Creating Sustainable Fishing Methods in Costa Rica

An Interactive Qualifying Project submitted to the faculty of Worcester Polytechnic Institute in partial fulfillment of the requirements for the Degree of Bachelor of Science

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Abstract

Costa Rica is a coastal population that relies heavily on fish consumption and currently faces the challenge of certain species being overfished. Our project team used surveys to gather consumption data in Costa Rica and gauge consumers' willingness to eat more sustainably. By working with the MarViva foundation, an oceanic conservation organization, our group conducted a social and economic analysis of the fishing industry in Costa Rica. The result of our project provided recommendations to MarViva on fish species that should be consumed more regularly with hopes of taking the pressure off of the commercial fish species. This project was conducted remotely due to the Coronavirus pandemic.

Acknowledgements

Our group is extremely fortunate to have the opportunity to work with the MarViva foundation and help to address the challenges of overfishing in Costa Rica. First off, we would like to thank our sponsor organization, MarViva, and more specifically our sponsor, Cristina Sanchez for all of the time and effort she put into our project. Our project would not have been possible without all her help and advice. Additional thanks to Professor James Chiarelli and Professor Pratap Rao for their help during the initial stages of the project in B term and the final stages in C term. Lastly, our group would like to thank Worcester Polytechnic Institute for allowing us to continue our IQP remotely and giving us a chance to make a positive impact in the world.

Executive Summary

With Costa Rica being one of the top visited locations in Central America, the country is constantly bringing in new tourists and the general public to explore the tropical nature and more importantly, enjoy the cultural seafood various cities in the area have to offer. However, certain species of fish in the coastline of Costa Rica are at danger due to improper fishing tactics and overfishing of popular demand. As a result, the environmental impacts of these practices are often overlooked by consumers leaving only a few people such as our project team and The MarViva Foundation to create awareness and change to provide a sustainable future in Costa Rican regions. The goal of our project was to gauge consumer awareness towards overfishing of commercial species in the oceanic areas of Costa Rica, analyze the data received from various people who eat fish, and address the current issues to the public. To achieve the goals of this project set forth we gathered information through intensive research throughout the following objectives:

- Analyzing the data and trends of various statistics in Costa Rica's fish market
- Researching the environmental impacts of overfishing in Costa Rica
- Gathering and interpreting consumer preferences/opinions on their consumption of fish and the effects of overfishing
- Recommend different methods and alternatives to Marviva to provide sustainability of the oceanica species for the future

Findings

In our attempt to pursue the objectives listed above, we have created surveys questioning consumers' preferences around consuming various species of fish in Costa Rica and collecting their opinions on the current issues caused by overfishing in their area. After analyzing all the

data received from consumers and research, these are what we found to be the main takeaways from this study:

- Corvina is the most commonly purchased fish to eat at home in Costa Rica along with Atun and Tilapia which share similar attractions
- Corvina is the most popular fish to eat at restaurants along with Pargo due to its unique serving style
- The majority of less popular fish species available for purchase at supermarket, fish market, restaurants, and other vendors are almost never purchased
- Consumers care more about the flavor, texture, and presentation of fish rather than the species and their environmental threat status
- Fish in Costa Rica is mostly purchased from local supermarkets
- Most consumers would be willing to try new fish species to reduce the harm to commonly consumes species
- Most consumers would pay more for certain fish species if they knew they were caught with proper fishing practices
- Most consumers are unaware of the impact of overfishing when purchasing fish but are willing to help created a more sustainable future for these aquatic species

Recommendations

After researching the history of Costa Rica's fish market and analyzing our data received from consumer responses, we have collected enough information to provide reasonable solutions to correct the currents overfishing impacts.

Our first recommendation, targeting the main source of the issue, is to reachout to the fishing industries in Costa Rica and convince them to focus on catching less popular species of

fish while advertising to the community that this will keep not only the fish industry sustainable, but the aquatic ecosystem as well. In addition to this, our group recommends encouraging commercial fishing companies to use the hook and wire method of catching species instead of the standard use of bottom trawling nets. This will eliminate the harm done to species unintended to be caught by these nets and the damage done to the ocean floor.

Furthermore, our group urges supermarkets and other fish vendors to develop a labeling system in which consumers would be provided with information on how the species was caught. Our data displays that the majority of consumers would even pay extra if they knew that the fish they were eating were caught with proper tactics.

Our group also recommends creating a large database of fishing records from fisheries and supermarkets in Costa Rica. This information would track the sale records and number of catches of each species and can be used to compare against sustainability rates of each species to make sure they are not in danger. This database would be provided to the public and government to create awareness of these issues. In an effort to inform the community of the dangers they might be causing when purchasing fish, we recommend that Marviva utilizes their local name recognition and social media to directly inform consumers before making any purchases.

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Chapter 1: Introduction

Maintaining and preserving marine ecosystems has been at the center of global environmental sustainability efforts for decades. Recently, with the challenges of climate change becoming more prevalent, it is more important than ever to implement sustainable practices. Coastal fishing communities are directly affected by changes in the marine ecosystem, and in turn directly benefit from the advantages of sustainability practices.

Costa Rica is a coastal nation long renowned for being rich in biodiversity and natural resources. Fishing is not only important to the economy of Costa Rica, but it is also a lifestyle that many Costa Ricans rely on for income and more importantly, food. Overfishing is a major concern for fishing communities worldwide but more specifically Costa Rica. As commercial boats significantly diminish the fish population along the coast, fishing communities suffer immensely. The negative effects of overfishing have serious ramifications on the fishing community in Costa Rica. Overfishing alters the entire marine ecosystem by changing the way fish reproduce and creates an imbalance of species within the ocean. This scenario erodes the food web and not only affects fish but can have a negative lasting effect on other marine life such as sea turtles and coral reefs.

Our group will be working with the MarViva foundation of Costa Rica. This foundation is an international, non-governmental, non-profit organization working to protect marine wildlife in areas such as Latin America and the Caribbean through sustainable methods. MarViva is a team that consists of biologists, political scientists, and geographers who provide their expert opinion on effective methods to maintain the aquatic ecosystem, as well as enforce existing laws, and establish new marine sanctuaries. MarViva has partnered with WPI in the past and is well

known for using data and methods generated by IQP projects and using that information to enact real legislation. MarViva uses project findings to lobby and influence representatives in the national legislature to take up these issues, resulting in legislation on the national level aimed at promoting sustainability and general environmental awareness. Our group will work with MarViva to create a market study that obtains information regarding fish consumption habits in Costa Rican communities and the type of species that are most popular within the region. Non-commercial fish species are those that are consumed at less of a rate than commercial fish species and by default are less popular. Non-commercial fish species are an important aspect for a region's biodiversity and are crucial to our groups efforts to promote more sustainable fishing practices. With the information from the market study we will be able to assess the awareness of consumers and their consumption of non-commercial fish species. We will also be able to measure consumers' willingness to buy non-commercial fish species and in turn create strategies to encourage the consumption of non-commercial fish, helping to mitigate the effects of overfishing and balance aquatic ecosystems.

Chapter 2: Background

2.1 The MarViva Foundation

The MarViva Foundation is a non-profit, marine conservation organization designed with the work model of political advocacy, multi-sectoral partnerships, participatory processes, and the use of communication tools to promote policies and standards, raise awareness, and create changes of attitude relating to marine issues. The work model of MarViva includes working with congressmen, prosecutors, port inspectors, park rangers, coast guards, chain marketing inspectors and marine resource vendors, distributors, and consumers in order to better voice concerns in marine sustainability. For example, in 2013, local authorities were supported by MarViva in establishing the Exclusive Artisanal Fisheries Zone (ZEPA) and expansion of the management area of 2.5 miles to 12 miles from the coastline in northern Chocó.

MarViva was instituted in Costa Rica in 2003 with the support of a Swiss philanthropist, Stephan Schmidheiny. It was created with the sole purpose of pushing towards conservation and sustainable use of marine and coastal goods and services within Central America. MarViva's operation areas are mostly located along the west coast of Costa Rica and Panama, neighboring the Pacific Ocean. Currently MarViva is planning to perform a market study in order to promote more sustainable fishing and decrease consumption pressures in commercial fish species by promoting the sale and consumption of less commercial fish species that may not be as well advertised or market favorable.

2.1.1 Costa Rica's Ocean Reliant Economy

Costa Rica's geography mainly consists of coastal plains split apart by five distinct mountain ranges. Since most flat land is coastal, most of the population in Costa Rica is located closer to the ocean. This proximity to the ocean drives the Costa Rican economy through marine based resources and international tourism. Costa Rica is a country seeking for the sustainable development of more commercial and recreational fishing activities, as well as the development of pisciculture. Pisciculture is the controlled breeding and rearing of fish and would allow for populations of fish to be more easily regulated by gaining direct control of how many fish are being produced and consumed. Finding this to be an effective alternative to open sea capture would directly benefit the country economically by creating jobs and resulting in higher yields of fish.

2.2 Costa Rica and the Fishing Industry

Costa Rica is very popular in comparison to other countries due to its environmental diversity and unique coastal attractions. As a result, the country is constantly welcoming new tourists, who are eager to embrace and enjoy the country's culture. Costa Rica provides many attractions for their guests varying from hiking historical volcanoes to ziplining through the tropical forests. It's no surprise that tourism is the main source of income and hard currency. Costa Rica brings in over 1.7 million new tourists every year on average. The majority of which come from either The United States or Canada, two countries that lack many environmental benefits that can be found in Costa Rica. Over 1.7 billion dollars are made from tourism in Costa Rica every year and 80% of tourists have been found spending their money on ecotourism-related activities (Embajada De Costa Rica, ND). One of these main activities, which is our main

focus, is their consumption of fish. Embracing the culture of Costa Rica involves embracing its wide variety of oceanic species as well.

One of the most common fish found in the Costa Rican waters is pargo rojo, which is the local red snapper. This fish can be frequently seen in most fish markets and restaurants. According to the Costa Rican Institute of Fisheries and Aquaculture, their Costa Rican production sales by species mentions that in 2018, 80 percent of fishery was devoted to catching tilapia, 13 percent towards shrimp, 4 percent towards rainbow trout, and 3 percent towards pargo rojo. In 2018, the production of tilapia increased by more than 1000 tons compared to 2017 due to the increase in exports. Additionally, the Costa Rica shrimp market has expanded its exports to several other nations primarily to be sold to the European market, thus, leading to an increase of production towards that species. Furthermore, the trout production from aquaculture farms has managed to increase from less than 550 tons in 2010 to 932 tons in 2018. Studies state that "exports of this premium product have been vital for the development of this aquaculture sector". Similarly, the production sale of the snappers has increased from 50 tons in 2015 to 600 tons in 2018. Even the production of oysters from aquaculture farms are raising concerns. Although the sale of oysters has been consistent at 16 tons per year since 2014, its potential to increase is well known and is expected to double or even triple its sales within the next few years (Navarro 2019).

As a result, many industries rely heavily on their income from fish. Companies such as hotels, fishing charters, restaurants, and individual sellers are constantly looking for several species of fish to either export, sell, or prepare as a meal. Reports state that there are over 287 aquaculture producers in Costa Rica generating over on average 2,005 direct jobs. As a result, it is difficult to influence the fish industry to consider changing their methods of fishing. Additionally, 69 percent of this industry is devoted to tilapia farming. Respectively, the fish

industry all together contributes to .10 percent of the GDP, 7.1 percent of the national livestock product, and on overage 1.6 percent of Costa Rica's exports (Navarro 2019).

2.2.1 Trawling and its Effects

Another harmful method of fishing is trawling. Trawling is the process of dragging a net through the water, pulled by a boat. The net aims for catching several species such as whiting, red hake, dogfish, crab, shrimp, and flounder. However, the net catches almost everything in its path. The endangered species that are at the highest risk of being captured by trawling are sea turtles because they often rest at the bottom of the sea, which is primarily where the net aims for its intended catches. In addition, these nets catch other endangered aquatic species such as sharks and dolphins. As a result, these species that are captured unintentionally typically die in the process (Staub, 2020).

Organizations such as MarViva with similar marine marine conservation concerns have taken many approaches in the past to try and eliminate harmful methods of fishing and any other actions that put these species at risk. However, most of these attempts have failed. A primary focus in Costa Rica has been the elimination of trawlers. Other like-minded people in the past seeking to see a better outcome for these species have gotten so far as to set forth new laws banning trawling but, with such a high demand for certain exports such as shrimp, fish, crab, and other net intended creatures, legislating a ban would never succeed. In October 2020, the Legislative Assembly of Costa Rica gathered together and approved a bill that continues the use of trawl nets, disregarding the concerns of environmental advocates. Marino Castro, legal and policy analyst at Turtle Island Restoration Network stated at the meeting that the decision directly impacts not only marine life, but artisanal fisheries that harvest species that have been

consistently at high risk due to trawl nets in the past. However, the majority of the board continues to state that the demand for the intended species outweighs rising concerns (Staub, 2020).

