Fishing for Change:

Amplifying the voices of artisanal fishermen in the fight against overfishing

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Abstract

Along Thailand's coasts, 250,000 artisanal fishing villages rely on fishing to survive. The Thai Sea Watch Association (TSWA) represents local fishermen and the challenges they face due to decreasing fish stocks. This project explored their experiences in the fishing industry and how the Thai public interacts with information online. Key findings included that fishermen are most concerned with immediate threats to being able to catch fish, and the Thai public interact with Facebook and Twitter the most. These findings were used to recommend that the TSWA focuses activism and education on issues that the fishermen themselves are interested in and invests more resources into creating engaging social media content to better amplify their voices to the rest of Thailand.

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Thai Sea Watch Association

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Executive Summary

Oceans and Overfishing

The oceans are important for maintaining the health of the planet and supporting life on Earth (Barner et al., 2015). For generations, people have seen the world's oceans as inexhaustible resources and global consumption of aquatic products has grown exponentially (Chenkitkosol, et al., 2022, World Wildlife Fund, 2015). Fishing has been identified as the primary cause for the decline in populations of aquatic products. While fishing is not damaging to marine wildlife on its own, it can have devastating effects when vessels catch fish faster than they can naturally reproduce. This is known as overfishing.

Fishing boat using a damaging fishing method (rbouwman/iStock).

Problems and People

Along the coastline of Thailand, 250,000 fishing villages rely on fish for food security and their livelihoods as a whole (Chenkitkosol et al., 2022). One of these villages is Ban Thung Noi, Kui Buri, one of three villages in the sub-district of Khao Daeng. The village consists of 233 households and just under a thousand residents, the majority of whom work as fishermen or in jobs supporting the fishing industry, such as fish packaging (Thedyam, P., Personal Communi-

cation, Dec 11, 2022). Increased demand for seafood and the rapid industrialization of the Thai fishing fleet during the 20th century has left Thai fishers grappling with sustainability issues (Environmental Justice Foundation, 2015). Unsustainable fishing practices have caused widespread overfishing, the impact of which has the potential to damage the economic livelihoods of small fishing communities and end generations of traditional Thai fishing (Chenkitkosol, 2022, World Wildlife Fund, 2022).

Map of Thailand.

Bang Thung Noi, Kui Buri (Google Earth).

Our sponsor, Thai Sea Watch Association (TSWA) representative Piya Thedyam, aims to represent local Thai fishermen as an activist through appeals to the government to protect their livelihoods and traditional fishing methods through better regulation of law and policy (Thedyam, P., Personal Communication, Jan 19, 2023). Khun Piya and the TSWA also have a goal of sharing information about issues in the fishing industry to the Thai public and seafood consumers (Thai Sea Watch Association, 2023). Currently, the TSWA has multiple websites and Facebook pages with inactive audiences and low engagement.

Bang Thung Noi fishermen working on a boat (Boonrukvanit).

People living in Bang Thung Noi have no other option besides working as fishermen. Decreasing fish populations and poorly enforced law and policy result in their constant struggle to make a living. Some have even had to sink their boats and abandon their livelihoods and lineage of traditional fishing. The potential to change the fishing industry and save traditional fishing could lie in educating more of the general public of challenges faced by artisanal fishermen every day, a potential the TSWA sees to help expand the success of their goals and objectives all over coastal communities in Thailand.

Objectives and Methods

This project presents recommendations to the Thai Sea Watch Association to help better support and represent the interests of the local fishermen in Ban Thung Noi and inform the Thai public of unsustainable practices contributing to instability in the Thai fishing industry. Learning about traditional fishing in a coastal village directly from the fishermen living there became the basis for this project, supported by research into communication methods and social media to determine the best medium for sharing how overfishing threatens the livelihoods of local fishermen and the health of Thai oceans.

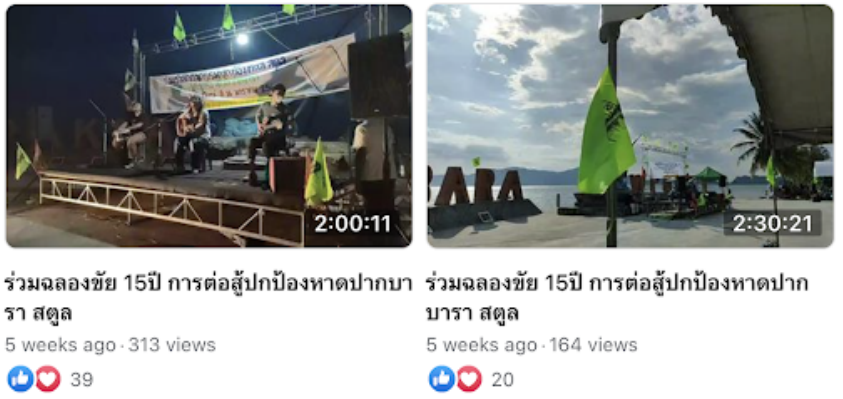
This goal was accomplished by completing the following objectives:

Determine current fishing methods and the factors of overfishing that affect local fishermen.

Khun Piya demonstrating a traditional fishing method (Wolfgang).

To learn about traditional fishing methods, the team traveled aboard a traditional fishing vessel to observe and take pictures for the report. A tour of the village given by Khun Piya supported initial observations, in which he demonstrated all of the selective fishing gear and how it contributes to the sustainability of artisanal, or noncommercial, fishing. To learn about the fishing industry from a fisherman's point of view, the team interviewed 11 local fishermen and heard their stories and opinions about the current state of the Thai fishing industry and how it affects their daily lives.

Determine the effectiveness of current strategies used by TSWA to spread awareness of current issues in the fishing industry and recommend appropriate improvements.



Two videos on TSWA's Facbook page (TSWA).

After some preliminary research into the websites used by the TSWA and their structure and engagement, we created a survey to determine how much the Thai public currently knows about the fishing industry, our sponsor organization, and what communication methods they prefer to consume and share information. To distribute our survey, we targeted two convenience populations, students at Chulalongkorn University and randomly chosen customers at various weekend markets and canteens in Bangkok.

Findings and Recommendations

Fishermen interviewed in Bang Thung Noi (Chow, Saidoung).

Key findings based on the interviews of fishermen in Kui Buri contradicted some of our previous assumptions and redirected our research away from technical aspects of overfishing towards socio-environmental pressures affecting how local fishermen perceive their position in the Thai fishing industry. When asked about fish populations declining over the past five years, the fishermen indicated that fish populations had grown in the past two years, and that catching more fish has not been as difficult for them recently. They also did not want to blame commercial fisheries for the effects of overfishing in their lives, noting that they also need to make a living or mentioning other causes of declining fish stocks instead. These findings indicate that the fishermen's primary concerns are not with the overarching effects of overfishing or competition from commercial fisheries, but rather with the quality of fishing in their daily lives and if they can support their families. The fishermen also brought up law and policy they thought would improve fishing conditions, notably increasing the distance from shore that commercial fishing vessels must fish at. This indicated a common solution between the fishermen that their experience indicated would be a good place to work to improve their lives. Based on these findings, we generated recommendations to the Thai Sea Watch Association to consider issues most concerning to the fishermen represented by the organization.

1. ***Continue to emphasize the use of and education about selective fishing methods.***

Our first recommendation is for the TSWA to continue to emphasize and encourage the use of selective fishing methods used by local fishermen. Their choices to use fishing methods that only catch certain species and mature fish even though they could catch more

fish with less selective methods demonstrates their dedication to keeping traditional, sustainable fishing alive. Local Thai fishermen standing behind their words with their actions, will support their messages calling for an increase in use of sustainable fishing methods and enforcement of policy that limits the use of methods that damage the environment and overcatch fish and bycatch species.

Selective fishing method (Wolfgang).

2. ***Discourage perpetuation of the "us" versus "them" competition between commercial fisheries and local fishermen.***

Even though they recognize that bait methods such as light generators and mass catch techniques like pair-trawl used by commercial fisheries increase bycatch and catch of juvenile species, local fishermen are still hesitant to blame commercial fisheries for the effects of overfishing they experience in their daily lives. If the TSWA could coordinate communication between leaders and members of commercial fisheries and local fishing groups, cooperation between both groups to establish similar goals and ideas about law and policy adjustments could bridge the gap and create a larger association of people looking to improve the fishing industry together.

3. ***Focus efforts on law and policy adjustments that the fishermen of Ban Thung Noi are the most interested in.***

There are many laws related to fishing in Thailand, gear used by different types of fishermen, and other influences that affect how

fishermen are affected by overfishing. Our sponsor may find more success focusing his efforts on one or two types of law and policy or enforcement of law dictated by what the local fishermen themselves are most concerned with. This will allow him to gather more focused support for a more reachable goal.

The findings from our survey analysis of 144 respondents indicated the need for improved awareness of the TSWA and improved usage of social media platforms by the organization. Under 15 percent of the survey population had heard of the TSWA or related organizations, while more than 80 percent of respondents indicated their knowledge of overfishing as a two or under from a scale of one to five. When further asked about how they consume and share media, the survey results showed for respondents of all ages, Facebook was the most popular platform for both consuming and sharing information whereas Twitter was the most popular for consumption of information by people ages 19 to 39. The TSWA already uses the best social media platforms for reaching Thai society as indicated by survey results, but does not use them to their full potential. Taking that into consideration, the team recommends the following:

4. ***Prioritize creating engaging content to attract a more active following on powerful social media platforms like Facebook and Twitter.***

Our survey results suggest that very few people know of the Thai Sea Watch Association or related organizations, only 12 percent of respondents indicating that they had heard of either. This raises the opportunity for our sponsor to increase his activity and quality of content on social media. We know our sponsor currently has an account on both of the most effective sites to reach the Thai public, Facebook and Twitter, but significant improvements can be made to further engage the audience. Creating easily consumable content is important to attracting and maintaining an active audience online. Fully taking advantage of these platforms is the next step for sharing the current problems in the fishing industry along with the struggles of local fishermen in his village to the people in Thailand.

Using our background research and footage from fishermen interviews, the team was also able to create a sample video for our sponsor. Many of our sponsor's current videos are up to two hours of uncut footage. Our video is around ten minutes in length and

demonstrates how to effectively engage an audience with specific content choices and editing to keep viewers interested. We are unsure if this is a viable solution for our sponsor due to limits on time and resources, but if he is able to prioritize adjusting the type of content he posts on his social media, our research has determined this to be an effective way to improve public awareness of the struggles faced by local fishermen in his village.

Conclusion

The team leaves Thai Sea Watch with recommendations on how to better support and represent the interests of the local fishermen in Ban Thung Noi, Kui Buri and inform the general Thai public of unsustainable practices contributing to instability in the Thai fishing industry. We not only recommend that TSWA explore more effective communication methods, but also to continue their emphasis on using and educating about selective fishing techniques that do not contribute to overfishing in Thailand. We also recommend strategies to not lose sight of the people this organization is aiming to represent, the artisanal fishermen of Thailand's coasts. The team see a future where ocean resources can be managed sustainably for these local fishermen if their voices can be projected by the TSWA and supported by its access to other organizations and resources.

Loacl fishing boat in Kui Buri (Chow).

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1 Introduction

The oceans play a critical role in maintaining the health of the planet and supporting life on Earth with food security, economic opportunities, and other benefits (Barner et al., 2015). For generations, people have seen the world's oceans as inexhaustible resources due to their size and extent, and have acted accordingly (World Wildlife Fund, 2015). As global populations have grown, so has the consumption of aquatic products (Chenkitkosol, et al., 2022). A fivefold increase in demand for fishery products over the past sixty years has led to the overexploitation of ocean environments through overfishing: fishing vessels catching fish faster than stocks can replenish (World Wildlife Fund, 2022). This not only has negative impacts on biodiversity and the functioning of ecosystems, but also reduces fishery productivity. The current state of overfishing has decreased fishery production by an estimated 16.5 million tons and 32 billion USD annually, affecting people all over the world who rely on aquatic products to feed their families or make income (Food and Agriculture Organization, 2022). The economic and environmental impact that overfishing has had on many countries needs to be addressed to protect fishery environments and the livelihoods of local fishermen for future generations.

Thailand was the 12th highest average fish-producing country as of 2019 and continues to be one of the top seafood exporters in the world (Chenkitkosol, et al., 2022). This industry supports 180,000 Thai workers directly employed on fishing boats and more than 500,000 other Thai workers, primarily female, employed in industries that support the fishing sector, e.g., the shipyard industry, fish processing industries, and the animal feed industry. Along the coastline, 250,000 artisanal fishing villages rely on fish for food security and their livelihoods as a whole. Increased demand for seafood and the rapid industrialization of the Thai fishing fleet during the 20th century has left Thai fishers grappling with sustainability issues (Environmental Justice Foundation, 2015). Thailand's marine resources are becoming exhausted, resulting in Thai fishermen catching less and less fish each year.

Unsustainable fishing practices are one of the main causes of the decline in size and diversity of fishing stocks along Thailand's coasts (Food and Agriculture Organization, 2022; Environmental Justice

Figure 1.1: Fishing village in Thailand (banjongseal324/freePik).

