Is sustainability on the menu?

An assessment of the environmental sustainability of fish offered in restaurants in Guadalajara, Mexico.

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Abstract

The world's fisheries have been in decline for more than forty years. In Mexico, about 80% of the fishery resources are at maximum capacity levels or overexploited. Given the magnitude of the problem, there is a need for solutions that involve all actors in the fish supply chain. However, solutions and research on how actors in the middle of the supply chain such as restaurants can be integrated to combat the problem are limited. Restaurants play a key role in the conservation of fish stocks as these can influence both fish production and consumption patterns. The purpose of this thesis is to assess whether restaurants in Mexico are including environmentally sustainable fish in their menus as well as to study the opportunities and challenges of adopting this type of fish in their menus. By using a mixed methods approach, quantitative and qualitative data were collected. First, a menu assessment of the environmental sustainability of fish offered in 40 restaurants of Guadalajara, Mexico was performed. Then, eleven semi-structured interviews with restaurants and experts on the drivers and barriers that influence restaurants to include sustainable fish on their menus were conducted. The quantitative data were analysed based on four tools: seafood guides, eco-labels, permanent fish bans, and underutilized fish species. The qualitative data was analysed based on internal and external drivers and barriers devised from the literature. Correspondingly, it was found that environmentally sustainable fish options in restaurants in Guadalajara are scarce. It was also found that the balance between sustainability and the quality, taste, and freshness of the fish as well as consumer demand are key drivers in the adoption of sustainable fish in the menus. The research also found particular barriers to the Mexican context that prevent the inclusion of sustainable fish in the menus. This thesis is of interest for restaurants as well as for consumers, public institutions and researchers looking for areas of opportunity to involve the restaurant sector in the recovery of fishing resources.

Keywords: Restaurants, fish, environment, menu assessment, Mexico.

Executive Summary

Problem definition and research questions

The persistence of overexploited fish stocks worldwide has been a critical issue since the 1970s. After more than forty years, the situation continues to be critical, as currently, 60% of fish stocks worldwide have reached their maximum sustainability threshold (FAO, 2018a). The situation is also not encouraging for Mexico, one of the largest fish producers in the world (FAO, 2018a), with 80% of fishery resources at their maximum capacity levels or overexploited (Espinoza-Tenorio, Espejel, & Wolff, 2015). Given the magnitude and persistence of the problem, initiatives to counter overfishing and promote sustainable practices, that involve different actors in the fish supply chain are required.

Restaurants can play an important role in the restoration of fish stocks and habitats as they can influence both food production and consumption patterns. Indeed, it is estimated that 70% of the seafood is consumed in restaurants (Koldewey, Atkinson, & Debney, 2009). This is particularly relevant as FAO (2018a) considers the increase in demand for fish and seafood to be one of the main causes of fish stock depletion worldwide. However, solutions involving restaurants as well as academic research on how these actors can join efforts to recover fish stocks by offering environmentally sustainable fish in their menus are scarce, particularly in the Latin American context.

In order to contribute to filling this research gap as well as to assist in the creation of solutions that involve this stakeholder in the restoration of fish stocks, the **purpose** of this research was to assess whether restaurants in Mexico are including environmentally sustainable fish in their menus. The thesis also sought to study the opportunities and challenges for restaurants to adopt sustainable seafood on their menus. In order to achieve this purpose, two research questions were raised:

1. To what extent have restaurants in Guadalajara, Mexico included environmentally sustainable fish on their menus?
2. What are the underlying drivers and barriers of restaurants that influence the adoption of environmentally sustainable fish in their menus?

Method and research design

In order to answer the research questions, an explanatory sequential mixed method research design was adopted (Creswell, 2014). In other words, the first part of the research had a quantitative approach, while the second part had a qualitative approach. For the first research question, a menu assessment of the environmental sustainability of the fish offered in 40 menus of restaurants in Guadalajara, Mexico, was conducted. In order to answer the second research question, eleven semi-structured interviews were conducted with restaurants and fisheries experts in Mexico.

Based on a literature review and analysis, conceptual frameworks were developed to analyze the quantitative and qualitative information. The conceptual framework for the menu assessment consisted of four tools a) the categorization of "Best Choice," "Good Alternative," and "Avoid" fish species of four different seafood guides; b) the presence of certified fish in the menu; c) the presence of underutilized species in the menu; and d) the compliance with permanent fish bans established in national regulations. Based on these criteria, a scoring method was later designed to assess the overall environmental sustainability of the fished offered in restaurants.

Likewise, the conceptual framework on drivers and barriers was developed based on existing literature and considered internal and external factors that influence food businesses in the inclusion of sustainable products.

Findings

The results of the menu assessment showed that only 19% of the species offered in the menus were considered "Best Choice" options and 31% as "Good Alternative" species according to the seafood guides that were taken as reference. In contrast, 50% of the fish species offered in menus were considered "Avoid" options. The most commonly offered species are octopuses, the various species of shrimp and clams.

No eco-labels or underutilized species were identified in the menus. On the contrary, two permanent banned species (Queen Conch and Manta Ray) were identified in 17.5% of the sample menus. As a result, the overall scoring of restaurants menus was low. The restaurant with the highest score only received 3.5 points out of 16 possible points. Moreover, eight restaurants received the lowest possible score (-4).

The drivers and barriers identified in the qualitative part of the study helped to explain the menu assessment results. For instance, the fact that permanently banned species were offered on the menus might be related to the barrier "lack of government support." According to the interviewees and the literature, the lack of surveillance and illegal fishing are some of the main issues of the fishing sector in Mexico. In addition, restaurant's lack of expertise or knowledge about sustainable fishing and the fish bans is another of the barriers by which certain banned species might have appeared on the menus.

Moreover, based on the interviews it was found that the high cost of certified products is a limiting factor in the inclusion of certified seafood on the menus. In addition, the interviewees pointed out that although certain restaurants may have some certified species, they prefer not to indicate this on the menu as not having all the species in the menu certified can confuse the consumer.

During the interviews, it was mentioned that the fact that consumers get irritated for not finding the fish they always expect to see on the menu, is one of the barriers to the inclusion of underutilized fish species. By not including these species in the menu restaurants miss the opportunity to be creative in the kitchen, one of the internal drivers for the adoption of sustainable fish indicated in the literature.

Other barriers identified during the interviews are lack of consumer demand, high costs of sustainable fish and lack of product supply. On the latter, this thesis added nuances to it that are particular to the Mexican context as it was found that suppliers' lack of infrastructure; export of sustainable products; the informality of small-scale fisherman (an important source of sustainable fish in Mexico); and that unsustainable fishing practices are adopted due to the poor remuneration of fishery products; hinder further the possibility of restaurants in Guadalajara to obtain sustainable fish.

Conclusions and recommendations

Regarding the first research question, it was concluded that the offer of environmentally sustainable fish in the menus of restaurants in Guadalajara is limited. The menu assessment indicated that there are many opportunities for improvement to involve the restaurant sector in the conservation of fish stocks such as the inclusion of underutilized fish species. However, the menu assessment also reflected more severe problems behind Mexico's fish supply chain such as illegal fishing and lack of compliance and surveillance to fish bans.

On the second research question, it was found that there are multiples drivers and barriers in the inclusion of sustainable fish in the menu. Concretely, an important driver to consider is the balance between taste, quality, freshness, and the environmental sustainability of the fish. In other words, if an environmentally sustainable fish is also of high quality, fresh and flavorful the probability of restaurants including it in their menus will increase. Another important driver is the consumer demand for environmentally sustainable fish. Conversely, from the demand side barriers in the inclusion of this type of fish are related to consumer misinformation about the environmental impact of the fish they consume, as well as their low willingness to pay. However, the results of this study also indicate that it is not only necessary to have a substantial demand for sustainable fish, but it is also necessary to have a reliable supply of this type of fish. In this regard, this thesis found particularities in the Mexican context that prevent sustainable fish from appearing on the menu.

Recommendations for restaurants
Restaurants can benefit from the results of this research as these allow restaurants to understand the environmental sustainability of the fish they offer as well as to discover areas of opportunity for increasing the supply of this type of fish on their menus. Based on the results of this research it is encouraged that restaurants remove permanently banned species from the menu; reduce the number of "Avoid" species such as octopus and increase the number of "Best Choice" options such as clams; include underutilized species in the menu as well as eco-labeled products. Collaboration between restaurants to demand sustainability from suppliers is also encouraged. Finally, restaurants can inform the consumer about overfishing and the initiatives the restaurant is taking to solve this issue (e.g., having some certified products). The menu is an excellent tool to convey this information just like the restaurant staff.

Recommendations for public sector
The fact that there are permanently banned species in the menus reflects the urgent need of public institutions to reinforce the surveillance of compliance to fish bans, as well as the importance of designing awareness campaigns to inform restaurants about the fish bans. It is important for public institutions to be involved in the design and implementation of strategies that enhance the value of capture fisheries so that fishermen do not opt for unsustainable practices.

Recommendations for the consumer
It is encouraged that consumers get information about the environmental impact of the fish behind its plate and to demand restaurants to include environmentally sustainable fish species.

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Abbreviations

ASC- Aquaculture Stewardship Council

CONABIO - National Commission for Knowledge and Use of Biodiversity

CONAPESCA - National Commission of Fishery and Aquaculture

EDF- Environmental Defense Fund

FAO- The Food and Agriculture Organization of the United Nations

FIP- Fishery Improvement Projects

FOS- Friend of the Sea

GHG- Greenhouse Gas

INAPESCA - National Fisheries Institute

INEGI- National Statistics and Geography Institute

LGPAS - National Law on Sustainable Fisheries and Aquaculture

MBA – Monterey Bay Aquarium (Seafood Watch Program)

MCS – Marine Conservation Society (UK)

MSC- Marine Stewardship Council

SAGARPA - Secretary of Agriculture, Livestock, Rural Development, Fisheries and Food

SEMARNAT- Secretary for Environmental and Natural Resources

1 INTRODUCTION

The persistence of overexploited fish stocks worldwide over the years is alarming. According to FAO (2018), overexploited fish stocks increased from 10% in 1974 to 33.1% in 2015. Furthermore, about 60% of fish stocks have reached their maximum sustainability threshold. With only 7% being under-exploited species (FAO, 2018a). The growing demand for seafood, unsustainable fishing practices, the destruction of marine ecosystems as well as illegal, unreported and unregulated fisheries are some of the causes for the high overexploitation rates (Dolmage, Macfarlane, & Alley, 2016; Jacquet et al., 2010).

The restoration of fish stocks can lead not only to higher economic returns but also to more significant social and ecological benefits (FAO, 2018a). Indeed, many initiatives have emerged to counter overfishing and promote sustainable practices such as seafood certification schemes, seafood guides, and consumer awareness campaigns (Dolmage et al., 2016; Jacquet et al., 2010). However, many of the solutions have focused on the production (e.g. sustainable management initiatives) or consumption side (e.g. seafood guides or awareness campaigns) with fewer initiatives focusing on stakeholders in the middle of the seafood supply chain such as wholesalers, retailers and restaurants (Dolmage et al., 2016; Jacquet et al., 2010).

Restaurants can play an important role in the conservation of fish stocks and habitats. This because restaurants can influence food production and consumption patterns through their purchasing power and by deciding and informing their customers about their food management practices (Chefs Collaborative, n.d.; Gössling, Garrod, Aall, Hille, & Peeters, 2011; Inwood, Sharp, Moore, & Stinner, 2009; Klein & Ferrari, 2015; Koldewey, Atkinson, & Debney, 2009).

The adoption of sustainable food management practices by restaurants means that they demand from their supplier's ingredients with specific characteristics (e.g., seasonal, locally produced products) which can lead suppliers to adapt to these demands (Gössling et al., 2011; Koldewey et al., 2009). The Culinary Institute of America & Harvard TH Chan School of Public Health (2018) have recognized that chefs can have a positive impact on the environment by understanding how to source fish from responsibly managed fisheries and farms. In addition, restaurants influence what a large number of people eat and can, therefore, influence their customers to eat more sustainably, not only by transforming sustainable ingredients into tasty food (Chefs Collaborative, n.d.) but by using tools, such as menus and waiting staff, to convey information about the sustainability of their ingredients (Filimonau, Lemmer, Marshall, & Bejjani, 2017; Koldewey et al., 2009). Indeed, research such as that of Filimonau et al. (2017) and Bacon & Krpan, (2018) has demonstrated that displaying information on food origin, environmental aspects, and nutritional value on restaurant menus, influence consumer choices to be more sustainable when eating out.

Moreover, by promoting sustainable food production and consumption systems, restaurants can contribute to mitigating GHG emissions (Gössling et al., 2011) and favor marine conservation (Koldewey et al., 2009). This considering first, that the food purchased by restaurants is estimated to be one of their primary sources of environmental impact (Jacobs & Klosse, 2016) and second that 70% of the seafood is consumed in restaurants (Koldewey et al., 2009).

1.1 Problem definition

In line with fisheries worldwide, Mexican fisheries have declined dramatically in the past years. Indeed about 80% of the country's fishery resources are at maximum capacity levels or overexploited (Espinoza-Tenorio et al., 2015). With an extensive coastline, larger than 11000 Km (Sarukhán et al., 2009), Mexico is one of the 20 largest producers of fish in the world with

an average annual production of 1.4 million tons of fish (FAO, 2018a). Therefore, the fishing sector is an important source of employment with more than 2 million Mexicans directly depending on this activity (Environmental Defense Fund- Mexico, 2015).

More than 60% of national fish production is distributed throughout Mexico and mostly consumed in restaurants given the embedded culture of eating out in the country (Espinosa-Romero, Rodriguez, Weaver, Villanueva-Aznar, & Torre, 2014 p. 291). In fact, there are 423, 074 restaurants (INEGI, 2014b) in Mexico, that is 3.5 restaurants per every thousand inhabitants (INEGI, 2014b). In comparison, Sweden and the US have 2.5 and 2 respectively (Statista, 2018a., 2018b, 2018c, 2018d).

Just as the solutions for overfishing have been mainly addressed to the first tier of the seafood supply chain as well as in the consumer side; a vast body of literature have focused on sustainable fisheries management and governance (Espinoza-Tenorio, Espejel, Wolff, & Zepeda-Domínguez, 2011; Olson, Clay, & Pinto da Silva, 2014) as well on fisheries certification schemes and ecolabels (Bush et al., 2013; Gutierrez et al., 2016; Parkes et al., 2010; Ponte, 2012). Conversely, there is little research on other stakeholders in the seafood supply chain, such as restaurants. In this regard, Lawley et al., (2017 p.285) state that "there are several gaps in the current research into sustainable seafood, with most studies focusing on the consumer and very limited research from the perspective of other stakeholder groups." In addition, Post & Mikkola (2012) have stated that more support and tools are required to make inroads towards increased sustainability in restaurants.

Although research focused on restaurants and sustainability is still scarce, existing restaurant-specific research have focused on the influence of restaurants in consumer sustainable food choices (Bacon & Krpan, 2018; Filimonau et al., 2017) others in the adoption of green initiatives in restaurants (Byrom, Lawley, & Clements, 2017; Chiu & Hsieh, 2016; Kasim & Ismail, 2012; Wang, Chen, Lee, & Tsai, 2013) and to a lesser extent other studies have focused on the inclusion of specific type of ingredients in restaurant menus such as locally produced products (Curtis & Cowee, 2009; Inwood et al., 2009). However, none of these studies has focused on the challenges of adopting sustainable seafood in restaurant menus, especially not in the Latin American context.

In order to contribute to research focused on restaurants, particularly from the perspective of the Mexican context, this research first seeks to understand whether restaurants in Mexico have included environmentally sustainable fish species in their menu. This serves as a starting point for understanding how involved this actor is in the promotion of sustainable fish species in Mexico, as to the best of the author's knowledge this is unknown. In addition, this thesis also seeks to assist in the creation of solutions that involve this stakeholder in the marine conservation of species by understanding some of the factors that drive or hinder the inclusion of environmentally sustainable fish in their menus.

In the light of the above, the **purpose** of this research is to assess whether restaurants in Mexico are including environmentally sustainable fish in their menus. The thesis also seeks to study the opportunities and challenges for restaurants to adopt sustainable seafood on their menus.

1.2 Research Questions

In light of the aforementioned and in order to achieve the purpose of this thesis, the following questions will guide the research.

1. To what extent have restaurants in Guadalajara, Mexico included environmentally sustainable fish on their menus?

2. What are the underlying drivers and barriers of restaurants that influence the adoption of environmentally sustainable fish in their menus?

1.3 Limitations and scope

The geographical scope of the thesis is Guadalajara, Mexico. One of the reasons for this is that research related to restaurants and sustainability in Mexico has been conducted mainly in the centre of the country and tourist areas such as the Riviera Maya. In this sense, no specific study has been identified on fish sustainability in restaurants of Guadalajara. Additionally, the geographical scope was selected due to the author's local knowledge of the city and her ability to obtain voluntary support from locals to gather information. It was therefore considered that these factors would help to conduct the research better.

Due to the chosen corresponding research questions, the thesis' scope is solely focused on fish and seafood. In other words, the menu assessment and the drivers and barriers only considered the sustainability of fish and seafood offered in restaurants and hence did not consider the sustainability of other ingredients such as vegetables or beverages. For this reason, the sample mainly consists of seafood restaurants. Additionally, while sustainability refers to social, economic and environmental aspects, for the purposes of this thesis, the focus is only on environmental aspects.

Importantly, the present research arises from the overexploitation of fishery resources in Mexico, and although it is recognized that some of the fish and seafood offered in Guadalajara's restaurants are farmed, this type of fish has a secondary place in the research being the primary focus the wild fisheries.

For the first part of the research, the menu was used as a unit of analysis. It is therefore recognized that the information in these is limited and may not adequately reflect the efforts and actions that restaurants take to make their menus sustainable. In addition, because the menus do not indicate the scientific names of the fish species, assumptions and/or generalizations had to be made about the types of species used in restaurants. For this reason, it is not entirely certain that the fish listed on the menu is the species that is assumed or said to be. As shown in Table 3-2 in section 3.1.2 the assumptions and/or generalizations were made based on information from government agencies such as the National Commission for Knowledge and Use of Biodiversity (CONABIO) and the National Commission of Fishery and Aquaculture (CONAPESCA), as well as from FAO.

Finally, the qualitative part of this research would have benefited from a larger sample of restaurants. Therefore, this limits the research ability to generalize the qualitative findings. However, the restaurants' perspective was complemented by also interviewing experts in gastronomy, sustainable fishing, fish traceability and a fish supplier regarding the drivers and barriers that influence restaurants for including sustainable fish in their menus.

1.4 Ethical considerations

The interviewees participated voluntarily in the research and were treated with respect during the interviews. At the beginning of each interview, the interviewees were asked for their authorization to record the audio of the interview. The audio file was only used for the purposes of this research.

In addition, in order to ensure the confidentiality of the interviews, the names of the interviewees and the organisations or restaurants of which they are part were kept anonymous.

Likewise, during the menu assessment process, in order not to harm the reputation of sample restaurants the information was carefully managed so that the results did not reveal which restaurant obtained which score on the environmental sustainability of the fish they offer.

1.5 Audience

Restaurants and consumers in Guadalajara, as well as Mexican public authorities, can benefit from this research. First, restaurants can benefit from the results of this research as these allow restaurants to understand the environmental sustainability of the fish they offer as well as to discover areas of opportunity for increasing the supply of this type of fish on their menus. Second, consumers can use this research to learn more about the environmental situation of the fish and seafood containing the tacos, ceviches[1] , and aguachiles[2] they consume when eating out. Third, through this thesis, Mexican public authorities can better understand the challenges that exist in the Mexican fishing sector and how these affect restaurants.

Finally, as the conceptual framework used to assess the environmental sustainability of the fish offered in restaurant menus has not been used before, academia might find it relevant for future research. The academic sector can also benefit from this research as this thesis contributes to filling the knowledge gap in finding solutions on how restaurants can contribute to restoring fish stocks.

1.6 Disposition (Outline)

In the first chapter of this thesis, the research problem is described, and the research questions are presented. This first chapter also presents the limitations and scope of the research, as well as the audience and ethical considerations.

Chapter 2 presents the literature review and analysis which focuses on developing the conceptual framework to answer both research questions. This chapter also explains what is meant by environmentally sustainable fish, a key concept of this research.

Chapter 3 introduces the research design and the research method that was followed for the sample selection, data collection, and analysis for both the quantitative and qualitative approach.

Chapter 4 presents the findings from the menu assessment and the conducted interviews based on the conceptual frameworks.

Chapter 5 analyses and discusses the findings. In this section, reflections on the research approach are presented as well as on the relevance and contributions of this thesis. Based on the reflections this section also mentions opportunities for future research.

Finally, Chapter 6 presents the conclusions of this research and provides recommendations for the audience and additional recommendations for future research.

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[1] Appetizer containing fish or seafood slices and is marinated with some citrus

[2] Typical Mexican dish that has shrimp, fresh chili, lemon, cucumber and onion.

2   Literature Review and Analysis

The first part of the literature review presents an overview of the status, challenges and national regulations of the Mexican fishing sector. It also presents an overview of the role of restaurants and menus in the fish supply chain. Further on, a definition of what is meant by an environmentally sustainable fish is provided, as this is a key concept for this research. Since it is considered necessary to understand some ways in which a sustainable fish can be measured, this chapter presents a review of the literature on academic research that has been conducted to evaluate the sustainability of restaurant menus. Likewise, the instruments available that can serve as a reference for assessing the environmental sustainability of fish such as seafood guides and certification schemes (ecolabels) are also presented in this chapter. Further on, the conceptual framework to assess the environmental sustainability of menus is presented.

Subsequently, a review of the literature on drivers and barriers to the adoption of sustainable fish in restaurant menus is introduced. At the end of this chapter, the conceptual framework for analysing the drivers and barriers that restaurants in Guadalajara face when including sustainable fish is presented.

Both conceptual frameworks sought to incorporate and structure relevant factors from the literature review and analysis.

2.1   Overview of Mexican fisheries

The purpose of this subsection is to provide an overview of the fisheries sector in Mexico and its main challenges. As well as the legal, political and administrative instruments that exist in the country to promote the sustainable development of fisheries and aquaculture.