2.3 Points of Concern

The option to more sustainably catch fish has always been available, however even fish that are farmed more responsibly can still be at risk of overfishing. Commercial fishing has become a threat to Costa Rican marine life and to small scale fishermen. Fishermen interviewed from the town of Samara on the Pacific coast of Costa Rica's Guanacaste province and Mal Pais a town in Puntarenas Province have spoken up on how they have found themselves nearly without work due to commercial fishing practices. These are just two of many small fishing communities made up of around fifteen to twenty fishermen. They, like many others, still use traditional practices, like hand fishing or single line fishing, and make their living relying on smaller catches. Two reasons for the impact on their community is: overfishing, meaning their catches have been becoming smaller; and commercial fishing, meaning that their relatively small catches are no longer in demand (Martin, 2017). They mainly place the blame on industrial fishing boats, illegal tactics and practices that do not follow regulation, and the ways they are affecting other wildlife. Markets that rely on the more 'popular' fish, or only supply them due to their popularity, blinds consumers to their other options. With an increase of diversity of fish in farming and fish consumption, fishermen of these low-consumption species would also gain an opportunity to earn more and improve on their own business. This has created a huge impact on the tropical marine ecosystems, when, likewise, an opposite and more positive impact would occur if the general community were more aware.

There are many points of concern revolving around fishing practices. Climate change directly affects the world's access to fish as a resource. Within climate change, we are trying to encourage more increased efforts to participate in more sustainable practices like fishing. A study analyzing the change in 'global catch' of 124 species from past to present, shows that when compared, we are now at 33% of the average yields from 1930 to 2010 (Free, 2019).

Along with this decrease, it also shows that demand is increasing. The maximum sustainable yield from the most recent season, in 2019, has dropped by 4.1 (Free, 2019). By definition the maximum sustainable yield is a quantity that determines the maximum catch that can be repeatedly harvested without creating negative impact. Statistics like these highlight the direct impact this problem has on food security, marine populations, and employment where places like Latin America rely heavily on fish as a resource.

In order to gain a better idea on the community's awareness and what their viewpoints are, we will be conducting a market study with MarViva to gather information and data. The goal of this study is to assess their community's knowledge and awareness of these issues and the species that are being affected, and as a result assess consumer willingness to possibly purchase less commercial species. Subsequently this will relieve the pressure of overfishing more commercial species. On top of this, the perception, knowledge, and awareness of these non-traditional species will also be assessed and therefore can also generate more information towards the study and gain a wider view on how the community sees and feels about overfishing, commercial fishing, and sustainable practices. All of the data collected will be used to create a strategy to encourage the consumption of less commercial species, creating a path to decrease overfishing and hopefully increase the balance within the marine ecosystems.

Chapter 3: Methodology

3.1 Areas of Focus

Wildlife conservation has been a growing concern to many societies worldwide. According to the philosophy of the environmental movement, all species are precious and their preservation is critical to maintaining diverse ecosystems. Endangered creatures have no voice of advocating for themselves so it is dependent upon the human race to seek solutions. This concern even expands to many invasive species within our marine ecosystem. These are current world issues that MarViva and our project aim to address.

Different locations across the nation rely heavily on certain species to provide a source of consumption for their community. All restaurants in Costa Rica, and especially those catering to the tourism industry, rely heavily on coastal companies for their income from fish. With fishing being one of the highest attractions in Costa Rica, this only puts these species in a more vulnerable position for extinction. Similar occurrences happen along the New England coast line. For example, Cape Cod, located in Massachusetts, is a well known oceanic vacation spot in which many tourists and fisherman prioritize their efforts towards catching Cod and Halibut year round due to its increased availability. Species in the Eastern Tropical Pacific are facing the same problem. These problems can be solved through tactics such as influencing fisherman to look for different species and providing a more sustainable marine environment.

The aim of this project is to assist MarViva in its efforts to create awareness for endangered marine life and help execute a plan to do so. Respectively, our project team will need to do extensive research and data analysis on various companies and their sale and consumption statistics. Our first aim will be to learn about the restaurants, hotels, fishing markets and any

other facilities that rely primarily on sea food consumption. Going more in depth we will need to research specific fish preferences within each organization and impose suggested actions that should follow based on what seems the most alarming. Furthermore, our group will discuss alternative plans for each of these organizations that will beneficially help the marine ecosystem while not impacting their source of income.

3.2 Collection of Fish Consumption Data

The purpose of learning about these restaurants, hotels, fishing markets, and supermarkets that rely heavily on the consumption of seafood, is so that companies that more accurately represent the consumption habits of the public are being represented once data collection begins. If these companies are less of a reflection of the normal consumption habits in the area, then the data collected will not accurately represent the consumption habits of the inhabitants. Luckily, MarViva has provided a list of establishments that best represent the consumption of fish by citizens within Costa Rica. We will compare the consumption statistics given to us through two surveys in order to compare the sales of fish to the consumption of fish. If discrepancies between common consumption and sales of fish occur, we can propose solutions to better fit the need within that community. If it is found that a few distinct species are being concentrated upon, we can propose changes for the practices of these companies. Collecting these statistics and comparing them to the sustainable catching rates, we can detect whether or not the fishing industry is maintaining the population of fish and not depleting the total population of specific fish species due to commercial pressures. To summarize, what are the most accurate fish consumption statistics in Costa Rica currently and are they sustainable? If not, what could be done to fix it?

3.3 Public Opinion on Consumption Alterations

Another objective is to collect information from surveys to learn how consumers would adapt to changes in their consumption habits. These surveys are needed in order to accurately gauge how most of the public would react to ad campaigns or sustainability movements that MarViva would want to campaign for in the future. For example, if we were to find out that most consumers were less inclined to change their habits, more funding could be allocated by MarViva towards advertising their economic or environmental concerns to the public, aiding in changing their perceptions on sustainability or personal consumption. If we were to find out that more consumers were willing to change their consumption habits in order to build a more sustainable marine ecosystem and economy, then recommendations could be made to fish sellers to better fit the requests of the public and reduce overfishing of popular species. In summary, do people know about the issue, and are they willing to change their habits in order to provide a more sustainable environment and economy in Costa Rica?

3.4 Data Analysis and Probable Limitations

In order to determine how we can most constructively implement more sustainable fishing practices in Costa Rica, we conducted a market study with MarViva. A market study means we used techniques like surveying, research, and analysis to gather data and information on the issue of overfishing and commercial fishing, as well as using these questionnaires to develop a concrete understanding of the community's overall opinion and knowledge. A market study allows us to identify our best way to move forward in analyzing our data, and putting together our study. By thoroughly analyzing the responses we have received from our surveys and community assessment, organizing this data, and forming an understanding of the needs of the community, these greatly help us in finding opportunities for the community and seeking

enforcement of more sustainable practices. This proved to be the most effective way to move forward for a multiplicity of reasons, incorporating various publications and research; one being fishsource.org.

Including a market study, presenting data to those who have a powerful voice in these communities will aid us in lobbying for more sustainable and responsible fishing practices. We have done this by contacting MarViva's target groups: supermarkets; distributors; restaurants; and consumers. Before deciding to suggest any reforms or new practices, this allows us to assess community knowledge of the problem and propose solutions, and consumer willingness to accept less commercially desirable species into their markets.

A limitation we may encounter is bias within these specific groups and their communities. We have taken this into consideration while determining our criteria for categorizing the use and meaning of our data, and how it will apply to the study. This includes response location, outliers, and majorities versus minorities . As well as following MarViva's credibility and mission -- "marine focus, its regional reach, its recognized image, its strong credibility, its emphasis on multisectoral and community participation, and its support for scientific information reaching out to the community" (MarViva.net)--, this is the best way to learn about our target audiences. Subsequently, this will also help us lead the Costa Rican community to encourage and enforce more sustainable fishing practices.

3.5 Survey and Community Assessment

One of the main methods that our group used to collect information is a survey. Surveys are one of the most efficient and effective ways to obtain data. The anonymity of surveys allows respondents to give more valid and candid answers, a feature in which our group used when

obtaining responses from the Costa Rican community. The questions in the survey are posed in a way that generates desired information regarding different consumption habits among Costa Rican consumers and establishments. Another method that our group used is a community assessment. By definition a community assessment is the process of identifying the strengths, assets, needs and challenges of a specified community. In our case the specified community is Costa Rica and the specific challenge that the community faces is overfishing. Within the community assessment our group sent out surveys to different establishments within Costa Rica such as restaurants, hotels, fisheries and in addition, consumers. The questions in the surveys relate to fish consumption habits and sustainability. Our final method of obtaining information comes from a website titled "fishsource.org." This website lists all of the species of fish that are being caught in Costa Rica as well as the fishery that catches the fish. All of these methods listed above will contribute valuable information and play a key role in conducting a successful market study.

3.6 Justification of Methods

The choices we have made to obtain our information (survey, community assessment, fishsource.org) provide the most efficient way to obtain relevant information regarding consumption habits in Costa Rica. One reason we chose creating a survey for our methodology is the anonymity factor. We offered our respondents the opportunity to remain anonymous when answering our questions on the survey. This way the results were more credible and valid as the respondents had no concerns about their identities being revealed. Our group phrased our survey questions to assess consumers' awareness of overfishing in Costa Rica as well as their willingness to choose a different alternative species to eat. In addition to anonymity, the surveys

were inexpensive and flexible. Our group used the free software google forms in order to create our surveys. This software made it easy for our sponsor to access and send out to the intended establishments and consumers. The community assessment provided our group with direct insight into the challenges faced by establishments and community members. This was an effective methodology as it allowed our group to create strategies to mitigate these specific challenges faced by establishments and consumers in Costa Rica. Perhaps the most convenient form of methodology is the website fishsource.org, which allowed our group to view popular fish species in Costa Rica and the fishery that is responsible for catching them. This website was an easy way to get basic information regarding the fishing industry in Costa Rica. In general, the above methods that our group chose best fit the type of information that our group needs to collect and are the most efficient means by which we seek to obtain this information.

Chapter 4: Results and Analysis

In an attempt to address the current issues occuring in the coastal regions of San Jose Costa Rica, our team, with the help of the MarViva Foundation, has sent out numerous surveys to gather various opinions from consumers. The following sections discuss the main points from the methodology in which our mission is to increase consumer awareness. Throughout this chapter we collect data from a diversified population of consumers, restaurants, and vendors to examine the statistics obtained, and propose more sustainable seafood options.

4.1 Demographics of Consumers:

Concerning the information gathered from consumer survey responses, Figure 1 shows that the majority of responses that we have collected are from females.

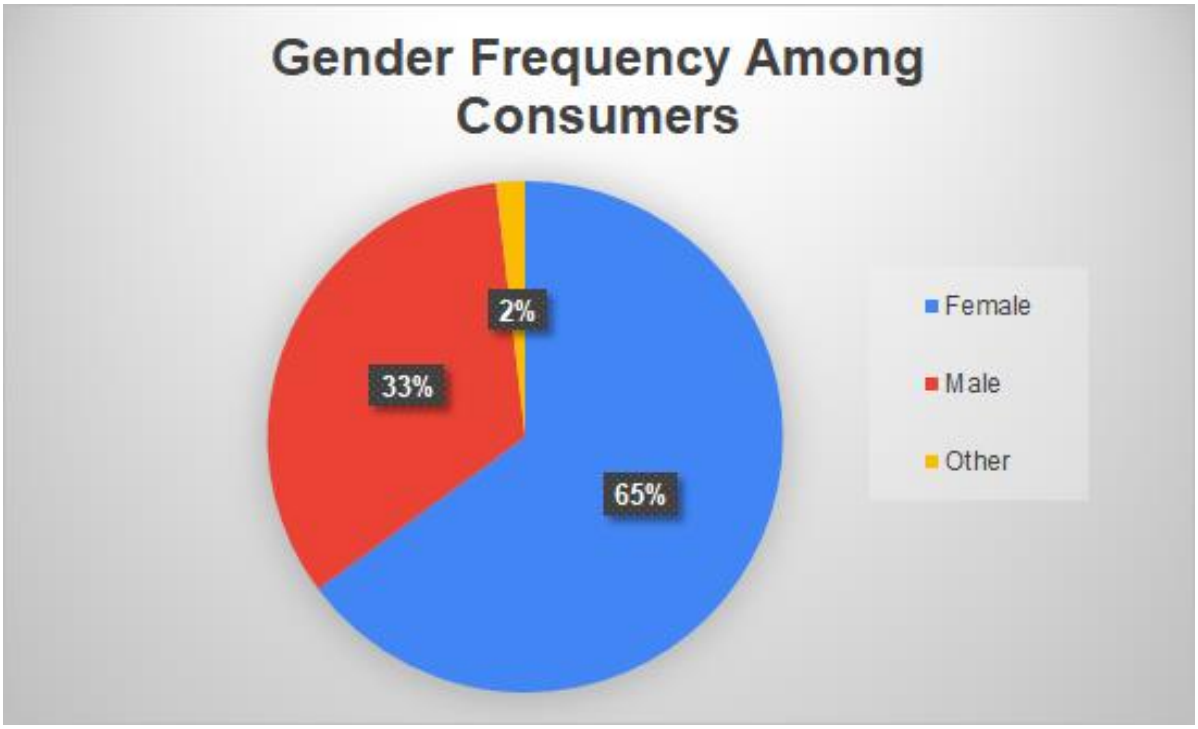

Figure 1: The gender frequency reported by consumers in Costa Rica

In total, approximately 65% of surveys were submitted from females and 33% from males, while the remaining 2% chose not to specify. In addition to the demographics of the consumer survey submissions, Figure 2 shows that the locations of the participants are very diverse. However, the majority of responses were received from San Jose since that is the location of the MarViva Foundation. To be more precise, 45% was from San Jose, 24% from Heredia, 12% from Alajuela, and the remaining 17% from surrounding cities in Costa Rica.