Foundation, 2015; Environmental Justice Foundation, 2023). In the 1960's, new technology was introduced to Thailand by a joint German-Thai government initiative to establish a fishing industry focused on inshore bottom trawling. During this time period, the number of Thai trawling vessels grew, and with it the use of damaging fishing methods such as bottom and pair trawling. While many commercial vessels are credited with using unsustainable fishing methods, smaller scale fishing operations are also capable of overcapacity, overfishing, or destructive fishing practices (World Wildlife Fund, 2015). In some cases, the activities of local fishermen groups are to blame for poor fishing conditions in an area, while other times, difficulties faced by fishing villages have been caused or aggravated by the activities of industrial fishing operations coming into their areas. It is unclear for each fishing village whether their own practices contribute to their daily struggles to catch fish or if they are being impacted by outside sources such as damaging commercial fishing methods or weak governance and management of fishing in their region. Organizations that represent artisanal fishing communities have the potential to aid in their struggles to maintain their livelihoods amidst declining fishing stocks. The team's sponsor organization, the Thai Sea Watch Association (TSWA), is an association of over fifty other artisanal fishing organizations (Thai Sea Watch Association, 2023). One of the goals presented on their website mentions strategies for research, campaigning, and dissemination of information. The TSWA has multiple

Figure 1.2: Sponsor logo (TSWA).

websites and Facebook pages with published papers and other resources, and also has representative leaders and members attend conferences and other events. While this information is accessible to anyone online, it is unclear how effective the Thai Sea Watch is at reaching the Thai public and if the information they present truly represents the interests of the artisanal fishermen in villages like the team's study site of Ban Thung Noi, Kui Buri.

Our goal for this project was to provide recommendations to the Thai Sea Watch Association to help them better support and represent the interests of the local fishermen in Ban Thung Noi, Kui Buri and inform the general Thai public of unsustainable practices contributing to instability in the Thai fishing industry. We traveled to Ban Thung Noi and conducted observations aboard a traditional fishing vessel and interviewed a TSWA leader in the village, Khun Piya Thedyam, along with other local fishermen. The information acquired on this trip allowed us to understand the sustainability of fishing methods currently used in the fishing village as well as how fishing has changed for the fishermen and what issues in the fishing industry are the most concerning to them. Additionally, our team surveyed members of the Thai public to understand how the Thai public consumes and shares information and their current knowledge of overfishing and the TSWA. Our research results include recommendations to support further research and opportunities for the future and current operations of the Thai Sea Watch Association in Ban Thung Noi. The recommendations reflect trends in the data that suggest how the TSWA can better represent the interests of the fishermen in Ban Thung Noi and inform the public of their goals and topics related to fishing in Thailand. This could better support the association in its goals to improve conditions for artisanal fishermen and work towards ensuring a sustainable future for fisheries all over Thailand.

Figure 1.3: Fishermen working on a fishing boat, Bang Thung Noi Kui Buri (Boonrukvanit).

2 Background

Overfishing not only affects the diversity and size of marine species populations, but also the livelihoods of fishermen located all along the world's coasts (World Wildlife Fund, 2015). The following chapter outlines general background and data on the current economic and environmental impacts of overfishing globally and in Thailand to establish a basis for this project's recommendations to help the Thai Sea Watch Association more effectively support artisanal fishermen in their struggles with the current state of Thai marine fisheries. We will discuss overfishing, its causes, and its effects on fishing industries on a global scale before narrowing the scope to the current state of the Thai fishing industry. We examine global case studies about mitigating bycatch and unsustainable fishing techniques as well as socio-environmental pressures on smaller fishing communities in order to understand current methods and strategies to reduce overfishing. We will also introduce our study site in Kui Buri and sponsor organization, the Thai Sea Watch Association (TSWA). We will present their current methods of spreading awareness and communicating their goals to residents of Thailand in comparison to the most effective ways to generate awareness and spread the goals of an organization according to the literature.

2.1 Overfishing

Overfishing is a global problem that has put considerable pressure on the world's oceans and fishing stocks (Barkin & DeSombre, 2013; Barner et al., 2015; World Wildlife Fund, 2015; World Wildlife Fund, 2022). Catching fish is not inherently damaging to fish population sizes except for when fish are caught at a rate higher than the rate at which they are able to reproduce. This is what is considered as overfishing. Since the 1970s, global fishery stocks have been depleting at an unsustainable rate and have declined over 25 percent (Food and Agriculture Organization, 2022) (Figure 2.1).

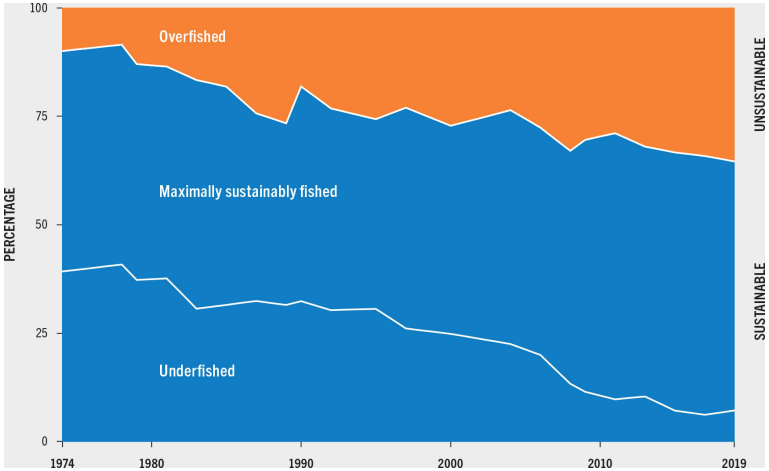

Figure 2.1: Global trends in the state of the world's marine fishery stocks, 1974–2019 (Food and Agriculture Organization, 2022).

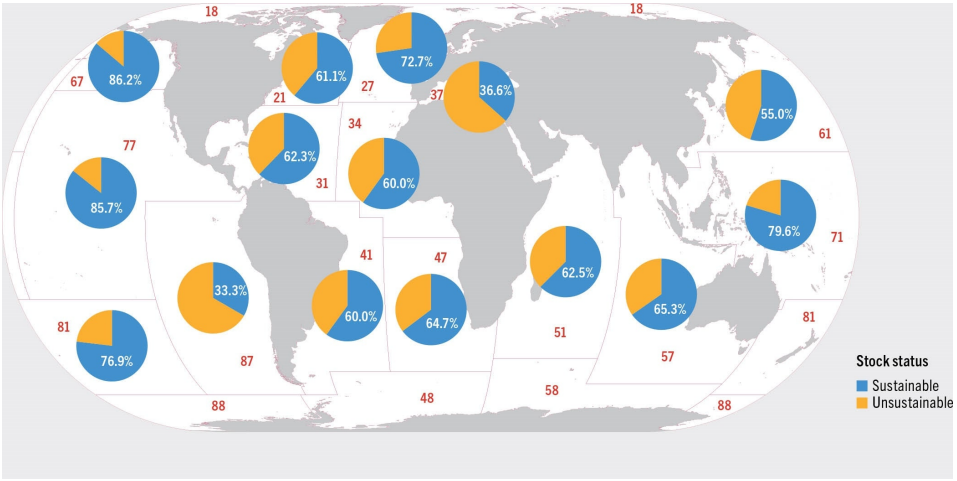

Figure 2.2: Percentages of biologically sustainable and unsustainable fishing stocks, 2019 (Food and Agriculture Organization, 2022).

Fig 2.2 illustrates the sustainability of each major fishing area in 2019. From this and the previous graph, we can see how over time more fish stocks are being fished at unsustainable levels, the consequences of which create a cycle of depleting fishing resources. Continuing to harvest without letting species replenish themselves can cause issues of food insecurity for billions of people who rely on fish for protein and limit economic opportunities for those whose livelihoods depend on the many jobs supported by the fishing industry (World Wildlife Fund, 2015; World Wildlife Fund 2022). In this section, we will further discuss the causes and consequences of overfishing.

2.1.1 Causes of Overfishing

Systemic overfishing is caused by many different aspects of the fishing industry (World Wildlife Fund, 2015; World Wildlife Fund, 2022). In particular, subsidies, Illegal, Unreported, and Unregulated (IUU) fishing, and unsustainable fishing methods create a cycle of overfishing where the consequences lead to further exploitation of ocean resources.

Subsidies are benefits given to the fishing industry from the government to offset the costs of fishing operations. This encourages people to enter or remain in the fishing industry to help domestic fishing fleets (Barkin & DeSombre, 2013; World Wildlife Fund, 2015; World Wildlife Fund, 2022). As of 2015, global fishing subsidies were estimated to be at around 35 million USD per year, about a fifth of the industry's total revenue. This has contributed to today's estimated overcapacity of two-and-a-half times the fish production we need globally. With no new or alternative opportunities in the fishing industry, new species and areas must become targeted instead as fishing stocks become exhausted, until all of the globe's fishing stocks eventually are overfished. The urgency of this situation has led to The United Nations 2030 Agenda for Sustainable Development to call for an end to harmful subsidies in global fishing industries.

Illegal fishing and trading puts pressure on global fish populations in addition to effects of overfishing already occurring through legal methods (World Wildlife Fund, 2015; World Wildlife Fund, 2022). Greater than 30 percent of catch of high-value species is currently estimated to be illegal, with IUU fishing estimated to make up to 36.4 billion USD per year. Tracking illegal catch is difficult due to lack of effective traceability and government capacity and cooperation. IUU fishing can lead to the collapse of legal fisheries if fishing stocks become depleted by illegal fishing activities, leading to social and economic losses for populations reliant on marine products to make a living (Food and Agriculture Organization, 2001).

Fishing techniques that result in a large amount of bycatch are another prominent aspect of unsustainable fishing.

Figure 2.3: Large indiscriminate fishing net (Green Queen).

Trawling gear is an example of a high-efficiency method resulting in the indiscriminate catch of large numbers of fish (Environmental Justice Foundation, 2023). Bottom trawling in particular is estimated to catch more fish than any other fishing method at more than 30 million tons of seafood a year. This is commonly regarded as the most damaging type of trawling due to the damage it can have on fish stocks, bycatch species, and the health of the seafloor. Trawl fishing is not a fishing method that can target certain sizes or species of fish. Nonspecific fishing methods along with the targeting of species that are low in productivity, take longer to reach maturity, and grow slowly lead to rapid declines in fish populations (World Wildlife Fund, 2015). A related contributor to the global overfishing problem is inconsistent fishing regulations in different countries (Barkin & DeSombre, 2013). Lack of a central authority to provide consistent regulations on net sizes, fish size quotas, and bycatch in different countries allows fishers in some countries to catch fish using methods that are deemed unsustainable in other countries.

2.1.2 Consequences of Overfishing

The effects of overfishing can have devastating consequences for marine ecosystems and the people who rely on them to survive (Barkin & DeSombre, 2013; Barner et al., 2015; World Wildlife Fund, 2015; World Wildlife Fund, 2022). As fish become overfished, their populations decrease significantly. Another aspect of the decrease in fish populations is accidental bycatch of non-target and juvenile species within those fish populations. Over time, it becomes very difficult for fish to reproduce at a rate that can keep up with fishing rates, leading to food insecurity for the people who rely on aquatic products. Decreasing fish populations, bycatch, and food insecurity are all results of overfishing related to the causes previously discussed. This section will discuss each one individually to continue to establish the connections between the causes and effects of overfishing and how they create a cycle perpetuating the decline in productivity of fisheries across the globe.

As previously discussed, the overcapacity of global fishing fleets has exhausted traditional fishing stocks and increased the amount of stocks that are considered to be overfished (World Wildlife Fund,

2015). While overcapacity means that there are more fishing fleets and fishermen employed than are needed to feed global populations, increased fishing effort does not coincide with catching more fish. In fact, between 2007 and 2012, the total weight in fish caught by marine fisheries fell by one million tons. As fish populations have fallen and become more difficult to catch, fishermen have been pushed to fish in deeper waters and farther down the food chain (McKeever & National Geographic Staff, 2022; World Wildlife Fund, 2015). This is called "fishing down", and has resulted in loss of ocean diversity and the decimation of fish populations that were unable to be accessed with previous fishing technology. Overfishing also changes the size of the remaining fish and the speed at which they reproduce (World Wildlife Fund, 2022). Decreasing the rate at which fish reproduce results in fewer fish spawning each year, further increasing the problem of a degrading fish population. If new fish populations continue to be exploited in this way, data suggests fishing populations could fall enough to create an economic collapse that could affect all global fisheries, including artisanal fishing operations (Barkin & DeSombre, 2013).

Unsustainable fishing results in bycatch and catch of juvenile species (Davies et al., 2009). Bycatch is identified as the accidental capture of unusable and unwanted species. These unusable and unwanted species are usually thrown back into the ocean dead or dying.

Figure 2.4: Sea turtle caught in a fishing net (Stella Hurtley).

Accidental bycatch of hundreds of thousands of marine mammals, seabirds, and turtles occurs each year along with bycatch of tens of millions of sharks. As of 2015, global bycatch levels were estimated to be around 7.3 million tons (World Wildlife Fund, 2015). After many decades of unsustainable fishing of juvenile species, many key species stocks have declined alongside bycatch species, such as Bluefin tuna and Grand Banks cod (World Wildlife Fund, 2022). The use of nonselective fishing gear and the resultant bycatch remains an urgent threat to remaining fishing stocks and the diversity and structure of vital ocean ecosystems (Davies et al., 2009).

Interconnected with decreasing fish populations and bycatch is another consequence of overfishing: food insecurity. As the demand for fish continues to increase, consumption of fish does not increase along with it (Food and Agriculture Organization, 2022; World Wildlife Fund, 2022). As the number of people depending on depleting fish stocks for food increases over time, dwindling fish populations are unable to produce enough aquatic products to meet demand. This becomes problematic because these aquatic products make up approximately 17 percent of the global consumption of animal proteins and for approximately 3.3 billion people, representing 20 percent of all animal protein consumed. In some southern Asian coastal countries, aquatic products represent on average 50 percent or more of the total animal protein being consumed.

