of locally sourced tawilis	4.22	Strongly Agree
2	Serving tawilis only during the open fishing season	4.23	Strongly Agree
3 4 5	Promotion of the use of smaller tawilis in production Reduction of food waste by using all parts of the tawilis in dishes Minimization of tawilis serving portion during limited supply	4.38 4.33 4.42	Strongly Agree Strongly Agree Strongly Agree
Result: Strategic Measure in Preparing Tawilis Dishes			

Table 1.2 Storage Handling

No.	**Statements**	**Mean**	**Interpretation**
1	Usage of temperature tools	4.21	Strongly Agree
2 3	Usage of proper labeling Usage of controlled inventory	4.24 4.38	Strongly Agree Strongly Agree
Result: Strategic Measure in Preparing Tawilis Dishes			

Table 1.3 Preservation

No.	**Statements**	**Mean**	**Interpretation**

1	Usage of canning as a preservation method of tawilis in the food establishments	2.93	Sometimes
2	Usage of drying as a preservation as method of tawilis in the food	3.17	Sometimes Always Sometimes Sometimes
3’	establishment	4.35	Sometimes Sometimes
4	Usage of freezing as a preservation method of tawilis in the food establishments	2.87	
5	Usage of pickling as a preservation method of tawilis in the food	3.29	
6	establishment	3.03	
7	Usage of salting as a preservation method of tawilis in the food establishment	3.02	
	Usage of smoking as a preservation method of tawilis in the food establishment		
	Usage of vaccum packaging as a preservation method of tawilis in the food establishment		
Result: Strategic Measure in Preparing Tawilis Dishes			

Table 2 Purchasing and Supply Plan

No.	**Statements**	**Mean**	**Interpretation**
1	Purchasing tawilis by contract	3.94	Agree
2	Purchasing tawilis by open market	4.29	Strongly Agree Agree
3	purchase	4.17	Agree Strongly Agree
4	Checking for tawilis dish certification	4.13	
5	labels	4.26	
	Purchasing in smaller quantites		
	Sourcing tawilis from suppliers who use responsible fishing practices		
Result: Strategic Measure used for the sustainability of Tawilis dishes			

Table 2 Purchasing and Supply Plan

No.	**Statements**	**Mean**	**Interpretation**
1	High cost of sustainable practices	4.35	Strongly Agree
2	Lack of knowledge and education	4.60	
3	among staff	4.16	Agree Strongly Agree
4	Unreliable suppliers	4.33	
5	Lack of regulatory support or incentives from the government	4.41	Strongly Agree
	Resistance to use sustainability sourced tawilis from customers		
Result: Challenges in implementing practices concerning use Tawilis			

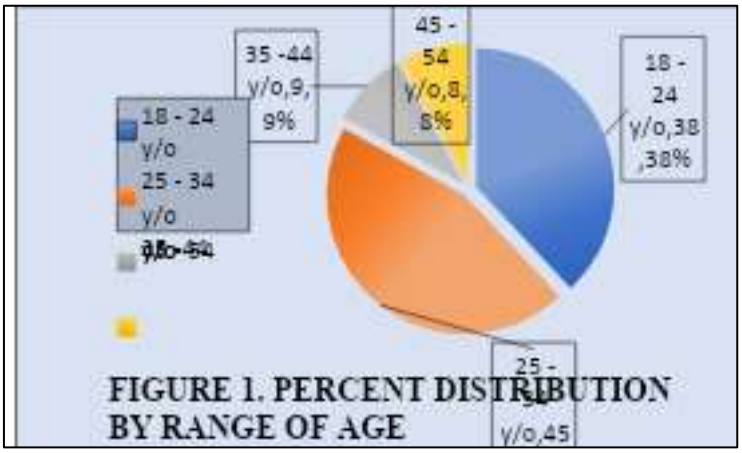


Figure 1. represents the percentage distribution of respondents by age range in the research study. The largest part of the chart corresponds to the age range of 25-34 years old, which accounted for 45 respondents representing 45% of the total respondents. The next largest part of the chart represents the age range of 18-24 years old, which accounted for 38 respondents representing 38% of the total respondents. The remaining two age ranges, 35-44 years old and 45-54 years old, account for 9 respondents representing 9% of the total, and 8 respondents representing 8% of the total respondents, respectively.