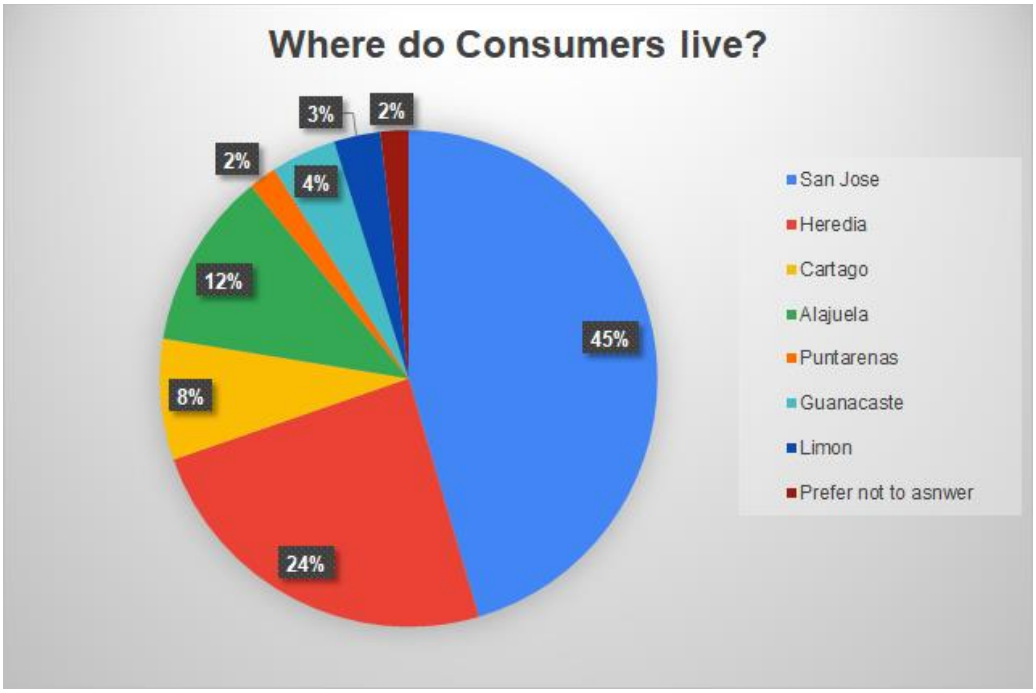

Figure 2: The locations in which these consumers live as a percentage of surveys done

We also received a wide range of responses from different age groups as shown in Figure 3. The largest number of responses (30%) were sent in from consumers between the ages of 41 and 50. 88% of our data have been received from consumers over the age of 31 with experience in consuming fish.

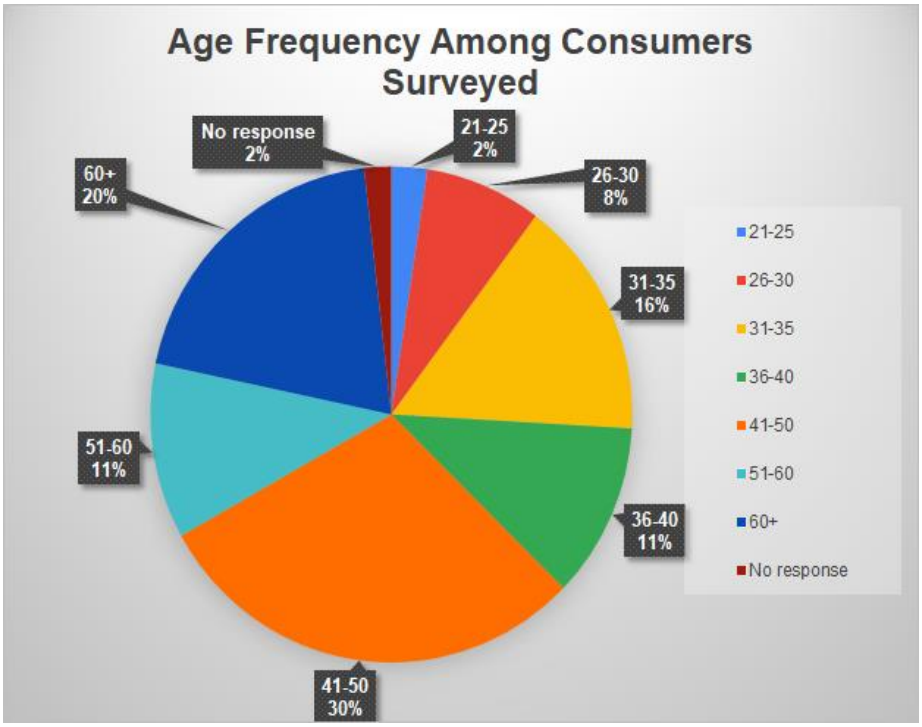

Figure 3: The age frequency as a percentage for consumers within Costa Rica

4.2 Fish Preferences of Consumers

With all the data gathered from the consumer surveys, our team has enough information to analyze the statistics behind fish preferences across various Costa Rican regions. Looking directly at the options of fish species most consumers would choose to eat at home, Corvina is in the highest demand as shown in Figure 4. Going more in-depth, out of 166 survey responses, 109 people said that they would prefer buying Corvina along with other species as displayed in Figure 5. That is roughly 22% in comparison to other species available.

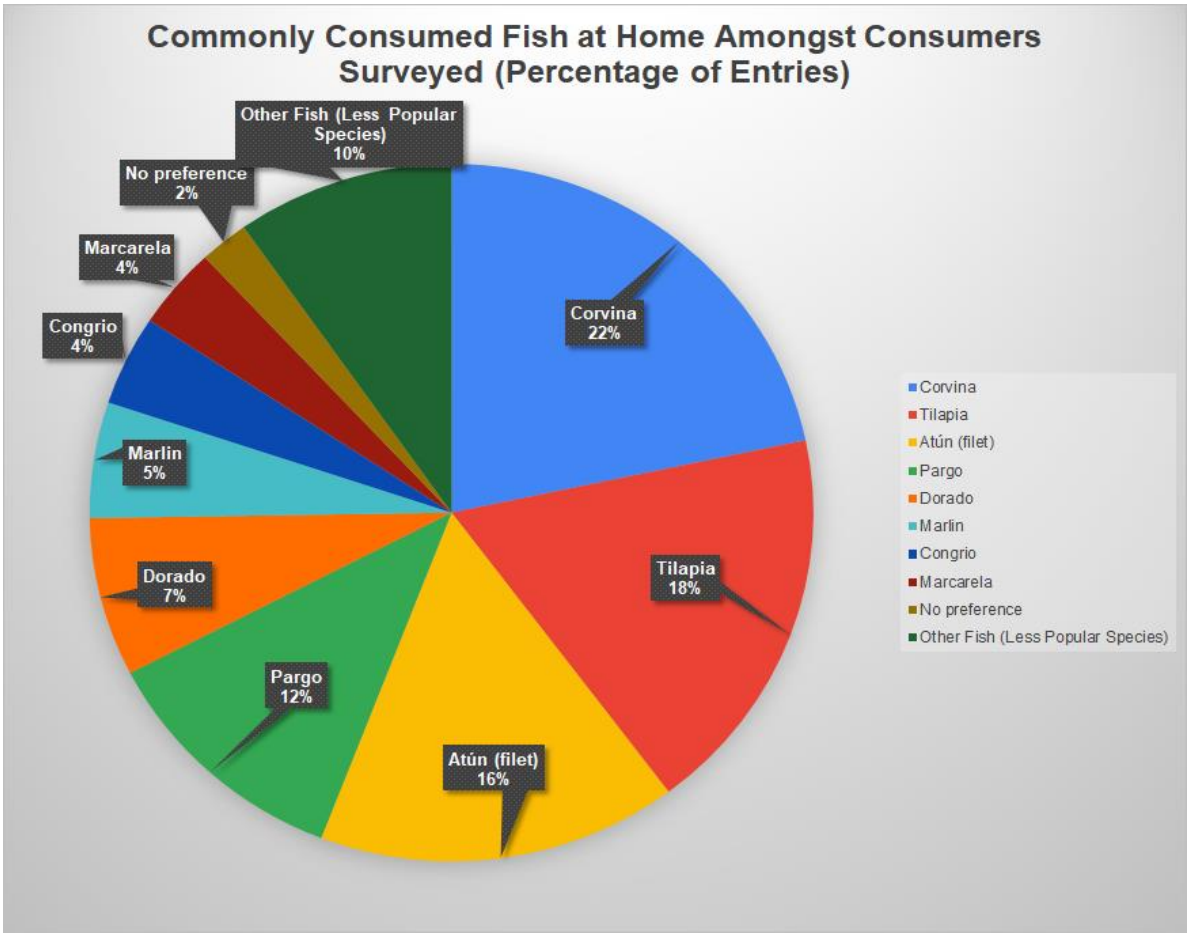

Figure 4: Chart indicating commonly consumed fish at home among consumers

Furthermore, the same data indicates that certain fish species such as Tilapia, Atun, and Pargo are also preferred by the respondents in regions throughout Costa Rica with favorability ranging from 12%-18% in respect to every available species. Analyzing the information received overall, it's clear to see that less popular species, along with Marcarela, Marlin, and Congrio are rarely consumed at home and make up less than 25% of chosen species.

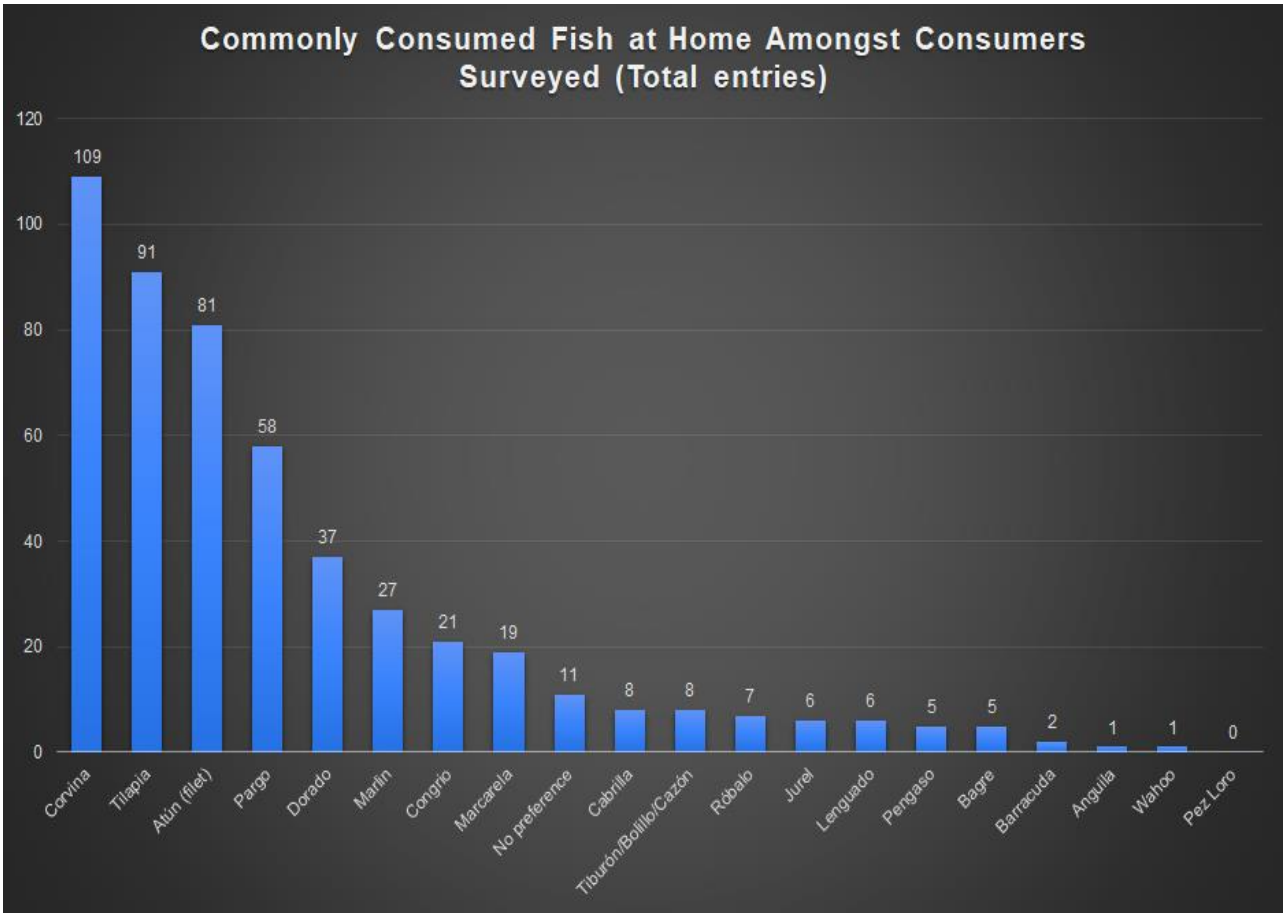

Figure 5: Bar graph indicating commonly consumed fish at home among consumers

The results from fish preferences from consumers at restaurants are very similar to those from consumers at home. When taking a first look at the data returned from the surveys you can see that Corvina is also the most popular fish to order at restaurants.