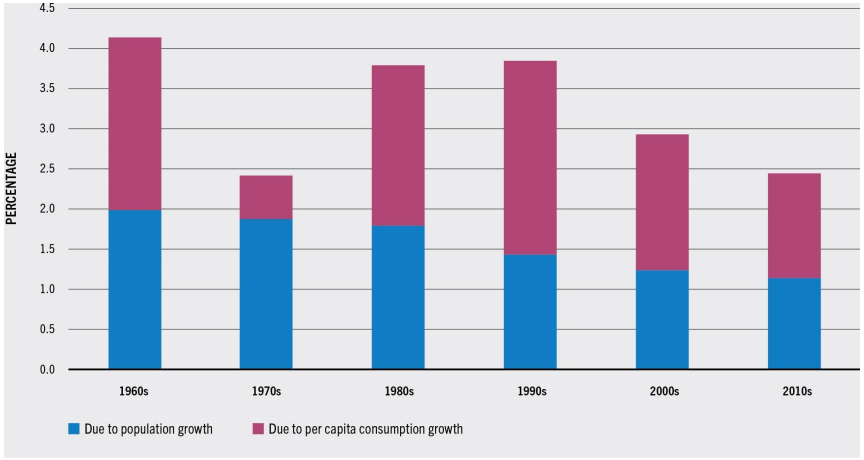

Figure 2.5: Average annual growth in aquatic food consumption (Food and Agriculture Organization, 2022)

In Figure 2.5, average annual growth in consumption of aquatic products has been decreasing since 1990. Aquatic product consumption growth has declined on average 1.5 percent annually since 1990, with over half of that coming from a decline in consumption per aquatic product consumer. Overfishing has contributed heavily to this food insecurity, as decreasing fish stocks and rising demand

make available fish population sizes unpredictable. These changes in food availability not only put more strain on the current fish stocks, but can also lead to overharvesting and exploitation of other food sources, contributing to food insecurity for populations who rely on those sources of protein as well.

Decreasing fish populations, bycatch, and food insecurity puts strains on the economies of fishing communities (World Wildlife Fund, 2022). Fish is one of the most traded food commodities, powering a 362 billion USD worldwide business. The UN Food and Agriculture Organization (FAO) estimates that 59.5 million people globally were employed as fishers as of 2021, 50 million of whom are employed in Asia (Ritchie & Roser, 2021). This number excludes the number of jobs related to the fishing industry, such as packaging and shipping, which rely on the success of the fishing industry to fuel their own industries (Hannesson, 2021). As the fishing industry expands, it creates more competition between fisheries as they try to fish for maximum profit. Competition is usually good for an economy, as it will lead to consumers having a higher quantity of products to choose from and pushes companies to improve their product quality. However, fish are a finite source with a set reproduction rate. In this case, competition decreases fishing stocks which in turn hurts the economic growth of the industry. The demand for fish is increasing around the world, which means that more businesses and jobs are reliant on these depleting stocks, creating a circular problem (Kadfak & Antonova, 2021). This has caused many fish supplies to be depleted to the point where fishermen are unable to continue to fish for their livelihoods.

2.2 Thailand's Fishing Industry

The fishing industry is vital to Thailand's economy and represents over half of the GDP per capita (Yenpoeng, 2018; Suwannapoom, 2019). Fish is the primary source of animal protein for most of Thailand's own coastal population, while the country was also the 3rd largest seafood exporter in the world as of 2015 (Environmental Justice Foundation, 2015). The fishing industry is one of the most prominent features of Thailand's economy, providing itself and other countries with a food source and creating over half a million jobs (Yenpoeng, 2018).

2.2.1 The Current State of Thailand's Fishing Economy

Thailand is ranked 15th in world capture fisheries and 10th in world aquaculture production in 2019 (Food and Agriculture Organization, 2022; Hannesson, 2021). Approximately 2.2 million tons of fish products are consumed in Thailand, which is approximately 33 kg per person per year. About 1.5 million tons of fish products are exported every year, with marine shrimp being one of the major exports, valued at around 200 billion baht or 2.7 billion USD (Chenkitkosol, 2022). The Thai fishing industry also employs around 650,000 Thai people in the aquaculture fields.

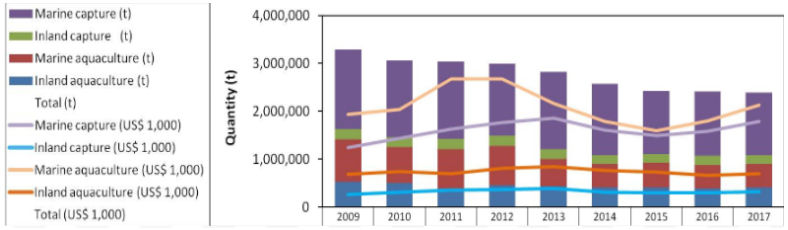

Figure 2.6: Fisheries production of Thailand in 2009-2017 by quantity (t) and value (USD 1,000) (Suwannapoom, 2019).

There are four sub-sectors of the fishing industry. Our research focuses on marine capture fisheries. Figure 2.6 represents the total number of aquatic products produced in metric tons (MT) from 2009 to 2017 and the value in thousands of USD (Yenpoeng, 2018). Fishery output declined in this time period and began to flatten out in 2015 when the Thai government increased its efforts to encourage sustainable fishing practices. The estimated quantity of fisheries production in 2017 was 2.39 million tons with a value of 4.92 million USD (Chenkitkosol, 2022).

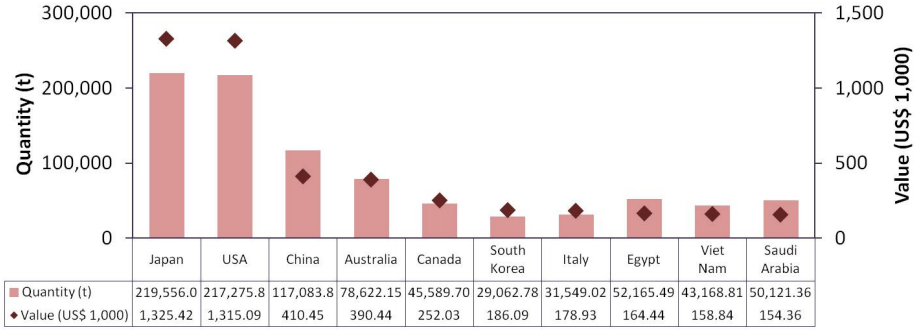

Figure 2.7: Top 10 destination countries in terms of value of fish and fishery products exported by Thailand in 2018 by quantity (t) and value (USD 1,000) (Chenkitkosol et. al, 2022).

Figure 2.7 shows the top destination countries to receive Thailand's exports. Japan imported the most aquatic products from

Thailand at approximately 220 thousand tons valued at 1.3 million USD. Aquatic products from Thailand are considered to be of good quality and are accepted all around the world (Suwannapoom, 2019). This has enabled Thailand to generate a revenue of upwards of 6 billion USD from the fishing industry, representing almost 10 percent of the country's total revenue.

2.2.2 Fishing Law and Policy

Thailand's policies in the fishing industry were ineffective until they faced major reforms in 2015 when the EU issued a yellow card, to Thailand for labor violations and IUU (illegal, unreported, and unregulated) fishing practices (Kadfak & Linke, 2021). This resulted in trade sanctions between the EU and Thailand and a drop of more than 115,000 tons of seafood exports. The Royal Ordinance on Fisheries led reforms across the whole fishing industry in reaction to these sanctions. They helped end the exploitation of immigrant workers and improved sustainability by deterring or eliminating IUU fishing through the standardization of licenses and by building a database to track the 42,000 vessels that form Thailand's fishing fleet. Furthermore, the reforms sought to ban the catch of juvenile commercial species, regulate the use of illegal fishing gear, and protect artisanal fisheries (Royal Thai Embassy, 2016). Prior to these reforms, policies were decentralized and split based on the territorial fishing grounds and managed by separate authorities. This lack of a centralized organization led to ineffective management and exploitation of workers. The lack of adequate labor management meant that workers were not always getting a fair wage, and bycatch and overfishing were commonplace (Kadfak & Antonova, 2021).

A few sections of fishing law and regulations were put into place in 2015 that are especially relevant to the operations of small fishing communities and their relationships with commercial fisheries (Royal Ordinance on Fisheries, 2015). In Section 57, it is stated that no person shall catch or take aquatic animals of a size that is smaller than that prescribed by the Minister on board of a fishing vessel. Section 61 states that no person should have possession of aquatic animals or animal products for commercial purposes knowing that they were acquired through wrongdoings listed in other sections of

the regulations or from a fishing vessel used in IUU fishing, as per the list of fishing vessels prohibited from entering the Kingdom of Thailand. In Section 70, it is noted that no person should engage in a fishing operation during a season of aquatic animals' ovulation and egg-spawning, larvae rearing, or during any other period of time where fishing catch of aquatic animals is limited for any reason as prescribed by the Minister. Finally, Section 71 details that the Minister or the provincial fisheries committee shall have the power to issue notifications regarding fishing gear in any form, requirements related to bycatch, and areas where gear must be temporarily fixed in any position during a fishing session.

The issue with the current policies arises from how difficult they are to enforce and regulate by the Minister or provincial fisheries committee (Thedyam, P., Personal Communication, Dec 11, 2022). The government is unable to directly observe fishing practices in much of Thailand. This allows for the use of illegal fishing techniques such as pair trawl, which results in a high frequency of bycatch and destruction of the environment. Additionally, the amount of fish caught by a vessel is measured daily, with the entire catch being weighed in kilos. This regulation limits the total catch amount; however, the size of each fish is not considered. This means fishermen can catch non-target and juvenile species if their entire catch is under the size quota set during that fishing season. These loopholes undermine the effectiveness of the 2015 regulations and continue to put a strain on marine ecosystems in Thailand.

A case study in Denmark investigates the application of Individual Transferable Quotas (ITQs) as a policy to decrease overfishing through limits on how many fish an individual fisherman can catch and sell (Merayo et. al, 2018). This system was introduced to Danish fisheries in 2003 and was fully implemented by 2007, with effects studied 10 years after. ITQs are considered an appropriate solution to management issues in the fishing industry due to their ability to spur improvements in efficiency and decrease overcapacity of seafood products. However, this policy is equally criticized due to negative social effects related to unemployment.

In the Denmark fisheries, when fleet size was reduced to meet quotas, economic profitability improved through reductions in fuel consumption and fishing activity, which also proved to positively

affect the environment (Merayo et al., 2018). Concerns centered around impacts on employment and smaller traditional fishing communities due to uneven distribution of benefits due to quota concentrations being based on vessel size. Full time employment was reduced by 68 percent, however, with no accompanying reduction in fishermen's salaries. The social effects on unemployment were not found to be significant, as unemployment rates in the studied communities were already below average.

The Denmark ITQ policy successfully mitigated overfishing while providing environmental and economic benefits for fleets and resulting in insignificant social issues relating to unemployment (Merayo et al., 2018). ITQs are suggested to be an applicable mitigation technique for overfishing by larger commercial fleets, but could prove inappropriate in smaller fishing villages where fishermen are already struggling with employment and fish in smaller independent fleets. This case study demonstrates the importance of establishing this context to fully understand the scope of overfishing and policy issues experienced by a community.

2.2.3 Commercial and Traditional Fishing

Commercial fishing boats only make up approximately 25 to 30 percent of the total number of fishing boats in Thailand's waters, but they contributed more than 80 percent of the total reported catch from 2005 to 2014 (Derrick et al., 2017).

Figure 2.8: Two commercial fishing boats moored in the sea (Chow).

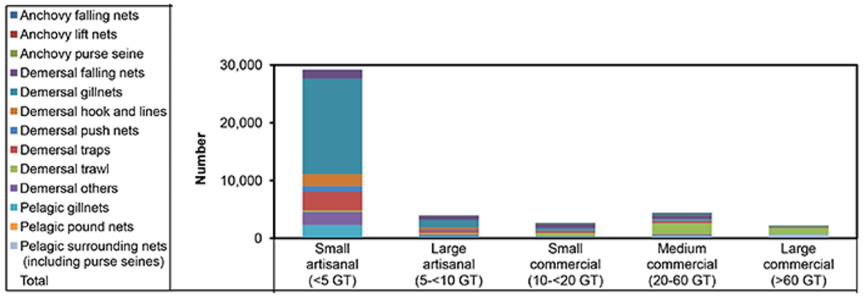

Figure 2.9: Number of fishing gears and different sizes of fishing vessels in Thailand in 2015 (Chenkitkosol, 2022).

Table 1: Types of fishing gear and amounts used by different sizes of fishing vessels in Thailand in 2015 (Chenkitkosol, 2022).