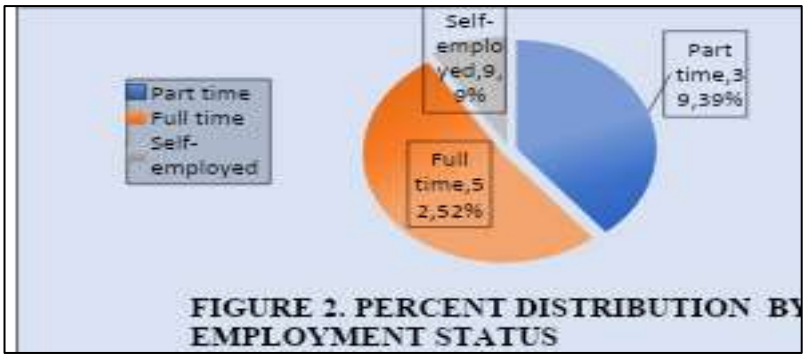
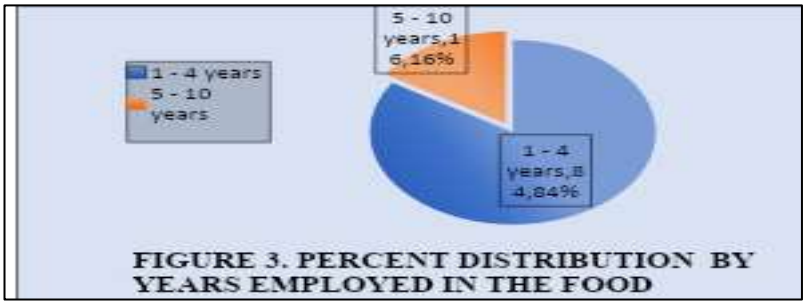


Figure 2. represents the percent distribution of respondents by employment status in the research study. The largest part of the chart corresponds to full-time employment status, which accounted for 59 respondents and represents 59% of the total respondents. The next largest part represents the part-time employment status, which accounted for 39 respondents representing 39% of the total respondents. The smallest part of the chart



shows 9 respondents which represents 9% of the total respondents.

Figure 3. represents the percentage distribution of respondents by years employed in their respective food establishments. The largest part of the chart corresponds to the range of 1-4 years of employment, which accounted for 84 respondents, representing 84% of the total population. The smallest part of the chart shows corresponds to the range of 5-10 years of employment, which accounted for only 16 respondents representing 16% of the total respondents.

DISCUSSIONS

The study found that local food establishments in Taal, Batangas are actively implementing strategic measures to ensure the sustainable preparation of tawilis dishes, reflecting their awareness and commitment to sustainability. Key practices include sourcing tawilis locally, serving it only during open fishing seasons, using smaller fish to allow larger ones to reproduce, reducing food waste by utilizing all fish parts, and minimizing serving portions during limited supply. In terms of storage, establishments maintain freshness through temperature control, proper labeling, and inventory management. Although preservation methods like canning and smoking are occasionally used, freezing remains the most common and convenient method.

Sustainable sourcing strategies are also evident, with establishments favoring open market purchases, buying from responsible suppliers, contract purchasing, checking fish certifications, and purchasing smaller quantities. Despite these efforts, establishments face several challenges, particularly the lack of staff education on sustainability, followed by high costs, unreliable suppliers, limited government support, and customer resistance. Most respondents are young and relatively new to the industry, highlighting the need for continued education and support to enhance sustainable practices further.

CONCLUSION AND RECOMMENDATIONS

The study revealed that most respondents were full-time employees aged 25–34, with 1–4 years of experience in the food sector. Local food establishments in Taal, Batangas show strong efforts toward sustainability in preparing tawilis dishes, employing strategies such as using locally sourced tawilis, serving only during open season, minimizing waste, and ensuring quality through proper storage methods. However, preservation practices are limited, with freezing being the most used method. The primary sustainable sourcing strategy involves purchasing tawilis from responsible suppliers, with additional practices like certified sourcing and smaller purchases. Despite these efforts, major challenges remain—particularly the lack of staff education, along with high costs, unreliable suppliers, limited government support, and customer resistance. Overall, while progress is evident, further action is needed to overcome these barriers and strengthen sustainability.

Staff Education on Sustainability: Local food establishments in Taal, Batangas should prioritize educating their staff about sustainable practices concerning tawilis through seminars and workshops. Topics include sustainable production, waste reduction, sustainable cooking ingredients, preservation methods, and relevant government policies and incentives. Partnerships for Support: Establishments are encouraged to collaborate with local organizations and government agencies (e.g., Taal Tourism Office, Municipal Agriculture Office, PENRO, DTI, DOST, PTCAO, and EMB) for training, technical assistance, and resources to overcome challenges like high costs and supply issues. Promotion of Sustainable Practices: Businesses should actively promote their sustainable efforts to customers via menu descriptions, social media, and other communication channels to build awareness and encourage wider adoption.

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