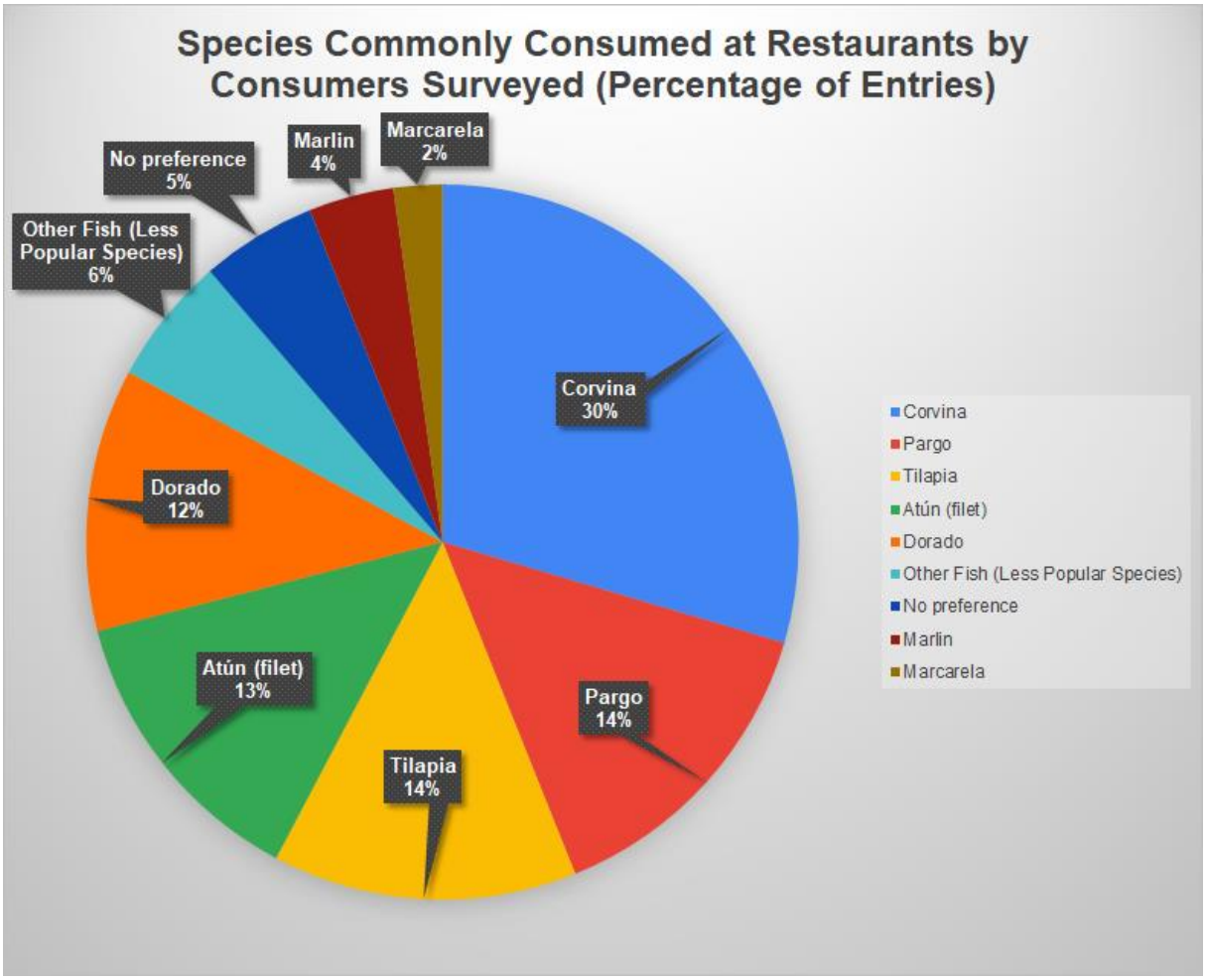

Figure 6: Pie chart indicating commonly consumed fish while at restaurants by consumers

Approximately 30% of consumers said that they would choose to purchase Corvina in comparison to other species. In addition to Corvina, species such as Dorado, Atun, Tilapia, and Pargo share a similar attraction at restaurants to those consuming at home with values ranging from 12%-14%. However, when comparing favored fish species to eat at home versus at restaurants, you can see significant differences. It's clear that most consumers are more likely to

purchase Atun, Pargo, Dorado, and Tilapia to consume at home rather than at a restaurant.

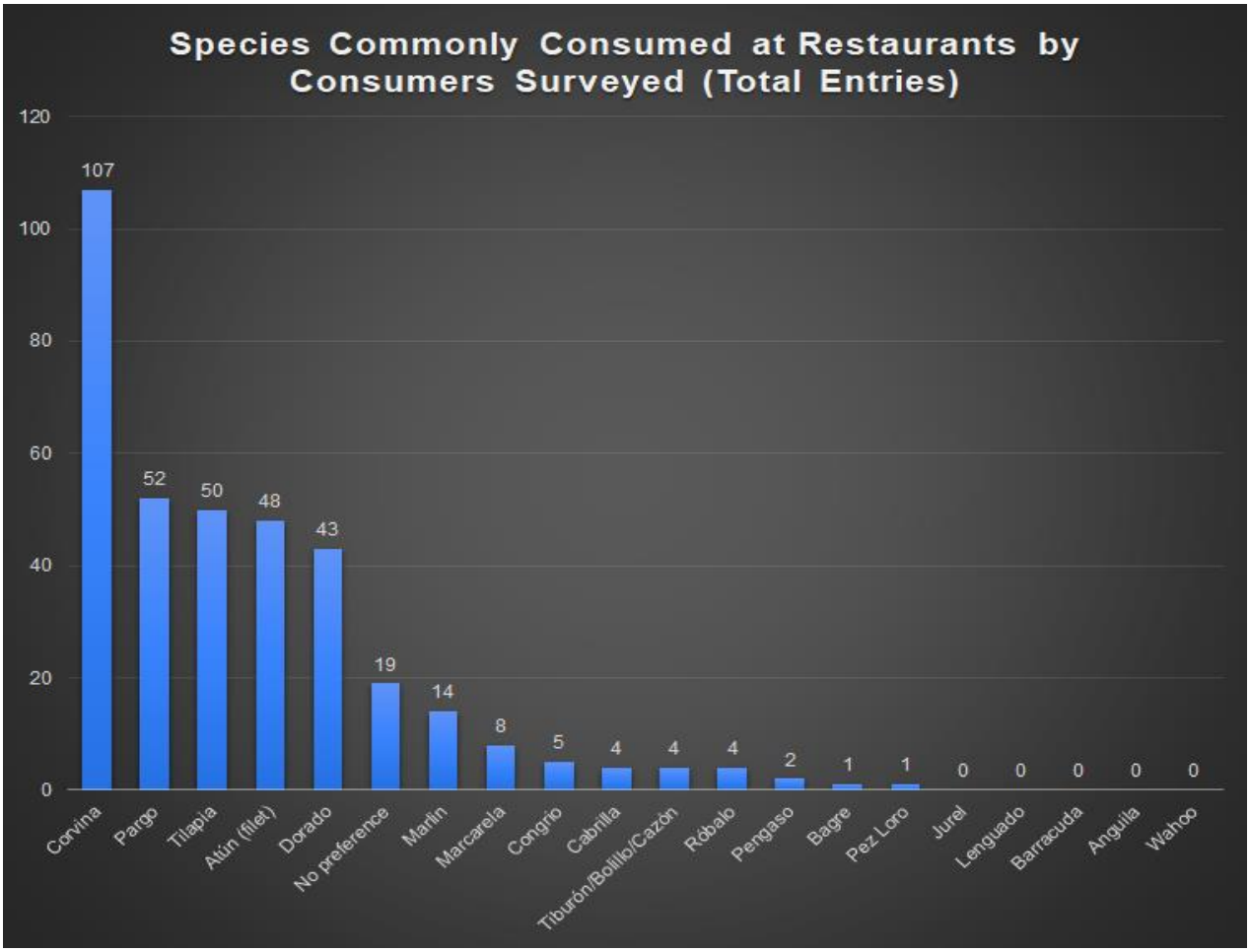

Figure 7: Bar graph indicating commonly consumed fish while at restaurants by consumers

Furthermore, Pargo is more likely to be consumed at a restaurant than at home. After speaking with native Costa Ricans who have experience in buying fish, this is because Pargo is a special dish in Costa Rica in which it is served as a whole piece rather than filleted. Additionally, after analyzing the results, respondents reported eating almost none of the less popular fish species at restaurants.

Going more in-depth on consumer preferences, we have collected data to interpret the thought process and motivations that underlie consumers' purchasing of various species of fish.

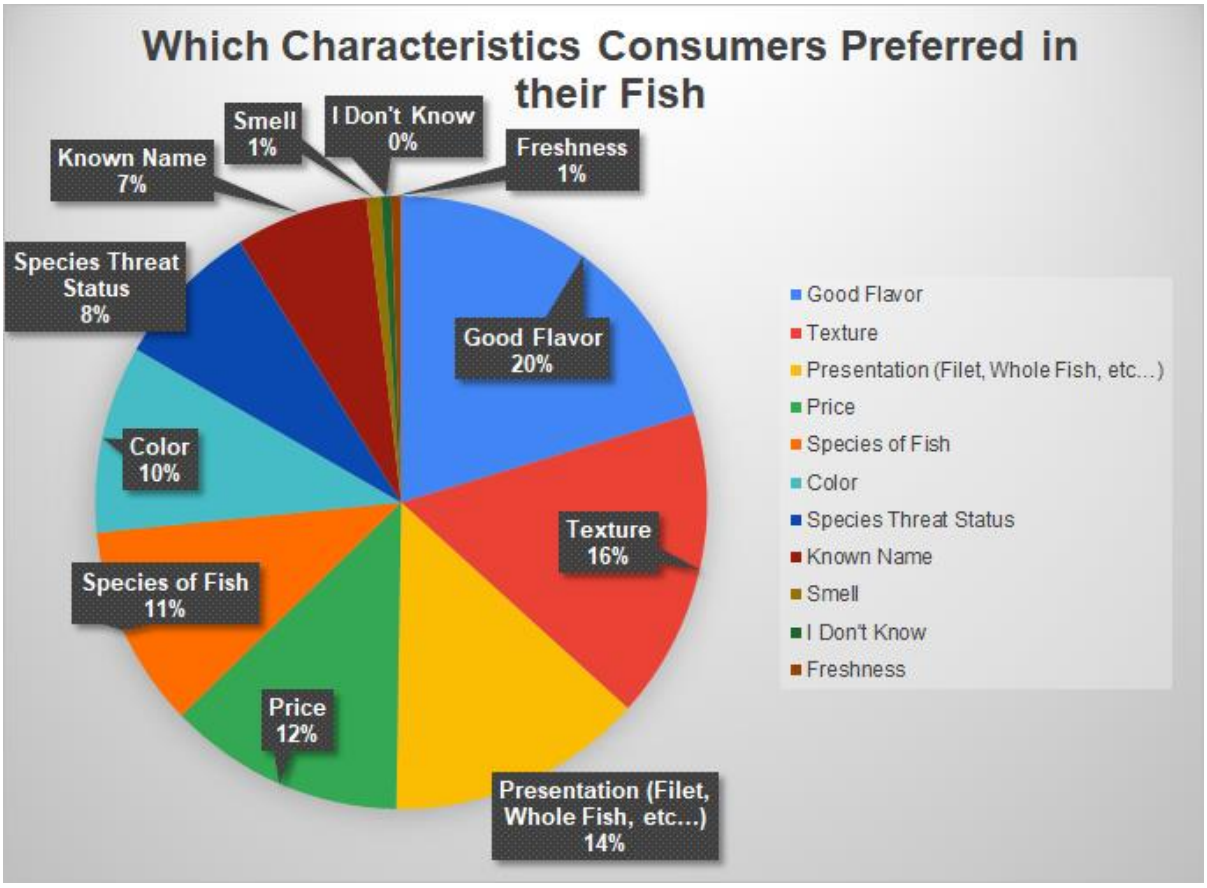

Figure 8: Commonly favored characteristics found in fish when being purchased by consumers.

When analyzing what entails the community to select a certain species, we can notice a few things. It's no surprise that the majority of consumers base their choice mainly on flavor. However, people also take into consideration the texture, physical presentation, and color as their top priorities. As seen in Figure 8, only 11% of people said they buy their fish based on the species and only 8% seem to make any consideration to the species threat status. Looking at the consistency of fish consumption over a week, 64% of responses said they only eat fish once a week and 20% twice a week.