	Small artisanal (<5 GT)	Large artisanal (5-<10 GT)	Small commercial (10-<20 GT)	Medium commercial (20-60 GT)	Large commercial (>60 GT)
Anchovy falling nets	98	99	162	338	84
Anchovy lift nets	2	0	4	7	0
Anchovy purse seine	13	49	58	129	190
Demersal falling nets	1,452	673	672	638	35
Demersal gillnets	16,524	1,282	356	229	24
Demersal hook and lines	2,097	230	73	43	4
Demersal push nets	972	277	121	113	46
Demersal traps	3,242	422	283	312	18
Demersal trawl	225	304	517	1,945	1,096
Demersal others	2,310	253	158	177	36
Pelagic gillnets	2,185	329	184	189	42
Pelagic pound nets	68	16	8	9	0
Pelagic surrounding nets (including purse seines)	35	46	68	312	629
Total	29,223	3,980	2,664	4,441	2,204

Figure 2.9 and accompanying Table 1 compare boat sizes to their primary fishing methods. This graph shows that medium to large commercial boats favor trawling, purse seining, and falling net methods for their high catch rate (Yenpoeng, 2018). These methods, while effective, can also result in a large amount of bycatch. In 1999, trawling made up 95 percent of all bycatch (Derrick et al., 2017). Small artisanal fishers make up the remaining 70 to 75 percent of the total number of fishing boats in use (Derrick et al., 2017). They predominantly use gill nets to fish (Yenpoeng, 2018). Gill nets are a selective fishing method designed so the fish can only manage to fit their head through the netting, but not the rest of their body, entangling them in the nets (National Marine Fisheries Service, 2021).

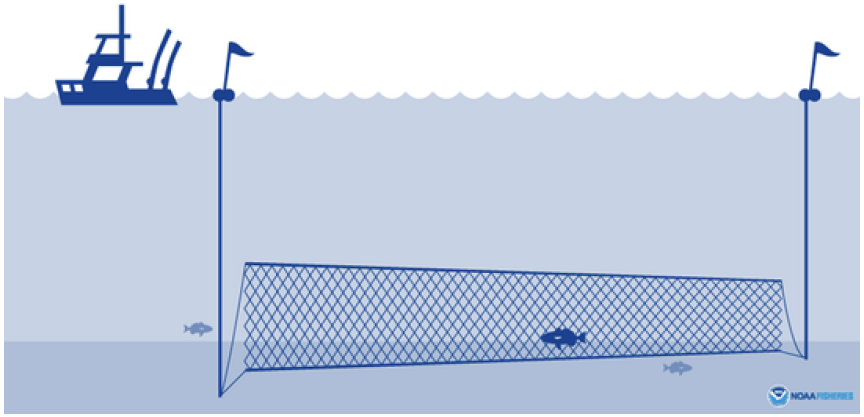

Figure 2.10: Visual of gill net fishing gear (National Marine Fisheries Service, 2021).

Figure 2.10 depicts how a gill net is set up and how fish are trapped. Using gill nets results in a large number of sea turtles and marine mammals becoming bycatch. Gill nets are used because they provide a high yield, but the resulting bycatch and the destruction of fish nurseries is damaging to marine diversity and environments. A study in southern Thailand interviewed 119 artisanal fishermen and found that artisanal fishermen use gill nets around coral reefs,

causing damage to the coral and removing juvenile fish from their habitats (Jones, Gray, & Umponstira, 2009).

The study from Jones et al. (2009) also mentioned that the general consensus from artisanal fishermen was that commercial fisheries are the main contributor to the decline in fish stocks, heavy extraction of all sizes of fish, and the removal of smaller types of gear like gill nets. The large trawlers pick up everything in their path including coral, small traps, sea turtles, and marine mammals. This study suggests that commercial fishers are using more efficient and sustainable methods than in the past, but bycatch and destruction of habitats are still prominent problems. Artisanal fishers are not immune to these problems either. Multiple fishers interviewed in the study by Jones et al. were reported to have dragged heavy nets over coral, causing destruction of the reef. Fishermen also admitted to illegally catching rays using gill nets because rays are valuable in local markets. Fishing methods used by both commercial and artisanal fishers are in question and so is the sustainability of their practices.

2.2.4 Mitigation Methods

Bulk fishing techniques such as purse seining and longlining result in an increased incidence of bycatch and capture of juvenile species (Davies et al., 2009; Senko, White, Heppell, & Gerber, 2014). The use of appropriate gear and replacements have been analyzed and could prove applicable to mitigate bycatch in Thailand. Gear modifications are a popular mitigation technique, which involves altering designs to make them less attractive to non-target species or have mechanisms that allow bycatch species to escape the net or be easily released by net operators (Senko et al., 2014). These modifications are not costly and do not require massive adjustments to current practices and thus are preferred mitigation techniques by many fishermen. Gear modifications have been studied in capturing three common bycatch species: the leatherback turtle, the black-footed albatross, and the vaquita porpoise (Senko et al.,2014). For the leatherback turtle studies, circle hooks replaced j-hooks along with bait switches from squid to mackerel or sardines. These adjustments combined for an 83 percent reduction in bycatch in this particular study. Gear changes such as using underwater set-

ting chutes instead of hanging tori lines above water and dying bait were studied for effects in bycatch of black-footed albatross. Blue-dyed bait was found to decrease bycatch of albatross by 95, 94, and 63 percent in three different studies, while contact with hooks of underwater netting and line systems decreased by 76 percent with an accompanying 86 & decrease in bycatch. The bycatch of vaquita porpoise was studied using shrimp, Scorpion, and Box trawl nets. Field studies have found industrial trawl net types to decrease bycatch of both porpoise and sea turtles, decreasing bycatch-to-shrimp ratios by 20-50 percent and using less energy.

Each of these gear modifications has been field tested in multiple studies performed by different research groups, with decreases in bycatch of marine megafauna observed for singular as well as combinations of two or more gear replacements or adjustments (Senko et al., 2014). These current fishing techniques can dramatically reduce bycatch and be used in many places worldwide.

Another relevant case study of coastal communities in the Global South investigates how socio-environmental pressures and coastal governance responses impact the livelihoods of fishermen (Andriesse et al., 2022). Eight fishing areas were studied in four countries: Ghana, Tanzania, Thailand, and the Philippines. Eight research areas were outlined as well, including educational attainment, association membership, change in fish catch, fishing income and change, and availability of agricultural opportunities. The research for Thailand clarifies the impacts of factors other than overfishing on the lives of fishermen and how they affect possible solutions to issues in the fishing industry there.

Conclusions drawn from survey results in two fishing areas of Thailand, Krabi and Trang, found that for being the richest country among the four studied, there were surprisingly low educational attainments (Andriesse et al., 2022). Participants were also asked about reasons they perceive are responsible for declining fish catch. The highest response in Thai fishing areas was “population increase”, followed by “overfishing” in Krabi and “sea water pollution” in Trang. “Climate change” was an option not chosen by most participants, which contradicted further survey data on perceptions of climate change. In Thai fishing areas, high percentages of prevalence, such as 85 percent, 80 percent, and 89 percent, were

reported for stronger waves, more coastal erosion, and more tropical storms, respectively. This suggests that despite scientific evidence that climate change has begun to impact all researched areas, all participants can not be assumed to be able to perceive climate change as an immediate threat. A third set of survey results reports the fishing villages' most important problems as reported by participants. The most frequently reported issues in Thai fishing areas were unpredictable weather and water shortage, followed by lower incomes, no land rights, and drugs. Issues such as overfishing, illegal fishing methods, and low fish catches were not reported by either community as important problems despite overfishing and illegal fishing being reported as present in both areas.

At the end of the study, it was concluded that less rigid structures such as local associations and informal local collective action have been effective in Krabi, Thailand, despite low participation (Andriesse et al., 2022). Trang, Thailand was one of the most marginalized communities studied. Policies from the government focused on relieving the effects of overfishing and supporting coastal livelihoods have failed due to focus on middle-income and average incomes instead of the most marginalized communities. Lack of land ownership and government-funded education for children of families in Trang has left fishermen there hopeless for the future career paths open to their children. Overall, perceptions of the causes of issues in these Thai fishing villages do not focus on fishing issues themselves, rather social and economic issues that exacerbate the effects of fishing issues and are more apparent to those who observe them. It is therefore essential to understand the scope of other socio-environmental and economic issues plaguing a study area before assuming that fishing issues there are the main drivers of the decline in quality of coastal livelihoods.

2.3 Artisanal Fishing Villages

There are over 250,000 small artisanal fishing villages on Thailand's coasts contributing 70 to 75 percent of the total fishing boats in Thai waters (Chenkitkosol, et al., 2022; Derrick et al., 2017). The Thai Sea Watch Association aims to support these local fishermen and surrounding communities in Thailand. The branch our team is working with is based in Ban Thung Noi, Kui Buri and the

leader, Khun Piya Thedyam, represents the local fishermen from the village. Refer to Appendix A for a full sponsor description.

2.3.1 Ban Thung Noi, Kui Buri

Ban Thung Noi is one of three villages in the sub-district of Khao Daeng. The village consists of 233 households and just under a thousand residents (Thedyam, P., Personal Communication, Dec 11, 2022). The majority of the residents work as fishermen or in jobs that support fishing.

Figure 2.11: House in the Bang Thung Noi fishing village (Wolfgang).

2.3.2 The Thai Sea Watch Association

One of the Thai Sea Watch Association's main goals is to share their research with a larger portion of the Thai society (Thai Sea Watch Association, 2023). To achieve this, our sponsor uses in-person events where he presents information on the struggles of local fishermen along with gear and policy changes. Additionally, our sponsor uses social media platforms to attempt to reach a larger audience and promote change in the fishing industry.

The Thai Sea Watch Association (2007) attends and supports in-person events related to current issues in the fishing industry to help spread awareness of their causes. The TSWA recently attended the Thai Folk Fishermen's Assembly in January of 2020. The assembly gave small-scale fishermen the opportunity to share their experiences, discuss guidelines for managing fishery resources, and address issues affecting various aspects of the fishing industry. The Thai Sea Watch Association voiced their opinions about local fishing communities working with the Department of Fisheries to help stabilize fishery resources.

Social Media and Engaging Content

Over the past ten years, social media sources have become increasingly popular and provided users with digital platforms to share their interests and opinions while connecting with others (Assimakopoulos, 2017). These sources have the potential to be incredibly powerful. In 2010, the Red Cross was able to generate over 8 million dollars in 48 hours for a natural disaster in Haiti (Gross, 2010). They did this by encouraging donations from people on social media sites such as Facebook and Twitter. This would not have been possible if the Red Cross's social media pages did not have large followings or if the posts on each platform were not engaging to those followers.

Facebook is the largest social media platform worldwide (Kemp, 2023). With 2.9 billion monthly active users, Facebook towers over other platforms such as Twitter. Functionally, both platforms are very similar. Facebook allows users to post content and for others to comment, like, and share it with their friends and other groups. Twitter has similar features but with an additional retweet feature. This allows a user to repost someone else's tweet and for their entire following to also see the tweet. Retweets can gain greater impression rates than the original post due to multiple users' audiences being able to view the tweet. Both of these platforms are incredibly powerful, but without the proper content they become less effective at attracting an audience.

Research done by Aaker et. al (2010) concluded that Facebook and Twitter are incredibly effective platforms when used correctly. An example from the research analyzed how posting engaging content on Facebook allowed the Obama campaign to win the 2008 election through engaging with the supporters through posts. Creating engaging content is not easy however. The content needs to target the correct audience and gain their attention. An example noted how teens abusing methamphetamine reacted positively to short advertisements containing fellow teens rather than older adults. Facebook recommends that an effective way to generate awareness through online content is to keep videos at a maximum of 15 seconds, where the attention of your viewer should be obtained in the first 3 seconds of the video (Facebook, n.d). Twitter on the other hand, works best when the user is sharing short, con-

cise information that gains the attention of the audience. In the research done by Aaker et. al (2010), Tweets were found most effective when sent to followers once or twice daily with a personal and casual tone rather than "the face" of an organization. The use of metadata tags or "hashtags" is also incredibly important to sharing information on any platform. Adding these to a post will allow it to be searchable by topic for all other users, even if they are not an active follower. Our sponsor uses the following social media sources: a website, Facebook, YouTube, and Twitter. The TSWA Facebook page is their primary form of communication, where they often post about research presented by guests in the fishing industry, news articles about illegal or unsustainable fishing, methods used in practice to decrease bycatch, and other news and information related to ocean conservation. The page has 13,000 followers and usually receives anywhere from 10-40 likes and 1-5 shares on each post. When compared to similar sized organizations, the current engagement is low (Aaker et. al). Along with their Facebook page, The Thai Sea Watch Association (2007) has a website where they have their mission available to the public along with recent publications on law and policy, folk fishing practices, news about activities performed by the association, and other related research and information. While the news tab has not been updated since 2021, other areas such as research publications and links to their Facebook pages seem to be updated more often, sometimes on a monthly or even daily basis. Tracked views on the blog within the website show that posts usually receive anywhere from 20-60 views. Aside from the Facebook page and website the TSWA uses to reach out to the general public, their Twitter and Youtube also leave a lot of room for improvement. The Thai Sea Watch Association Twitter only has 9 followers and has only posted one tweet. Similarly, their YouTube channel has 14 followers and

Figure 2.12: Facebook page used by the Thai Sea Watch Association (TSWA).

averages around 10-50 views per video.

2.4 Summary

Thailand relies heavily on the fishing industry as a source of food for their population as well as to support its economy through exports (Derrick et al., 2017, Chenkitkosol, 2022). The impact of overfishing on small fishing communities already in competition with larger commercial fisheries has the potential to damage the economic livelihoods of generations of Thai fishermen and their families. While mitigation techniques such as new policy and law and gear modifications have been explored in different European and Asian countries, inadequate research exists for its applicability for small Thai fishing communities, while other research suggests that it is important to understand all socio-environmental and economic pressures on fishing villages before assuming that fishing issues are the main contributors to decreases in quality of coastal livelihoods (Senko et al., 2014; Merayo et al., 2018; Andriesse et al., 2022). One of the main goals of the Thai Sea Watch Association is to support artisanal fishermen in villages like Ban Thung Noi through sharing information about overfishing and the current state of the Thai fishing industry with the Thai public and seafood consumers. Outreach techniques need to be analyzed to determine if social media use through sources such as websites and Facebook could be improved. This could unite the Thai public in improving local fishing to help continue to feed the country and protect ocean environments. Providing recommendations to the TSWA based on the literature and field studies in Thailand can help them to better represent and support smaller fishing communities and their vital role in the fishing industry.