2.1.1   The Mexican coastline and the city of Guadalajara

Mexico is one of the largest coastal countries in the world, with more than 11,000 kilometres of coastline (Sarukhán et al., 2009). The country is surrounded by the Pacific Ocean, the Atlantic Ocean, and the Caribbean Sea (See Figure 2-1). In addition, the country has its own sea, the Sea of Cortez also known as the Gulf of California. Mexico's geographic location can explain its great diversity of marine species and ecosystems. For example, Mexico has the largest number of marine mammal species in the world, with 47 different species (Sarukhán et al., 2009). In addition, 2 184 different species of marine fish have been discovered; a figure surpassed only by the Asia-Pacific region (Indonesia, Philippines, Australia and Papua New Guinea) (Sarukhán et al., 2009). Furthermore, the percentage of marine endemic species is about 32% of the country's total marine species (Sarukhán et al., 2009).

Despite the country's extensive coastal zone, Guadalajara is not located on the coast (See Figure 2-1). The city is located in the west part of the country and is the second largest city in Mexico with around 4.5 million inhabitants (INEGI, 2014a). Guadalajara is surrounded by lakes and dams and is located within four hours' drive of the Pacific Ocean, which facilitates the provision of fresh fish every day (Pedroza-Gutiérrez & Hernández, 2017). In addition, the state in which Guadalajara is located, Jalisco is geographically close to two of the largest seafood producing states in the country, Nayarit and Sinaloa (CONAPESCA, 2014). In other words, its strategic position and connectivity facilitate the distribution of fish to the city.

Figure 2-1. Geographical location of Guadalajara. Oceans and seas that surround Mexico.
Source: Adapted from Open Street Map Contributors (n.d.)

2.1.2 Main challenges of the Mexican fisheries

As mentioned above, Mexico is one of the largest producers of fish worldwide (FAO, 2018) and the fisheries sector is a relevant source of employment in the country (Environmental Defense Fund- Mexico, 2015). However, as fisheries worldwide, Mexican fisheries have also declined dramatically in the past years (Espinoza-Tenorio et al., 2015). Indeed, it is estimated that about 25% of the fish stocks are overexploited, and 57% are currently at their maximum exploitation rate (Espinoza-Tenorio et al., 2011)

In addition, it is estimated that unreported and illegal fishing (out of season, in restricted areas or using restricted gear) represent between 40-60% of reported landings in Mexico (Cisneros-Montemayor, Cisneros-Mata, Harper, & Pauly, 2013; Mangin et al., 2018) and that 80% of the fisheries are also at risk of habitat loss, ecosystem disruptions and marine pollution (Cisneros-Montemayor et al., 2013; Hernandez & Kempton, 2003)

Not only the ecological potential of fisheries is affected, but also their economic and social potential. Economically speaking, it is estimated that "the current added value for fisheries products in Mexico is 80% less than the global average" (Mangin et al., 2018 p.2). Therefore, it is not surprising that Mangin et al., (2018) demonstrated that if the rates of overexploitation and illegal fishing in Mexico are maintained in the future, not only will the fish population in the Mexican fisheries be depleted, but so will the incomes of the fishermen and the families that depend on them.

Moreover, according to Cisneros-Montemayor et al., (2013) and Mangin et al., (2018), some of the causes of overexploitation, illegal fishing and minimal profitability of the Mexican fishing sector relate to the large coastal territory, inconsistent administrative practices, limited enforcement in the fishing sector, strategies emphasizing harvest volume rather than harvest value and unreported fisheries.

2.1.3 Fish policy in Mexico: legal, institutional and policy instruments

Mexico's fisheries policy is based on the National Law on Sustainable Fisheries and Aquaculture (LGPAS for its Spanish acronym) as well as on policy instruments, such as fish-management plans and programmes; administrative instruments, such as fish bans; and information instruments such as the National Fisheries Chart (Ibáñez, Pérez-Ramírez, & García-Calderón, 2014; Ley General de Pesca y Acuacultura Sustentable (LGPAS), 2014)

General Law on Sustainable Fisheries and Aquaculture (LGPAS)

The General Law on Sustainable Fisheries and Aquaculture is the legal instrument that guides the sustainable development of fishing and aquaculture in Mexico. The Law objectives are to promote and regulate the management and sustainable use of fisheries and aquaculture; and to establish foundations for the conservation and protection of fishery and aquaculture resources (Article 2, LGPAS).

As its name implies, the Law adopts sustainability as one of its principles, which integrates economic, social and environmental aspects (Article 17, Paragraph XI, LGPAS). The LGPAS also has as one of its principles the precautionary approach for establishing catch limits and conducting assessments of the impacts of fishing and aquaculture activities (Article 17, Paragraph VIII, LGPAS).

Institutions involved in the Mexican fishing policies

There are two main federal institutions involved in the country's fisheries policy: The Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) and The Ministry of Environmental and Natural Resources (SEMARNAT).

The SAGARPA, through the National Commission of Fishery and Aquaculture (CONAPESCA) and the National Fisheries Institute (INAPESCA), is responsible for the production policies established in the LGPAS (Article 8). The Ministry grants fishing permits, establishes the fishing bans and creates the fisheries ordinances and management plans (Article 8, LGPAS). It is also responsible for the construction of the National Fisheries Chart, which provides species exploitation indicators (Article 8, LGPAS; Espinoza-Tenorio et al., 2015; Ibáñez et al., 2014).

 The SEMARNAT is responsible for environmental issues and promoting sustainable development and conservation of natural resources (Article 9, LGPAS; Espinoza-Tenorio et al., 2015). The SEMARNAT establishes the marine ordinances, marine management plans y delimits the Natural Protected Marine and Coastal Areas (Article 9, LGPAS; Espinoza-Tenorio et al., 2015).

At the federal level, there are also other instances involved in the Mexican fisheries policy. Among these is the National Commission for Knowledge and Use of Biodiversity (CONABIO), responsible for promoting and protecting the country's fisheries biodiversity (Espinoza-Tenorio et al., 2015).

Regional and municipal authorities perform administrative tasks of national fisheries policies, such as the issuance of fishing permits. (Articles 6 and 11, LGPAS).

Fishing bans

As stated in the LGPAS (Article 4, Paragraph XLVII), fishing bans are legislative instruments that prohibit fishing for certain species in a specific period of time or a fishing area. The fishing bans aim to protect the processes of reproduction and therefore the population of marine species (Article 4, Paragraph XLVII, LGPAS). It is the SAGARPA the responsible for verifying the legal origin of fisheries and aquaculture products and supervise the fishing inventories during the no-fishing seasons (Article 8, Paragraph XXIII, LGPAS). Together with SEMARNAT, SAGARPA defines the banned fish species (Article 9, Paragraph V, LGPAS).

In some cases, restrictions are imposed for the entire year (permanent bans), while in others they are only applied at specific times of the year (temporary bans). Currently, there are 17 groups of fish species in a permanent ban and 28 groups of marine and freshwater species in a temporary ban (SAGARPA & CONAPESCA, 2018). Appendix D shows the permanently banned species.

2.2 Overview of restaurants and menus in the fish supply chain

Because this thesis focuses on the restaurant sector, this section presents where this actor is in the fish and seafood supply chain. This section also presents the importance of the menu as a tool to convey relevant information about the ingredients offered in a restaurant and how it can support sustainability.

2.2.1 Restaurants in the seafood supply chain

A rough representation of the actors between the upstream and downstream activities of the seafood supply chain is shown in Figure 2-2.
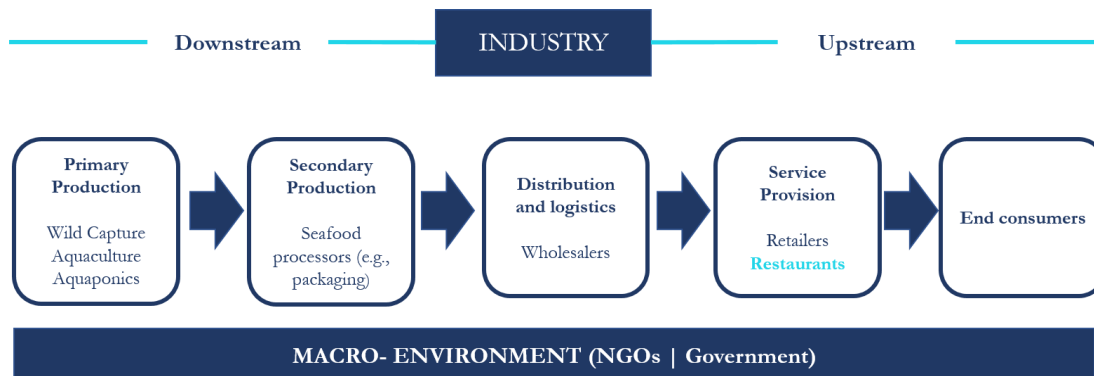
Figure 2-2. Fish and seafood supply chain.

Source: Adapted from Lawley, Birch, & Craig (2017)

As shown in Figure 2-2 restaurants are further away of the primary production stages in the supply chain, and because of this, they highly rely on their suppliers to provide information about the fish and seafood production processes as well as information on the products' environmental sustainability (Lawley et al., 2017). Conversely, restaurants have direct contact with the end consumer to whom they inform about the characteristics of the fish they offer, particularly through their menu. The importance of this instrument is presented later in this section.

Regarding wholesalers, for the specific case of Guadalajara, El Mercado del Mar (The Sea Market) is particularly relevant as it is the second largest wholesale fish market in Mexico. According to Pedroza-Gutiérrez & Hernández (2017), between 500 and 1000 tons of fish are

distributed on the market every day, and a variety of about 350 fish species are offered in the market.

Due to its size and volume of distribution, the Mercado del Mar is an important supplier of other markets in the city and other surrounding cities. The market is also a supplier of restaurants within the city (Pedroza-Gutiérrez & Hernández, 2017). However, the Pedroza-Gutiérrez & Hernández (2017) study found that the wholesalers at the Mercado del Mar prefer not to sell directly to restaurants or supermarkets as they pay several days after the delivery.

2.2.2 The role of restaurant menus in sustainability

A menu is an information tool used by restaurants to enable their customers to place food orders (Filimonau et al., 2017; Jacobs & Klosse, 2016; McCall & Lynn, 2008). Usually, the menus are designed to promote dishes which are a distinctive feature of the restaurant, that are in line with the values of the consumers and that provide a profitable return (Bowen, Morris, Bowen, & Morris, 2006). For this purpose, the menu contains information about the ingredients contained in each of the dishes and their prices. In some cases, information on the method of preparation as well as photographs of the dishes are also included (Thomas & Mills, 2006).

Menus can also indicate information related to nutritional, environmental and social features of the ingredients, such as the disclosure of calories, eco-labels, and other product traceability features (Filimonau et al., 2017; Thomas & Mills, 2006). This information can lead the consumer to make more informed decisions about the meals that they order in restaurants (Filimonau et al., 2017).

As it is an informative tool that influences consumer choices, the menu is considered to be a nudging instrument (Bacon & Krpan, 2018; Filimonau et al., 2017). In other words, the menu can be designed in a way that draws consumers' attention to specific products features (e.g., environmental and social aspects) in order to influence consumer behaviour (Bacon & Krpan, 2018; Filimonau et al., 2017; Lehner, Mont, & Heiskanen, 2015). Indeed, research such as that of Filimonau et al. (2017) and Bacon & Krpan, (2018) has demonstrated that displaying information on food origin and nutritional value, as well as chef recommendations influence consumer choices to be more sustainable when eating out.

In addition to serving as an architect of decision making, menus can also be used for historical analysis to infer changes in the availability of marine resources. In analysing 376 menus dated from 1928 to 1974, Van Houtan, McClenachan, & Kittinger (2013, p 290) showed that the restaurant menus are more than information or nudging tools and that these "represent and intriguing data source with the potential to fill existing knowledge gaps and measure long ecosystem changes."

Moreover, by making informed decisions when ordering and presenting their ingredients, restaurants can play an important role in the sustainability of food production and consumption systems (Gössling et al., 2011) and favour marine conservation (Koldewey et al., 2009). This considering that the food purchased is estimated to be one of the primary sources of the environmental impact of restaurants (Jacobs & Klosse, 2016) and, as mentioned before that 70% of the seafood is consumed in restaurants (Koldewey et al., 2009). In turn, restaurant menus can be a useful tool for communicating sustainability and traceability of their ingredients and can be designed to influence their consumers' decisions to be more sustainable.

As an informative tool, menus can provide valuable information on the sustainability of the ingredients and can, therefore, serve as a sustainability indicator (Jacobs & Klosse, 2016), for

this reason, menus are used as a unit of analysis to answer the first research question of this thesis.

2.3 Defining environmentally sustainable fish and seafood

Although there are differences in the conceptualization of sustainable fish among the various stakeholders of the seafood supply chain (FAO, 2016; Hilborn et al., 2015; Lawley et al., 2017), this section seeks to present the existing consensus on what is meant by sustainable fish and seafood, as it is a key concept for the present research.

The first important thing to note is that despite that the concept "sustainability" encompasses social, economic and environmental aspects (FAO, 2016; Frankic & Hershner, 2003; Lawley & Howieson, 2015), when it comes to sustainable fish and seafood, the focus tends to be on the environmental sustainability and to a lesser extent to social and economic impacts such as fishermen's livelihoods (Hilborn et al., 2015; Olson et al., 2014). Generally, the environmental sustainability of a fish is measured according to its environmental impact. For this reason, sections 2.3.1 and 2.3.2 present some of the aspects which researchers, fish certification schemes and seafood guides consider when measuring the environmental impact of fish, whether caught in the wild or farmed.

2.3.1 Wild fisheries

As far as wild fisheries are concerned, two dynamics are generally considered to measure the environmental impact, population, and ecosystem dynamics. The fisheries management practices are also taken into consideration for measuring the environmental impact of wild fisheries (See Figure 2-3) (Hilborn et al., 2015; Lawley et al., 2017; Marine Stewardship Council, n.d.; Monterey Bay Aquarium. Seafood Watch, 2015b; Ocean Wise, n.d.; Olson et al., 2014; Ponte, 2012; SeaChoice, 2016; The Environmental Defense Fund, 2018)

Figure 2-3. Generally considered aspects in assessing the environmental sustainability of captured fish.

Source: Adapted from Hilborn et al., (2015); Lawley et al., (2015); Marine Stewardship Council, (n.d.); Monterey Bay Aquarium. Seafood Watch, (2015b); Ponte (2012)*; Ocean Wise, (n.d.).; Olson et al., (2014); SeaChoice, (2016); The Environmental Defense Fund, (n.d).*

Population dynamics refer to the abundance of a particular fish species. The abundance is measured considering the species population size, exploitation rate, and the fish mortality. Ecosystem dynamics are measured considering the a) forage fish impacts, b) bycatch and fishing gears' effects and c) other ecosystem impacts (Hilborn et al., 2015; Lawley et al., 2017; Marine

Stewardship Council, n.d.; Monterey Bay Aquarium. Seafood Watch, 2015b; Ocean Wise, n.d.; Olson et al., 2014; SeaChoice, 2016; The Environmental Defense Fund, n.d.).

a. **Forage fish** impacts refer to the impact of fishing in marine predators. As the intensity of fishing in a given area increases, the number of fish and seafood will decrease, affecting marine predators that depend on these fish as a source of food (Hilborn et al., 2015).

b. **Bycatch** refers to the unintended capture of marine species (Schmitt, 2011; WWF, 2015) in most cases is a consequence of the fishing equipment (Bollmann et al., 2010; Gutierrez et al., 2016; Hilborn et al., 2015). For example, some fishing equipment is placed at a sea level that prevents certain marine animals from swimming over and therefore being accidentally caught (Seafood Watch, 2018). For this reason, for fishing equipment such as gillnets, is suggested to place them deeper in the water to avoid bycatch.

c. **Other ecosystem impacts** relate to the impact of fishing on the seafloor habitat as well as in other types of flora and fauna.

The performance of the fishery system is also taken into consideration (Ponte, 2012). The primary objective of the fish management system is its ability to manage the fishing pressure so that it does not overpass the population and ecosystem dynamics (Hilborn et al., 2015). For this purpose, it is necessary to comply with relevant local, national and international regulations (Ponte, 2012). It is also necessary to continually monitor and conduct scientific research of the fishing site (Marine Stewardship Council, n.d.; Monterey Bay Aquarium. Seafood Watch, 2015b; Ocean Wise, n.d.; SeaChoice, 2016; The Environmental Defense Fund, n.d.).

2.3.2 Aquaculture

As shown in Figure 2-4, with regards to aquaculture, there are three general aspects considered to measure its environmental impact: ecosystem dynamics, sources of nutrients as well as fish health and welfare.
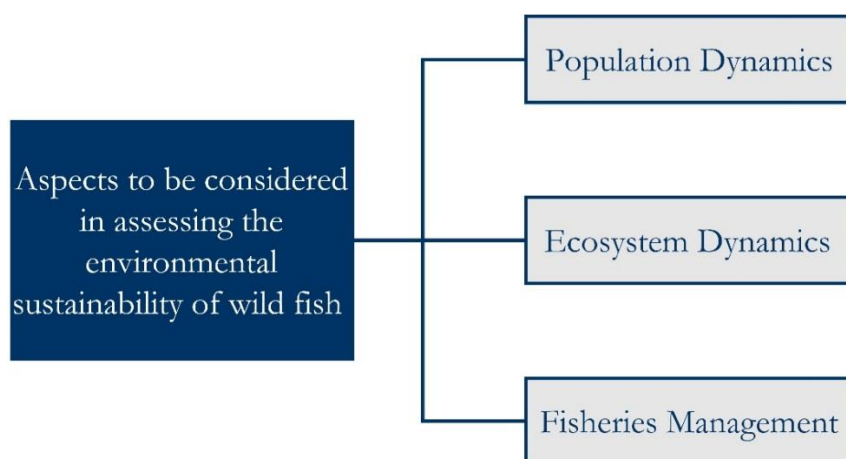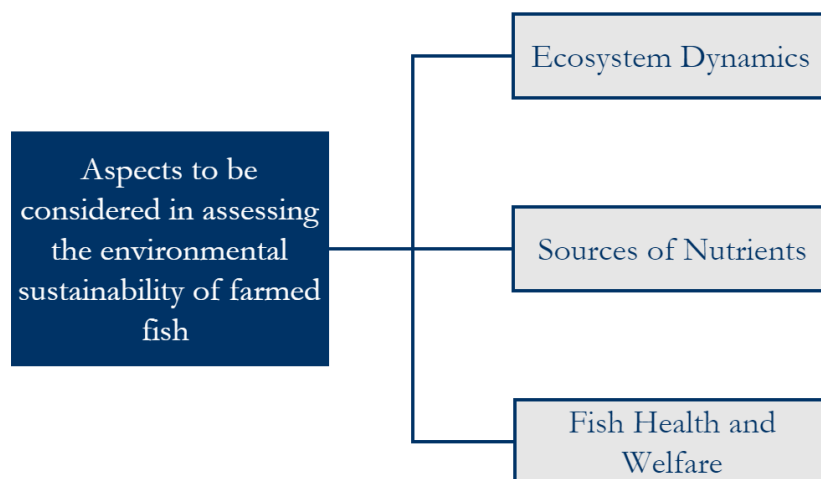

Figure 2-4. Generally considered aspects in assessing the environmental sustainability of farmed fish.

Source: Adapted from Aquaculture Stewardship Council, (2018); Monterey Bay Aquarium. Seafood Watch (2015a)*; Ocean Wise, (n.d.); SeaChoice, (2016); The Environmental Defense Fund, (n.d.); Bosma & Verdegem (2011).*

Ecosystem dynamics refers to the impacts of the farms on biodiversity, habitat and water bodies. With regards to biodiversity, consideration is given, for example, to whether farms use wild fish as feed as this has a direct impact on fish stocks. Habitat damage is closely related to the alternation or destruction of the habitat due to the land used for the farms. Repercussions on water bodies refer to the effects of effluents on water quality as this causes organic pollution (e.g., the introduction of exotic species in the wild) and eutrophication. Additionally, freshwater consumption and the impacts on groundwater and soil are considered (Aquaculture Stewardship Council, 2018; Monterey Bay Aquarium. Seafood Watch, 2015a; Ocean Wise, n.d.; SeaChoice, 2016; The Environmental Defense Fund, n.d.; Bosma & Verdegem, 2011).

In order to measure the environmental impact of the farms, it is also important to consider whether the sources of nutrients are organic or inorganic as these can affect nearby water bodies and their ability to be restored. Finally, the measures adopted to safeguard health and fish welfare, for instance, the methods of controlling diseases, pathogens and parasites are also taken into consideration (Aquaculture Stewardship Council, 2018; Monterey Bay Aquarium. Seafood Watch, 2015a; Ocean Wise, n.d.; SeaChoice, 2016; The Environmental Defense Fund, n.d.; Bosma & Verdegem, 2011).

2.3.3 Summary of the definition of environmentally sustainable fish

Based on the explained criteria for evaluating the environmental sustainability of wild fisheries and aquaculture practices considered by different actors in the seafood supply chain, for the purposes of this thesis, sustainable seafood is considered to be one which population would not reach a threshold where it could never recover. In other words, there is a balance between population size and exploitation rate and where there are positive ecosystem dynamics. For capture fish, that refers to low or non-existent bycatch, low impact on forage fish and low impact on the seafloor. For the case of aquaculture environmental sustainability refers to mitigation of habitat impacts and protection of biodiversity as well as control of water use and discharge of effluents.

As the environmental sustainability of fish is difficult to identify at a glance, there are certain instruments that enable the recognition of environmentally sustainable fish such as seafood guides and ecolabels (Bush et al., 2013). These and some other instruments to identify environmentally sustainable fish are explained in the following section.

2.4 Measuring fish sustainability

2.4.1 Academic research in which menus are assessed in terms of traceability or sustainability

This section recounts the literature identified, in which menus have been used as a unit of analysis to assess the sustainability of its ingredients or to assess how they influence or reflect consumption patterns. In this regard, six scientific publications were identified.