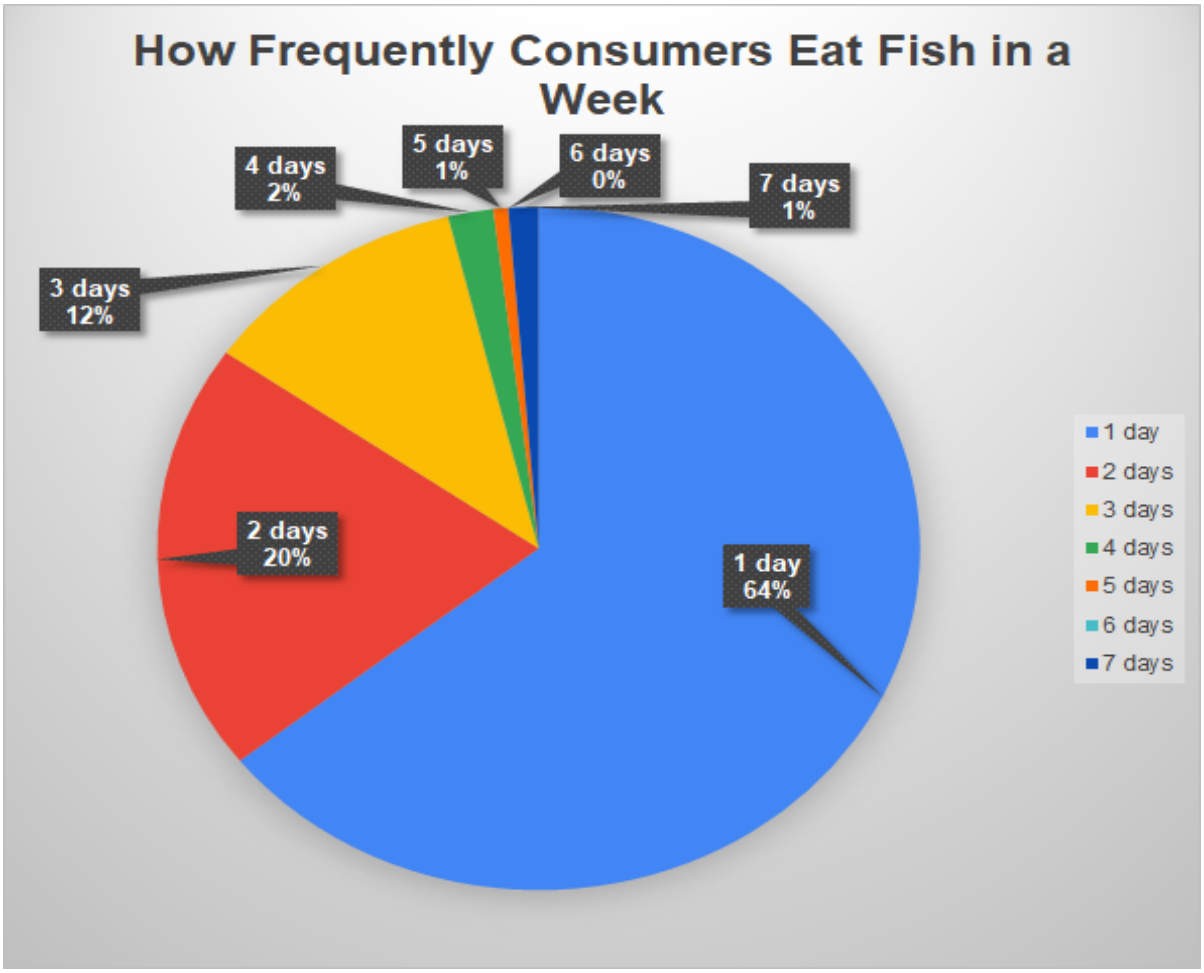

Figure 9: How frequently consumers eat fish weekly

4.3 Public opinion of sustainability

One of the main focuses of this project is to gauge consumers' willingness to implement more sustainable fish practices into their eating habits. Our ultimate goal is to encourage consumers to eat less popular fish species in hopes of taking commercial pressure off the more exploited species. The survey that was sent to consumers provided valuable data regarding their fish consumption habits as well as their willingness to be more sustainable. We were able to obtain a general idea of the fish species that are most and least commonly eaten among consumers in Costa Rica. From this information, our group was able to determine which species

are under the most commercial pressure and in turn, the less popular fish species that our group would like to target and recommend to consumers to eat. One question that we asked within our survey was, "Would you be willing to consume new species of fish to reduce the fishing pressure of those overexploited species?" 140 out 150 responses replied yes.

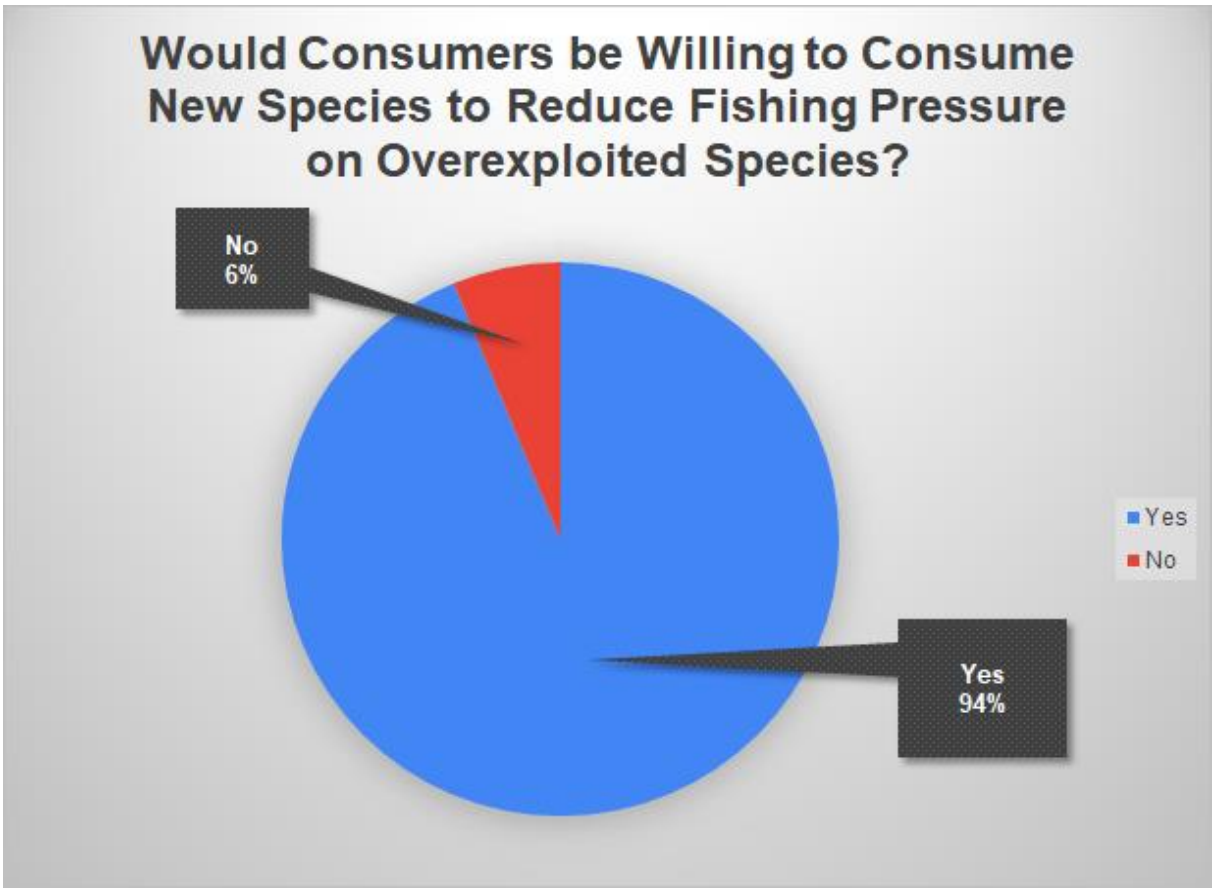

Figure 10: Consumers willingness to reduce fishing pressure on overexploited species are shown as a percentage

This signifies to our group that the majority of the population that we surveyed is willing to change their eating habits and eat less popular fish to take the pressure off the more commonly consumed fish. We also asked consumers what they believe to be the most and least sustainable method of fish capture. Wire and hook fishing was the method consumers believed to be the most sustainable while trawling was the method consumers believed to be the least sustainable.

These responses demonstrate that our surveyed population is knowledgeable of which methods of fishing are the most sustainable.

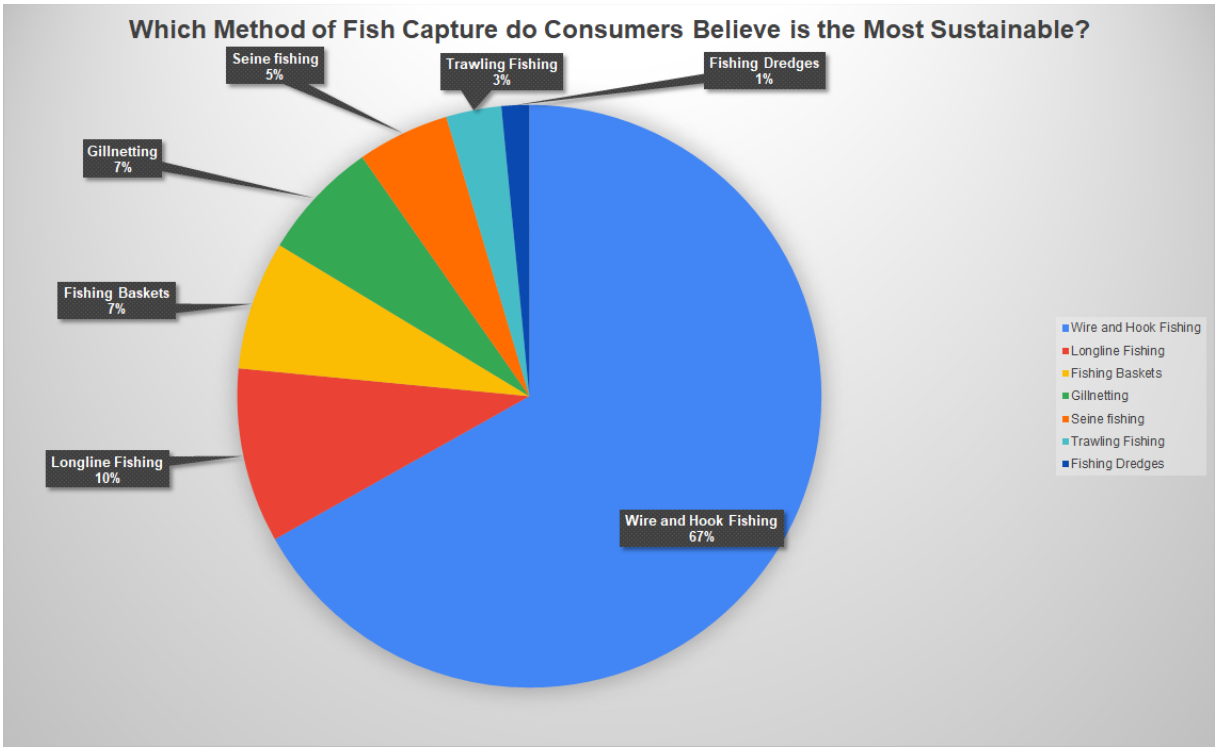

Figure 11: The methods of fishing consumers believe is most sustainable

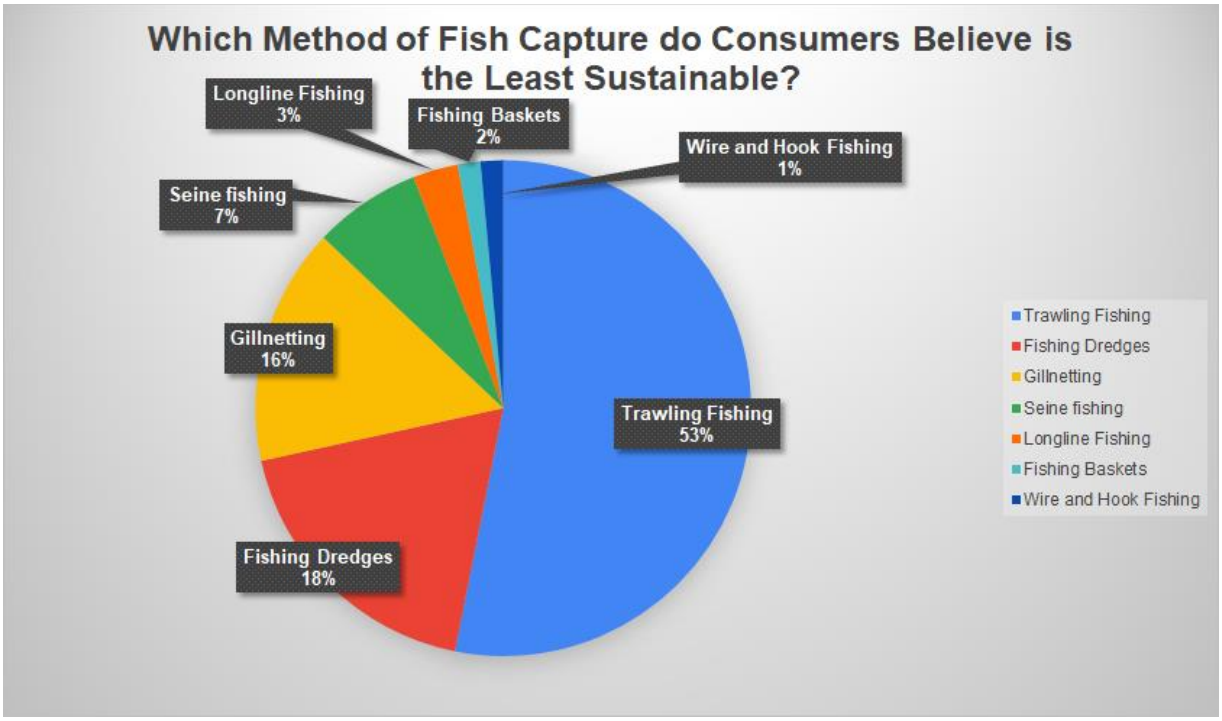

Figure 12: The methods of fishing consumers believe is least sustainable

4.4 What consumers want from their fishing market

One question that we asked was "What kind of information would you like to know when buying the fish?" The top response that consumers wanted to know was the fishing method that was used to capture the fish. This demonstrates to our group that the respondents want to be aware of how their fish was caught and we can assume that consumers prefer their fish to be caught with sustainable practices being used.

When we asked consumers about the amount that they would be willing to overpay for more responsibly caught fish, consumers were more willing to overpay than to not overpay. Many consumers in Costa Rica are fine with paying five to ten percent more for fish that are caught using responsible fishing tactics and labeled to represent those practices as seen in the chart below.