Figure 2.13: Local fishermen working to feed their families (Boonrukvanit).

3 Methods

The goal of this project is to provide recommendations to the Thai Sea Watch Association to help them better support and represent the interests of the local fishermen in Ban Thung Noi, Kui Buri and inform the general Thai public of unsustainable practices contributing to instability in the Thai fishing industry.

The objectives to meet our goal are:

1. Determine current fishing methods and the factors of overfishing that affect local fishermen.
2. Determine the effectiveness of current strategies used by the Thai Sea Watch Association to spread awareness of current issues in the fishing industry and recommend appropriate improvements.

3.1 Determine Current Fishing Methods and the Factors of Overfishing that Affect Local Fishermen

Our first objective was to determine current fishing methods used by local fishermen and the factors of overfishing that affect local fishermen's lives. To evaluate fishing methods we used direct observation along with interviews with local fishermen and our sponsor to support the data with real experiences. Additionally, we used the interviews to understand how local fishermen perceive the direct effects of overfishing on their lives as well as their understanding of overfishing in Thailand as a whole.

3.1.1 Interviewing Locals and our Sponsor in Ban Thung Noi, Kui Buri

The purpose of conducting interviews was to gather information about the types of fishing methods local fishermen use, anecdotal economic information, and record stories about how overfishing has directly impacted the lives of locals in the fishing village.

Figure 3.1: Interviewing a local fisherman (Chow).

Our goal was to find and interview at least 10 local fishermen. We conducted many of our interviews on docked boats as they were working and around the residences of other local fishermen. The interview questions focused on the economic loss and environmental problems that arise from overfishing and root causes, as well as prompts for personal stories from fishermen about their lives in the fishing industry. We asked these questions to understand the fishermen's perspectives and what is important to them and their livelihoods. Additionally, the leader of our sponsor organization, Khun Piya, was able to add additional information about the selective fishing methods that local fishermen in the village use to catch fish. See Appendix B for the full interview protocol and Appendix C for information on the coding method we used to analyze the interviews.

3.1.2 Shadowing Local Fishermen

The purpose of shadowing fishermen was to conduct visual observations of their work, and more specifically, their fishing methods. We were able to see the gear they used and observed how it affects bycatch and the amount of sellable fish caught. Data collected from observing fishermen mainly consisted of images used to support verbal information from interviews on selective fishing methods and materials, as well as visual content for our report.

We consulted with our sponsor to connect with fishermen who were comfortable taking us on their vessel for observation and consented to us taking pictures of their gear, what they catch, etc. We made sure to acquire verbal permission to include any fishermen in images and video that would be included in our final published report or other project materials.

3.2 Determine the Effectiveness of Current Strategies Used by the Thai Sea Watch Association to Spread Awareness of Current Issues in the Fishing Industry and Recommend Appropriate Improvements.

Our second objective was to determine the effectiveness of the TSWA's outreach campaigns and recommend improvements to the way they use social media. We surveyed the Thai public about their knowledge of overfishing and what media sources reach them best.

3.2.1 Surveying the Thai Public

The goal of collecting survey data was to gain information about the scope of TSWA's outreach using their current communication platforms as well as how much general knowledge Thai people in Bangkok have about overfishing in their country. This helps to determine if improved awareness communication is necessary depending on the current public knowledge, and how reach can be improved. We used convenience sampling to collect as large of a sample size as we were able to, as we did not have the time or resources to target specific demographics of people throughout all of Bangkok. Our target was to receive anywhere from 50-100 responses to our survey at the minimum. To distribute our questionnaires, we first printed out 20 QR codes that contain a web version of our questionnaire and posted them on appropriate floors and areas of Chulalongkorn University to reach university students. We also asked students to post the QR code on their social media accounts. As our main source of collecting random responses, we attended a local market and various canteens around Bangkok and asked people to participate in our survey by scanning the QR code.

Figure 3.2: Distributing surveys at a local market (Saidoung).

We targeted individuals who appeared to be older and non-students to add more random individuals to our survey and make our responses more representative of Bangkok as a whole. Using this survey to collect our data was ideal due its ability to reach many people in a shorter time span than it would take to interview people.

The questionnaire consisted of a series of questions related to the respondent's knowledge of current overfishing issues in Thailand and their opinions on effective communication methods. To address liability issues with students or children under the age of 18, we restricted anyone under the age of 18 from taking the survey at all. The full survey questionnaire is available in Appendix D and information on the survey analysis is available in Appendix E.

3.3 Summary

From this research, we plan to provide recommendations to The Thai Sea Watch Association (TSWA) to help them educate the general public about sustainable traditional fishing methods to increase awareness of overfishing and the struggles of local fishermen throughout Thailand.

4 Findings and Analysis

This chapter contains findings developed from interviewing local fishermen in Ban Thung Noi, Kui Buri and from survey data on the effectiveness of our sponsors outreach and different types of social media. It includes findings about local fishermen and their points of view on commercial fisheries and government policy. Additionally, there are findings from our survey discussing social media usage.

4.1 Traditional Fishing Methods and the Effect of Overfishing on Local Fishermen

By analyzing the information gathered from our site visits and interviews, we developed the following findings concerning fishing gear used in Ban Thung Noi, Kui Buri, as well as how local fishermen experience and are affected by current issues plaguing fishing in Thailand. The data we collected consisted of 11 interviews with fishermen and direct observation of fishing methods from shadowing local fishermen and from a tour with our sponsor. Interview transcripts are detailed in Appendix F.

1. **Local fishermen in the Ban Thung Noi fishing village primarily use selective fishing methods to catch adult fish and reduce the bycatch of other species and juvenile fish.**

Figure 4.1: Three layer shrimp nets (Shemesh).

Figure 4.2: Fishing rods used to catch Indian Salmon (Shemesh)

Figure 4.3: Gil nets used to catch mackerel (Wolfgang).

Figure 4.4: Shell used to catch octopus (Wolfgang).

Figure 4.5: 1000 Indian Salmon buoys (Wolfgang).

Figure 4.6: Indian Salmon buoy made from plastic bottle (Wolfgang).

Figure 4.7: Splendid Squid and Cuttlefish trap (Wolfgang).

Six of eleven fishermen mentioned during their interviews that they use selective fishing techniques and only catch adult fish. These methods were described as being effective at reducing bycatch of unintended species and only allowing for adult fish to be captured, reducing the bycatch of juvenile fish. According to our sponsor Khun Piya Thedyam, "the people in this village focus on catching aquatic animals with separative techniques. There are no destructive tools in the village". Another fisherman also mentioned their "boats only catch big fish that are able to reproduce [before they are caught]."

The fishermen describe the importance of using selective fishing techniques and using these methods as "local wisdom that has been passed for many generations". The fishermen understand that if they catch both the adult and juvenile fish, then "they will have only caught small sized fish that are unusable" and unable to reproduce. Bycatch of other species and juvenile fish is one of the biggest problems surrounding overfishing today (Davies et al., 2009). These fishermen understand that catching juvenile fish will lead to a further decrease in populations and "fewer fish stop the traditional fisherman [from continuing to fish]." These fishermen cannot continue to make a living if there are less fish and using selective methods is the best way to prevent the decrease of fish populations.

Figure 4.8: Local fishermen using selective methods (Boonrukvanit).

2. **Fishing is deeply ingrained in the Ban Thung Noi community and has become vital to supporting the 233 households that make up the village.**

When asked how fishing is important to their lives, seven out of the eleven total respondents indicated that fishing was their "main source of income", with three of these respondents further elaborating that "[they] live by the sea every day, and fishing is [their] only job". This is further supported by 55 percent of respondents mentioning that the location of their village limits them to fishing, as there are no other career options. One fisherman noted, "[They] don't have land to farm". Most of these fishermen started fishing before the age of fifteen (73 percent) and seven out of the eleven respondents had deep generational ties to fishing. Three out of these seven fishermen went on to further emphasize the importance of families. In one response to how fishing is important to his life, a fisherman emphasized "[fishing] is important to my life as it is a way to feed my family". Four of the total eleven fishermen also noted that feeding their families was one of the main reasons that fishing was important in their lives.

3. **While most of the fishermen are able to observe a decrease in fish populations that directly affects their ability to bring in fish, they are more apt to see smaller increases or decreases as more important due to the immediate effect on their lives.**

As expected based on data from the Department of Fisheries, ten out of the eleven fishermen interviewed indicated that fish populations have decreased over the past five years (Chenkitkosol et. al, 2022). This baseline data supports one of the main points in the problem statement provided by our sponsor: that overfishing is impacting small fishing villages in Thailand. While it was expected that most of the fishermen would experience decreased amounts of fish, six out of the eleven fishermen continued to elaborate that while they noticed a general decrease over the past five years, the amount of fish in the recent two years increased. As one fisherman stated "the [overall] amount of fish is decreasing but this year the amount of fish is increasing".

4. **Although fishermen in Ban Thung Noi attribute decreasing fish populations to commercial fishing methods, they are not concerned with blaming commercial fisheries or painting them in a negative light. Instead, they consider solutions that would improve fishing conditions for all fishermen in Thailand.**

One of the main topics to be researched as part of our original problem statement was competition between traditional fishermen and commercial fisheries. Both the media and our sponsor suggest conflict between commercial fisheries and traditional fishermen (Petchkaew, 2022; Thedyam, P., Personal Communication, Jan 19, 2023). While there may be disagreements, many of the local fishermen felt it was not necessary to blame the commercial fishermen. When asked about how commercial fisheries affect their lives, five out of eleven fishermen responded that commercial fisheries catch all fish including juvenile fish that are then unable to grow up and reproduce to restore fish populations. However, two of those five fishermen then went on to elaborate that commercial fisheries should not be blamed. Out of the total eleven fishermen interviewed, six held similar opinions. Respondents felt that blaming either traditional or commercial fishing would be in vain, and that other problems in the fishing industry should be considered instead, such as climate change and poorly enforced law and policy. Two of the fishermen even went on to mention that commercial fishers are their relatives; one of them noting that the competition is "hard on the level of community relations". Two other fishermen exhibited hesitancy to answer any questions about commercial fisheries, mentioning that they could get in trouble or refusing to comment at all.

5. **Most traditional fishermen in Ban Thung Noi agree on the necessity of well-enforced fishing regulation and policy to improve fishing conditions and the livelihoods of all fishermen.**

When asked about their opinions on the current regulations and policy in the fishing industry, eight out of eleven respondents mentioned the importance of policy to maintaining healthy fish populations for fishermen to be able to fish from. 75 percent of these eight responses mentioned that the policy is not well enforced or

has flaws, while 50 percent indicated that there are disadvantages for smaller fishing boats and traditional fishermen as a direct consequence of the way the laws are written or fail to be enforced. Five out of the total eleven fishermen interviewed mentioned that the current regulations have the potential to work, they just have loopholes or aren't enforced properly. Light generators used by commercial vessels to attract large amounts of fish were a common issue mentioned. As described by one of the fishermen, "by law, commercial fisheries are forbidden to have light generators." Three other fishermen mentioned in their interviews that commercial fishing boats continue to use these lights for bait regardless of the law. One of our respondents responded to this, saying: "I think if they followed the regulation it would not affect our lives" when asked how commercial fishing affects fishermen's lives in Ban Thung Noi.

A common policy mentioned by the fishermen throughout their interviews were regulations regarding how far traditional and commercial fishing boats can fish from the shore. According to four responses, traditional fishermen are limited to fishing within three nautical miles from the shore, while by law commercial fisheries must take their boats outside of the three nautical mile range (Chenkitkosol et. al, 2022). Three out of seven responses mentioning issues with fishing distances noted that commercial fisheries often fish inside the range that only traditional fishing boats are allowed to occupy. The other four of these responses indicated that they would like the boundary to be pushed further out for traditional fishing boats so that they can have access to more fish populations than those dwindling inside the three nautical mile boundary. When asked about his thoughts on the current law and policy, one fisherman responded with the following: "I am waiting for another resolution that's about opening the bay, closing the bay. It's good that the commercial ship can't enter so we can still make a living".

Analysis

We have already established in our background that fishing is vital to Thailand as a leading supplier of seafood around the world (Environmental Justice Foundation, 2015; Chenkitkosol, 2022). Of the around 650,000 people employed by Thailand's fishing industry who fuel seafood exports, it is important to remember that those who live in small villages such as Ban Thung Noi sell fish inde-

pendently as their only source of income to feed their families and maintain their equipment. These villages don't have the resources for any other way of life, issues in the fishing industry are not just an inconvenience to them. The effects of overfishing, including decreases in fish populations they have already directly observed, have the potential to cripple them and their families' basic survival: traditions passed on to them through generations (Thedyam, P., Personal Communication, Jan 19, 2023).