Among these is the study conducted by Klein & Ferrari (2015). The authors assessed the sustainability of the seafood offered in the menus of ocean conservation conventions in Australia held between 2012 and 2013. For this purpose, the sustainability assessment was based on the Australian Marine Conservation Society (MCS) Seafood Guide. Which, as most of the recommendation lists, uses a red ("Avoid"), yellow ("Good Alternative" or "Some Concerns") and green ("Best Choice") ranking system to measure fish sustainability. Klein & Ferrari (2015) obtained information on the type of species offered during the conventions as well as the places from which they were fished or farmed directly from the food caterers. The examination of the menu items containing seafood found that 24% of the fish and seafood offered at these

conventions were considered unsustainable; 54% were considered "Good Alternative" options; and only 17% of the species offered were "Best Choice" species (Klein & Ferrari, 2015). The authors pointed out that to reduce the number of "Avoid" species, greater leadership is needed from the ocean conservationists who participate in the conventions. Restaurants also need to be held accountable and trained to increase sustainable seafood availability. Klein & Ferrari (2015) also state that the availability of sustainable seafood in large grocery stores and in other supply centres should be encouraged.

Moreover, the study by Jacobs & Klosse (2016) investigated what aspects can be decisive in making a successful sustainable transition in the restaurant industry in the Netherlands. For that purpose, the authors had three units of analysis: the restaurant owner, the guest and the menu. However, it is not very clear how the menu analysis was conducted; the authors state that the analysis has an environmental approach and that the life cycle assessment could be used as a tool for measuring the impact of the dishes served at the restaurants. However, the results of the menu assessment were not available at the time this thesis was conducted.

Cawthorn et al., (2015) implemented a protocol for authenticating fish species in restaurants and retailers in South Africa using DNA barcoding. The aim of the study was to identify indices of fish mislabelling in these businesses. The authors found that between 18% and 19% of fish samples offered in restaurants and retailers are incorrectly labelled in terms of species. Therefore, the authors state that there is a need to strengthen the labelling regulations and law enforcement in South Africa.

Moreover, Gössling, Garrod, Aall, Hille, & Peeters (2011) studied how the adoption of food management practices can contribute to reducing GHG emissions in the foodservice industry. For this purpose, the authors reviewed the carbon intensity of 6 types of vegetables, 3 types of cereals, 5 types of meat as well as 2 species of pelagic fish and 4 species of deep-sea fish. The authors concluded that the complexity and lack of information on the GHG intensity of food is a significant barrier to the adoption of food management practices with low carbon intensity. However, the authors provided recommendations for decisions that must be considered so that the foodservice industry can reduce its emissions. Specifically, regarding fish, the authors state that pelagic fish species (e.g., herring) should be chosen instead of deep-sea species, as the latter has higher GHG emissions per calorie than the former (Gössling et al., 2011).

A study by Van Houtan et al. (2013) analysed 376 restaurant menus in Hawaii dated from 1928 to 1974 in order to identify the changes in the availability of marine resources. They found that before 1940, reef fish, horse mackerel and bottom fish were common, but by the early 1960s they were no longer commonly offered on the menus and were replaced by species obtained from the ocean's pelagic zone. By 1970, 95% of the menus offered large pelagic fish. The authors did not provide reasons on why the supply of the species may have changed.

Finally, Filimonau, Lemmer, Marshall, & Bejjani (2017) conducted a menu intervention approach to explore how the menu design influences consumer choices in order to make them more environmentally and socially benign. The authors found that information on price, food origin, and nutritional value does influence consumers' decisions when they eat in restaurants. In this study, it was also found that while the information on the carbon intensity of food, in general, is well perceived by consumers, it is not known whether it influences consumers' decisions.

2.4.2 Seafood guides and certification schemes

In the previous section, a review of the academic research conducted to assess the sustainability of the menus was given. One of the identified studies Klein & Ferrari (2015) uses a seafood

guide as an instrument to assess the sustainability of menus. This section explains not only how NGO's seafood guides help to identify the environmental sustainability of fish but also explains how certification schemes can also help to identify this type of fish. Both instruments are commonly used as information tools to distinguish which fish and seafood are environmentally sustainable from those that are not.

This section also describes some of the strengths and weaknesses of the seafood guides and certification schemes as it is considered that they reflect some of the challenges of measuring the environmental sustainability of fish and seafood.

Purpose and functioning

Seafood guides and certification schemes aim to have a positive environmental impact on fisheries management practices by promoting sustainable seafood and creating demand for these type of fish (FAO, 2016; Koldewey et al., 2009; Roheim, 2009). To achieve this purpose the certification schemes and guides inform, create awareness and provide guidelines for consumers and retailers to differentiate between sustainable and unsustainable fisheries (De Silva, 2011; FAO, 2016; Hilborn et al., 2015; Koldewey et al., 2009).

Certification schemes assess the performance of specific fisheries or aquaculture farms using a set of criteria or standards, usually with an environmental approach (Parkes et al., 2010), that consider population and ecosystem dynamics as well as fisheries management (Aquaculture Stewardship Council, 2018; Hilborn et al., 2015; Lawley et al., 2017; Marine Conservation Society, 2017). In order to be assessed by the certification instances, fisheries and fish farms have to pay for the service and comply with the criteria, if these have a good performance, then that can lead to an ecolabel on the product packaging and in some cases, in restaurant menus (Parkes et al., 2010). The most common certification schemes for fisheries are Friend of the Sea (FOS) and the Marine Stewardship Council (MSC) and for aquaculture is the Aquaculture Stewardship Council (ASC).

NGO's seafood guides, inform consumers and different actors in the value chain as to whether one species of fish is more sustainable than another. This by using a three-tiered traffic light ranking system to categorize species into those that are better choices, those that should be consumed with caution and those that should be avoided (FAO, 2016; Koldewey et al., 2009; Roheim, 2009).

Species categorized as "Avoid," usually colour-coded in red, include fish that has one or more severe problem. This means that the abundance of the population is low and therefore the species is being overfished, or that there are high environmental impacts on other species or the ecosystem in general (Roheim, 2009; Seafood Watch, 2018; The Environmental Defense Fund, 2018). Fish that need to be consumed with caution, also called "Good Alternative" and colour coded in yellow, have fewer problems, but there are still challenges in the management of fisheries or farms that can be improved such as the gear with which fish are caught or the use of inorganic nutrients in the case of farms (Roheim, 2009; Seafood Watch, 2018; The Environmental Defense Fund, 2018). Finally, the fish considered as "Best Choice," colour-coded in green, have excellent management that avoids damage to other species and allows the fish species to subsist in the long term. They also have minor damage to the ecosystem where the fish are caught or farmed (Roheim, 2009; Seafood Watch, 2018; The Environmental Defense Fund, 2018).

Strengths and weaknesses

Parkes et al., (2010) analysed sustainable fish ecolabels and NGO's seafood guides based on seven attributes: scope, accuracy, independence, precision, transparency, standardization and cost-effectiveness. The authors demonstrated that the recommendation lists are less accurate and precise than the certification schemes, and for this reason, the latter is more useful to consumers when trying to purchase sustainable fish or seafood. However, the authors point out that certification schemes are time-consuming and costly and usually less common in developing regions. Regarding standardization, the authors found that there is a contradiction in the information both the seafood guides and certification schemes provide, which confuse the consumer. Indeed, the study by Roheim (2009) confirmed that, while there are similarities between seafood guides, these tend to contradict each other and can, therefore, confuse the consumer.

Furthermore, Roheim (2009) states that the fact that the seafood guides consider the catch area, the gear type and the country of origin to determine if a fish is a better or worse alternative to the environment adds complexity for the consumer. This because, it is challenging to identify for the end consumer and even for well- informed staff in restaurants and retail stores the catch area, the gear type and the country of origin of a fish or seafood. Moreover, Roheim (2009) as well as Olson et al., (2014) and Ponte (2012) state that in generalizing, seafood guides do not distinguish those small productions that are managed sustainably from those that are not.

Finally, FAO (2016), Hilborn et al. (2015), Olson et al. (2014) and Ponte (2012) also criticised both the seafood guides and certification schemes for not giving equal importance to social aspects such as labour conditions of workers and other environmental aspects (e.g. greenhouse gas footprints, fuel required for the boats).

In a nutshell, certification schemes enable the identification of environmentally sustainable fish through ecolabels, while the seafood recommendation lists provide a traffic light ranking to differentiate between those species that are better, worse and those that should be eaten with caution.

2.4.3 Other factors that may reflect the environmental sustainability of fish: underutilized species

There are other strategies that have been considered to ensure fisheries sustainability, one of them being the promotion of underutilized fish species (Witkin, Dissanayake, & McClenachan, 2015). Underutilized food species are those that have limited competitiveness with respect to mainstream species (Padulosi, Heywood, Hunter, & Jarvis, 2011). It is considered that by promoting underutilized species, the pressure on over-exploited species (which represent only a small percentage of the world's fish species) can be reduced (Witkin et al., 2015; Zhou, Smith, & Knudsen, 2015).

Fisheries diversification can also bring other benefits such as reducing impacts on marine ecosystems, increase overall fisheries production and income generation as well as contributing to food nutrition and security (Padulosi et al., 2011; Witkin et al., 2015; Zhou et al., 2015).

Restaurants play a key role in promoting underutilized and/or invasive fish species. For example, restaurants located in the Sub-Atlantic from the United States to Belize have made efforts to promote the consumption of the lionfish (*Pterois miles and P. volitans*), an invasive species considered to be one of the greatest threats of the tropical Atlantic (Morris, 2012). In addition, chefs have recognized that if they use lesser-known fish species, they tend to reduce costs because these are generally less expensive (Jeff Gordinier, 2015). And for the specific case

of Mexican seafood dishes like tacos, these species are easy to include in the dishes as the fish only needs to be fried and wrapped in a tortilla (Jeff Gordinier, 2015). Underutilized species also lead kitchen creativity and to more original menus, in words of Jeff Gordinier (2015) restaurants can create consumer awareness by using underutilize species in their dishes and watch "consciousness shift with each bite."

It is important to note that although underutilized species may reduce pressure on over-exploited species, possible rebound effects must be considered. In other words, if the promotion of underutilized species is to be common, these species can become overexploited and cause harmful effects on the ecosystems in which they inhabit (Witkin et al., 2015). For instance, within 50 years, Mon-fish and Acadian redfish, went from being underutilized species to suffering severe alterations in their population number (Witkin et al., 2015).

The literature review presented in this section identified tools that could be used to fulfil one of the purposes of the thesis: to measure the environmental sustainability of the fish offered in menus of restaurants in Guadalajara. Section 2.5 presents how the main findings of the literature review have been operationalized for the definition of the conceptual framework.

2.5 Conceptual framework for assessing the environmental sustainability of the fish offered in the restaurant menus

The conceptual framework for the menu assessment incorporates and operationalizes the literature review presented in sections 2.1.3 and 2.4 into tools for measuring the environmental sustainability of fish offered in restaurant menus in Guadalajara (See Figure 2-5). The tools being a) seafood guides; b) ecolabels; c) permanent fish bans; and d) underutilized species.
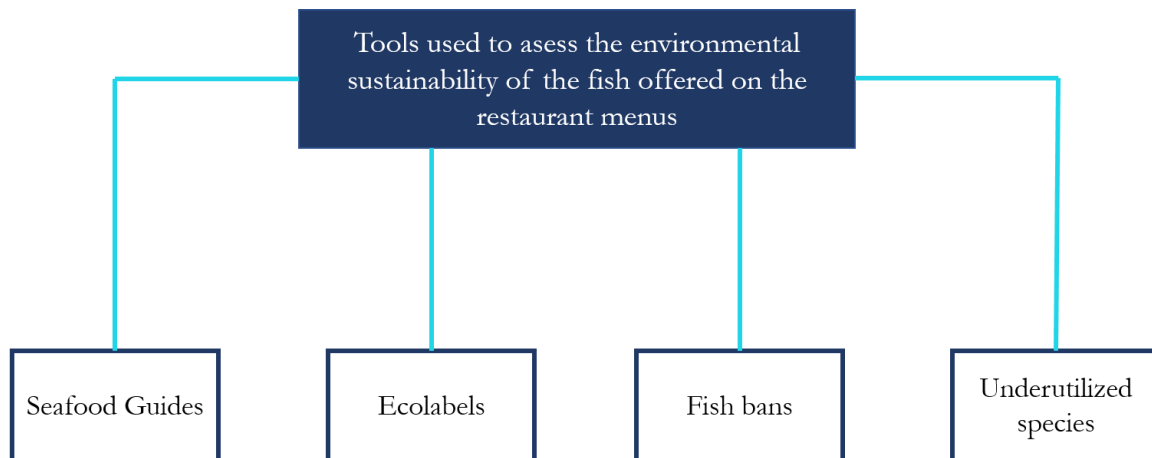
Figure 2-5. Tools considered for the assessment of the environmental sustainability of fish offered in the restaurant menus in Guadalajara.
Source: Created by the author.

2.5.1 Seafood Guides

Based on the study by Klein & Ferrari (2015), the traffic light system of specific seafood guides was taken into consideration to evaluate the environmental sustainability of the fish and seafood offered in restaurants in Guadalajara. Section 3.1.3 explains which seafood guides were used for this purpose.

The reason why it was decided to use the method of Klein & Ferrari (2015) as one of the instruments for the menu assessment, is because the Jacobs & Klosse (2016) method is

unspecific and conducting a life cycle assessment or measuring the GHG emissions of various ingredients in the menus, like Gössling et al., (2011) would be extremely complex and time-consuming. Using DNA barcoding was found unfeasible given the resources to conduct this research. Finally, the purposes of the studies by Filimonau et al., (2017); Van Houtan et al., (2013) differ for the ones of this thesis.

Moreover, because the certification schemes and ecolabels are less common in developing and emerging countries, like Mexico (Parkes et al., 2010), with only 4% of the total number of certified fisheries worldwide (Pérez-Ramírez, Castrejón, Gutiérrez, & Defeo, 2015), it was necessary to consider seafood guides as these are less expensive.

2.5.2 Eco-labels

Eco-labels were also used as a reference to evaluate the environmental sustainability of fish offered in the menus. The inclusion of eco-labels as an assessment tool is mainly due to their precision and accuracy in reflecting the efforts that fisheries make to reduce their environmental impact (Parkes et al., 2010).

2.5.3 Permanent Fish Bans

As a legislative instrument of the Mexican fisheries policy, the fish bans were also used as a tool to evaluate the environmental sustainability of the fish offered in the restaurant's menus. It was decided not to adopt the temporary bans as an assessment tool since it is required to know precisely the month in which the fish offered on the menus was caught. Although the permanent bans also have complexities, these are the ones that were taken into consideration for the menu assessment (see Appendix D) as these do not require knowing the date of capture. Assumptions on the fishing area were made and are presented in section 3.1.3.

2.5.4 Underutilized species

Finally, due to the important role that restaurants play in the promotion of underutilized species, for the menu assessment, it was also considered if restaurants in Guadalajara include underutilized species in their menus.

For all of the above tools except for the ecolabels, reference lists with different fish species were consolidated (Appendices C, D and E) and used to conduct the menu assessment. Section 3.1 explains how these reference lists were consolidated.

2.6 Conceptual Framework on the drivers and barriers of including sustainable fish on the menus

This section outlines the main drivers and barriers that influence restaurants when trying to include sustainable fish on their menus. These were identified based on the existing literature and serve as the conceptual framework for the interviews' analysis.

Mainly three articles served to provide structure to the identified drivers and barriers. These were the studies of Chkanikova & Mont (2015); Kasim & Ismail (2012) and Walker, Di Sisto, & McBain (2008).

Walker et al., (2008) who explore the drivers and barriers that affect an organization to implement green supply chain management strategies, categorized the drivers and barriers into internal and external. Kasim & Ismail (2012) also categorized drivers and barriers into internal and external when studying the drivers and barriers that influence restaurants in the adoption of environmental management practices. On the other hand, Chkanikova & Mont (2015) only

studied the external factors that affect food retailers when adopting sustainable supply chain, this arguing (in accordance to (Hoffman, 2000)) that "the supply chain sustainability agenda is not objectively defined by the company, but is rather socially constructed by the external corporate environment" (p. 67).

In summary, based on the literature, drivers and barriers were grouped into internal and external factors that affect restaurants. Internal factors are those related to the in-house operation and organization of the company (Kasim & Ismail, 2012). External factors are those that influence the performance and behaviour of the company from the outside, such as stakeholder's interests and national and international regulations (Chkanikova & Mont, 2015; Kasim & Ismail, 2012; Walker et al., 2008).

The internal drivers and barriers were not subcategorized since neither Kasim & Ismail (2012) nor Walker et al. (2008) established subcategories for these. However, for external factors subcategories were established as these are more than internal drivers and barriers, and it facilitates their understanding. For this, the external subcategories of Hoffman (2000) and Chkanikova & Mont (2015) which coincide with those of Kasim & Ismail (2012) and Walker et al. (2008), although with different names, were taken as a reference. These being: regulatory, resource, market and social factors. What differs is that Chkanikova & Mont (2015) categorize the costs as an external barrier instead of an internal barrier as Kasim & Ismail (2012) and Walker et al. (2008) do. For the purpose of this research, the costs would be considered as an internal barrier.

The internal and external drivers and barriers identified are explained below. Table 2-1 was created based on the literature and summarizes the main drivers and barriers that serve as the conceptual framework for the interviews' analysis.

2.6.1 Internal Factors

Among the internal drivers identified in the literature are top management involvement and employee connectedness. The higher the commitment of restaurant leaders to the environment, the easier it will be to adopt environmental practices in the restaurant such as the inclusion of sustainable ingredients in the menu (Kasim & Ismail, 2012; Lawley & Howieson, 2015). However, the adoption of sustainable practices does not only depend on the top management involvement but also on the participation of the rest of the company's staff (Kasim & Ismail, 2012).

Having fresh, tasty and quality ingredients is one of the priority objectives of restaurants (Curtis & Cowee, 2009; Glazer, 2012; Lawley & Howieson, 2015; Thomas & Mills, 2006). Therefore, the inclusion of sustainable ingredients on the menu will only happen if these are quality, fresh and tasty products. According to Lawley & Howieson (2015), the place of origin of the product (e.g., local) can also be a driver for restaurants when purchasing ingredients.

Kasim & Ismail (2012) also state that the adoption of environmental practices can trigger innovation. For the specific case of restaurants, the use of underutilized species can represent an opportunity for more creative cooking and original dishes (Jeff Gordinier, 2015; Sustainable Fisheries, 2017).

One of the most relevant internal barriers to the adoption of environmental practices relates to costs. This since the purchase of sustainable products can imply high expenses for restaurants (Chkanikova & Mont, 2015; Curtis & Cowee, 2009; Kasim & Ismail, 2012; Lawley & Howieson, 2015). According to Dolmage et al. (2016 p. 6) "seafood typically leaves low-profit margins which necessitate high concern for costs."

Moreover, restaurants may also have limited or no knowledge or experience in adopting environmental criteria when purchasing their ingredients (Chkanikova & Mont, 2015; Curtis & Cowee, 2009). Restaurant owners and/or chefs can also lack awareness and concern of the impact of the products they purchase (Dolmage et al., 2016; Kasim & Ismail, 2012; Lawley & Howieson, 2015) which represents an internal barrier for the adoption of environmental practices.

Additionally, chefs' lack of time to obtain product information beyond food quality and the taste is another of the internal barriers to the inclusion of sustainable products in the menus (Lawley & Howieson, 2015). Chefs are usually overwhelmed with operational processes that prevent them from doing in-depth research on the characteristics of the products they purchase (Lawley & Howieson, 2015).

2.6.2 External Factors

Regulatory

The adoption and implementation of environmentally sustainable practices can be better achieved if the government gets involved and puts pressure on businesses to adopt these practices (Chkanikova & Mont, 2015; Kasim & Ismail, 2012; Smith, 2008). Such pressure can be established through national or international legal instruments or political or administrative instruments (Chkanikova & Mont, 2015). Conversely, one of the main barriers in the adoption of sustainable business practices is the lack of government involvement and leadership to support businesses in the adoption of sustainable practices (Chkanikova & Mont, 2015; Kasim & Ismail, 2012).

Resource factors

According to Hoffman (2000) resource factors, relate to shareholder, supplier and investor relations. Therefore, pressure from investors to increase investment returns (Chkanikova & Mont, 2015), brand integrity (Chkanikova & Mont, 2015; Dolmage et al., 2016; Kasim & Ismail, 2012; Lawley & Howieson, 2015; Mena, Julien, & Mirzabeiki, 2017; Thomas & Mills, 2006) as well as gaining competitive advantage and differentiation are identified as resource factor drivers for restaurants (Chiu & Hsieh, 2016; Chkanikova & Mont, 2015; Dolmage et al., 2016; Glazer, 2012; Jeff Gordinier, 2015; Kasim & Ismail, 2012; Lawley & Howieson, 2015; Thomas & Mills, 2006).

On the other hand, the lack of product supply and availability is considered to be a resource factor barrier (Chkanikova & Mont, 2015; Kasim & Ismail, 2012). Dolmage's et al., (2016) study found that the difficulty to find sustainable products was one of the main challenges for restaurateurs in Vancouver to adopt seafood sustainability. The lack of availability also relates to what Lawley calls "consistency of supply," this means that suppliers have not always the capacity to supply the same product in the same volume or quantity. According to Curtis & Cowee (2009), the consistency of supply also relies on the seasonal availability of the product as well as the local climate. This because local climate (e.g., too dry, too cold, too far from the coast) can impede restaurants to obtain sustainable ingredients (Curtis & Cowee, 2009).

Chkanikova & Mont (2015) also state that supplier relationships are another of the resource factors barriers. This is for two reasons, the first of which is related to tradition. The buyer can have a good relationship with his supplier, who for years has been reliable and therefore it is difficult to change it from one day to the next only because the supplier does not have the capacity to offer sustainable products. The second reason relates to power, that is, the buyer, in this case, the restaurants, have little power of influence over the suppliers' production methods

and therefore the restaurant purchases the supplier products regardless of their environmental impact.