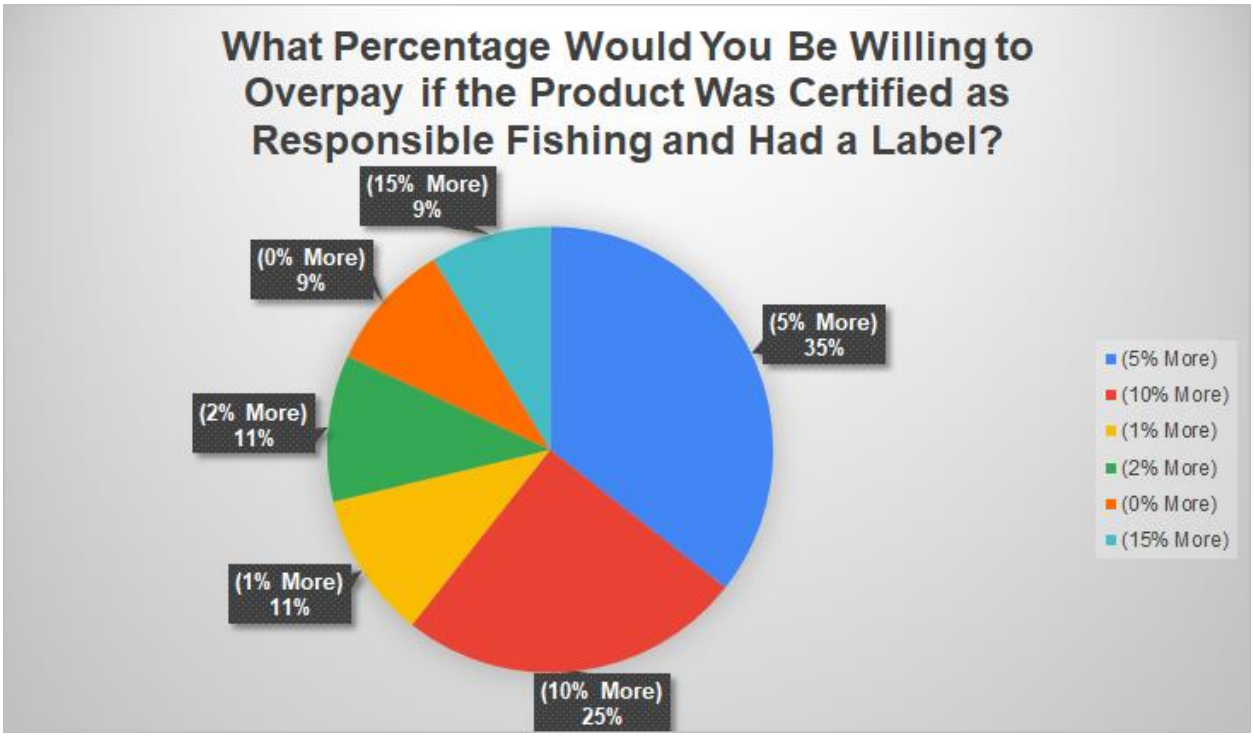

Figure 13: Percentage consumers would overpay if a product was certified as responsibly caught

From figure 13, we can push forth more sustainable fishing practices in the Costa Rican fishing industry with minimal increases in cost for consumers. This willingness to pay more also shows that there is a strong market for consumers that make purchases based on the sustainability of both the local ecosystem and economy.

When we surveyed consumers, we also asked them which species they would be willing to eat in place of species that had higher commercial pressures placed upon them. From our results, we gathered that consumers in Costa Rica had an overall high willingness to change their fish purchases if it is known that those changes would reduce commercial pressures on other fish species. Out of all the options for specific types of fish, most options had around the same percentage of interest when it came to consumption. Most species had very little disparity between one another when it came to overall interest in replacing their commonly consumed fish with the newly offered species. The plurality of submissions in this question stated that they would be willing to consume any fish in a replacement showing that a decent amount of consumers have no direct preference to another species if their choices were limited. This question was very important for us to gather information for because, for example, if it turned out that a majority of consumers decided to replace their commonly consumed fish with Dorado, then we would have to take into account how promoting its consumption in place of one of the most commonly consumed fish, Corvina, could indirectly lead to higher commercial pressures on Dorado and in turn, reduce the sustainability of that fish resource.

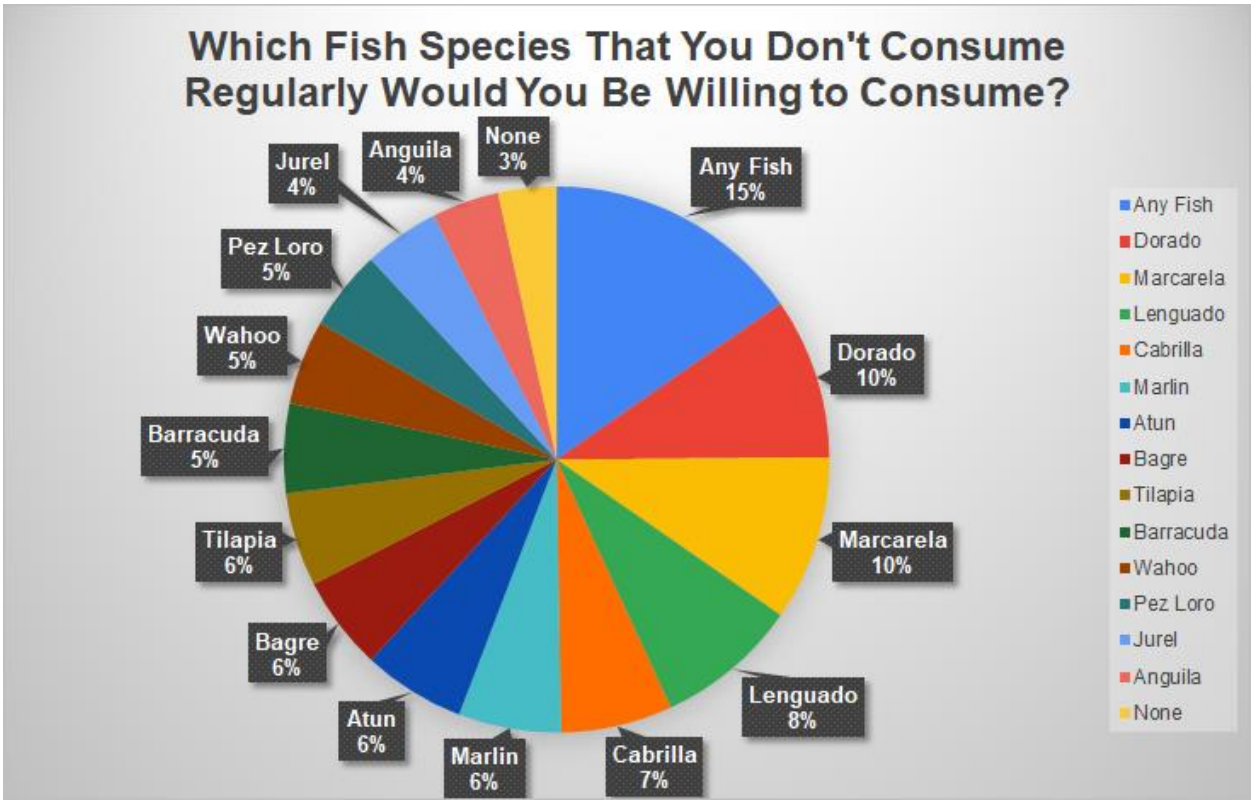

Figure 14: Willingness of consumers to eat certain fish species separate from their usual diet

Another question we had for consumers revolved around the information they can gather while purchasing fish for personal consumption. From our survey, we found that consumers generally know very little about the fish they're purchasing with a plurality of consumers knowing nothing about the fish that they purchase from supermarkets, fisheries, and other fish providers. The other pieces of information that consumers mainly knew when purchasing fish were the location they were captured, the date of capture, and the method of capture. One benefit of knowing this information is that we can promote fish sellers to inform consumers more about the fish they eat.

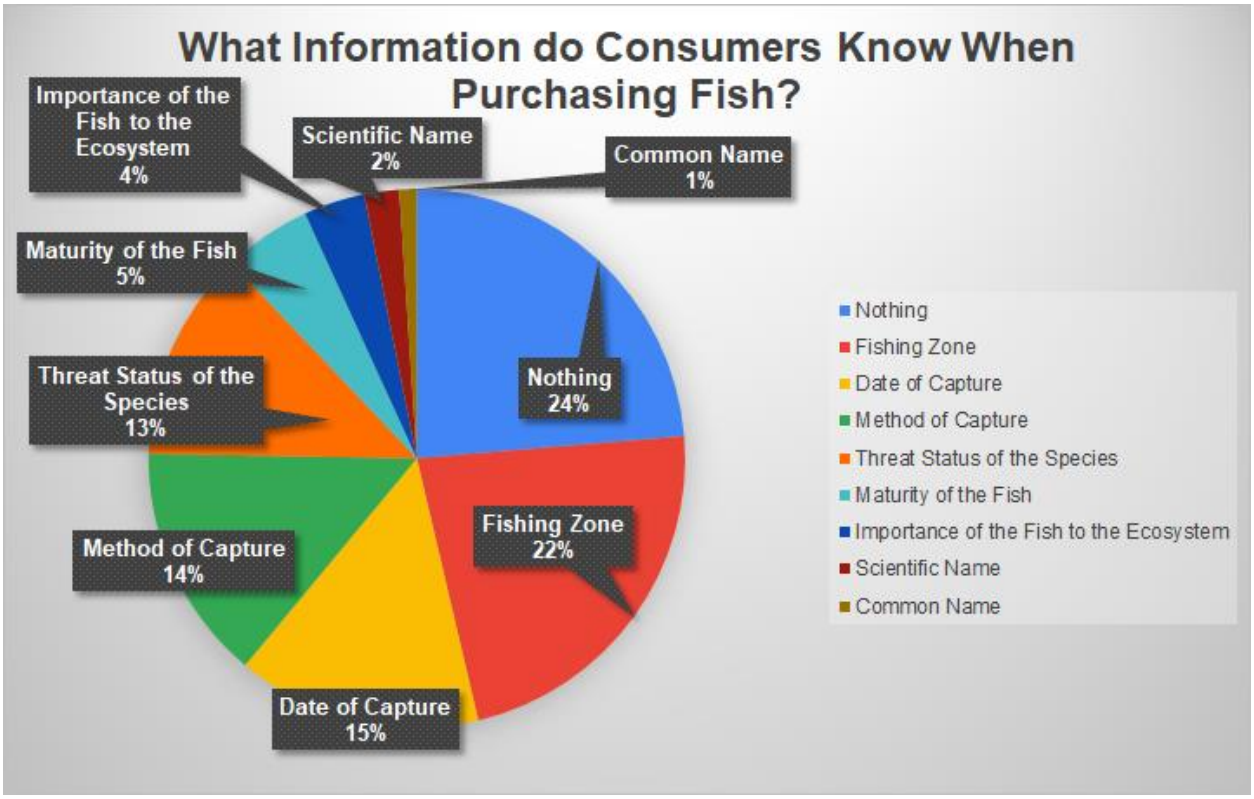

Figure 15: The information consumers are aware of when purchasing fish

Expanding on this point, we decided to survey consumers on which information they would want to know about the fish they're purchasing. From our survey answers shown in figure 15 we found that the three main pieces of information that consumers knew, versus the information they wanted when purchasing fish varied. For example, when we compare the top three pieces of information in order from each question, we see that consumers generally know the fishing zone, date of capture, and method of capture for the fish they're purchasing, but when we compare it to that of the question for what information consumers want, we see that the top three pieces of information include the method of capture, date of capture, and the threat status of the species.

From this we can see that consumers don't receive enough information about the threat status of species as much as they would like to. This difference calls great attention to the fact that

consumers statistically care more about the longevity of the ecosystem than that of personal want.