While the fishermen have observed decreasing fish populations, it is also clear that fishermen without access to data such as presented by the Department of Fisheries are more concerned with issues that affect them daily, and are therefore less likely to be alarmed by patterns over larger time periods if they are benefitting from or comfortable with the current conditions. This informs how to best present problems in the fishing industry to the public; if traditional fishermen are not alarmed about issues that pose a threat to their livelihoods over time, it will be difficult to gain their support in any emotionally charged attempts to educate the general public of issues they are not currently concerned about. This was further exhibited by how many of the fishermen did not want to blame the commercial fisheries even after mentioning issues with commercial fishing practices and gear, instead bringing up problems with law and policy they attribute to causing commercial fisheries to use damaging fishing methods. This demonstration of social identity – "us" versus "them" – relates to a comment made by Khun Piya Thedyam, that "originally local fishermen and big industries had no conflict with each other, but since the amount of fish is decreasing they compete for resources and compete for fishing areas, and these effects cause disparity". He continued to establish that divisions between traditional and commercial fishing extend past the village of Ban Thung Noi, noting that "at the national level, the unity of the people in this nation is divided into two sides, traditional and industrial fishing communities, which are clearly divided into government and community sectors". Intergroup conflict has been fuelled by social identity all over the world for decades, contributing to some of the longest-lasting conflict in history (Hewstone et. al, 2014). Hewstone et. al cites studies in the mid-1950s to the early 2000s that have studied the effects of prejudice on intergroup

interactions. The term contact hypothesis refers to a proposition that contact between two conflicting groups can decrease prejudice between them, improving intergroup relations. There are four "optimal" conditions for the meeting of two groups: that they have equal status, the situation in which they contact should require cooperation between the groups, they should be working towards common goals, and the contact should be mediated through a legitimate organization. The responses given by the fishermen in the interviews suggest that contact between local fishermen and commercial fisheries could be productive. Although the groups do not have equal status, both groups depend on the ocean to support their livelihoods, making protecting fish populations a joint interest. Contact could be mediated by the Thai Sea Watch Association assuming its authority is recognized by commercial fisheries, or the TSWA could contact another government or fishing-related organization to organize contact between leaders and fishermen of both groups. To encourage cooperation, appropriate law and policy to preserve ocean resources could be discussed. Many respondents indicated that the law and policy is not well enforced, but that it has potential. It may be helpful for the TSWA to focus on law and policy that is most important to the local fishermen themselves, which might also benefit commercial fisheries as well. The two issues touched upon the most by the local fishermen in Ban Thung Noi were distances certain fishing vessels are allowed to fish from the shore and equipment used illegally by commercial vessels. Focusing on these laws could attract more fishermen to our sponsor's cause and create compromises that satisfy and help all fishermen and the environment of the Gulf of Thailand.

4.2 The Effectiveness of Current Strategies Used by the Thai Sea Watch Association to Spread Awareness of Current Issues in the Fishing Industry

Analysis of the survey results led to the development of the following findings related to current awareness surrounding the Thai Sea Watch Association and new methods of spreading awareness to people in Thailand. The data we collected consisted of 144 responses, 43 percent students and 57 percent non students. The ages

of our respondents were grouped into three groups; 19 to 39, 40 to 59, and 60 or more years. We received 56 percent of our responses from people ages 19 to 39, 36 percent from people ages 40 to 59, and 8 percent from people over the age of 60.

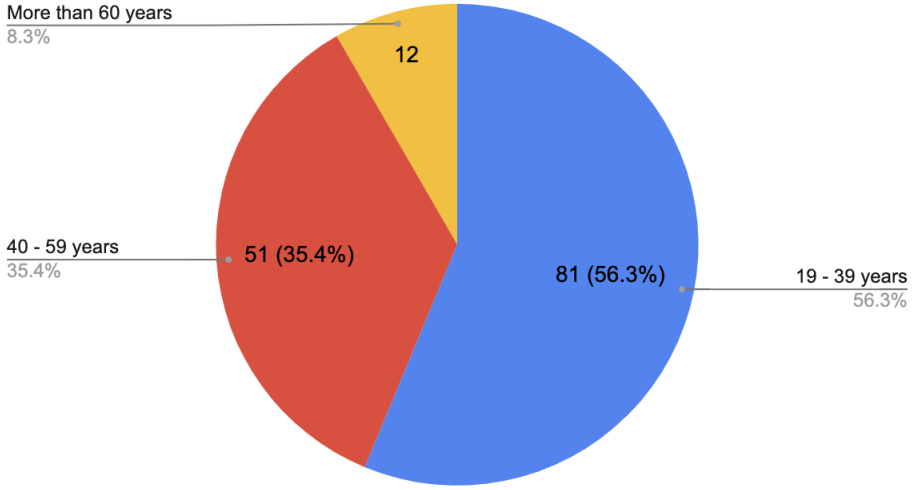

Figure 4.9: Distribution of respondents ages.

1. **Based on responses to our survey, people in Thailand have very little knowledge of the fishing industry and fishing related organizations such as the Thai Sea Watch Association, but still believe that overfishing occurs in Thailand**

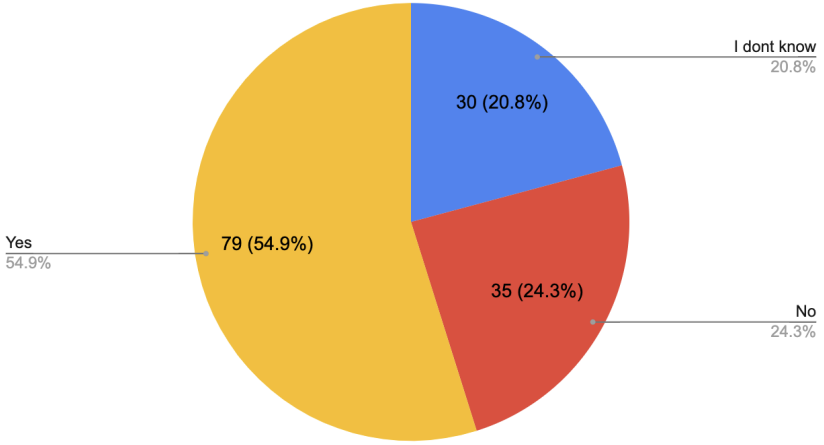

Figure 4.10: Respondents opinions on if overfishing occurs in Thailand.

When asked if overfishing occurs and is a problem in Thailand, 55 percent of the respondents answered yes (Figure 4.10). When asked to rate their knowledge of the fishing industry on a scale from 1 to 5, respondents answered on the lower end of the scale, with 83 percent of respondents rating themselves a 3 or lower and 61 percent rating themselves at 2 or lower (Figure 4.11). The ages of the respondents were evenly distributed for each rating, indicating that the age of the respondent had very little influence on their knowledge of the Thai fishing industry (Figure E.1, Appendix E).

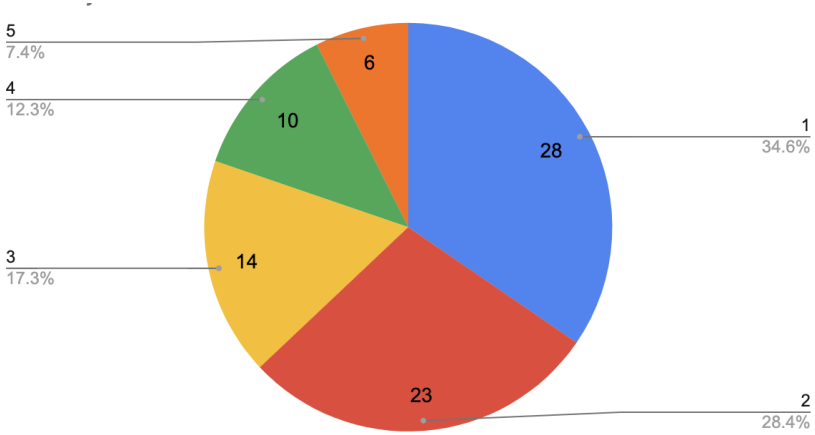

Figure 4.11: Respondents rating their knowledge of the Thai fishing industry on a scale from 1 to 5 (higher is better).

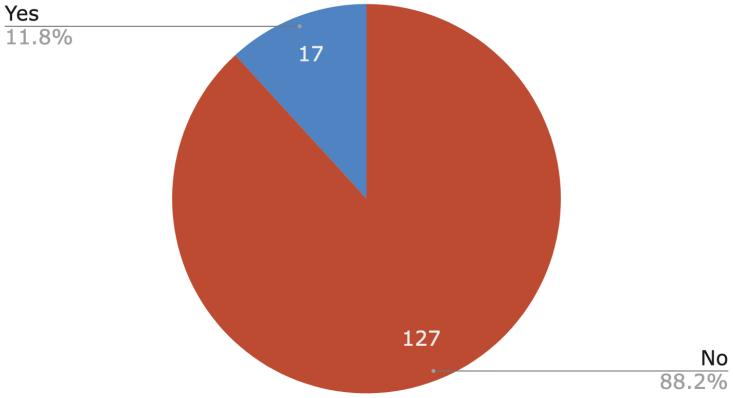

Figure 4.12: Distribution of people who have heard of the Thai Sea Watch Association.

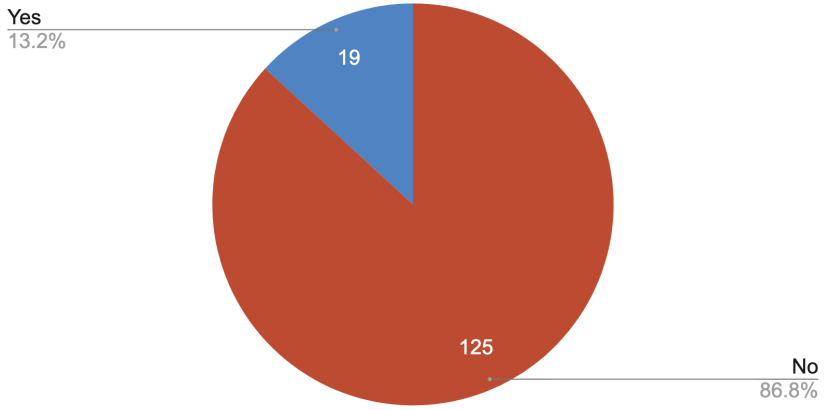

Figure 4.13: Distribution of people who know of other organizations related to fishing in Thailand.

Two questions asked in our survey were "Do you know of the Thai Sea Watch Association?" and "Do you know of any other fishing related organizations in Thailand?". Both responses received almost the exact same distribution of responses, about 12 percent yes and 88 percent no (Figure 4.12, 4.13). Additionally, many of these "yes" responses were from our sponsor or people in the village of Ban Thung Noi who already know of the Thai Sea Watch Association. From this we can conclude there is very little knowledge of the Thai Sea Watch Association or any other fishing related organizations outside of the fishing village.

2. **According to our survey, Facebook is the best source for many people of different ages and occupations to consume information whereas Twitter is the best source to reach younger people and students**

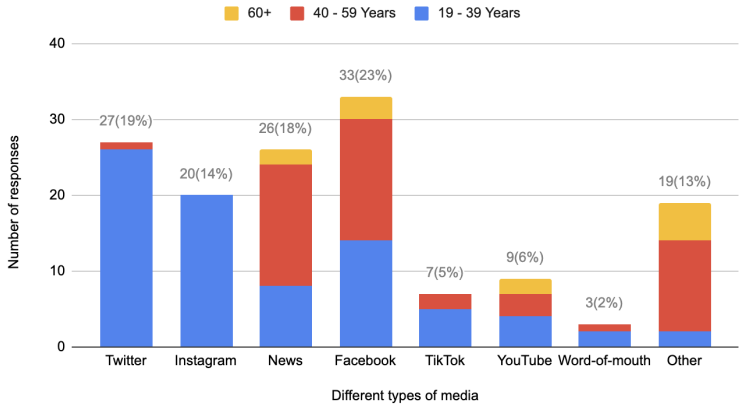

Figure 4.14: Distribution of media sources that reach respondents best based on age.

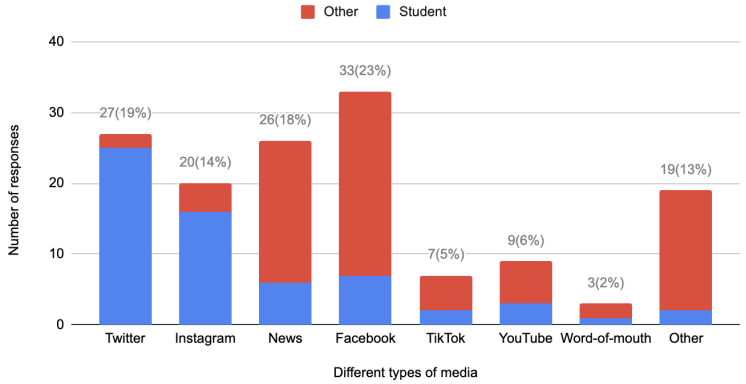

Figure 4.15: Distribution of media sources that reach respondents best based on occupation.

From our survey, we can see that Facebook (23 percent), Twitter (19 percent), and the news (18 percent) are the best sources to reach our respondents (Figure 4.14, 4.15). Of these top three sources, Facebook is the most diverse by age, attracting 17.2 percent of people aged 19 to 39, 31.4 percent of people aged 40 to 59, and 25 percent of people aged 60 or more years. Facebook responses are mostly dominated by other occupations, with students only representing 7 of 33 responses (21 percent). Therefore, this was not the most popular source for the youngest age group. That would be Twitter, with 26 of 27 responses (96 percent) coming from this age group and 25 of 27 responses (93 percent) coming from students.

Additionally, Instagram is completely dominated by the youngest age group (100 percent), but does not have as many total responses as Twitter and Facebook. For the middle and oldest age groups, the news and Facebook were the most popular sources. The news was mostly represented by age groups which are non-students and did not have many responses from the younger age group. There was also a large number of other responses from the two older age groups such as “television”, “school” and “leaflets”.