Finally, because most chefs have limited time to seek for specific information about the product, they highly depend on their supplier to provide information about it (Curtis & Cowee, 2009; Dolmage et al., 2016; Lawley & Howieson, 2015). Namely, sustainability, place of origin, methods of production, quality and others (Lawley & Howieson, 2015). Therefore, if the restaurant supplier cannot give such information or provides incorrect information, this can become a barrier to the adoption of sustainable menus. This is a risk all chefs face given the complexity of the food value chain (Lawley & Howieson, 2015).

Market factors

Market factors are those related to consumers, competitors, trade associations and consultants (Hoffman, 2000). Voluntary industrial agreements, as well as sustainable standards and certification schemes, can be a market driver (Chkanikova & Mont, 2015). This because industrial forums and associations serve as spaces to discuss challenges faced by the industry among which are issues related to sustainability. For example, through these agreements participating companies can harmonize purchasing processes and requirements in order to promote sustainability (Chkanikova & Mont, 2015). Sustainable standards or certification schemes facilitate compliance with sustainability particularly in complex supply chains such as the food supply chain (Chkanikova & Mont, 2015; Reinecke, Manning, & von Hagen, 2012).

An additional market driver for the adoption of sustainable ingredients in menus and in general in the adoption of environmental practices in the food industry is the consumer demand for environmentally friendly products (Chiu & Hsieh, 2016; Chkanikova & Mont, 2015; Dolmage et al., 2016; Kasim & Ismail, 2012; Lawley & Howieson, 2015; Smith, 2008). By offering products that match consumer preferences, restaurants can attract new customers and therefore increase sales and profits, even more than the competition does (Chiu & Hsieh, 2016; Chkanikova & Mont, 2015; Kasim & Ismail, 2012).

However, even if the consumer is interested in buying green products, because sustainable products tend to have higher prices than regular products, consumers would not always show their concerns when purchasing (Chkanikova & Mont, 2015; Dolmage et al., 2016; Lawley & Howieson, 2015).

Moreover, the abundance of standards and eco-labels can confuse consumers, which means that they cannot differentiate one product from another and therefore fail to purchase products with eco-labels (Chkanikova & Mont, 2015; Reinecke et al., 2012).

Social factors

Social factors refer to the influence of public pressure on organizations and how actors like NGOs, community, press, academia can influence companies' behavior (Hoffman, 2000).

The pressure of stakeholders such as consumers, media, NGOs and academia through consumer boycotts, NGO campaigns, negative publicity in media and scientific alerts can lead businesses in the food industry to adopt environmental practices (Chkanikova & Mont, 2015; Kasim & Ismail, 2012; Smith, 2008). Contrariwise, if this pressure does not exist, it may represent a barrier to the adoption of environmentally sustainable practices(Chkanikova & Mont, 2015; Kasim & Ismail, 2012; Smith, 2008).

Just as one of the drivers for adopting sustainable products is the consumer demand for green products, lack of consumer awareness of environmental issues is a significant barrier to the adoption of sustainable practices in businesses such as restaurants (Chkanikova & Mont, 2015; Kasim & Ismail, 2012). And even if consumers are aware to a certain degree, usually "supply chain outside the farm, during transport, processing, manufacturing or retailing remains invisible to consumers" (Smith, 2008 p. 852).

Finally, some businesses in the food industry have also been wary of removing unsustainable products from their businesses as this may also represent losing customers (Chkanikova & Mont, 2015; Kasim & Ismail, 2012).

Table 2-1 summarizes the internal and external drivers and barriers that were identified in the literature and that were described in this section.

Table 2-1 Drivers and barriers of including sustainable fish on the menu

Internal Factors	
Drivers	**Barriers**
• Top management involvement • Employee Connectedness • Food quality, taste, and freshness • Origin of the ingredients • Innovation and creativity in the kitchen	• Costs • Limited knowledge or expertise • Lack of awareness or concern for the environment • Time constraints to seek information about the product
External Factors	
Drivers	**Barriers**
Regulatory Factors	
• Pressure and/or support from the government to take action	• Lack of leadership or support from the government to take action
Resource Factors	
• Pressure from investors to increase investment returns • Brand reputation and integrity • Competitive advantage, differentiation	• Lack of product supply • Local climate, seasonal availability • Relationship with supplier • Lack of communication and information flows from producer to restaurant
Market Factors	
• Consumer demand for green products • Voluntary agreements and certification schemes within the industry	• Insufficient demand for green products • Consumer willingness to pay for green products is low • Too many ecolabels can confuse the consumer
Social factors	
• Pressure from consumers, NGOs, media, and academia	• Insufficient consumer awareness • Insufficient pressure from consumers, NGOs, media, and academia

	• Consumer discomfort over the removal of traditional (unsustainable) products

Source: Adapted from Birch, Lawley, & Hamblin, 2012; Chiu & Hsieh, 2016; Chkanikova & Mont, 2015; Curtis & Cowee, 2009; Dolmage et al., 2016; Glazer, 2012; Hoffman, 2000; Jeff Gordinier, 2015; Kasim & Ismail, 2012; Reinecke et al., 2012; Smith, 2008; Thomas & Mills, 2006.

3 METHOD

In order to answer the research questions an explanatory sequential mixed method research design approach was adopted (Creswell, 2014). This type of research design consists of two phases, the first one being quantitative and the second qualitative. For each phase different sample sizes are used (Creswell, 2014). According to Creswell (2014 p. 224), "the intention of this design is to have the qualitative data help explain in more detail the initial quantitative results."

For this reason, for the first research question a quantitative analysis (menu assessment) was performed and in order to better understand the results of the quantitative analysis, for the second research question, a qualitative analysis was conducted (interview analysis on drivers and barriers). For both the quantitative and qualitative approach, the first step was to conduct a literature review as a basis for defining the conceptual framework for collecting and analysing information. Precisely because this research starts with existing concepts, the thesis has a deductive approach (Gummesson, 2000).

Table 3-1 summarizes the steps that were taken in order to answer the research questions. Sections 3.1 and 3.2 explain in detail the methodology adopted to answer each of the research questions.

Table 3-1-Summary of the Research Method Process

Research Question	Research Approach	Step 1	Step 2	Step 3
RQ 1. To what extent have restaurants in Guadalajara included environmentally sustainable fish on their menus?	Quantitative	Literature review	Creation of an environmentally sustainable menu framework	Menu assessment
RQ 2. What are the underlying drivers and barriers of restaurants related to the adoption of environmentally sustainable fish in their menus?	Qualitative	Literature review	Creation of the drivers and barriers framework	Design, conduct and analyse interviews with restaurants and experts

Source: Created by the author.

3.1 Menu assessment

In order to answer the first research question, a menu assessment was conducted. The objective of the menu assessment was to evaluate the environmental sustainability of the fish and seafood offered in restaurants in Guadalajara. For this first part of the research, the menu was the unit of analysis.

In order to define the aspects under which the environmental sustainability of the menus would be evaluated a literature review was conducted. For this purpose, the databases Google Scholar and LUB Search were utilized using search terms such as menu assessment, sustainable fish and

menus, sustainable fish in restaurants, sustainable fish Mexico. Other relevant literature was found by looking through the reference cited in the articles that were found in the initial search.

The conceptual framework (Section 2.5) resulting from the literature review served as a reference for performing the menu assessment. Figure 3-1 summarizes the process that was undertaken for conducting the menu assessment. This process is described in depth in this section.
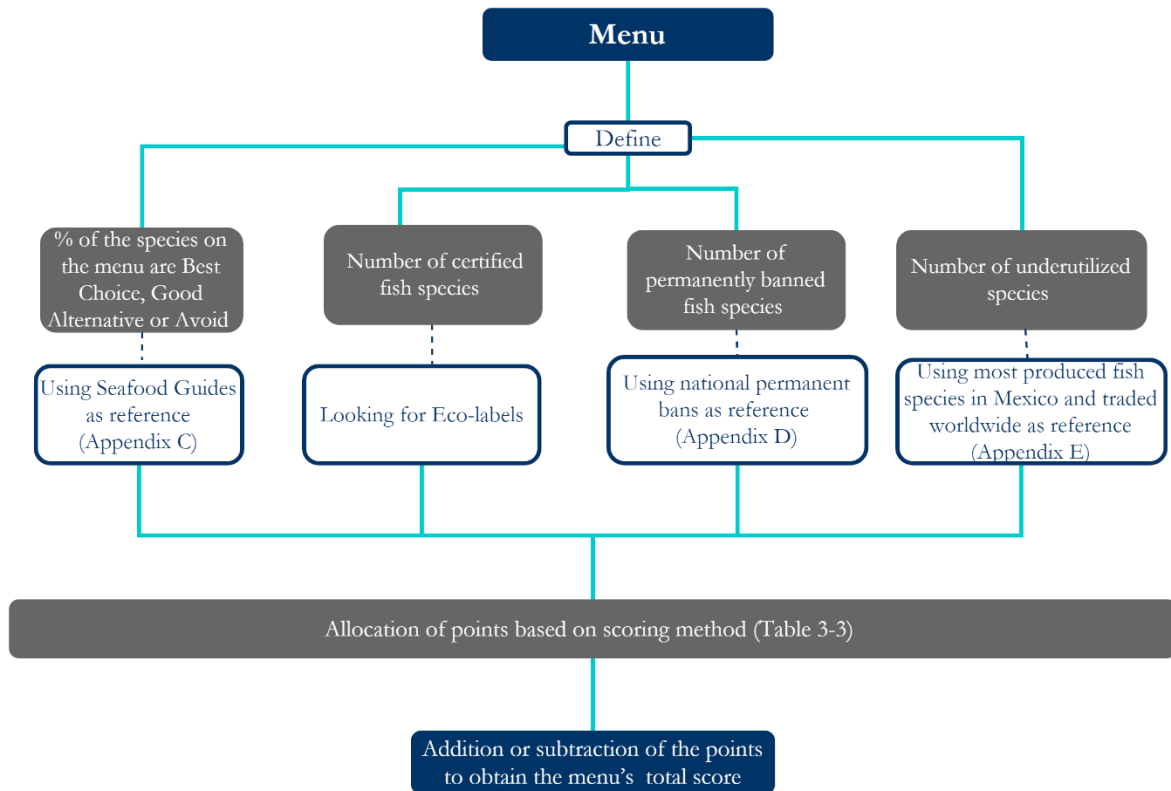
Figure 3-1. Summary of the menu assessment process.
Source: Created by the author.

3.1.1 Sample Selection

The research sample consisted of 40 restaurants offering fish and seafood (see Appendix A). Initially, the sample was selected using online platforms for searching and/or recommending restaurants (e.g., TripAdvisor). Priority was given to seafood restaurants and secondarily to sushi and other restaurants with fish dishes. In order to avoid the inclusion of a single restaurant niche such as fine dining restaurants, as these restaurants have particular conditions that may allow them to include more sustainable species, the sample restaurants were sought to be of varied sizes and with differing prices for food.

Once the seafood restaurants that were found in the first search were registered, and in order to include more restaurants in the analysis, snowball sampling was later used. Namely, as "snowball sampling occurs when the researcher starts gathering information from one or a few people… to find significant contacts for sampling" (Lopez & Whitehead, 2013 p. 125); the author asked her contacts in Guadalajara to help identify more seafood restaurants in the city. Those mentioned by the author's contacts were therefore also included in the sample.

3.1.2 Data Collection

Once the sample was defined, the restaurant menus were obtained through the restaurants' websites and/or Facebook pages. For some exceptions, the menus had to be requested directly to the restaurants.

Because the vast majority of the menus do not specify the type of fish and shrimp species used for their dishes, the restaurants were contacted by phone to find out in detail what type of shrimp (blue, brown, red or white), fish and tuna (Bluefin or Yellowfin tuna) they use. For other types of seafood, there was no need to request the type of species from the restaurants, either because it was well defined or because assumptions were established. Assumptions were necessary for those species with multiple varieties (e.g., different tuna species include Albacore, Bigeye, Yellowfin, Skipjack, Bluefin (ISSF, 2018) for the purpose of this research only two were taken into consideration). The list of assumptions is presented in Table 3-2.

The fish and seafood referenced in each of the restaurant menus were recorded in a database. Regardless of how many dishes the fish or seafood was used in, the species were only registered once in the database. For example, if the tilapia in a restaurant was used for ceviche[3] and tacos, it was only registered once in the database. For shrimp and tuna, specific species were registered (e.g., white shrimp, brown shrimp) but generic categories of these species were also created (e.g., shrimps from Latin America). This is because not all the sample restaurants knew precisely the type of shrimp or tuna they were offering. So, if this was the case, shrimp or tuna were registered under the generic category.

Table 3-2.- Assumptions about the type of tuna, salmon, marlin, crab and clam's species used by restaurants.

Tuna
Although there are different species of tuna, for the menu assessment it was assumed that the type of tuna offered on the menus of restaurants in Guadalajara is exclusively Bluefin and Yellowfin tuna. This is based on the most commonly caught and traded tuna species in Mexico according to CONABIO (2014a, 2014b).
Marlin
The recipes for smoked tuna in Mexico are also known as "Marlin." When looking at the 50 most highly produced species in Mexico (see Appendix E), the Marlin is not one of them (CONAPESCA, 2014). This is mainly because fishing for different types of Marlin is only permitted for recreational use (SAGARPA & CONAPESCA, 2018). Therefore, for the purposes of this thesis, it is assumed that the Marlin offered in the sample restaurants is actually tuna.
Crab
Crabs offered on the menus in which the species was not specified, were assumed to be Blue Crabs. This is because the Blue Crab is the only type of crab that is among the 22 species primarily produced and commercialized in Mexico (CONAPESCA, 2014; Vinet & Zhedanov, 2011).
Salmon
It was assumed that the salmon offered in Mexico is Atlantic Salmon. This because according to FAO (2018), this type of salmon accounts for more than 50% of the total global salmon market.
Clams

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[3] Appetizer containing fish or seafood slices and is marinated with some citrus

> Common species offered in restaurants in Mexico include Atrina Maura and Chocolate clams. However, these species were not categorized differently. The general category of seafood guides for clams, mussels, and oysters was used for both species.

Source: Created by the author.

3.1.3 Data Analysis

For the four tools mentioned in the conceptual framework except for the ecolabels, reference lists with different fish species were consolidated (Appendixes C, D and E). These lists served as a reference point to determine the environmental sustainability of fish and seafood offered in the sample restaurants. This section explains how said reference lists were developed.

Seafood guides

As mentioned, it was decided to consolidate a database of best and worst environmental choices for fish and seafood based on existing seafood guides. Thus, the database obtained was used as a reference to measure how environmentally sustainable is the seafood offered by the sample restaurants. In other words, instead of using one recommendation list to conduct the menu assessment, as Klein & Ferrari (2015) did, a database with information from different recommendation lists was used to evaluate the menus. It was decided to use several seafood guides to give more solidity to the study. It is recognized that the consolidation of a single list based on different seafood guides is a complex process and as mentioned in section 5.3.2 it can be a limiting factor of the method employed. The creation of this database consisted of four steps.

The **first step** to build the reference list was to define what seafood guides would be used for reference. A list of the seafood guides was created taking into consideration those analysed by Parkes et al. (2010) and Roheim (2009), as well as those considered by the restaurant certification organizations such as the Sustainable Restaurant Association. As Roheim (2009) did, this list was complemented by the seafood guides listed by Incofish International Seafood Guide. In total, 37 lists were identified.

Based on Roheim's (2009) methodology, of the 37 lists, those prior to 2013 were discarded, as well as lists that focus primarily on health issues and that have the exact same methodology as the Monterey Bay Aquarium (e.g., Safina Centre and OceanWise). Due to the geographical scope of the thesis, guides primarily from North America were selected with the exception of the Marine Conservation Society from the United Kingdom, as it considers international fisheries that may be pertinent for consumers and buyers in Mexico. Priority was also given to lists which focus exclusively on fish and seafood, for this reason, the IUCN red list was excluded, as "the marine realm is very poorly covered in the IUCN Red List, comprising less than 12% of the species included" (IUCN, 2017).

The resulting list of seafood guides considered for the conceptual framework is Monterey Bay Aquarium (MBA) through their program Seafood Watch; the Environmental Defense Fund (EDF); the Marine Conservation Society (MCS) and Greenpeace Red List (see Appendix B for a description of these seafood guides).

Once the seafood guides were selected, **the second step** consisted in searching the fish and seafood species offered in the menus on the seafood guides websites. This in order to identify the corresponding species category: "Best Choice," "Good Alternative or "Avoid." It is important to note that the revised seafood guides have ratings of best to worst species to eat, but they are called differently. In order to standardize the terms, the concepts used were the same as those used in the MBA, that is: "Best choice," "Good Alternative" and "Avoid." Each

of the fish species identified in the menus and their respective categories were recorded in a database (see Appendix C).

However, building the database was complex, as Roheim (2009) pointed out, the seafood recommendation lists consider many factors such as geographical area and gear type to evaluate the environmental sustainability of fish and seafood.

To facilitate the construction of the seafood guide reference list, with respect to the geographical focus, it was decided to include in the database mainly information on fish captured in water bodies near Mexico, such as in the Gulf of Mexico, the North Pacific Ocean or East Central Pacific. The case of the Atlantic Cod serves to exemplify this. While the recommendation lists categorize the Atlantic Cod differently from the Northeast Pacific, "Best Choice," and the Atlantic Cod caught in Russia or Japan listed as one of the "Avoid" species, due to the geographical approach, the Atlantic Cod was registered in the database as "Best Choice."

The gear type used for fishing was beyond the scope of the study as this information is not available in the restaurant's menus. Therefore, if the same species had different impact categories due to the gear type used to fish it, then the worst-categorized option was selected based on the precautionary principle which refers to "taking preventive action in the face of uncertainty" (Kriebel et al., 2001 p. 871). To exemplify this, if the Blue Marlin captured with longline (deep-set) was categorized as "Good Alternative" but the Blue Marlin captured with drifting longline was classified as "Avoid," and there were no geographical differences, then the Marlin was included in the database as "Avoid."

For some cases, the categorization of a fish differed depending on whether it was farmed or caught. However, when this happened, the geographical criterion or the precautionary principle were applied. This is due to the fact that information on whether the fish on the menu was farmed or caught is not available. For example, if a farmed fish species had the category "Best Choice" but the same species caught in the wild had the category "Good Alternative" it was registered in the reference list as the latter category due to the precautionary principle.

Fish and seafood were registered under the same category when all the lists matched. However, when the categorization of the guides did not match, it was necessary to choose only one of the options. This was the **third step** in the consolidation of the database. Again, the geographical scope and the precautionary principle were used to decide on how the species would be categorized. For instance, if the categorization differed between MBA, Greenpeace or EDF and MSC, then the categorization of the first two lists was registered in the database due to the geographical approach (North America). And if the categorization differed between EDF, MBA or Greenpeace, then the worst ranked species was selected due to the precautionary principle.

To illustrate the above, if the salmon was categorized by the MBA as "Avoid"; as "Good Alternative" by EDF and "Best Choice" by the MCS. The latter was first excluded due to geographical priorities. And because of the precautionary principle, the "Avoid" category was selected, which means that the salmon was registered in the reference list as "Avoid." It should be noted that some species have only been categorized by only one seafood guide, which is the case for the Queen conch.

Certain exceptions had to be made either to the seafood guides used as a reference, the registry of species found on the menus, the geographical approach, and the precautionary principle. These exceptions are Gulf Coney, Fish Roe, and Edible Jellyfish. Information about Gulf Coney was not found in any of the five seafood guides of reference. However, this species is categorized by IUCN as "least concern," so as an exception this species was included in the

database as "Good Alternative." Fish roe and edible jellyfish were excluded from the assessment because only one restaurant offers fish roe and only one offers jellyfish, and no specific information was found about them in the seafood guides.

Ecolabels

No specific reference list was created to evaluate this criterion. Eco-labels such as ASC or MSC, as well as other types such as community-based certifications, were sought instead.

Fish Bans

As previously mentioned, only the permanent bans established by SAGARPA & CONAPESCA (2018), in force during the implementation of this thesis, were taken as a reference to evaluate the environmental sustainability of the menus. These species are listed in Appendix D. While there are permanent bans applicable only to specific fishing areas in the country, it was assumed that the permanent bans are applicable to all fishing areas in Mexico. It is acknowledged that this may affect restaurants that obtain fish listed in permanent bans, but which do not come from restricted areas.

Importantly, two exceptions were made to the permanent fish bans, the first for shrimp and the second for Marlin. While varied species of shrimp are permanently banned, these refer to those caught mainly in the Yucatan Peninsula. However, for the purposes of this thesis, it is assumed that shrimp from Guadalajara's restaurants are either farmed or sourced from the Pacific, due to geographic proximity. As previously mentioned, for the purposes of this thesis, it is assumed that the Marlin offered in the sample restaurants is tuna. It is recognized, however, that some restaurants may actually be using Blue Marlin or other species of the family *Istiophoridae* or that they may source some of the shrimp they use from the Yucatan Peninsula.

Underutilized species

Considering that underutilized species are defined as those who have limited competitiveness with respect to mainstream fish species (Padulosi et al., 2011). And that although there are studies such as the one by Méndez, Fócil, & Sánchez (2016) that investigate the potential for exploitation of underutilized species such as the Devilfish (*Hypostomus plecostomus*) in Mexico. There is little information available in the country or at a regional level regarding which species have the potential for human consumption, but which are not an environmental, social, economic or marine biodiversity threat.

Therefore, for the purposes of this thesis, underutilized species of fish will be considered as those that are not among the 50 most produced species in the country according to CONAPESCA (2014). As well as those that are not part of the main groups of species in world trade in fish and fishery products according to FAO (2018a). These fish and seafood species are listed in Appendix E.

3.1.4 Scoring

In order to score the overall environmental sustainability of each of the menus, a scoring model was created (See Table 3-3) using as inspiration the Marine Conservation Society (2014) rating method and process. Points were assigned to each menu based on a) the percentage of fish and seafood offered by category: "Best Choice", "Good Alternative" or "Avoid"; b) the number of fish and seafood species offered in the menus that are certified; c) the number of fish species offered that are permanently banned and; d) the number of underutilized fish species offered. The addition or subtraction of the points gave the total score for each of the menus.