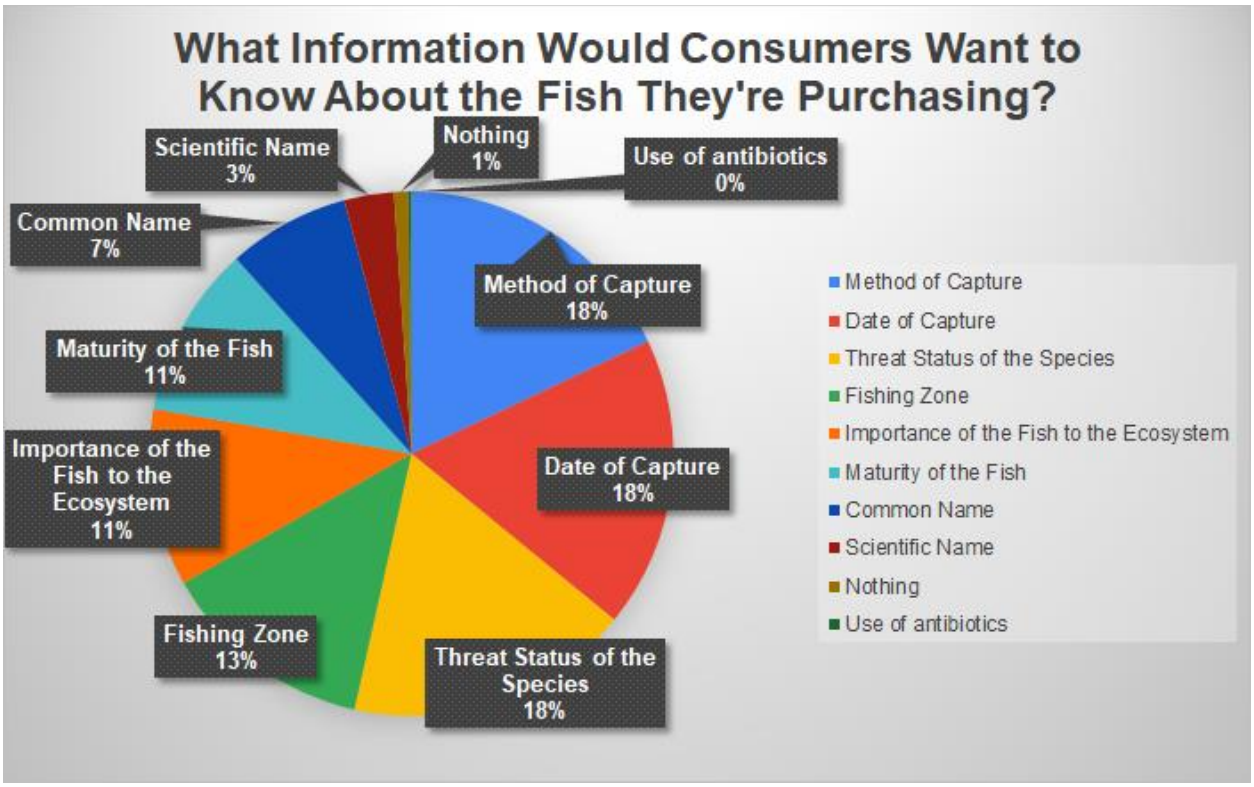

Figure 16: What consumers want to know about the fish they are purchasing

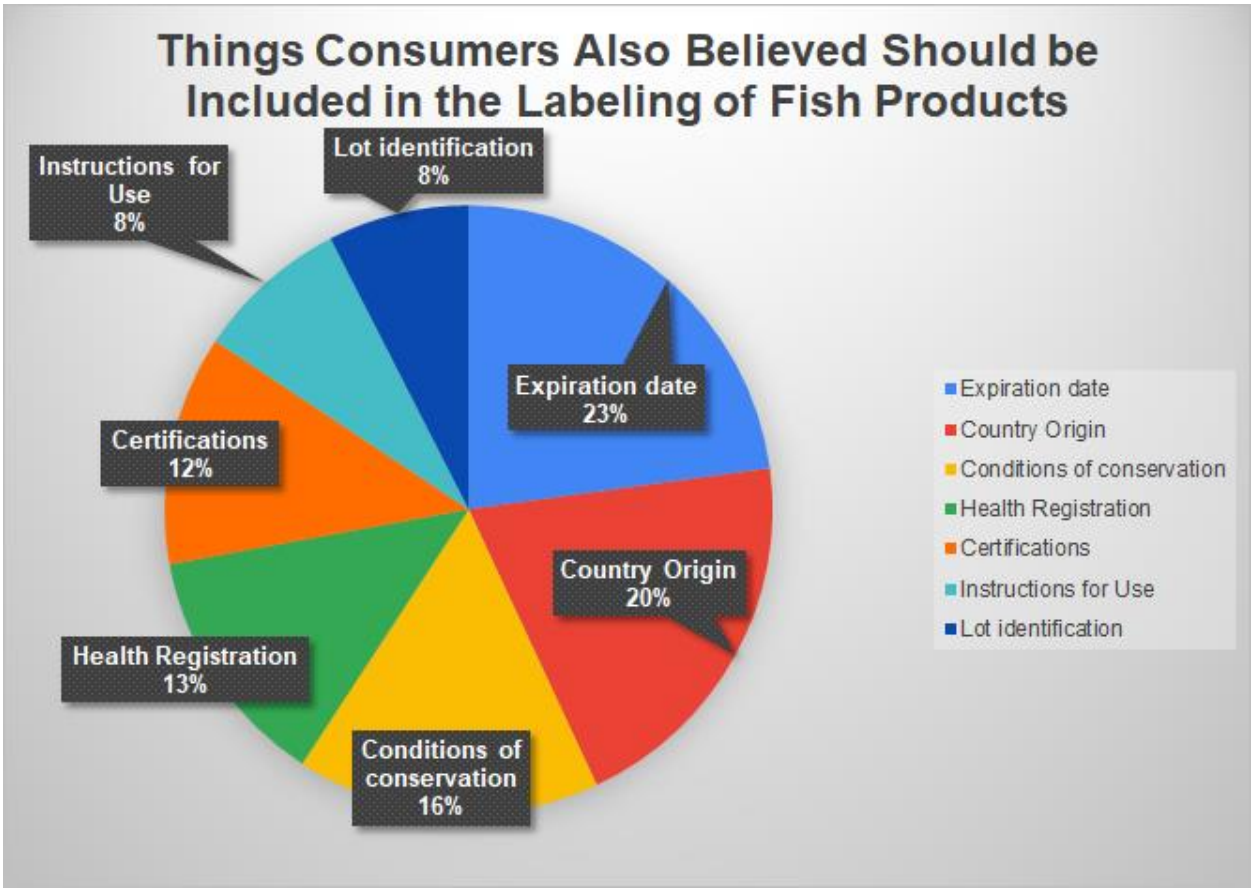

Figure 17: Things that should be included in labeling of fish products as reported by Costa Rican consumers

Referencing figure 17, there is significant weight to most of the answers provided. If the option were presented to them, consumers would want to know as much as possible about what they're consuming. This would allow for transparency regarding whether a fish is endangered, ethically sourced, farmed, fresh, etc. It's become evident that the consumers of Costa Rica care a great deal about their marine ecosystem; however, the options and/or labeling usually provided don't allow for them to act on their morality, for example, as one does when choosing free range or small farm eggs over others. By adding more detailed labeling, consumers can choose ethics as reason to decide whether or not these species are worth consuming. The answers with the most weight are ones highlighting two important labels: expiration date and origin. These are

essential and are expected; however, all of the answers provided to this question have a significant number of responses. The current labeling requirements for fish products in Costa Rica include: product name, net content and weight, report of any artificial flavoring of coloring, registration number, import information, expiration date, origin, and instructions. Most of these are mentioned in the survey, but one can notice that there is no information regarding conservation or method of capture. From the data collected in Figure 17, one can see that consumers believe these should be included as well. Adding more criteria that highlight methods of capture and species information can make knowledge on this issue more common, and allow consumers to act on their values when purchasing these species. These amongst others are suggestions we will have for the future of this market, as we want the consumers to be able to act on their values.

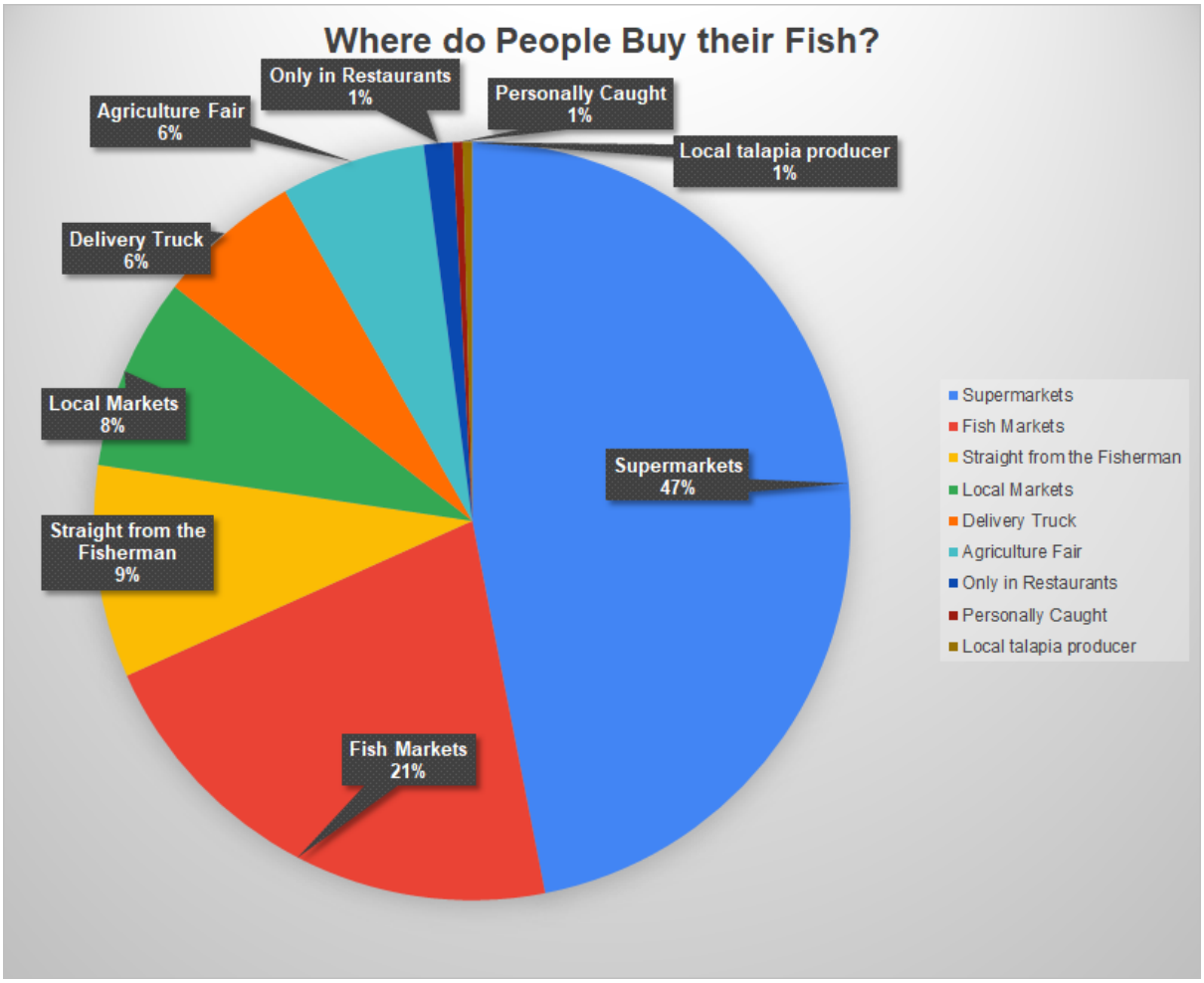

Figure 18: Pie chart indicating the types of establishments in which they usually purchase fish for consumption

Above in figure 18 we decided to survey consumers pertaining to the locations in which they buy fish. This question was important to gather in order to learn about the diversity of where consumers make their purchases of fish. From these results we can see that around half of consumers purchase their food from supermarkets. This huge discrepancy between purchasing from other locations shows that there is a lack of diversity among where consumers purchase their fish. This focus on supermarkets also indirectly moves money away from smaller fish providers such as local fishers, and local food fairs. Promoting diverse purchasing of fish from various providers would greatly improve the local economy in which those purchases are made.

Chapter 5: Conclusion and Recommendations

5.1 Recommendations for Fishing Industry in Costa Rica

After compiling all of our data and findings it is evident that certain fish species are more heavily consumed than others (Corvina, Tilapia, Pargo). As a result these species are under immense commercial pressure to be caught. First and foremost our team recommends to the fishing industry in Costa Rica to focus on catching less popular fish and advertising to the community that by consuming the less popular fish they are helping the industry become more sustainable and strengthening the aquatic ecosystem. Although none of these species (Corvina, Tilapia, Pargo) are endangered, it is imperative that they are not overfished. Due to the fact that most people regularly consume these species it would create a serious problem for consumers in Costa Rica if these species were to become endangered. In addition, our group strongly encourages commercial fishing companies to use the fishing method of hook and wire instead of trawling. It is evident that trawling is extremely detrimental to the aquatic ecosystem as it harms any species caught by the net and disturbs the ocean floor. In terms of places where consumers buy fish such as supermarkets and fisheries, our group urges these places to use a system of labeling. These labels would provide information as to how the fish were caught and certify that the fish are caught using sustainable practices. This labeling system would appeal to the majority of consumers in our surveys that prefer to know how their fish were caught and would make fishing industries in Costa Rica more aware of how they are catching their fish.

5.2 Recommendations for MarViva

In order to improve data collection for MarViva and encourage more sustainable fishing practices in Costa Rica we have compiled a list of two recommendations for MarViva. One of

these changes focuses greatly on data collection while the other recommendation focuses entirely on providing information to the public on sustainability within the fishing industry.

1. *Create a collective database of fishing records from large fisheries and supermarkets located in Costa Rica*

   Based upon our research we found that there was a lack of easily accessible information when it came to the sales records of the local fishing market within Costa Rica. Our recommendation to MarViva is that they create a database through their website that provides past sales records of the local fishing industry. This database would include total catches of every fish species as well as sales records for each of those species. With this information, MarViva could easily track the catching rates of the local fishing industry and compare them to those of years past, making recommendations to either the fishery or local government when catching rates exceed that of the sustainable catching rates for each distinct species. This database would also be made easily accessible to the public so that they could make more informed decisions about which fish they should be eating in order to increase sustainability within the economy.

2. *Promote the consumption of lesser eaten species through either physical informational documents in common fish marketplaces such as supermarkets, or restaurants, or through digital media on MarViva's social media account(s)*

   One difficulty when attempting to alert the public about environmental sustainability is first getting the information to them. What we recommend is that MarViva utilize their local name recognition through physical or digital media to directly inform consumers before making purchases that may endanger certain fish species or the local ecosystem. Within this media, MarViva could inform consumers of which fish species are at risk due

to high consumption and offer less commercially pressured species of fish that are similar in flavor, texture, or presentation. This information could be updated seasonally based upon catching data collected from seasons prior through MarViva's personal database. Another benefit would be informing consumers about where to purchase their fish. By informing people that forty seven percent of consumers purchased their fish from supermarkets and twenty one percent from fish markets, consumers can make alternative purchases at local markets and fishermen instead in turn, improving the sustainability of both the local economy and ecosystem. On top of this, MarViva could also alert consumers about fish providers that are not falling within catching regulations and deter people from purchasing from those businesses that break the rules for profit. In turn this would lead to less commercial pressure from large fishing industries on specific species of fish.