3. **Results of our survey suggest Facebook and word of mouth are the best sources for people of many different age groups and occupations to share information with others whereas Instagram is a better source for younger people and students**

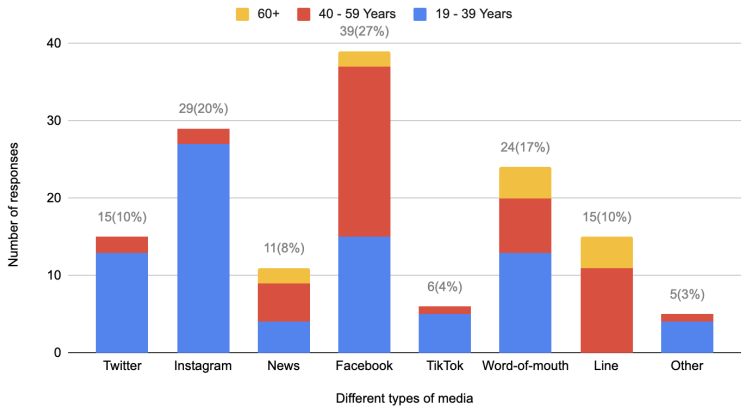

Figure 4.16: Distribution of the best media sources for sharing content with others by age.

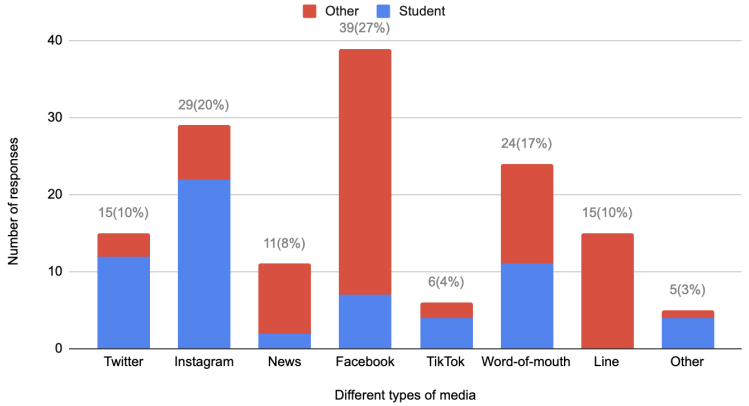

Figure 4.17: Distribution of the best media sources for sharing content with others by occupation.

From our survey results, we can see Facebook is the most popular source for respondents to share information with others with a

total of 39 of 144 responses (27 percent) (Figure 4.16, 4.17). Close behind Facebook are Instagram (20 percent) and word-of-mouth (17 percent). Facebook and word-of-mouth have the most even distribution of people in all age groups, but word-of-mouth is the most evenly distributed for students versus non-students. Instagram is also very popular for the youngest age group and students, with a majority of the 29 responses coming from the younger age group. Line only received responses from the older two age groups and only from non-students. The least popular methods for sharing information were the news and TikTok.

Analysis

We established in our background that overfishing was a problem in Thailand. What we did not know was the awareness that surrounded this issue or the public knowledge that the Thai Sea Watch Association had previously generated. From the data we collected, it is clear that our respondents generally seemed to know that overfishing is a problem in Thailand, but when asked about their knowledge of the fishing industry as a whole they didn't seem to know very much. The same respondents also did not know about the Thai Sea Watch Association or any other related organizations. This presents our sponsor with an opportunity to improve education of the Thai public about TSWA as an organization and local fishermen's struggles in the current state of the Thai fishing industry.

From the data collected on media sources, we can suggest the best source for people of many age groups to consume and share information is Facebook. Our sponsor already uses Facebook as indicated previously, but lacks an active audience and engaging content for the audience to consume. The Facebook page has a following, but the followers do not interact enough with the content being posted. As explained in the background, taking advantage of short videos, conducive content, and the Facebook groups feature can grow his active audience and therefore the awareness of people in Thailand (Facebook, n.d). Based on the survey results, Twitter and Instagram are the best sources to reach a younger age group. Twitter was especially popular when the user was consuming content. This is most likely due to the retweet feature, which was described in the background section. The Twitter page our sponsor uses has

very few followers and also has room for potential improvement. Twitter is a powerful source for sharing information to a lot of people at once, but our sponsor's page lacks an audience and content. Our sponsor currently does not have an Instagram page. It may be valuable for him to create an Instagram account and generate a following. Both sources can be very effective in allowing younger people to consume the information our sponsor posts.

Additionally, finding a way for more people to talk about the problems in the fishing industry, specifically the livelihoods of local fishermen, would be very valuable to our sponsor. Our sponsor already attends in-person events to share his opinions and educate people about overfishing prevention in small villages like Ban Thung Noi. To help support these events, people could learn about the information discussed at the conference from one of the social media sources. Social media is an incredibly powerful tool, but without the proper content becomes less effective at attracting and engaging an audience.

4.3 Limitations

The research presented in this project contains limitations that are important to consider alongside its analysis and resulting conclusions.

1. Survey Sample Size

Our survey utilized a convenience sample limited by time and resources. We were unable to produce a truly random sample of the Thai public due to our base location in Bangkok and insufficient resources to properly sample people from all over the country. We also had insufficient resources to produce a large enough sample of random people in Bangkok. Our final method of approaching individuals in the street was able to produce a random sample, however we were only able to interview 144 individuals, almost half of which were students. Survey analysis takes this limitation into account through breakdowns of age, job, and other demographics.

2. Access to Related Organizations and Individuals

Access to organizations and individuals related to our project topic was limited due to a variety of reasons. Attempts were made

to reach out to multiple members of the Thai Sea Watch Association and related boards, however their busy schedules and communication barriers often resulted in meetings falling through. Access to fishermen for interviews in Ban Thung Noi was also limited by our sponsor. Khun Piya is an important leader and figure in the village and therefore could have unintentionally influenced the responses we received in our interviews, as well as which fishermen we were able to speak with throughout the interview process. Additionally, we were only able to interview a small number of fishermen (11) and they were all from the same village. Our data does accurately support our findings, but only for the village of Ban Thung Noi. Our findings can not be generalized across all fishing villages on Thailand's coasts.

3. Thai Language Fluency

All of the interviews and surveys for this project were initially conducted in Thai and then translated into English. The primary writers of the analysis section for these research methods were not fluent in Thai. This could have resulted in slight misinterpretations of parts of the interviews, as context, tone, and slang were not able to be understood by English speaking team members during interviews. The analysis of all Thai material depends solely on the Thai-to-English translations and notes from Thai speaking group members.

5 Recommendations and Conclusion

This chapter outlines the team's recommendations to the Thai Sea Watch Association to increase awareness of the struggles local fishermen face due to the effects of overfishing. It includes recommendations for our sponsor to consider what areas of the fishing industry he is focusing his efforts in and additional methods to grow his active following on social media.

5.1 Recommendations for the Thai Sea Watch Association in Kui Buri

Continue to emphasize the use of and education about selective fishing methods.

The importance of selective fishing methods to fishing traditions in Ban Thung Noi adds credit to claims these fishermen make about improving law and policy to protect the ocean and fish populations from overfishing. Their choices to use fishing methods that only catch certain species and mature fish even though they could catch more fish with less selective methods demonstrates their dedication to keeping traditional, sustainable fishing alive. Use of selective fishing methods should continue to be taught and encouraged between families and neighbors not only to continue to support the ocean ecosystem around Kui Buri fishing communities, but also to maintain the credibility of local fishermen, as their methods are continually supported by practice and data. Education about selective fishing methods should also continue to be a pillar of the goals of the Thai Sea Watch Association. If audiences can see that local Thai fishermen stand behind their words with their actions, it will support their messages calling for an increase in use of sustainable fishing methods and enforcement of policy that limits the use of methods that damage the environment and overcatch fish and bycatch species.

Discourage perpetuation of the "us" versus "them" competition between commercial fisheries and local fishermen.

Even though they recognize that bait methods such as light generators and mass catch techniques such as pair-trawl used by commercial fisheries increase bycatch and catch of juvenile species,

local fishermen are still hesitant to blame commercial fisheries for the effects of overfishing they experience in their daily lives. There are a few reasons for this, some realize that there are bigger issues at play such as climate change or problems with law and policy, some are afraid to speak about commercial fisheries in fear of getting in trouble, and some note that commercial fishers are their friends and neighbors and that blaming them for anything would be in vain. Social identity often continues to create unnecessary stress in intergroup conflict, especially when both groups share similar goals (Hewstone et al., 2014). The contact hypothesis could be a concept that the Thai Sea Watch Association considers to improve the relationship between local fishermen and commercial fisheries in Kui Buri for the betterment of the fishing industry for everyone. If the TSWA could organize a meeting between leaders and members of commercial fisheries and local fishing groups, cooperation between both groups to establish similar goals and ideas about law and policy adjustments or enforcement that benefit both groups could bridge the gap and create a larger association of people looking to improve the fishing industry together.

Focus efforts on law and policy adjustments that the fishermen of Ban Thung Noi are the most interested in.

In our interviews with the local fishermen of Ban Thung Noi, regulation of a few specific equipment and laws were mentioned by more than a few respondents. In activism for socio-environmental issues, it is easy to become overwhelmed by all of the problems associated with an overarching issue (Andriesse et al., 2022). There are many laws related to fishing in Thailand, gear used by different types of fishermen, and other influences such as climate change and economic stressors that affect how fishermen are affected by overfishing. Our sponsor may find more success focusing on one or two types of law or enforcement of law dictated by what the local fishermen themselves are most concerned about to be able to gather more focused support for a more reachable goal. For example, a few of the fishermen mentioned that commercial fisheries illegally use light generators as bait to draw many fish up to the surface. This could be a target for the Thai Sea Watch to advocate for better regulation of fishing gear. Another group of fishermen mentioned that the distances that local and commercial fishermen can fish from the

shore is not well regulated, some emphasizing that they would like to see commercial fishing boats held outside the fishing range for local fishermen better or that they would like to see the distance for commercial fishing boats pushed out further. These laws and policies could also be good targets for the TSWA to better represent the needs of the fishermen of Ban Thung Noi and improve fishing conditions for everyone in the Gulf of Thailand by Kui Buri.

Prioritize creating engaging content to attract a more active following on powerful social media platforms like Facebook and Twitter.

Our survey results suggest that very few people know of the Thai Sea Watch Association or related organizations, raising the opportunity for our sponsor to increase his activity and quality of content on social media. Both Facebook and Twitter are powerful platforms for sharing content with others. From our background research, we know our sponsor currently has accounts on both, but is not using them to their fullest potential. Creating easily consumable content is an important part of using each platform. People are more inclined to watch a short seven second video clip than an hour long full interview (Facebook, n.d). Posting consumable content is step one, but generating an active audience is another important part of using these platforms. Our sponsor could or join active Facebook groups to generate more of a following for himself and the Thai Sea Watch Association's Facebook page. He also could attract people with a large following to retweet his posts on Twitter. Fully taking advantage of these powerful social media platforms is the next step for sharing the current problems in the fishing industry along with the struggles of local fishermen in his village.

Using our background research and footage from the fishermen interviews, the team was able to create a sample video for our sponsor. Since our sponsor lacks engaging content on his social media, we have provided him with video as an example of the format his future content should follow to effectively engage the audience. The video engages the audience by sharing the struggles of fishermen we interviewed in a concise, edited video format. Based on results from other organizations with similar content improvements, using this format for future videos could result in upwards of a 100 per-

cent increase in views on Facebook (Guevera, 2011). This would be incredible for our sponsor if he is willing and able to put in the time and resources to create content of this quality and on other platforms, such as Twitter. To produce this video the team needed multiple days of shooting, transcribing, and analyzing interviews along with around three thousand Baht to hire an editor to edit the footage. For our sponsor to commit to this, he would need to hire someone who specializes in social media and content production. We are unsure if this is a viable solution for our sponsor due to his limits in time and resources, but based on the data we gathered during this project we believe that this could be an effective method of increasing awareness of the struggles local fishermen face due to the effects of overfishing.

5.2 Conclusion

Our team leaves Thai Sea Watch with recommendations on how to better support and represent the interests of the local fishermen in Ban Thung Noi, Kui Buri and inform the general Thai public of unsustainable practices contributing to instability in the Thai fishing industry. We not only recommend that TSWA explore more effective communication methods, but also to continue their emphasis on using and educating about selective fishing techniques that do not contribute to overfishing in Thailand. We also recommend strategies to not lose sight of the people this organization is aiming to represent, the artisanal fishermen of Thailand's coasts. We see a future where ocean resources can be managed sustainably if the voices of local fishermen can be projected by the Thai Sea Watch Association and supported by its access to other organizations and resources. Along with these recommendations, our research creates a base for additional projects such as development of a tour of fishing boats and selective fishing methods in the Ban Thung Noi to promote knowledge of traditional fishing in Thailand amongst residents and tourists who buy and consume seafood. This and similar branches of our project can create future opportunities to further support these local fishermen and their livelihoods for generations to come.

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Appendices

Appendix A: Sponsor Description

General information

The Thai Sea Watch Association (TSWA) (2007) is an association of organizations related to artisanal fishing and ocean conservation in Thailand. The TSWA was developed by members of a small fishing community dating back to 1981, and is now made up of 53 separate organizations of fishing communities on Thailand's coasts. They have a seven-part mission which includes the following objectives:

1. To cooperate and coordinate with other government and non-governmental organizations in promoting and improving the quality of life for local fishermen.