Through expert judgement, the scoring method consists of a scale of 16 to -4. This means that the highest possible score is 16 points. The highest score can, therefore, be obtained if a) between 100% of the species offered on the menu are considered "Best Choice" (+8 points); b) the menus offer at least one certified species (+4 points); c) at least one underutilized species is offered (+4); and d) there are no permanent banned species on the menu.

Conversely, the lowest possible score is -4. This will be the case for those menus with between 76 and 100% of species categorized as "Avoid" and no certified nor underutilized species on the menu; This is will also be the case for restaurants that offer at least one permanently banned species.

Table 3-3 - The scoring method used to assess the environmental sustainability of the menus

Score Card 1. Seafood Guides				
Best Choice Species				
Percentage of "Best Choice" species offered in the menu	**100 to 75%**	**74 to 50%**	**49 to 25%**	**24 to 10%**	**Less than 10%**
Allocated points	8	7	6	5	0
Good Alternative Species				
Percentage of "Good Alternative" species offered in the menu	**100 to 75%**	**74 to 50%**	**49 to 25%**	**24 to 10%**	**Less than 10%**
Allocated points	4	3	2	1	0
Avoid Species				
Percentage of "Avoid" species offered in the menu	**Between 10 to 25%**	**Between 26 to 50%**	**51% to 75%**	**76% to 100%**	
Allocated points	-1	-2	-3	-4	
Score Card 2. Ecolabels				
4 positive points are awarded to restaurants that offer at least one certified species and indicate this on their menus.				
Score Card 3. Fish Bans				
Default rating. A total score of -4 points, the lowest possible scoring, was automatically given to menus offering one or more permanently banned species				
Score Card 4. Underutilized Species				
4 positive points are given to restaurants that at least offer one underutilized species son their menus.				

Source: Created by the author

It is important to note that for the calculation of the total score, the points assigned for the first scorecard (Seafood Guides) were divided by the number of categories. In other words, the score obtained in the first category was divided by three when the restaurant offered "Best Choice," "Good Alternative" and "Avoid Species." By 2 if the restaurant only offered two of these categories and by 1 if only 1 option is offered. The reasoning behind it is that the scoring would be more equitable for restaurants depending on the type of species they offer.

The default scoring (-4) was assigned because the compliance to national regulations, in this case, the permanent bans established by SAGARPA & CONAPESCA (2018) is one of the minimum criteria that restaurants should follow to contribute to sustainable fishing.

Again, through expert judgement and considering that certification schemes are not in commonplace in emerging and developing economies like Mexico nor the underutilized species (Parkes et al., 2010; Pérez-Ramírez et al., 2015), it was decided to assign 4 points to restaurants with even just one of these species offered in the menu.

3.2 Content analysis of interviews

The menu assessment did not allow to understand the challenges and motivations restaurants face when trying to include environmentally sustainable fish species in their menus. In this sense, once the menu assessment was performed, and in order to consolidate a conceptual framework to answer the second research question, a literature review was conducted. For this purpose, a similar method to the one used for the menu assessment's literature review was followed. The databases Google Scholar and LUB Search were also utilized using search terms such as sustainable seafood in restaurants; green initiatives in restaurants, drivers and barriers; and sustainable seafood, challenges, and motivations. Other relevant literature was found by looking through the references cited in the articles that were found in the initial search. For this reason, and to a lesser extend grey literature was also included in the literature review.

The conceptual framework (section 2.6) resulting from the literature review served as a reference for the design and analysis of the interviews.

3.2.1 Sample Selection

Because this thesis has an exploratory sequential mixed method approach, Creswell (2014) states that the qualitative sampling should be purposeful sampling, in other words, it should consist of individuals that were part of the quantitative sample. Therefore, six restaurants that were part of the menu assessment were contacted. Only four of these restaurants were available for interviews. It was intended to include the perspective of restaurants that had good scoring results, but also of those that had regular and bad results and at least one that had the default rating. In other words, the restaurants contacted were chosen on the basis of quota sampling a type of purposive sample[4], which is when "the researcher decides the number of participants and which characteristics they need to possess" (Lopez & Whitehead, 2013 p.124). However, and as mentioned in section 1.3 the number of restaurants contacted and interviewed was limited, and this is recognized as a limitation of this research.

Interviews with experts were conducted in order to expand what was described in the literature review and to support the content of the restaurants' interviews. A snowball sampling was then used to identify experts. Nine experts were contacted, and seven of them were available for interviews.

The final list of interviewees can be found in Appendix F. As mentioned in section 1.4, the names of the interviewees and their organizations have remained anonymous.

3.2.2 Data Collection

Eleven semi-structured interviews were conducted. The interviews aimed to create a more in-depth understanding of what factors influence the adoption of environmentally sustainable fish in restaurants menus. Because semi-structured interviews allow for flexibility (Lopez & Whitehead, 2013), predominantly open-ended questions were used. Specific questions were also asked about the conceptual framework on drivers and barriers (section 2.6). Importantly, not all the interviews were the same and had to be adapted according to the background

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[4] This type of research happens when the researcher "sets out to find people who can and are willing to provide the information by virtue of knowledge or experience" (Tongco, 2007 p 147).

(restaurateur/expert) and the conversation flow with the interviewee. The interview guide used for the interviews can be found in Appendix H.

It is important to mention that in order to complement the findings of the first research question, during the interviews, interviewees were asked about their perception of the environmental sustainability of the fish offered in the restaurants of Guadalajara. No conceptual framework was followed for this question; the experts were merely asked for their opinion. Because this question was only addressed to experts, this is recognised as a limitation of the method as the research could have benefited from the inclusion of the restaurants' perspective on how sustainable their menu is.

All interviews were conducted in Spanish via video call or phone call, except three, for which written responses were provided. The quotations used in the interviews were therefore translated by the author of this thesis.

3.2.3 Data Analysis

The interviews were audiotaped and transcribed. The interviews' content was coded "using a combination of emerging and predetermined codes" (Creswell, 2014 p. 199). This means that an initial codebook was created prior to conducting the interviews based on the drivers and barriers' conceptual framework and was later developed or changed based on the interviews' analysis. The final codebook can be found in Appendix G; this includes the definitions and examples of quotes that were used for each of the codes. The codebook and the use of NVivo as a coding software allowed a systematized and reliable coding process that can be followed by other researchers.

3.3 Data validation

The triangulation of data was the strategy used to assure the validity of the results (6 & Bellamy, 2012; Creswell, 2014). In other words, the qualitative and quantitative methods were converged to find evidence from the different sources of information in order to ensure findings' accuracy and coherence (Creswell, 2014).

4 FINDINGS

4.1 Findings on the environmental sustainability of menus

In this section, the results obtained from the menu assessment are presented. The menus of 40 restaurants were scrutinized to identify the type of fish and seafood they offer on their menus and to evaluate their environmental sustainability based on the reference seafood guides' fish standards ("Best Choice," "Good Alternative," and "Avoid"); the fish bans; and underutilized species (See Appendices C, D and E). The menu assessment also considered the inclusion of certified species in the menus. This section presents the overall scoring that the sample menus received based on the scoring method established in section 3.1.4.

4.1.1 Fish species identified in the menus

Thirty-six groups of fish and seafood species were identified on the menus of restaurants in Guadalajara. On average, the restaurants in Guadalajara offer around 8 different species of fish and seafood. The restaurant with the greatest variety of these offers 16 different species, and the restaurant with the least variety only offers 3 different species of fish and seafood.

The most commonly offered species are octopus (offered in 36 of the 40 restaurants analysed); the various species of shrimp (used in 36 of the restaurants); clams (offered in 26 restaurants); Marlin[5] (used in 21 restaurants); Blue crab and salmon (used in 16 restaurants respectively). Based on the seafood guides taken as a reference, it was identified that the six most commonly offered fish species in the restaurants of Guadalajara, four are categorized as "Avoid" options. However, the Blue crab and two of the species of shrimp (brown and white) are considered "Good Alternatives" species. Only the clams are considered as "Best Choice" options.

Not so commonly offered species in the menus (i.e., found only in one menu), include the Abalone, the Atlantic cod, the European anchovies, the Freshwater eels, the Grouper, and the Yellowtail amberjack. Of these six species three are categorised as "Avoid," and two are categorised as "Good Alternative" options. Only the Abalone is considered a "Best Choice" alternative.

Figure 4-1shows the rest of the identified species offered in the menus of restaurants in Guadalajara.

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[5] Smoked marlin, usually yellowfin tuna.
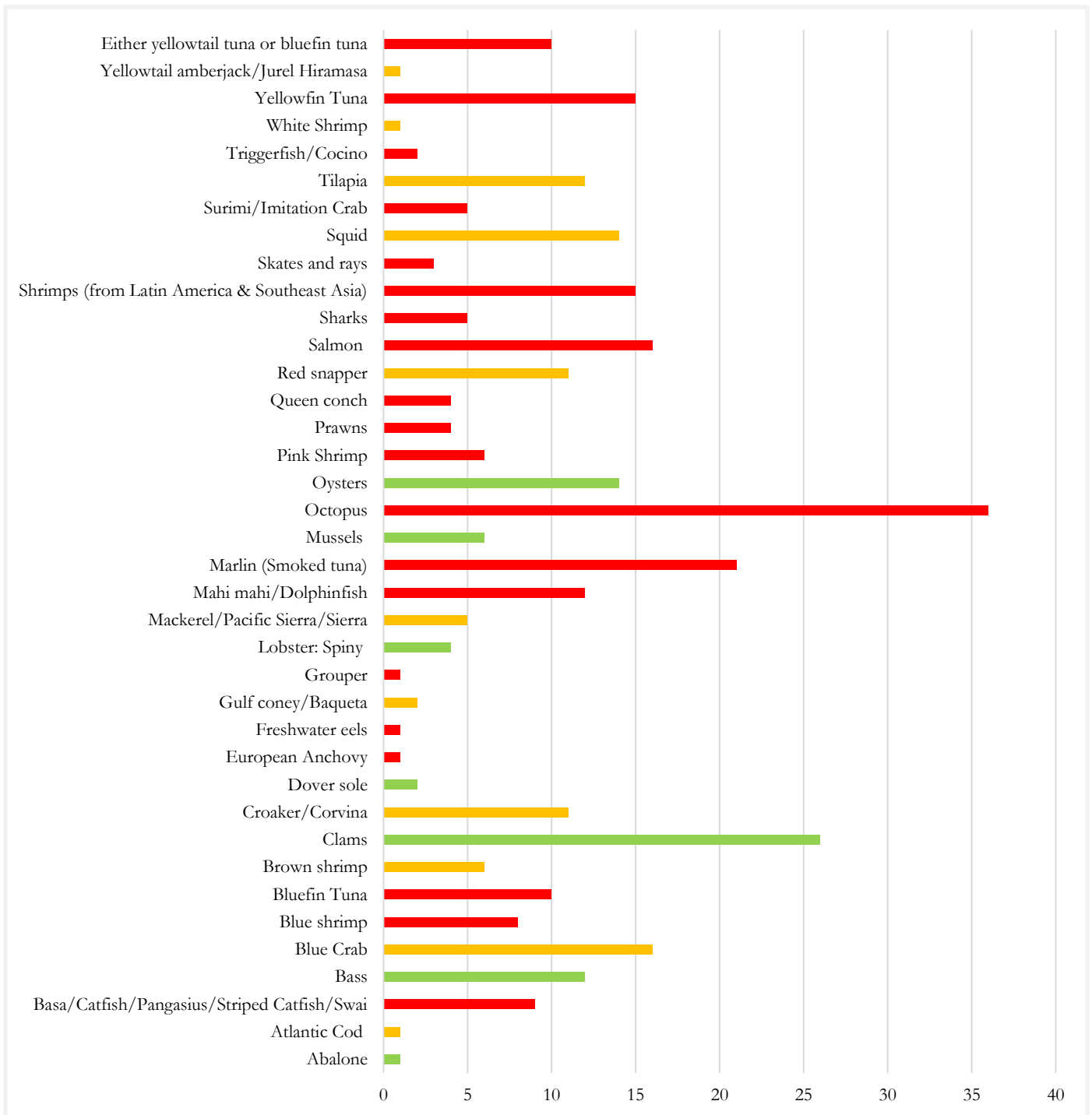
Figure 4-1. Species of fish and seafood offered in restaurants in Guadalajara, 2018.

Red bars indicate the species categorized as "Avoid." Yellow bars indicate the "Good Alternative" species and the "Best Choice" species are indicated by the green colour.
Source: Created by the author

4.1.2 Percentage of the fish and seafood species offered in restaurants, by category: Best Choice, Good Alternative and Avoid.

As shown in Figure 4-2, of the 36 group of fish species offered in the restaurant menus, 50% are not environmentally sustainable options (n=18). Only 31% of the species are listed as "Good Alternative" options (n=11), and only 19% of the species are considered as "Best Choice" options (n=7).
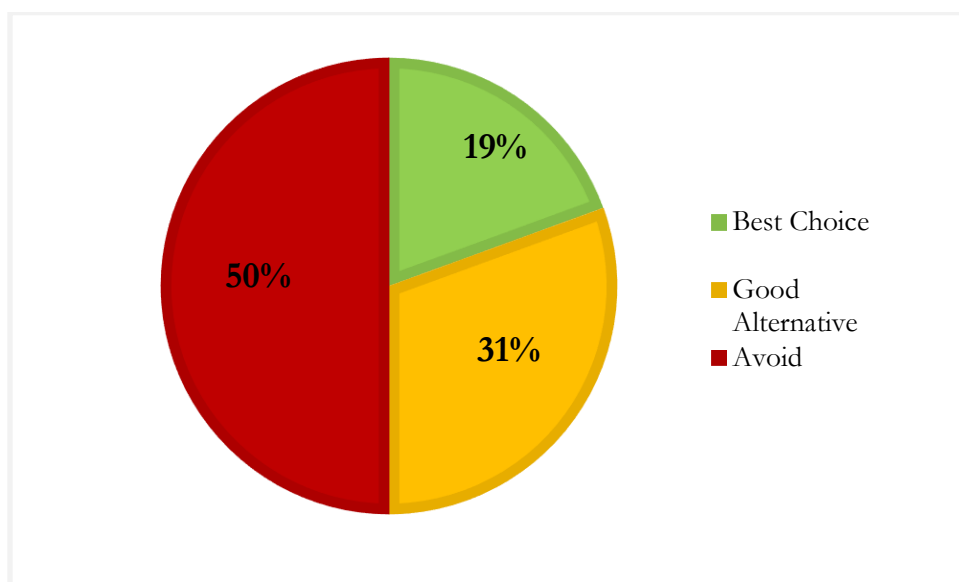
Figure 4-2. Species of fish and seafood offered in restaurants in Guadalajara by environmental sustainability category: "Best Choice," "Good Alternative" and "Avoid" 2018.
Source: Created by the author

4.1.3 Certified fish species in the menus

No ecolabels from certifiers such as ASC or MSC, nor community-based certifications, were found on the scrutinized menus.

4.1.4 Permanently banned fish species in the menus

Of the 17 groups of permanently banned fish and seafood species, irrespective of the exceptions (see section 3.1.3), two were found on the menus. These being: Queen conch and Manta rays.

Queen conch is offered by 4 restaurants (10% of the menus), and Manta rays were found in 3 restaurants, that is in 7.5% of the total menus. There were no cases of restaurants offering both banned species.

4.1.5 Number of underutilized species in the menus

When a comparison was made between the species offered in the sample menus and the most produced fish species in Mexico and most commonly traded worldwide (see Appendix E), all the species offered, matched those included in this list. Except for three species: Mahi-mahi, Triggerfish and Freshwater eels. However, no positive scores were given to the menus that offered them, as these three species are considered to be "Avoid" options by the seafood guides.

In other words, it is not coherent to award points to these three species as the promotion of underutilized species does not aim to reduce pressure on commercialized fish by generating secondary negative environmental impacts. Therefore, no restaurant in Guadalajara offers or includes underutilized species in its menus.

4.1.6 Overall environmental sustainability of the menus

Based on the scoring method (see section 3.1.4), the 40 scrutinized menus were evaluated. The highest possible score was equivalent to 16 points, and the lowest possible score possible was -4. The scoring results on the environmental sustainability of the menus are shown in Figure 4-3, below. The bars in this figure were colour coded as shown in Table 4-1.

Table 4-1. Colours used for coding the overall scoring of the menus

Score	Colour -coding
Between 16 to 12.1 points	Blue
Between 12 to 8.1 points	Dark Green
Between 8 to 4.1 points	Light Green
Between 4 to 1.1 points	Yellow
Between 1 and -0.9	Orange
Between -1 and -2.9	Light Red
Between -3 and -4	Dark Red
Default scoring: -4 points	Grey

Source: Created by the author
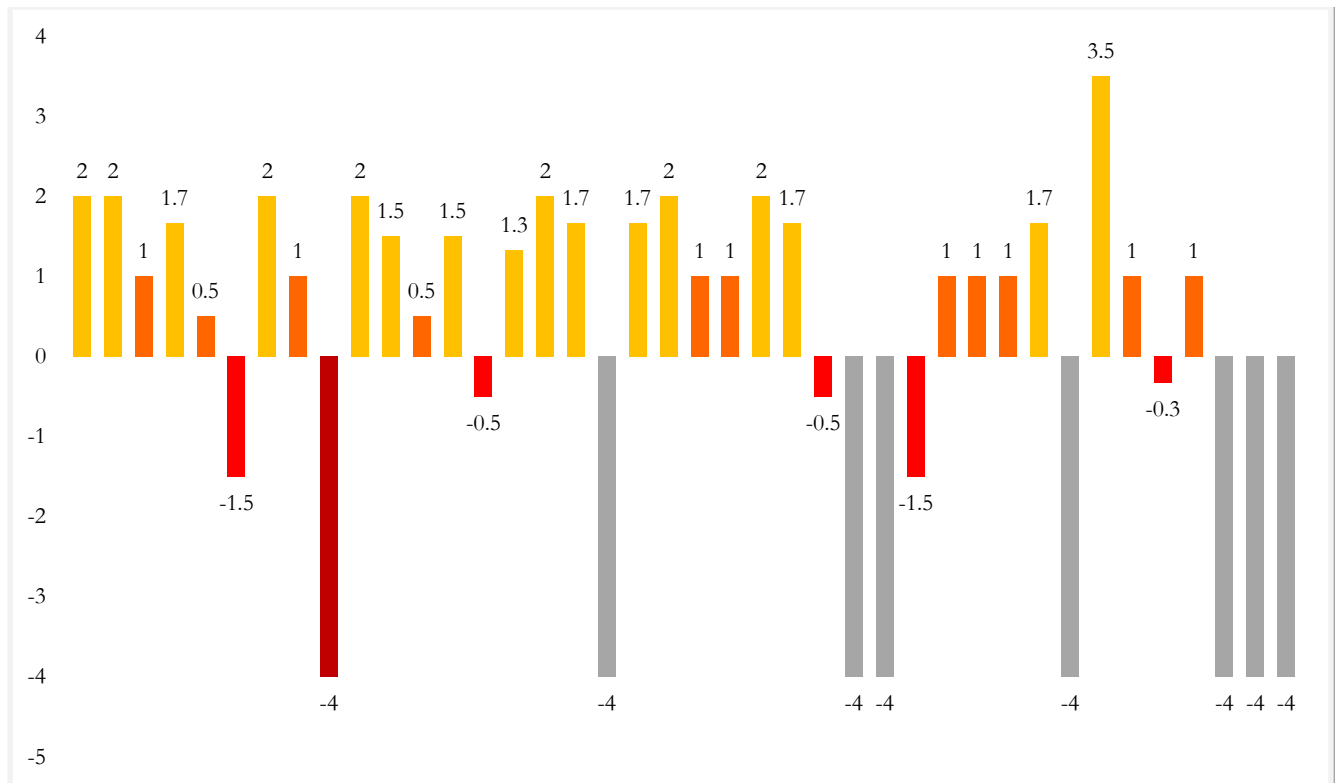
Figure 4-3. Scoring results of the environmental sustainability of restaurant menus in Guadalajara
Source: Created by the author

As shown in figure 4-3, the restaurant with the highest score reached 3.5 points, which means that no restaurant scored the highest possible score (16). Of the 40 analysed menus, 7 had the default rating as these restaurants include in their menus permanently banned species. One restaurant also received -4 points, as 100% of the fish species in its menu are categorised as "Avoid."

The restaurant with the highest score has a menu with 75% of fish species categorized as "Best Choice." This restaurant offers 4 different species of fish and seafood, two of which are clams and oysters ("Best Choice" species). In addition, the restaurant with the most "Good Alternative" species offers only 50% of these on its menu.

It was also found that besides the menu with 100% of the species offered categorized as "Avoid," seven other restaurants have at least 70% of "Avoid" options on their menus. These restaurants offer between 10 and 5 different species of seafood that match the species most commonly offered by restaurants in Guadalajara, namely octopus, shrimp, and tuna.

4.1.7 Interviewees' perceptions of how environmentally sustainable the fish offered on the menus are

As noted in section 3.2.2, in order to complement the menu assessment's findings, the interviewed experts were asked about their perception of the environmental sustainability of the fish offered in the menus. In general, all the experts interviewed mentioned that the probability that the fish offered in restaurants in Guadalajara is sustainable is low. Indeed, I4 and I5 mentioned that it is improbable that fish offered in restaurants is environmentally sustainable. As described by I4 "from what I know, from what I've seen of fisheries, I think it's unlikely you're eating a fish that was caught responsibly." I3 & I7 mentioned that despite this, initiatives and policies are emerging to make fish more sustainable, i.e., "work is in progress" (I7).

Other interviewees stated that there is no way of knowing whether the fish offered in restaurants is environmentally sustainable or not, there is no information (I1, I4, I6 & I11). The following quotes exemplify this: "I can't tell you they're sustainable like I can't tell you they're not. You can't really prove it, we all run that risk (I11);" and "I think it's hard to know. For many restaurants and consumers, there is no way to know where the fish comes from if it is legal or not. But in general terms, I believe that fish in restaurants is not environmentally sustainable. If fisheries management has struggled to be sustainable, consumption is much further away (I6)."