5.3 Importance of Data Collected

From our initial research and creating a methodology to compiling data and creating our market study, we have learned that there is much to be improved regarding Costa Rica's fishing industry. Policy changes that affect not only trawling but also imported fish caught by trawlers will make tackling this a more serious effort; although trawling was banned by the government, the law has since been overturned as of October 2020 making this a more pertinent issue. Alongside this, an improved labeling system will prove appealing to consumers seeking more transparency. This may include added criteria for the standard at which fish product labeling is held by. Continuing, a wider and more tightly knit database will make this possible. A system that allows information to be traced from fisheries and supermarkets will also promote a

systemic change in the way fish are distributed and consumed in Costa Rica. These recommendations will provide aid to the consumers, the industry, and the surrounding environment.

As mentioned before, based on the data collected we can infer that consumers do care about the information regarding the fish they consume; however, it is not apparent nor easily provided for them. Our data highlights this disparity between the market, distributors, and consumers. As labeling becomes more transparent, we can hope that consumers can act on their values when making decisions, as the people of Costa Rica have proven to be very aware of their marine, coastal, and land ecosystem, and the impacts their decisions have. Policy changes, bans, and explicit labeling are approaches in which we can hold vendors and other distributors accountable for the impact they are having, give room for sustainable industry growth, and encourage ecologically sustainable practices.

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Appendix A: English and Spanish Version of Consumer Survey Questions

Appendix A-1: Survey Questions in English

MarViva Consumer Survey

We are conducting research on fish consumption habits for our Interactive Qualification Project at the Worcester Polytechnic Institute in Worcester, USA, in order to create a more sustainable fish market in Costa Rica. We are interested in your experiences as a local fish consumer in Costa Rica. Your participation will involve filling out an online survey. This investigation has no known risks.

Please note that we will do our best to protect your privacy. For the purposes of this survey, your name and personal information will not be collected. Our team will refer to you as a consumer. You, as a participant, have the freedom to skip any questions you do not wish to answer and you have the possibility to ask us, the surveyors, any questions you wish. The information collected by the survey will be stored in a safe place.

1. 1. Sex?

   Mark only one oval.

   - ◯ Female
   - ◯ Male

2. 2. In which province do you live?

   Mark only one oval.

   - ◯ San Jose
   - ◯ Heredia
   - ◯ Cartago
   - ◯ Alajuela
   - ◯ Puntarenas
   - ◯ Guanacaste
   - ◯ Limon

3. 3. What is your age?

Mark only one oval.

- 15-20
- 21-25
- 26-30
- 31-35
- 36-40
- 41-50
- 51-60
- older than 60

4. 4. What species do you regularly consume at home?

Check all that apply.

- [ ] Tuna (filet)
- [ ] Cabrilla
- [ ] Marcarela
- [ ] Marlin
- [ ] Róbalo
- [ ] Anguila
- [ ] Bagre
- [ ] Barracuda
- [ ] Jurel
- [ ] Lenguado
- [ ] Wahoo
- [ ] Pargo
- [ ] Pez Loro
- [ ] Tilapia
- [ ] Congrio
- [ ] Pangaso
- [ ] Tiburon/Bolillo/Cazón
- [ ] Corvina
- [ ] Dorado
- [ ] He has no preference/doesn't know him

5. 5. What Species consume Regularly In Restaurants?

Check all that apply.

- [ ] Tuna (filet)
- [ ] Cabrilla
- [ ] Marcarela
- [ ] Marlin
- [ ] Róbalo
- [ ] Anguila
- [ ] Bagre
- [ ] Barracuda
- [ ] Jurel
- [ ] Lenguado
- [ ] Wahoo
- [ ] Pargo
- [ ] Pez Loro
- [ ] Tilapia
- [ ] Congrio
- [ ] Pangaso
- [ ] Tiburon/Bolillo/Cazón
- [ ] Corvina
- [ ] Dorado
- [ ] Has no preference / does not know it

6. 6. Which characteristics are important to you when you choose a fish for consumption? Choose the top two

Check all that apply.

- [ ] Soft Taste
- [ ] Texture
- [ ] Color
- [ ] Species
- [ ] Price
- [ ] Species Threat Status Known Name
- [ ] Presentation (filet, whole, chop)

Other: [ ] _____

7. 7. How many days a week do you consume fish (on average)?

Mark only one oval.

- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7

8. 8. Which of the following options do you usually buy fish that you eat at Home?

Check all that apply.

- [ ] Straight from the fisherman
- [ ] Truck delivering home (intermediary) Farmer's Fair
- [ ] Local Markets
- [ ] Supermarket Fisheries
- [ ] Other: _____

9. 9. What kind of information do you know when buying the fish?

Check all that apply.

- [ ] Fishing area
- [ ] Method of fishing or catching
- [ ] State of threat of species
- [ ] Scientific name
- [ ] Date of capture
- [ ] Importance of this species in the marine ecosystem
- [ ] Size of sexual maturity

Other: [ ] _____

10. 10. What kind of information would you like to know when buying the fish?

Check all that apply.

- [ ] Fishing area
- [ ] Method of fishing or catching
- [ ] State of threat of species
- [ ] Scientific name
- [ ] Date of capture
- [ ] Importance of this species in the marine ecosystem
- [ ] Size of sexual maturity
- [ ] Common name

Other: [ ] _____

11. 11. In addition to the above information, what should be included in the labelling of the fishery product?

Check all that apply.

- [ ] Country of origin
- [ ] Expiration date
- [ ] Instructions for use
- [ ] Conservation conditions
- [ ] Registration or health notification
- [ ] Certifications

12. 12. Which of the following fishing methods are most sustainable?

Check all that apply.

- [ ] Hook
- [ ] Longline
- [ ] Baskets
- [ ] Gillnetting
- [ ] Seine
- [ ] Trawling
- [ ] Dredges

13. 13. Which of the following fishing methods are most destructive?

Check all that apply.

- [ ] Hook
- [ ] Longline
- [ ] Baskets
- [ ] Gillnetting
- [ ] Seine
- [ ] Trawling
- [ ] Dredges

14. 14. Would you be willing to consume new species of fish to reduce the fishing pressure of those overexploited species?

Mark only one oval.

- ( ) Yes
- ( ) No

15. 15. Which of the following types of fish, which you do not regularly consume, would you be willing to eat?

Check all that apply.

- [ ] Tuna (filet)
- [ ] Cabrilla
- [ ] Marcarela
- [ ] Marlin
- [ ] Eel
- [ ] Bagre
- [ ] Barracuda
- [ ] Mackerel
- [ ] Finger
- [ ] Wahoo
- [ ] Golden
- [ ] Fish
- [ ] Parrot
- [ ] Tilapia
- [ ] Any None
- [ ]
- [ ]

16. 16. What percentage would be willing to overpay if the product were certified as responsible fishing and had a label:

Mark only one oval.

- ◯ 0%
- ◯ 1%
- ◯ 2%
- ◯ 5%
- ◯ 10%
- ◯ 15%

Appendix A-2: Survey Questions in Spanish

MARVIVA

Encuesta al consumidor de MarViva

Estamos realizando una investigación sobre los hábitos de consumo de pescado para nuestro Proyecto de Calificación Interactiva en el Instituto Politécnico de Worcester en Worcester, Estados Unidos, con el fin de crear un mercado pesquero más sostenible en Costa Rica. Estamos interesados en sus experiencias como consumidor local de pescado en Costa Rica. Su participación implicará el llenado de una encuesta en línea. Esta investigación no tiene riesgos conocidos.

Tenga en cuenta que haremos todo lo posible para proteger su privacidad. A los efectos de esta encuesta, no se recopilará su nombre ni su información personal. Nuestro equipo se referirá a usted como consumidor. Usted, como participante, tiene la libertad de omitir cualquier pregunta que no desee responder y tiene la posibilidad de hacernos a nosotros, los topógrafos, cualquier pregunta que desee. La información recopilada por la encuesta se almacenará en un lugar seguro.

1. ¿Sexo?

- ◯ Masculino
- ◯ Femenino

2. ¿En cuál provincia vive?

- ◯ San Jose
- ◯ Heredia
- ◯ Cartago
- ◯ Alajuela
- ◯ Puntarenas
- ◯ Guanacaste
- ◯ Limon

3. ¿Cuál es su edad?

- ◯ 15-20
- ◯ 21-25
- ◯ 26-30
- ◯ 31-35
- ◯ 36-40
- ◯ 41-50
- ◯ 51-60
- ◯ Mas de 60

4. ¿Qué especies consume regularmente en casa?

- [ ] Atún (filet)
- [ ] Cabrilla
- [ ] Marcarela
- [ ] Marlin
- [ ] Róbalo
- [ ] Anguila
- [ ] Bagre
- [ ] Barracuda
- [ ] Jurel
- [ ] Lenguado
- [ ] Wahoo
- [ ] Pargo
- [ ] Pez Loro
- [ ] Tilapia
- [ ] Congrio
- [ ] Pangaso
- [ ] Tiburón/Bolillo/Cazón
- [ ] Corvina
- [ ] Dorado
- [ ] No tiene preferencia/ lo desconoce

5. ¿Qué especies consume regularmente en restaurantes?

- [ ] Atún (filet)
- [ ] Cabrilla
- [ ] Marcarela
- [ ] Marlin
- [ ] Róbalo
- [ ] Anguila
- [ ] Bagre
- [ ] Barracuda
- [ ] Jurel
- [ ] Lenguado
- [ ] Wahoo
- [ ] Pargo
- [ ] Pez Loro
- [ ] Tilapia
- [ ] Congrio
- [ ] Pangaso
- [ ] Tiburón/Bolillo/Cazón
- [ ] Corvina
- [ ] Dorado
- [ ] No tiene preferencia / lo desconoce

6. ¿Cuáles de las siguientes características son las más importantes cuando usted elige un pescado para consumo? Elija las dos principales

- [ ] Sabor suave
- [ ] Textura
- [ ] Color
- [ ] Precio
- [ ] Especie
- [ ] Estado de Amenaza de la Especie
- [ ] Nombre conocido
- [ ] Presentación (filete, entero, chuleta)
- [ ] Other: _____

7. ¿Cuántos días a la semana consume pescado (en promedio)?

- ○ 1
- ○ 2
- ○ 3
- ○ 4
- ○ 5
- ○ 6
- ○ 7

8. ¿En cuál de las siguientes opciones suele comprar el pescado que consume en casa?

- [ ] Directo al pescador
- [ ] Camión que entrega a domicilio (intermediario)
- [ ] Feria del Agricultor
- [ ] Mercados locales
- [ ] Supermercado
- [ ] Pescaderias
- [ ] Other: _____

9. ¿Qué tipo de información usted conoce al momento de comprar el pescado?

- [ ] Zona de pesca
- [ ] Método de pesca o de captura
- [ ] Estado de amenaza de la especie
- [ ] Nombre cientifico
- [ ] Fecha de captura
- [ ] Importancia de esta especie en el ecosistema marino
- [ ] Talla de madurez sexual
- [ ] Other: _____

10. ¿Qué tipo de información le gustaría conocer al momento de comprar el pescado?

- [ ] Zona de pesca
- [ ] Método de pesca o de captura
- [ ] Estado de amenaza de la especie
- [ ] Nombre cientifico
- [ ] Fecha de captura
- [ ] Importancia de esta especie en el ecosistema marino
- [ ] Talla de madurez sexual
- [ ] Nombre común
- [ ] Other: _____

11. Además de la información anterior, ¿Qué debería incluirse en el etiquetado del producto pesquero?

- [ ] País de origen
- [ ] Identificación del lote
- [ ] Fecha de vencimiento
- [ ] Instrucciones de uso
- [ ] Condiciones de conservación
- [ ] Registro o notificación sanitaria
- [ ] Certificaciones

12. ¿Cuál de los siguientes métodos de pesca son más sostenible?

- [ ] cuerda
- [ ] palangre
- [ ] arrastre
- [ ] cerco
- [ ] trasmallo
- [ ] nasa
- [ ] rastras

13. ¿Cuál de los siguientes métodos de pesca son más destructivo?

- [ ] cuerda
- [ ] palangre
- [ ] arrastre
- [ ] cerco
- [ ] trasmallo
- [ ] nasa
- [ ] rastras

14. ¿Estaría dispuesto a consumir nuevas especies de pescado con el fin de reducir la presión pesquera de aquellas especies sobreexplotadas?

- ◯ Si
- ◯ No

15. ¿Cuáles de los siguientes tipos de pescado, que no consume regularmente, estaría dispuesto a consumir?

- ☐ Atún (filet)
- ☐ Cabrilla
- ☐ Marcarela
- ☐ Marlin
- ☐ Anguila
- ☐ Bagre
- ☐ Barracuda
- ☐ Jurel
- ☐ Lenguado
- ☐ Wahoo
- ☐ Dorado
- ☐ Pez Loro
- ☐ Tilapia
- ☐ Cualquiera
- ☐ Ninguno

16. Qué porcentaje estaría dispuesto a pagar de más si el producto estuviera certificado como pesca responsable y tuviera una etiqueta:

- ○ 0%
- ○ 1%
- ○ 2%
- ○ 5%
- ○ 10%
- ○ 15%