4.1.8 Summary of the Menu Assessment Results

In summary, of the 36 group of fish species most commonly offered in Guadalajara restaurants, 50% are considered environmentally unsustainable. Moreover, on average, restaurants in Guadalajara offer almost 60% "Avoid" species on their menus and only 23% "Good Alternative" and 19% "Best choice species." No eco-label or environmental sustainability certificate was found on the menus. Neither were species considered as underutilized found in the menus. Moreover, of the 17 permanently banned groups of fish species, two are offered in some of the seafood restaurants in Guadalajara. Finally, the interviewees stated that the probability that the fish offered in the restaurants of Guadalajara is environmentally sustainable is very low.

4.2 Findings on drivers and barriers to including sustainable seafood choices in restaurants menus

In section 2.6 the conceptual framework for drivers and barriers that restaurants face when trying to adopt sustainability in their menus was presented. These were categorized into internal and external factors (regulatory, resource, market and social factors). This section presents the internal and external drivers and barriers that were confirmed during the interviews as well as the additional identified barriers. The analysis of the qualitative results is presented in section 5.2.

4.2.1 Internal factors

Three out of eleven interviewees (I1, I8 & I11) mentioned that the commitment of the chef and the restaurant owner is a driver for adopting sustainability in the menu. Only two of the eleven interviewees (I1 & I4) spoke about the importance of staff involvement, mainly in terms of sharing information regarding the origin and production of fish to the consumer. However, they mention this to be a barrier instead of a driver. In other words, the current lack of staff participation in sustainability issues is an impediment to the adoption and consumption of sustainable fish in restaurants (I1 & I4).

In addition, most of the interviewees (all except I7) indicated that food quality, taste, and freshness is a key driver in the selection of fish and seafood in restaurants. Three interviewees (I1, I3 & I4) linked quality with sustainability. In other words, they indicated that a high-quality fish is likely to have been farmed or caught in a way that has a less environmental impact. For instance, I4 stated "they are buying quality, and when you buy quality the fish production is more meticulous because they are paying more. So, this fish is more likely to be responsible." However, another of the interviewees noted that while quality can be linked to sustainability, "generally they (restaurants) are not interested in making fish sustainable, they simply want the product in the quantity and quality they need" (I6).

A few interviewees (I3 & I10) mentioned that the fact that the product is local or national is a driver for restaurants' selection of fish. One of the interviewees (I3) stated that "local products are preferred, as they encourage the economy of the region and at the same time, they (restaurants) are obtaining fresher products at a lower price."

Creativity in the kitchen was also acknowledged to be a driver for including sustainable fish or underutilized species on the menu by two interviewees (I9 & I11). In words of I9 "it limits our offer to the client a bit (referring to sustainable fish), but at the same time it also makes us creative by looking for other options in our menu."

Most of the interviewees (except I9) confirmed that costs constitute a significant barrier to including sustainable fish in their menus. In the words of I3 "as a restaurant, you are looking for the best product at the lowest cost, without sacrificing quality of course." Moreover, three of the interviewees (I4, I6 & I7) pointed out that precisely the high costs of certifications such as MSC are one of the significant challenges for which these are not commonly used in Mexico.

The restaurants' lack of knowledge and expertise on sustainable fishing or on the procurement of sustainable products, was also confirmed by most of the interviewees (I3, I5, I6, I7, I8, I10, I11, and I12). For instance, two of the restaurants interviewed stated: "I certainly do not know what the term environmentally friendly might be or what it means" (I2); and "I don't have the knowledge nor the skills to choose or to know which fish or fishing technique is better for the environment. Nor am I aware of the certifications that exist, it is our intention, but we have not done it..." (I8).

Awareness or concern for the environment was also mentioned by seven interviewees (I1, I3, I5, I6, I8, I9 and I11). However, most of them did not refer to this topic as a barrier but instead as a driver for the inclusion of sustainable fish in the menu. In other words, the interviewees stated that restaurateurs' concern for the environment and their commitment to being socially responsible businesses motivate them to obtain sustainable ingredients. On this point, I1 mentioned that "the reasons why restaurants get involved is because it's incredible to take care of the environment! The story, knowing exactly where their fish comes from, that motivates them a lot."

Finally, few interviewees (I5, I8 & I11) recognized that the operational activities of restaurants are demanding and that this prevents them from seeking and understanding the information they are receiving from different stakeholders on sustainable fishing. One of the restaurants pointed: "Surely there are species that should not be commercialized during certain seasons as these are banned. And I know that it is information can be found, but with the daily restaurant operations, this is difficult to do" (I8).

4.2.2 External factors

Regulatory factors

Five interviewees (IE, I5, I6 I7, I11) mentioned the importance of government support as a driver for the adoption of sustainable fish in restaurants. However, seven interviewees (I3, I4, I5, I6, I7, I8 & I11) highlighted the lack of government support as an important barrier for restaurants to have the possibility to offer sustainable fish. In this regard, interviewees pointed out that corruption, lack of inter-institutional coordination, the absence of reliable information records, as well as insufficient surveillance in production and distribution centres as well as in restaurants are significant challenges for the supply of sustainable fish. For example, interviewees noted that "We already know that many of the notice of arrivals are forged, and those are the ones the government is using to make their studies and policy proposals (I4); "The law is supposed to penalize, but the businesses (referring to the restaurants) are still running" (I3); and "there is very little capacity in the government to do inspection and surveillance, it is almost non-existent" (I6).

Resource factors

None of the interviewees mentioned that pressure from investors to increase financial investment was a driver for adopting sustainable fish on their menus, nor was it a barrier. Few interviewees (I4, I6 & I11) mentioned that brand reputation is one of the drivers for including sustainable fish in the menu. Furthermore, with the response of eight of the interviewees (I2, I3, I4, I7, I8, I9, I10 & I11) it was confirmed that gaining competitive advantage and differentiation are key drivers for the adoption of sustainable fish in the menu.

Six of the interviewees (I1, I2, I3, I6, I8 & I11) acknowledged that the lack of product availability and supply constitute a significant challenge. For instance, two of the interviewed restaurants (I2 &I8) stated that one of their main challenges in the adoption of sustainable fish is "the lack of suppliers" (I8). The seafood supplier interviewed also pointed out that one of their main challenges is that they do not have much variety (of fish) and that "the customer may get bored" (I1). Two other interviewees (I11 & I6) stated that the Mexican government launched a campaign to promote the sustainable consumption of seafood called "Fishing for the Future" however, I11 said "how are you going to create a movement, if you really don't know if sustainable fishing exists in Mexico …. why do you create a demand for a product that doesn't exist? In this regard, I6 also pointed out that thanks to the campaign "there was more demand and more consumption of fish, but that did not mean that the supply came from fishermen who were managing the fisheries correctly."

In addition, during the interviews, it was not acknowledged that the local climate was a constraint to the provision of sustainable fish. However, some interviewees (I3, I5, I6 & I11) mentioned that restaurants do adapt their menus according to the seasonality of the products. For example, by having a "catch of the day " menu (I11). Hence, the seasonality was perceived by the interviewees as a driver and not as a barrier.

The relationship with the supplier as a challenge for the inclusion of sustainable fish in the menu was not mentioned during the interviews.

One of the challenges that were mentioned continuously by ten of the interviewees (I1, I2, I3, I4, I5, I6, I7, I8, I10 & I11) relates to the lack of communication and information flows from producer to restaurant or product traceability. Only 1 restaurant (I9) stated: "not only is it possible (to obtain product information), but it is an obligation on the supplier to provide it" (I9). On the other hand, another of the restaurateurs stated, "the information that I have (about the fish) has never seemed very reliable to me, so I get confused" (I8). Another of the interviewees also stated, "The information is lost; the information is increasingly degraded, and no record is kept of it…. from the fisherman to the transporter, to the wholesaler and so on" (I5).

Market factors

Most interviewees (I1, I2, I3, I4, I5, I7, I8, I9, I11) say that consumer demand for sustainable products is indeed an opportunity for restaurants to adopt sustainable fish. Some said that, although demand is not entirely in place, it is starting to grow in Guadalajara (I5, I7, I9, I11). One of the interviewees stated: "There are already diners who are concerned about the environment…. (restaurants) must listen to these opinions and adjust the menu to what the customer is asking for. If, as a restaurant, you ignore these suggestions, you won't be able to operate for a long time" (I3).

Only one interviewee mentioned the voluntary industry agreements (I1) as a driver. She mentioned that although there are challenges of collaborating to promote sustainable fishing, at least two multi-stakeholder organizations have emerged in Mexico which seek to promote

sustainable fisheries. Regarding certification schemes, interviewees (I1, I3, I6 & I11) stated that these are uncommon due to its high costs. No specific sustainable standard for the Mexican context was mentioned.

Most of the interviewees (I1, I4, I7, I3, I5, I2, I11, I6, I8) indicated that the price of sustainable fish is a major barrier to the final consumer and therefore a barrier to the inclusion of this type of fish in the menu. In the words of one of the restaurateurs, "for example, we now sell the aguachile[6] for $120 MXN, but if it goes up to $200 MXN or $220 MXN then my clients would say: it's cool that I have less impact, but I only have $120 MXN" (I8).

In four interviews ecolabels were mentioned (I1, I3, I6 & I11). Respondents pointed out that too many eco-labels are not a challenge, on the contrary, the problem is that they are uncommon. Two interviewees indicated (I1 & I11) that even though some restaurants offer one or two certified fish species, they do not indicate this certification on the menu. This "so as not to put the other dishes at a disadvantage' (I11).

Social factors

No interviewees referred to pressure from consumers, NGOs, media and academia as a driver nor as a barrier to the adoption of sustainable fish.

The majority of respondents (I1, I2, I3, I4, I5, I6, I8, I9 & I10) said that the consumer is still uninformed or unaware of the problem behind the fish on their plate and that it is, therefore, a challenge for restaurants. For instance, one of the restaurateurs stated: "Here in Mexico and particularly in Guadalajara, I think we still don't have much of a sustainable product culture, we are governed by quality, price, and availability" (I2).

Only one of the interviewees mentioned that consumer discomfort from the absence of traditional or unsustainable products on the menu is a barrier to including sustainable fish in restaurants (I3). In her own words, "if a person goes to a restaurant because they like a certain dish and suddenly that dish no longer exists, the customer may get angry and stop going, which is bad for the restaurant."

4.2.3 Additional identified barriers

Six additional barriers were identified based on the interviews, which do not fit with the analytical framework. These are described below.

Restaurants' administrative processes

One of the interviewees (I11) indicated that a factor that hinders producers of sustainable fish to sell the product to restaurants is related to restaurants' bureaucratic administrative processes. According to the interviewee, restaurants pay within 20 to 30 days after receiving the product which is a significant inconvenient for fish producers, farmers, and wholesalers.

Infrastructure

Five interviewees (I1, I4, I5, I6 & I7) noted that those who produce or supply sustainable fish in Mexico do not have the infrastructure or technology necessary to reach potential buyers such as restaurants. According to the fish supplier interviewed (I1): "The infrastructure restricts considerably where our product can be commercialized, and we do not have enough infrastructure." The interviewees also mentioned that sometimes, due to infrastructure issues, it

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[6] Typical Mexican dish that has shrimp, fresh chili, lemon, cucumber and onion.

is easier to deliver fish caught in Baja California or other northern Mexican states to the United States than to Guadalajara or Mexico City.

Producer informality

Other interviewees (I1, I4 & I6) mentioned that a challenge for the inclusion of sustainable fish in restaurants and other food businesses is that small-scale fishermen, who are more likely to have a lower environmental impact and offer this type of fish, tend to be informal. In other words, small-scale fishers tend to not meet the expected quantities and delivery dates of their potential buyers, causing their buyers to replace them with more reliable suppliers.

Fishermen's economic needs.

Moreover, two interviewees (I4 & I7) mentioned that a challenge in the provision of sustainable fish is linked to the economic needs of fishers, especially small-scale fisherman an important provider of sustainable fish. Although they are aware of their impact on the environment when fishing, at times, they adopt unsustainable practices to keep producing as the income they receive from fisheries is meager. This situation reduces the chances of restaurants to obtain sustainable fish.

Export of sustainable Mexican fish

An additional barrier identified through the interviews (I4, I6 & I7) is the fact that most of the sustainable fish in Mexico is exported, mostly to the United States, which limits the possibility of restaurants in Guadalajara to find sustainable fish. According to the interviewees, one factor influencing this is the fact that foreign buyers bear the high costs of the product and demand larger quantities than do small businesses such as restaurants. Regarding this, one interviewee (I4) stated: "The NGOs that are working on this issue do not want sustainable fishing to focus on exports because Mexicans also deserve access to responsible fishing."

Indistinct use of the types of Fishery Improvement Projects (FIP)

Finally, two interviewees (I7 & I11) mentioned that one of the problems in ensuring the environmental sustainability of fish produced and offered in Mexico is related to the FIPs. According to the interviewees, some fish buyers are satisfied with producers having a FIP without checking whether the FIP is exhaustive[7], basic[8] or prospective, misusing it as a quality assurance scheme. Because of this, the interviewees pointed out that having a FIP itself "does not guarantee the sustainability of the fish" (I11) especially if the fish comes from a primary or prospective FIP. Interviewees pointed out that this happens because ecolabels are not common in Mexico and are expensive and this is an alternative created by the big buyers (e.g., wholesalers) as a proxy to measure the sustainability of fish. According to the interviewees, this situation prevents actors such as restaurants from being able to distinguish a sustainable fish from one that is not.

4.2.4 Summary of the results on drivers and barriers

Almost all the drivers and barriers stated in the conceptual framework were confirmed by the interviewees, except for two drivers and two barriers. The unconfirmed drivers are discussed in section 5.2. Moreover, additional barriers were identified during the interviews that do not fit into the analytical framework applied, these being restaurants' administrative processes,

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7 "Addresses a comprehensive spectrum of environmental issues required for a fishery to achieve a high level of sustainability" (Conservation Alliance for Seafood Solutions, 2015 p. 9) and be certified.

8 "Entry point for fisheries that are beginning to address environmental issues" (Conservation Alliance for Seafood Solutions, 2015 p. 9)

infrastructure, economic needs of fishermen, export of Mexican sustainable fish and, indistinct use of the types of FIPs. These barriers are also discussed in section 5.2.

5 DISCUSSION AND ANALYSIS

The purpose of this chapter is to increase the understanding of both the quantitative and the qualitative findings of this research as well as to discuss them based on the literature presented in chapter 2. This chapter also discusses some of the research limitations, contributions and provides recommendations for future research.

5.1 Environmental sustainability of the fish offered in restaurants in Guadalajara

The presence of environmentally sustainable fish in the restaurant menus of Guadalajara is not a common practice. One of the findings that support this is the fact that of the 36 group of fish species offered in the restaurant menus, 50% are categorized as "Avoid" species by seafood guides. Conversely, only 19% of the offered species are considered "Best choice" options. In comparison, Klein & Ferrari (2015), using the MCS seafood guide as a reference, found that only 24% of the offered species in the menus of ocean conservation conventions in Australia are not environmentally sustainable and that 17% of the offered species were "Best Choice" options. Klein and Ferrari's suggestions for reducing the number of "Avoid" species offered are in line with overcoming two of the barriers identified in the literature consulted and confirmed during the interviews. These being: restaurants' limited knowledge and expertise as well as lack of availability of supply. In addition, the fact that sustainable and certified fish (e.g., spiny lobster), tends to be exported to the US due to their high costs, may be one of the reasons for which the "Best choice" options are not commonly offered in the scrutinized menus.

One other point that indicates that the fish and seafood offered in restaurants in Guadalajara are not environmentally sustainable is that eco-labels were not found on the menus. In accordance with Parkes et al. (2010) and the interviewees' statements (I4, I6 & I7), the absence of eco-labels in the menus of restaurants in Guadalajara is related to their high costs. This issue is in line with what Pérez-Ramírez, Castrejón, Gutiérrez, & Defeo (2015) found on their research, only 4% of the fish species certified worldwide are in developing or emerging countries like Mexico. However, it is important to mention that some interviewees (I1 & I11) pointed out that some restaurants do have some certified fish but do not indicate this on the menu. The reason behind this is for not put the other products at a disadvantage or confuse the consumer.

Despite the important role that restaurants play in the promotion of underutilized species, as the literature indicates (Jeff Gordinier, 2015; Morris, 2012), no restaurant in Guadalajara offers or includes underutilized species in its menus. One interviewee (I3) pointed out that the lack of underutilized species in the menus may be related to the barrier "consumer discomfort when the products they expect to see are not in the menu" and to the fact that consumer is not used to this species. However, the literature indicates that is easy to include underutilized species to Mexican seafood dishes like tacos as the fish only needs to be fried and wrapped in a tortilla, which makes it difficult for the consumer to distinguish the type of fish species used (Jeff Gordinier, 2015). Additionally, the literature also indicates that the inclusion of underutilized species can make the kitchen more creative, but this may not be a strong driver for restaurants to adopt these species. After all, only two interviewees (I9 & I11) mentioned this to be an important driver for restaurants.

The fact that 17.5% of sample restaurants received the default rating, as these include in their menus permanently banned species, also supports claiming that the environmental sustainability of fish offered in restaurants in Guadalajara is poor. This finding mirror two of the main challenges of Mexican fisheries identified in the literature: limited enforcement and illegal fishing. According to the literature, illegal fishing represents between 40-60% of reported landings in Mexico (Cisneros-Montemayor, Cisneros-Mata, Harper, & Pauly, 2013; Mangin et

al., 2018). Thereunder, interviewees confirmed that the lack of government support is a significant barrier and it may be related to the fact that there are banned species in the menus. Moreover, twelve species of sea turtles are permanently banned, and through the menu assessment, they were not found to be offered in the restaurants. However, one of the interviewees (I3) pointed out that there are restaurants that still offer them, and even though they do not mention it on the menu, as these species are permanently banned, the restaurant staff is the one who lets the consumer know that these species are available.

Finally, the scoring of the overall environmental sustainability of the menus also demonstrates that the environmental sustainability of fish offered in restaurants is low. The findings show that no restaurant reached the highest possible score (16 points). In fact, the menu with the highest score only reached 3.5 points. In addition, 32.5% of the menus received a negative score, and eight of them received the lowest possible score (-4). The overall results of the menus' environmental sustainability scoring were in line with the experts' opinions, who considered that the chances of fish offered in restaurants being sustainable are very low. The menu assessment results may also be closely related to the barriers identified by the literature and confirmed by the interviewees discussed in the section below.

5.2 Factors influencing the inclusion of sustainable fish species in the menus

The interviews confirmed that the drivers and barriers faced by restaurants in Mexico when including sustainable fish match those identified in the literature (Section 2.6). Except for two drivers and two barriers, which were not mentioned during the interviews. The barriers being the relationship with the supplier and lack of pressure from consumers, NGOs, media and academia; and the drivers, pressure from investors to increase investment returns and pressure from consumers, NGOs, media and academia. Section 5.3.2.1.2 provides a retrospective analysis of some of the possible reasons why these issues were not raised during the interviews.

Additionally, Table 5-1, at the end of this subchapter, summarizes the unconfirmed drivers and barriers together with those that were confirmed during the interviews based on the analytical framework as well as the additionally identified barriers.

5.2.1 Main drivers and barriers

The drivers that were highlighted by most of the interviewees (i.e., between nine and eleven of them) are two. The first is "food quality, taste, and freshness," this driver was confirmed by all the interviewees, except for I7, and it is also a well-known and well-documented driver identified by the literature (Curtis & Cowee, 2009; Glazer, 2012; Lawley & Howieson, 2015; Thomas & Mills, 2006) as these characteristics are crucial factors for restaurants when selecting ingredients for their menus. Therefore, for environmentally sustainable fish to be included in the menu, it must also be fresh, flavorful and of excellent quality. Interestingly, some interviewees (I1, I3 & I4) mentioned that quality tends to go hand in hand with sustainability. According to the interviewees, catching and farming practices with low environmental impact, tend to be more caring and produce healthier, quality fish.

Consumer demand for green products is the second driver that was identified both by the literature and by the majority of the interviewees (I1, I2, I3, I4, I5, I7, I8, I9, I11). Importantly, the interviewees mentioned that the consumer demand is not entirely in place in Guadalajara. One of the reasons for this, according to the interviewees, is because the Mexican consumer is in general, unaware of the environmental problems behind the fish on their plate. In other words, the insufficient consumer awareness, a social factor, was recognized by most of the interviewees as a significant barrier to the inclusion of sustainable fish in the restaurant's menu.

Consumer low willingness to pay, costs and lack of communication flow between suppliers and restaurants are three other barriers identified by the literature and reaffirmed by the majority of the interviewees. The interviewees (I1, I4, I7, I3, I5, I2, I11, I6, I8) confirmed that the fact that the consumer is not willing to pay much is one of the barriers for including sustainable fish in the menu. Regarding costs, the literature states that profits from fish are low and therefore costs are a relevant factor in the acquisition of fish in restaurants (Dolmage et al., 2016), interviewees agreed with this (all except I9).

Interestingly, the lack of communication flows was the only resource barrier mentioned by most of the interviewees (I1, I2, I3, I4, I5, I6, I7, I8, I10 & I11). The interviewees confirmed what is stated in the literature, food supply is extremely complex (Chkanikova & Mont, 2015; Lawley & Howieson, 2015) and restaurants in Guadalajara highly depend on the supplier to obtain information on product's method and place of production or capture, quality, and sustainability. However, in some cases, based on the interviews it was found that the supplier is not able to provide this information, or the restaurateur perceives the information to be unreliable or confusing.

The factors least mentioned by the interviewees (i.e., only by one or two of them) are mostly internal drivers (employee connectedness, the origin of the ingredients and creativity in the kitchen). Similarly, only one interviewee (I1) mentioned industrial agreements as a market driver for adopting sustainable fish in the menu. Likewise, only one interviewee (I3) mentioned that consumer discomfort for not finding traditional or unsustainable products on the menu was a barrier for the adoption of sustainable fish in the menus. The fact that these factors have been scarcely mentioned does not mean that they are not relevant. However, due to the scope of this research, the reasons why these factors were not mentioned frequently by the interviewees are uncertain. Despite this, section 5.3.2.1.2 provides a hindsight analysis of some of the possible reasons why these issues were scarcely mentioned during the interviews.

It is worth mentioning that the conceptual framework for drivers and barriers refers to some factors as drivers, however, in some cases, these were identified as barriers to interviewees or vice versa. Employee connectedness is one of these cases, it was perceived as a barrier for the interviewees and not as a driver as identified in the literature, as according to the interviewees (I1 & I4) the staff in restaurants in Mexico are generally unaware of essential characteristics of the product they offer. Furthermore, two factors were identified as a driver for the interviewees instead of as a barrier as stated in the literature, those being: concern for the environment, and local climate & season availability. Finally, the fact that many ecolabels can confuse the consumer was mentioned during the interviews however it was not considered a barrier nor as a driver.

The abovementioned may have occurred due to the particularities of the Mexican fishing sector. For instance, local climate and season availability are indicated in the literature as barriers (Curtis & Cowee, 2009). However, the interviewees mentioned that this is not the case in Mexico, as the climate conditions and the country's marine biodiversity are an opportunity for restaurants to offer different species of fish in their menu and adapt to seasonal products. Interestingly and as previously mentioned, the fact that underutilized species were not listed in the menus may serve to indicate that restaurants are currently not taking advantage of this opportunity. Moreover, the consulted literature indicates that chefs' lack of awareness or concern for the environment tends to be a barrier in the inclusion of sustainable ingredients in restaurants menus (Dolmage et al., 2016; Kasim & Ismail, 2012; Lawley & Howieson, 2015). However, interviewees, particularly the interviewed fish supplier (I1), indicated that chefs' concern for the environment is an important driver that helps the restauranteur to deal with other barriers of including sustainable fish in their menu. However, the fact that restaurants' lack of knowledge

and expertise on sustainable fishing or on the procurement of sustainable products, was confirmed by most of the interviewees may serve to indicate that this is not a common situation for restaurants in Guadalajara. Finally, because eco-labels are not common in Mexico, mainly due to their high costs, the fact that too many ecolabels can confuse the consumer was not considered to be a driver nor a barrier by the interviewees (I1, I3, I6 & I11).

5.2.2 Additional identified barriers

As mentioned in section 4.2.3, during the interviews, additional barriers that do not fit with the analytical framework were identified. These being restaurants' administrative processes, infrastructure, producer informality, fishers' economic needs, export of Mexican sustainable fish, and indistinct use of the types of Fishery Improvement Project (FIP). Based on the conceptual framework it is considered that the first barrier can be considered as an internal barrier, while the following four barriers can be considered external barriers, specifically resource factors barriers as they are interrelated to the lack of availability or supply of the product. However, the latter (indistinctive use of the types of FIPs) can be considered a market factor barrier as it can be related to voluntary agreements and certification schemes within the industry.

Some of the additional barriers are in line with the challenges of Mexican fisheries identified in the literature (section 2.1.2). Namely, the fact that the small producer chooses unsustainable practices because the income received from the caught fish is minimal can be a consequence of fishing strategies in Mexico that promote and emphasize the harvest volume rather than the harvest value of the fish. These strategies have caused Mexican fisheries to have 80% less added value than the global average (Cisneros-Montemayor et al., 2013; Mangin et al., 2018). This factor, therefore, increases the supply of unsustainable fish, reducing restaurants' options for obtaining environmentally sustainable fish.

Moreover, the results of the study by Pedroza-Gutiérrez & Hernández (2017) are in line with the administrative process barrier. Their study found that the wholesalers of the Mercado del Mar of Guadalajara prefer not to do business with restaurants because they take too long to pay. This issue indicates that if restaurants want to increase the sustainable fish in their menus, they need to make some changes to their purchasing policies.

5.2.3 The lack of availability of sustainable fish in Mexico

The lack of availability of product or supply was not a barrier mentioned by the vast majority of the interviewees. However, it is considered that the additionally identified barriers are related to this point. In other words, the additional barriers disaggregate some of the challenges early in the supply chain that prevent sustainable fish produced in Mexico from reaching restaurants in Guadalajara. These being the lack of infrastructure and capacity of producers to distribute the product throughout Mexico as well as the informality and the economic needs of the small-scale fishermen, who, according to the interviewees, account for much of the sustainable fisheries production.

Overall, the additional identified barriers diminish the supply of sustainable fish in Mexico and therefore are factors that raise concerns as they hinder restaurants in Guadalajara to have access to sustainable fish. Indeed, the limited supply of sustainable fish in Mexico is related precisely to what some interviewees mentioned; there is no purpose of boosting demand for a product that does not exist (I6 & I11). It also aligns with what the fish supplier (I1) mentioned: "We do not claim that our product is sustainable, it is a responsible product because we have no way to prove it is completely sustainable." Therefore, if there is little or no supply of sustainable fish in Mexico, and the ways of ensuring it, such as FIPs are misused, one cannot expect restaurants in

Guadalajara to offer this type of fish and seafood on their menus, and indeed this was reflected through the menu assessment. Under this circumstance, the barriers are too high for the restaurant itself to address them.

Although industry associations were rarely mentioned during the interviews, industry agreements may be one of the factors that could help restaurateurs overcome these barriers. In other words, a restaurant may not have the capacity to overcome the barriers listed in the literature and confirmed by the interviewees on its own, but one way to overcome them is working together with other restaurants. As mentioned by Chkanikova & Mont (2015) one of the benefits of the industrial forums and industry associations is precisely to harmonize sourcing requirements. By doing this the companies can include sustainability as one of the requirements to purchase the products from suppliers, thus leaning them towards adopting these practices.

It is also interesting that the relationship with the supplier was not mentioned explicitly by the interviewees as a barrier to the adoption of sustainable fish. However, the lack of supply and the high dependence of restaurants on information given by the supplier may serve as proxies suggesting that the power of the restaurateur vis-à-vis the supplier, in general, is low.

In brief, the results of the menu assessment are an indication that the environmental sustainability of fish offered in restaurants in Guadalajara is very low. This also coincides with what was pointed out by the interviewees and with the main challenges of fisheries in Mexico that were identified in the literature consulted. Importantly, most of the drivers and barriers identified in the literature were confirmed in the interviews with a few exceptions. Furthermore, this thesis adds to the nuances of the barrier "lack of supply" in the Mexican context. These nuances indicate that as there is not enough supply of sustainable fish in Mexico and this makes it difficult to include them in the restaurant menus of Guadalajara. Therefore, while the restaurant's role in the seafood supply chain is important, there are many barriers they face in including sustainable fish in their menus that restaurants cannot face alone.

Table 5-1. Confirmed, not confirmed and additionally identified drivers and barriers.

DRIVERS		
	Internal factors	External Factors
Confirmed	• Top management involvement (3) • Employee Connectedness (2) (*perceived as a barrier by interviewees*) • Food quality, taste, and freshness (10) • Origin of the ingredients (2) • Innovation and creativity in the kitchen (2)	**Regulatory Factors** • Pressure and/or support from the government to take action (5) **Resource Factors** • Brand reputation and integrity (3) • Competitive advantage, differentiation (8) **Market Factors** • Consumer demand for green products (9) • Voluntary agreements and certification schemes within the industry (1)
Not confirmed	None	**Resource Factors** • Pressure from investors to increase investment returns **Social factors**

	Internal Factors	External Factors
		• Pressure from consumers, NGOs, media and academia
BARRIERS		
	Internal Factors	External Factors
Confirmed	• Costs (10) • Limited knowledge or expertise (8) • Awareness or concern for the environment (7) *(considered as a driver for the interviewees)* • Time constraints to seek information about the product (3)	***Regulatory Factors*** • Lack of leadership or support from the government to take action (7) ***Resource Factors*** • Lack of availability of product of supply (6) • Local climate, seasonal availability (4) *(perceived as a driver for the interviewees)* • Lack of communication and information flows from producer to restaurant (10) ***Market Factors*** • Insufficient demand for green products (4) • Consumer willingness to pay for green products is low (9) • Too many ecolabels can confuse the consumer (4) *(not considered a barrier nor a driver)* ***Social Factors*** • Insufficient consumer awareness (9) • Consumer discomfort over the removal of traditional (unsustainable) products (1)
Not confirmed		***Resource Factors*** • Relationship with supplier ***Social Factors*** • Insufficient pressure from consumers, NGOs, media, and academia
Additionally identified	***Internal Factors*** • Restaurants' administrative processes (1)	***Resource Factors*** • Infrastructure (5) • Producer informality (3) • Fishermen's economic needs (2) • Export of sustainable Mexican fish (3) ***Market Factors*** • Indistinctness of the types of Fishery Improvement Project (FIP) (2)

The number in parenthesis indicates the number of interviewees that confirmed the drivers and barriers.
Source: Adapted from Birch, Lawley, & Hamblin, 2012; Chiu & Hsieh, 2016; Chkanikova & Mont, 2015; Curtis & Cowee, 2009; Dolmage et al., 2016; Glazer, 2012; Hoffman, 2000; Jeff Gordinier, 2015; Kasim & Ismail, 2012; Reinecke et al., 2012; Smith, 2008; Thomas & Mills, 2006

5.3 Reflections on the research

5.3.1 Reflections on the relevance and contribution of the thesis

This thesis contributed to the knowledge of restaurants, a stakeholder in the fish supply chain that has been not sufficiently studied and involved in the solutions to recover fish stocks, in the context of one of the largest producers of fish and seafood worldwide, Mexico.

With respect to the adopted conceptual framework, the present thesis measures the environmental sustainability of the fish offered in restaurants menu beyond commonly used instruments such as ecolabels and seafood guides. In other words, the thesis also uses instruments that to the best of the author's knowledge, had not been used before such as fish bans and the promotion of underutilized species.

Moreover, the findings of this thesis have confirmed and amplified the literature. For instance, it was confirmed that two of the main issues of the Mexican fisheries (lack of surveillance and illegal fishing) are reflected in such a simple and quotidian instrument as a menu. Therefore, this thesis indicates that a menu is an interesting unit of analysis and that it can be used in studies which not only focus on how these influence consumer decisions. The qualitative findings also add nuances to the barrier "lack of supply of sustainable fish" identified in the literature. It was also confirmed that drivers and barriers that affect other actors in the food supply chain (such as food retailers) or restaurants in different contexts coincide with those faced by restaurants in Guadalajara. For this reason, the thesis has added a perspective on the existent literature on drivers and barriers.

Finally, although the qualitative sampling was small, awareness was raised among interviewees. Particularly among the interviewed restaurateurs, who showed interested in the subject and who asked the author for advice on how to make their menus more sustainable.

5.3.2 Reflections on the research approach

It is considered that this thesis fulfilled the objective of an explanatory sequential mixed method approach, as "the qualitative data helped to explain in detail the quantitative results" (Creswell, 2014 p. 224). For example, through the qualitative approach, it was identified that the high costs of eco-labeled fish are an important barrier to the inclusion of this type of fish in the menu and were, therefore, one of the reasons why certified fish were not found in the scrutinized menus.

In addition, because the conceptual framework adopted to answer the second research question did not focus exclusively on the four criteria defined in the quantitative framework and instead considered different internal and external drivers and barriers, the qualitative part of this research broadened the spectrum of reasons why environmentally sustainable fish is included on the restaurant's menus. Because of this, for example, it was also found that "lack of product supply" is a major barrier on the inclusion of sustainable fish on restaurant menus.

A disadvantage of having a broader spectrum of drivers and barriers or one that was not exclusively focused on the four criteria of the quantitative conceptual framework is that it limited the identified drivers and barriers that specifically relate to these criteria. For example, the qualitative framework limited the understanding of causes for which there are few underutilized

species in the menu, beyond consumer discomfort. Therefore, future research could further relate the four criteria of the quantitative framework to the drivers and barriers of the qualitative framework.

Specific reflections on the method and both the quantitative and qualitative analytical frameworks are presented below.

On research questions

Based on the limitations of the method and analytical framework presented below, it is considered that the conducted research process has enabled to answer both research questions. As mentioned below, it is considered, however, that it would be interesting to apply the same research questions, for example, to another city in Mexico or to another actor in the value chain.

On method

5.3.2.1.1 Quantitative approach

While in general terms it is considered that the menu assessment method is robust, there are indeed areas for improvement. Specifically, for the **data collection**, when calling the restaurants to know in detail the type of fish they offered, some of the employees were hesitant to give the answer, particularly for the type of shrimp. Based on the analysis of drivers and barriers, the interviewees pointed out that in general, the staff of the restaurants in Guadalajara does not know basic information about the fish, such as the species. Therefore, it is believed that the lack of knowledge of the staff could affect the results of the menu evaluation. That is, the staff may have indicated that one type of fish is used in the menu, when in fact another species is used.

As for the **data analysis**, particularly regarding the seafood guides used to evaluate the menus, too late in the research it was found that the CONABIO's seafood guide was missed. Although the list was not part of the seafood guides considered to measure the sustainability of the menus, the list was reviewed, and it was confirmed that it follows similar guidelines to the lists that were considered for this thesis. It was indeed found that for some of the species the CONABIO categories matched those of MBA, EDF, MCS and/or Greenpeace. What differs is that CONABIO's seafood guide includes endemic Mexican fish species and provides geographical accuracy to the Mexican context. For this reason, future research should take it into consideration.

Moreover, for the data analysis, it was decided to use several seafood guides to give more solidity to the study. However, it is recognized that it was a laborious process to unify the criteria of the lists and that having taken only one as a reference would not have affected the accuracy of the results as, besides the seafood guides, other factors were also taken into consideration to assess the environmental sustainability of the menus. Through this process however it was confirmed what was stated by Roheim (2009), while there are similarities between seafood guides, these tend to contradict each other and can, therefore, confuse the user.

The **scoring method** was created by the author. However, considering the novelty of the author in the topic, and considering that no existing scoring method was identified that would meet the purposes of this investigation, the used scoring method has many opportunity areas. For instance, the allocation of points. The author allocated points based on her criteria, but these could be further improved. A weighting of the criteria could also be reconsidered, that is, to analyze in more detail which of the four criteria could have more weight in the scoring.

5.3.2.1.2 Qualitative approach

As mentioned, the explanatory sequential mixed methods research has a strong quantitative orientation and therefore entails unequal sample sizes for the quantitative (larger) and qualitative approach (smaller) (Creswell, 2014). However, precisely because the sample size of the qualitative approach is small, the results of the qualitative approach cannot be generalized. Moreover, because the final list of interviewees included a few restaurants, in retrospective, the qualitative sampling plan would have been changed in order to include more restaurants.

In hindsight, specific questions regarding the unconfirmed drivers and barriers would also have been asked to the interviewees. In other words, perhaps if specific questions on drivers and barriers would have been asked, for example, on the barrier "relationship with the supplier," this subject would have come up during the interviews. Thereupon by not asking specific questions about some drivers and barriers, there may be biases on those unconfirmed or scarcely mentioned. Additionally, restaurants would also have been asked about their perception of the sustainability of their own menu, this question was only asked experts, but the research would also have benefited from the restaurants' perspective on their menus.

On analytical framework

5.3.2.1.3 Quantitative approach

In general, the conceptual framework for the quantitative approach was useful in guiding and structuring the processes of data collection and analysis. However, one of the limitations of this thesis was introduced by the choice of including seafood guides as a criterion to assess the environmental sustainability of the fish offered in restaurants menus. This because the limitations of the seafood guides stated in section 2.4.2 also restricted this study. Namely, their complexity as they consider many factors to measure sustainability (e.g., gear type. catch area, country of origin) that are difficult to identify by the user just by looking at the menu; and precision as seafood guides tend to generalize. Clearly stating the assumptions, adopting the precautionary and the geographical approach were useful tools to address such limitations.

In addition, the fact that seafood guides are continually being updated influences the temporal validity of the results. To prevent this from affecting the results significantly, other criteria were also included in the conceptual framework (i.e., ecolabels, fish bans, and underutilized species).

Concerning the fish bans, only two species offered in the restaurants' menus were permanently banned. However, many of the species offered on the menus are temporarily banned, such as octopus (the most commonly used species in restaurants) and abalone. And while temporary bans were beyond the scope of this study, future research could expand the results of this research by studying if restaurants are indeed aware and comply with the temporary bans.

5.3.2.1.4 Qualitative approach

Different conceptual frameworks were taken as reference for the development of the one used during this research. This in order to have a robust conceptual framework suitable for restaurants. However, the combination of different conceptual frameworks resulted in multiple drivers and barriers which prevented an exhaustive analysis of each of them and instead the results gave a general overview. To avoid this, the conceptual frameworks that were used as a reference can be used separately. For example, by using institutional theory, like Chkanikova & Mont (2015) did, future research can go deeper into the external drivers and barriers.

5.3.3 Opportunities for future research

In summary, due to the novelty of the conceptual framework used for the menu assessment and the geographical context, it would be interesting if future research could apply it in a different

geographical context. If applied in any city in Mexico, it will, therefore, be necessary to consider CONABIO's seafood guide. Future research could also consider temporary fish bans, established by the SAGARPA and CONAPESCA, as part of its scope.

Furthermore, due to the small qualitative sample, future research could also expand the knowledge of drivers and barriers restaurants face when including sustainable fish in their menus by using a larger sample. As mentioned before, future research could also further connect the quantitative conceptual framework with the qualitative framework.

Finally, the research questions could be applied to other actors in the supply chain, such as fish distributors and/or wholesalers, which according to the interviewees is a sector where not much is known. Future research could also study the interests of the consumers of Guadalajara with regards to fish and seafood as consumer demand turned out to be an important driver for the inclusion of sustainable fish species on the menus.

6 CONCLUSIONS

A summary of the main results of the thesis, as well as the conclusions derived from these, are presented in this chapter. Recommendations for specific actors who may benefit from the results of this research as well as additional recommendations for further research are also presented.

Considering the research questions posed at the beginning of this thesis, and based on the data collection, findings, and analysis, two general conclusions are drawn.

First, the offer of environmentally sustainable fish in the menus of restaurants in Guadalajara is limited. The menu assessment results showed that based on seafood guides standards, only 19% of the species offered in restaurant menus in Guadalajara could be considered "Best Choice" options. Conversely, 50% of the species offered are considered "Avoid" options. Moreover, no eco-label nor underutilized species were found on the menus and conversely two permanently banned species were found in 17.5% of the analyzed menus. Therefore, the overall score results in the sustainability of the menus were very low. The menu with the highest score only reached 3.5 points out of 16 possible points. Additionally, 32.5% of the menus received a negative score.

The menu assessment results indicate that there are many opportunities for improvement to involve the restaurant sector in the conservation of fish stocks such as the inclusion of underutilized fish species on their menus. However, the menu assessment also reflects more severe problems behind Mexico's fish supply chain such as illegal fishing and lack of compliance and surveillance to fish bans.

For the second research question, it can be concluded that there are multiples drivers and barriers to the inclusion of sustainable fish in the menu. Concretely, it is important to consider the balance between taste, quality, freshness, and the environmental sustainability of the fish, as the first three characteristics are crucial factors for restaurants when selecting ingredients for their menu. The behaviour of the Tapatío[9] consumer is also important. If the consumer does not demand, is not informed about the environmental impact of the fish behind the plate and is not willing to pay a few extra Mexican pesos for the product, it is unlikely that what is currently offered in the restaurants' menus of Guadalajara will change in the future.

However, the results of this thesis also indicate that it is not only necessary to have a substantial demand for sustainable fish, but it is also necessary to have a reliable supply of this type of fish. In this regard, this thesis found particularities in the Mexican context that prevent sustainable fish from being available on the menus. Specifically, the lack of infrastructure, the economic needs and the informality of the small-scale fisherman, an important source of sustainable fish in Mexico. Not to mention that a high percentage of this type of products are exported to the US mainly because of the high costs of acquiring this type of fish in Mexico. Because of this, future solutions should consider these challenges that the restaurant sector in Guadalajara faces in order to come up with solutions on how this sector can be involved in the restoration of fish stocks.

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[9] Term used to refer to someone from Guadalajara

6.1 Recommendations for the audience of this study and further research

6.1.1 Recommendations for restaurants

Restaurants can use this thesis to know the current environmental situation of the fish they offer and some opportunity areas to improve their situation. For instance, first and foremost, restaurants should remove any permanently banned species from the menu, this means no more Manta ray tacos or Queen conch dishes. Restaurants can also opt for underutilized species especially given Mexican biodiversity and that other restaurateurs in the Mexican Caribbean have already adopted this practice by selling the lionfish, an invasive species considered to be one of the greatest threats of the tropical Atlantic. In addition, restaurants can reduce the number of "Avoid" species on their menu such as octopus as well as increase the number of "Best Choice" species. If possible, restaurants can also start looking for eco-labeled products to be included in their menus. And if restaurants have eco-labeled products, these should be indicated in the menu providing more information to the customer about why only a few are certified.

Moreover, restaurants are encouraged to collaborate with each other in order to demand fish sustainability from their supplier, beyond quality, freshness, and taste. Collaboration could, for instance, increase the supply of sustainable fish and reduce costs. Restaurants can also work together with their supplier to learn more about how the fish they get is captured or produced and to find solutions together to reduce transaction timeframes to pay suppliers for the product. Moreover, restaurants should inform the consumer about the problem of overfishing and the alternatives the restaurant is taking in this regard (e.g., having some certified fished in the menu). The menu is an excellent tool to convey this information just like the restaurant staff.

6.1.2 Recommendations for the public sector

The fact that there are permanently banned species in the menus reflects the urgent need of public institutions to reinforce the surveillance of the bans not only for the restaurant sector but in early stages of the supply chain. It is also encouraged to create awareness campaigns on the fish bans, as restaurants' lack of information turned out to be a barrier identified in the qualitative approach of the research. It is also important to support suppliers to overcome barriers such as lack of infrastructure and to design and implement strategies that are not only based on volume but also on the value of capture fisheries so that small-scale fishermen do not have to opt for unsustainable practices.

6.1.3 Recommendations for the consumer

The results of this study indicate that currently there are few sustainable seafood options in restaurants in Guadalajara. The Tapatío consumer can, therefore, start to question the origin of the fish behind its plate and to demand restaurants to include environmentally sustainable fish species. This is relevant since consumer demand and insufficient consumer awareness resulted in important drivers and barriers respectively, that influence restaurant in the adoption of environmentally sustainable fish.

6.1.4 Additional recommendations for future research

Future research can benefit from the inclusion of different types of tools to assess the environmental sustainability of fished offered in restaurant menus as more areas of opportunity and challenges faced by restaurants were identified than if only seafood guides had been taken into consideration, as had been the case in past studies. In addition, although the menu is an

everyday instrument, as a unit of analysis it proved to be a relevant source of information as it reflects many of the environmental problems behind the ingredients offered in restaurants.

Finally, this thesis contributes to research on how restaurants can become involved in the recovery of fish populations by first presenting an overview of the current environmental situation of the fish offered in the restaurants of Guadalajara. And secondly by presenting some of the drivers and barriers that restaurants face when including sustainable fish in their menus. Which must be taken into consideration in finding solutions that include restaurants in the fight against overfishing and the promotion of marine biodiversity.

Therefore, in addition to the recommendations given in section 5.3.3, future research could investigate how the specific barriers found in this thesis could be addressed. For example, by studying how economic value could be added to the production of small-scale fisheries; how the costs of purchasing environmentally sustainable fish can be reduced for restaurants, how to strengthen the compliance and surveillance to fish bans or how industrial agreements in the restaurant industry of Guadalajara can increase the offer of sustainable fish in the menus.

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APPENDIX A. List of Sample Restaurants

1. 1000 Caguamas
2. Anita Li
3. Boca del Cielo
4. Burrinero
5. Cabanna
6. Caleta
7. Campomar
8. Casa Tomás
9. Cervecería Chapultepec
10. El Carnal
11. El Farallón de Tepic
12. El Gordo
13. El Pargo
14. Elena, Leña y Mar
15. Josela Marina
16. Juniko
17. La Docena Oyster Bar
18. La Mar
19. La Merluza
20. La Minita
21. La Muerta
22. La Panga
23. Los Arcos
24. Los Compios
25. Los Meros
26. Mariscos Pepe
27. Ponte Trucha Negro
28. Puerco Espada
29. Puerto Clandestino
30. Puerto Poke
31. Rinconcito Ensenada
32. Sal de Mar
33. Save
34. Shelter
35. Shrimp and beer
36. Suehiro
37. Taco Fish la Paz
38. Tacos el Güero
39. The Happy Fish
40. Timonela Fondita

APPENDIX B. Description of Seafood Guides used as a reference to measure the environmental sustainability of fish

Guide Author	Seafood Guide Descriptions and websites	Seafood guides criteria for sustainable fisheries and aquaculture
Monterey Bay Aquarium (Seafood Watch)	The recommendations of the MBA Seafood Watch consumer guide aim to help consumers and businesses in the US to choose sustainable seafood that is fished or farmed. Fish choices are categorized in three ways: best choices, good alternatives and avoid The Information used was obtained from the 2018 Seafood Watch online guide. Which at the time of the research was done, the guides were found, respectively, at: http://www.seafoodwatch.org/	The MBA Seafood Watch has both standards for fisheries and aquaculture. Criteria for Fisheries 1. Impact on the species under assessment: abundance and fishing mortality 2. Impact on other capture species: abundance, fishing mortality and modifying factor (discards and bait use) 3. Management effectiveness: management strategy and implementation, bycatch strategy, scientific research and monitoring, enforcement of management regulations, stakeholder inclusion 4. Impacts on the habitat and ecosystem: physical impact of fishing gear on the habitat; mitigation of gear impacts, ecosystem-based fisheries management (Monterey Bay Aquarium. Seafood Watch, 2015b) Criteria for Aquaculture 1. Data: having robust and up-to-date information on production practices and their impacts publicly available 2. Effluent: waste discharged per ton of fish, management of farm-level and cumulative impacts 3. Habitat: habitat conversion and function and farm sitting regulation and management 4. Chemical use 5. Feed: wild fish use, net protein gain or loss, feed footprint 6. Escapes: escape risk score 7. Disease, pathogen and parasite interaction 8. Source of stock: Independence from wild fish stocks 9. Predator and wildlife mortalities 10. Escape of secondary species (Monterey Bay Aquarium. Seafood Watch, 2015a)
	The EDF Seafood Selector considers wild fisheries and fish	Criteria considered by the EDF include

The Environmental Defense Fund (EDF)	farming operations for more than 200 types of seafood frequently sold in the **U.S. market.** Fish choices on the Seafood Selector are categorized in three ways: Eco-best choices, Eco- ok choices and - fisheries Eco-worst choices The information used was acquired from The EDF Seafood Selector 2014. Which at the time of the research was done, was found at http://seafood.edf.org/	1. Life history: how fish responds to fishing pressure 2. Abundance: population size, skewed age, sex ratios 3. Gear impacts on habitat 4. Bycatch (unintended catch) due to gear type used for fishing 5. Management: it is checked whether the fishery is regulated and effectively managed (e.g., fish monitoring). (The Environmental Defense Fund, 2018)
Marine Conservation Society (UK)	The MCS Good Fish Guide provides advice so that consumers in the UK purchase the most sustainable fish. Fish choices are rated from 1 to 5. One is the most sustainable option and five the least sustainable. The information used was acquired from the Marine Conservation Society "Good Fish Guide" 2017. Which at the time of the research was done, was found at https://www.mcsuk.org/goodfishguide/search	The organization has both aquaculture and wild capture ratings. Wild capture criteria 1. Stock or species status: based on biomass and fishing mortality 2. Management: considers management framework and objectives for the fishery (e.g., adequate monitoring, compliance with scientific advice) 3. Capture method and ecological effects: includes capture method and ecological effects, bycatch and fishing in Marine Protected Areas (Marine Conservation Society, 2017) Aquaculture criteria 1. Feed sustainability: replace marine proteins and oils with sustainable vegetable proteins 2. Ecological effects: considers impacts of construction, chemical and organic waste, disease transfer, spaces, predator control 3. Fish health and welfare 4. Management: regulation compliance and/or third party audited production standards (Marine Conservation Society, 2014)
Greenpeace	The Greenpeace seafood list has only one category: red. This means that the list only provides information on the fish and seafood that must be avoided.	The organisation's criteria for listing a species are as follows: 1. The vulnerability of species (e.g., late age of maturity, slow growth rate, low reproduce capacity) 2. Fishing in deep water habitats 3. Destructive fishing methods (mainly bottom trawling and dredging)

	The information used was acquired from Greenpeace Canada's Redlist 2016. Which at the time of the research was done, was found at https://www.greenpeace.org/archive-international/en/campaigns/oceans/seafood/red-list-of-species/	4. Disregarding scientific advice (such as the statements made by the Northwest Atlantic Fisheries Organization (NAFO) Scientific Council) 5. Overfishing: based on third parties' mathematical models of the dynamics of the fish population which estimate the overall fishing rate and size of the adult stock 6. Using indiscriminate fishing methods (by-catch) 7. Catching threated or protected species categorized by national or international species 8. The impact to entire ecosystems (e.g., harm to top predators) 9. Illegal, unregulated and unreported (IUU) or pirate fishing (Greenpeace International, n.d.)
Source: Adapted from Greenpeace International, 2016; MCS, 2017; Monterey Bay Aquarium. Seafood Watch, 2015b; The Environmental Defense Fund, n.d.		

APPENDIX C. Reference list on the environmental sustainability of the fish species based on seafood guides

Fish species	Rating	Seafood Guides
Abalone	Best Choice	EDF
Atlantic Cod (not from Japan, Russia or Alaska)	Good alternative	MBA EDF
Basa, Catfish, Pangasius, Striped Catfish, Swai	Avoid	MBA EDF
Bass	Best Choice	MBA EDF
Blue Crab	Good alternative	MBA EDF
Blue shrimp	Avoid	EDF
Bluefin Tuna	Avoid	MBA EDF Greenpeace MCS
Brown shrimp	Good alternative	EDF
Clams, Mussels & Oysters	Best Choice	MBA EDF
Croaker, Atlantic (Corbina, Corvina)	Good alternative	MBA EDF
Dover sole	Best Choice	MBA EDF
European Anchovy	Avoid	MBA EDF
Freshwater eels	Avoid	MBA EDF MCS
Gulf coney/Baqueta	Good alternative	IUCN [exception]
Grouper	Avoid	MBA EDF MCS
Lobster: Spiny (Mexico)	Best Choice	MBA EDF
Mackerel/Pacific Sierra/Sierra	Good alternative	MBA MCS

Mahi mahi/dolphinfish	Avoid	MBA EDF
Marlin (Blue and Striped)	Avoid	MBA EDF MCS
Octopus	Avoid	MBA EDF MCS
Shrimp, pink	Avoid	EDF
Prawns (unless organic certified)	Avoid	EDF MCS Greenpeace
Queen conch	Avoid	MBA
Red snapper	Good alternative	MBA EDF
Salmon (Canada Atlantic, Chile, Norway & Scotland) both caught at sea and farmed	Avoid	MBA EDF Greenpeace MCS
Sawfish Pristis pristis, P.pectinata, P.perotteti	Avoid	MCS
Sharks	Avoid	MBA EDF Greenpeace
Shrimp and prawns from Latin America & Southeast Asia	Avoid	MBA EDF Greenpeace
Skates and rays	Avoid	Greenpeace MCS
Squid	Good alternative	MBA EDF MCS
Surimi/ Imitation Crab	Avoid	MBA
Tilapia	Good alternative	MBA EDF MCS
Triggerfish (Cocino)	Avoid	MBA
White Shrimp	Good alternative	EDF
Yellowfin Tuna	Avoid	Greenpeace
Yellowtail amberjack/Jurel Hiramasa	Good alternative	MBA

Source: Adapted from Greenpeace International, 2016; MBA, 2018; MCS, 2017; The Environmental Defense Fund, 2018.

APPENDIX D. Permanent banned fish species 2018

Permanently banned species 2018
Whales
Shrimps ➤ Pink (Farfantepenaeus duorarum) ➤ Brown (Farfantepenaeus aztecus) ➤ White (Litopenaeus setiferus) ➤ Red (Farfantepenaeus brasiliensis) ➤ Roughback shrimp (Trachypenaeus similis)
Conchs (of the Yucatan coastline) ➤ Queen conch (Lobatus gigas) ➤ Horse conch (Pleuroploca gigantea) ➤ Whelks (Busycon sp.) ➤ Chank shells (Xancus sp.) ➤ Milk conch (Strombus costatus)
Black sea rod or Caribbean Sea whip (Plexaura homomalla)
Common bottlenose dolphin (Tursiops truncates)
Sea-Elephant (Macrorhinus angustirostris)
Guadalupe fur seal (Arctocephalus townsendii)
Manatees (Trichechus manatus)
Jenkinsia (Jenkinsia lamprotaenia)
Manta Rays (various species)
Marlin ➤ Black Marlin (Makaira indica) ➤ Striped Marlin (Tetrapturus audax) ➤ Shortbill spearfish (Tetrapturus angustirostris) ➤ Swordfish (Xiphia gladius) ➤ Blue Marlin (Makaira nigricans) ➤ While Marlin (Tetrapturus albidus) ➤ The Indo-Pacific sailfish (Istiophorus platypterus)
Sharks ➤ The whale shark (Rhincodon typus) ➤ Basking shark (Cetorhinus maximus) ➤ White shark (Carcharodon carcharias)
Marine turtles (various species)
Freshwater turtles (various species)

Totoaba (Totoaba macdonaldi)
Vaquita (Phocoena sinus)
Sea cucumber (Actinopyga echinites)

Source: Adapted from SAGARPA & CONAPESCA (2018)

APPENDIX E. Main groups of fish species produced in Mexico and main groups of fish species traded worldwide

Main Fish Species produced in Mexico	Main Groups of Fish Species in World Trade.
Abalone	Billfishes
Clams	Bivalves
Anchovy	Bonitos
Tuna	Cods
Coco Sea Catfish, Gafftopsail	Cuttlefishes
Bagre	Flounders
Gulf cone	Freshwater fish
Skipjack	Haddocks
Sand drum	Hakes
Bream	Halibuts
Albacore	Octopuses
Broomtail Grouper/Rock Hind	Other fish species (e.g., anchovies, sardines, herring)
Squid	Other pelagic fish (e.g., Pangasius and tilapia)
Shrimps	Prawns
Conchs	Salmons
Common carp	Shrimps
School Shark	Smelts
Charal	Soles
Cutlassfish	Squids
Gulf weakfish or Corvina	Trouts
Sea Urchin	Tunas
Greater Amberjack	
Red snapper	
Blue Crab	
Jack mackerel	
Lobster	
Prawns	
White Mullet	
Dover sole	
Mullet	
[Largemouth] Bass	
Atlantic mackerel	
Red Grouper	
Tilapia	
Oysters	

Silver or white pomfret	939
Red snapper	7869
Sea Cucumber	1428
King Mackerel	3635
Ocean Whitefish	2126
Octopus	33265
Rays	8002
Snook	8710
Grunt	3413
Lane snapper	1699
Red gurnard	2438
Sardine	180033
Mackerel/Pacific Sierra/Sierra	20410
Shark	19467
Trout	10112

Source: Adapted from CONAPESCA, (2014); FAO, (2018a)

APPENDIX F. List of interviews

Interviewee	Day of the interview	Channel through which the interview was conducted	Type of organization
I 1	June 28, 2018	Videocall	Fish supplier
I 2	July 14, 2018	E-mail	Restaurant
I 3	July 15, 2018	Videocall	Academia
I 4	July 24, 2018	Videocall	NGO
I 5	July 25, 2018	Phone call	Expert (Gastronomy)
I 6	July 26, 2018	Videocall	NGO
I 7	July 27, 2018	Videocall	Expert (Fish traceability)
I 8	August 1, 2018	Phone call	Restaurant
I 9	August 7, 2018	E-mail	Restaurant
I 10	August 9, 2018	E-mail	Restaurant
I 11	August 21, 2018	Videocall	Certification body

Source: created by the author

APPENDIX G. Codebook

Code name	Definition	Example
Internal factors		
Top management involvement	Influence of the restaurant owner or head chef on the inclusion/non-inclusion of sustainable fish in the menu	"The willingness of the restauranteurs themselves, to have these products in their storage, that is the most important thing" (I 11).
Employee connectedness	Comments regarding the importance of the participation of restaurant staff for the inclusion of sustainable fish on the menu	"I also believe that all (restaurants) are limited in their ability to have staff sharing fish information" (I1)
Food quality, taste, and freshness	Interviewees' comments on the importance of fish quality, taste and freshness for its inclusion on the menu	"We rely entirely on quality to select our inputs, although sometimes the product is more expensive, we have certain standards" (I2)
Origin of the ingredients	Influence of the origin of the product (e.g., local) for the purchase of ingredients	"Local products are preferred, as they encourage the economy of the region and at the same time they (restaurants) are obtaining fresher products at a lower price" (I3)
Innovation and creativity in the kitchen	Comments regarding the kitchen creativity resulting as a driver to include sustainable fish in the menu	"It limits our offer to the client a bit (referring to sustainable fish), but at the same time it also makes us creative by looking for other options in our menu" (I9)
Costs	Influence of costs on restaurants for the inclusion of sustainable fish on the menu	"And then (the restaurants) ask how affordable are the price? I have heard many saying that sustainability should not cost more, and I personally disagree, sustainability requires management, and management requires investment" (I11)
Limited knowledge or expertise	Comments on how the lack of training and knowledge of restaurants on sustainability limits the inclusion of sustainable fish in the menu	"Sometimes (restaurants) are not even sure that the fish they buy is fresh. The restaurant sector must be trained; good programs must be created to guarantee good fish handling, safety, and fish bans compliance" (I5).
Lack of awareness or concern for the environment	Comments on how the restaurants' awareness of environmental issues	"It is important to seek general, environmental, social and even particular benefits. It seems to me to be a significant issue (referring to

	influences the inclusion of sustainable fish in the menu	sustainable fishing), and I think that in the end, it is always beneficial" (I8)
Time constraints to seek information about the product	Related comments on how restaurateurs' busy agendas limit the inclusion of sustainable fish in the menu	"I think chefs are being given a lot of information. They don't have time to process all of it" (I11)
External Factors		
Regulatory factors		
Government support	Importance of government involvement and support for the promotion of sustainable fish	"Regulation makes it harder and harder to keep doing things wrong" (I7)
Lack of government support	Comments on how the lack of government involvement and support for the promotion of sustainable fish limits its inclusion on the restaurant menus	"I feel that the existing Mexican regulation is not being followed up or taken seriously. We already know that we live in a country where corruption can do anything, the lack of interest of the authorities which is very sad" (I8)
Resource factors		
Pressure from investors	Influence of investors in the inclusion of sustainable fish in the menu	No comments from the interviews were coded under this code
Brand reputation and integrity	Influence of good reputation and integrity results from the inclusion of sustainable fish in the menu	"I wish they (restaurants and other buyers) could have the information of what we are witnessing in the fisheries, of the risk that exists for the company, in terms of reputation" (I4)
Competitive advantage, differentiation	Comments on how the inclusion of sustainable fish in the menu can help restaurants to gain competitive advantage or to differentiate from their competitors.	"Those who want to add value and show that that are complying with good practices are the ones who want to buy sustainable fish… that allows them to sell at a higher price..." (I7)
Lack of availability of supply	Influence of lack of availability of the product and supply on the inclusion of sustainable fish in the menu	"We don't have much variety of sustainable fish, and the customer may get bored" (I1)
Local climate, seasonal availability	Influence of the local climate of the seasonal availability of products in the adoption of sustainable fish in the menu	"Responsible consumption should be associated with not assuming that you find the same species all year round. That means that we should consume seasonal products, not the species that are banned" (I3)

Relationship with supplier	Influence of supplier relationship for the inclusion/not inclusion of sustainable fish in the menu	No comments from the interviews were coded under this code
Lack of information flows from supplier to restauranteur	Importance of the information provided/not provided by the supplier to the restaurants for the inclusion of sustainable fish in the menu	"When you go to a place and buy the fish, nobody will ever be able to tell you where that fish comes from, because it's a very long supply chain" (I1)
Market factors		
Consumer demand for sustainable products	Importance of consumer demand for responsible products	"The community, in general, is gradually changing its mindset about nature" (I9)
Voluntary agreements and certification schemes within the industry	Influence of voluntary industrial agreements or certification schemes on restaurants' adoption of sustainable fish	"There is a conglomerate of restaurants, and they made a policy of introducing sustainable fish and products" (I1)
Consumer willingness to pay for green products is low	Comments on how the consumer responds to the price of sustainable fish limits the inclusion of these on the menus	"The customer may tell you that they do want the product (sustainable fish), but when they see the price, they don't buy it" (I1)
Too many ecolabels can confuse the consumer	Comments on how too many ecolabels confuse the consumer when deciding which fish to eat	"I asked a well-known restaurant in Mexico City why they didn't include ecolabels on their menus. They told me they couldn't include them, not all of his products were certified, so they didn't want to put the other dishes in disadvantage" (I11)
Social factors		
Pressure from consumers, NGOs, media, and academia	Influence of stakeholders' pressure such as consumers, media, NGOs, and academia on restaurants to adopt sustainable fish	No comments from the interviews were coded under this code
Insufficient consumer awareness	Influence of consumer awareness or concern for the environment in the inclusion of sustainable fish in the menu	"When is the ban? Is the fish seasonal or not? What is in the right size? ... that kind of information is not available to consumers, well it's on the internet, but nobody is going to Google it at the restaurant" (I4).
Consumer discomfort over the	Influence of how consumers may get upset/disappointed by the restaurant if the product	"If a person goes to a restaurant because they like a certain dish and suddenly that dish no longer exists, the customer may

removal of traditional (unsustainable) products	they are looking for is no longer available	get angry and stop going, which is bad for the restaurant" (I3).
Other factors		
Other factors	Comments that could not be coded within the other codes were categorized under "other factors." The comments categorized under this code turned out to be additional identified barriers	"The infrastructure restricts considerably where our product can be commercialized, and we don't have enough infrastructure right now." (I1)

Source: created by the author

APPENDIX H. Interview Guide

For restaurants

1. Based on what criteria do you select the fish and seafood offered in your business? For example quality, freshness, price...

2. Is the environmental impact of the fish and seafood one of the aspects you consider when designing your menus?

3. Have you considered offering fish and seafood with low negative environmental impact? What are the reasons for this?

4. What would make it easier for you to have environmentally sustainable fish or seafood on your menu?

5. What prevents you from having environmentally sustainable seafood on your menu?

6. Do you think that the inclusion of fish and seafood with low environmental impact could give you added value or differentiate you from other shellfish businesses/restaurants? Why?

7. Do you think that in general, your customers are concerned about the environmental impact of the fish and seafood they consume?

8. Do you think that the fish bans established in the Mexican regulation are a factor that drives, limits or is indifferent in the selection of fish and seafood that you include in your menu? Why?

9. Do you think that not including environmentally sustainable fish could affect or benefit your business? How?

10. Have you found a supplier that offers environmentally friendly fish or seafood?

For experts

1. Based on your experience, what are the challenges of sustainable fishing in Mexico?

2. What are the opportunities for sustainable fishing?

3. What are the challenges and opportunities to commercialize this type of fish, particularly in restaurants?

4. How do fishermen collaborate with their business partners to promote sustainable fish consumption?

5. One of my research questions seeks to answer how sustainable are the fish offered by restaurants in Guadalajara and I would like to know what your perception/opinion on the matter is?

6. What do you think could help "green" the menus of restaurants and seafood in Mexico?

7. What prevents this type of fish and seafood from being offered in restaurants?

Final questions for both restaurants and experts

1. Is there anything you consider useful for my research that you would like to add or ask?
2. Is it possible to contact you later in case of additional questions?
3. Would you like to receive a copy of the audio, as well as the final results of the thesis?