2. To promote conservation and restoration of marine and coastal resources.

3. To promote education, research and knowledge development in sustainable resource management.

These objectives are supported by the organization's focuses on marine and coastal resources, energy management, and community enterprise. The TSWA is a non-governmental organization (NGO) but it still receives funding from the Thai government and other private and public agencies. These agencies include: The Department of Environmental Quality, The Office of Knowledge Management and Development, and the Ministry of Social Development and Human Security (SCG). They are also funded by foreign organizations such as Oxfam GB, the Japanese Embassy, the French government, Terre des Hommes, Misereor, and Cebemo (Cordaid).

Organization structure

According to their website, the Thai Sea Watch Association is organized as follows:

1. **Association President:** Mr. Vichokesak Ronnarongpairee
2. **Chief:** Mr. Narit Duangsuwan
3. **Chief:** Prof. Dr. Jarunee Chiewwarisajja
4. **Treasurer:** Mrs. Benchawan Phengnhu
5. **Hostess:** Mr. Somnuk Phannasak
6. **Registrar:** Mrs. Jinda Jittanang
7. **Secretary and Managing Director:** Ms. Oijai Wongsuwan
8. **Association Fundraising:** Ms. Saowalak Prathumthong
9. **Association Fundraising:** Ms. Hasanah Koh Masaw
10. **Public Relations:** Mr. Preecha Rombannlo
11. **Director:** Mr. Samaae Jemudor
12. **Director:** Miss Lamai Manakarn
13. **Director:** Ms. Supaporn Phanrai
14. **Director:** Mr. Noi Kantan
15. **Director:** Mr. Somboon Khamhaeng

Our sponsor, Khun Piya Thedyam, is a regional representative for Kui Buri stationed in our research site, Ban Thung Noi village.

Past projects

The Thai Sea Watch Association has completed the following projects as of 2020:

1. Projects to promote conservation and restoration of coastal residents **Apr. 2010 – Jun. 2020**
2. Women's network and leadership development projects **Oct. 2010 - Jun. 2020**
3. Project establishment and monitoring depression disaster **Feb. 2011-June 2020**
4. Capability development project for the Southern Fisheries Association **Mar. 2011 – Jun. 2020**
5. Aquatic Animal Enrichment Promotion Project Jan. **2018 - Jun. 2020**

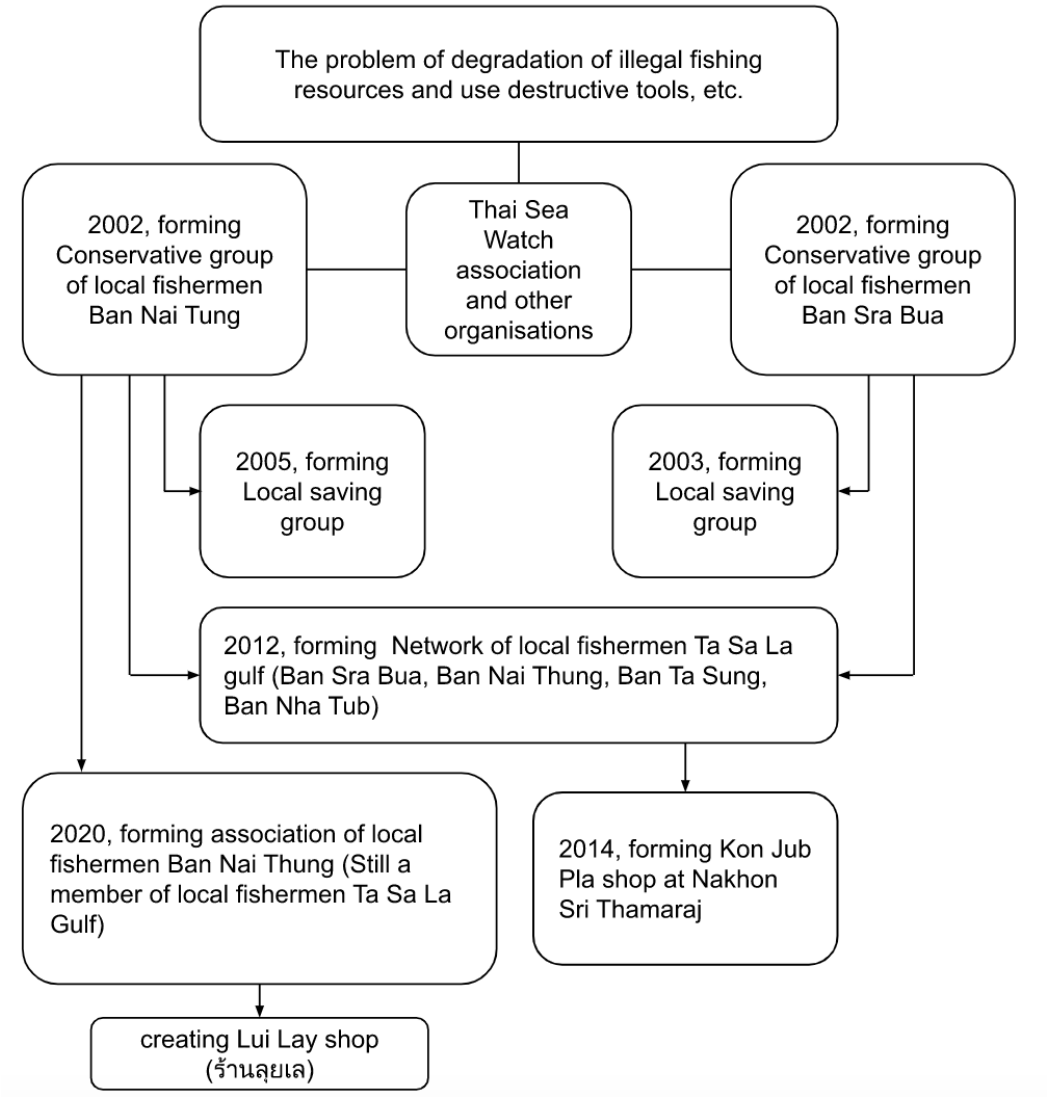

Figure A.1: Flow chart of the formation of the Thai Sea Watch Association (Thai Sea Watch Association 2020).

Appendix B: Fishermen Interview Protocol

Intro Script

(Introduce ourselves). We are a group of students from Worcester Polytechnic University (WPI) in the United States and Chulalongkorn University (CU) here in Thailand. We are working with the Thai Sea Watch Association (TSWA) to do research on the effects of overfishing on the Thai fishing industry. We would like to interview you on your experiences in the fishing industry.

We can be contacted with questions or concerns here:

gr-thailandiqpfishingpractices@wpi.edu

Consent

First ask the interviewee if they consent to being recorded. Tell them that the recording could be used by the Thai Sea Watch Association online and in our research, receive verbal consent for one or both. Let the interviewee know that their responses will remain anonymous unless they give permission for their names to be used either in quotes or paraphrased in a report that will be published by WPI and CU. Additionally, let the interviewee know that they have the right to not answer any questions they would prefer not to respond to.

Questions

1. Would you like to be anonymous? *If not, ask and record the interviewee's name.*
2. Describe how fishing is important in your life.
3. How long have you been in the fishing industry?
4. Do you feel that the numbers of fish that you catch have increased or decreased over the past 5 years? *Has it become more difficult to catch fish? Why or why not?*
5. Describe your experiences with commercial fishing. *Ask about how their lives have potentially changed because of commercial fishing. How do commercial fishing techniques affect you?*
6. What is your opinion on current fishing regulations? *Ask about gear and policy regulations.*

Closing Remarks

Thank you for taking the time to speak with us! Your responses will be very helpful for conducting our research. Now that the

interview is over, have you changed your mind about your responses remaining anonymous/public? Do you still consent to the recording of your responses being kept? Do you have any questions for us at this time?

Appendix C: Interview Coding Process

To analyze the content of the interviews, we used a combined deductive and inductive coding scheme, a qualitative data analysis system where some aspect of data is assigned a descriptive label that can be tracked to relate content across all of the data (University of Illinois Library, 2023). We used both knowledge we had previously acquired from background research and the data itself to find themes between responses. For our first method, we applied our codes to all transcripts of video and audio recordings of our interviews that were first transcribed from Thai and then translated into English by our Thai group members. We organized and tracked our data using a method where transcribed interviews were organized in a Word document and then transferred to an Excel document where a list of codes were organized (Ose, 2016). Excel formulas were used to apply the codes to each interview which eventually allowed related text from each interview to be grouped for analysis. This method was used to analyze the responses all of the fishermen gave to the same questions, allowing for identification of themes brought up in a similar context. Additionally, we used a whole interview approach where themes were identified and highlighted throughout entire interviews to capture the overarching themes mentioned and emphasized throughout the entire duration of an interview. Our methods for creating codes changed as we viewed the data, but were all based on common ways researchers establish themes in their data, such as repetitions, indigenous typologies (local terms that are unfamiliar but used in a particular context for the research topic), metaphors or analogies commonly referenced in responses, transitions from the topics we ask about to similar topics respondents find important, and missing data (gaps where fishermen may have refused to answer questions or go into detail that could indicate connections in our data) (Ryan & Bernard, 2003).

Appendix D: Survey Questionnaire

***You must be 18 years old or older to fill out this form**

We are a group of students from Worcester Polytechnic University (WPI) in the United States and Chulalongkorn University (CU) here in Thailand. We are working with the Thai Sea Watch Association (TSWA) to do research on the effects of overfishing on the Thai fishing industry. We would like you to complete this questionnaire so that we can determine how people in Thailand think about fishing and the current state of the marine ecosystem in Thailand.

We can be contacted with questions or concerns here:

gr-thailandiqpfishingpractices@wpi.edu

Additional Information

All responses to the following questions will remain anonymous and will only be used to generate a statistical analysis of the survey's results. If you are not comfortable answering a question or feel you cannot answer a question you may leave it blank. Please complete as many questions as you can.

Survey Language

1. Select survey language
   (a) Thai
   (b) English

   *In Google Form, response "Thai" directs participant to Thai translation of survey, response "English" directs participant to English translation of survey

Participant Age
You must be 18 years of age or older to fill out this form!

1. How old are you?
   (a) Under 18
   (b) 19-39
   (c) 40-59
   (d) 60+

   *In Google Form, response "Under 18" directs participant to submit the survey without being able to complete questions

Survey Questions

1. Where did you find this survey? *(Short Response)*
2. What is your occupation? *(Short Response)*
3. Where do you currently reside?
   (a) Bangkok
   (b) Other
4. Rate your knowledge of the Thai fishing industry.
   (a) 1 *(Least)*

(b) 2
(c) 3
(d) 4
(e) 5 *(Most)*

5. Based on your knowledge, do you think overfishing occurs in Thailand?

(a) Yes
(b) No
(c) I do not know

6. If your answer to the previous is yes, how did you become aware of overfishing? *Select all that apply*

(a) News source
(b) online source
(c) Instagram
(d) Facebook
(e) TikTok
(f) Youtube
(g) Line
(h) Twitter
(i) Snapchat
(j) Face to face
(k) School/Education facilities
(l) Flyers/ Posters
(m) Television
(n) Other (include field to put in your own answer here)

7. Have you ever heard of the Thai Sea Watch Association?

(a) Yes
(b) No

8. If your answer to the previous question is yes, Where did you hear of the Thai Sea Watch Association?

(a) Facebook
(b) Twitter
(c) TSWA Website
(d) Other (include a field to put in your own answer here)

9. Have you ever visited the Thai Sea Watch Association's website?

(a) Yes
(b) No

10. Have you ever visited the Thai Sea Watch Association's Facebook page?

(a) Yes
(b) No

11. If your answer to the previous question is yes, How often do you visit the website?

(a) Daily
(b) Weekly
(c) Monthly

(d) Yearly
(e) Other

12. Have you ever visited the Thai Sea Watch Association's Facebook page?

(a) Yes
(b) No

13. If your answer to the previous question is yes, How often do you visit the Facebook page?

(a) Daily
(b) Weekly
(c) Monthly
(d) Yearly
(e) Other (include a field to put in your own answer here)

14. How do you share information you find interesting with others? *(no more than 3)*

(a) News source
(b) Online/internet source
(c) Instagram
(d) Facebook
(e) TikTok
(f) Youtube
(g) Line
(h) Twitter
(i) Snapchat
(j) Face to face
(k) School/Education facilities
(l) Flyers/Poster
(m) Other (include field to put in your own answer here)

15. Have you heard of, followed online, or participated in any other organizations or associations related to the Thai fishing industry?

(a) Yes
(b) No

16. What types of sources of information do you think reach the most people in your communities and circles?

(a) News source
(b) Online/internet source
(c) Instagram
(d) Facebook
(e) TikTok
(f) Youtube
(g) Line
(h) Twitter
(i) Snapchat
(j) Face to face
(k) School/Education facilities
(l) Flyers/Poster
(m) Television
(n) Other (include a field to put in your own answer here)

Appendix E: Survey Analysis and Results

As participants took the survey, responses were collected in a Google Form and automatically exported to a Google sheet. The Google Sheet allowed us to organize responses into visual aids such as graphs and charts. Working with the data in Google Sheets was convenient because the data was automatically updated every time a survey was taken, and allowed for us to use the Google Translate command to quickly switch Thai responses into English for analysis by WPI students. We collected data from users about their age and their occupation which allowed us to compare the age or occupation of the user to the responses of other questions to clearly highlight trends between participant responses.

Additional Figures

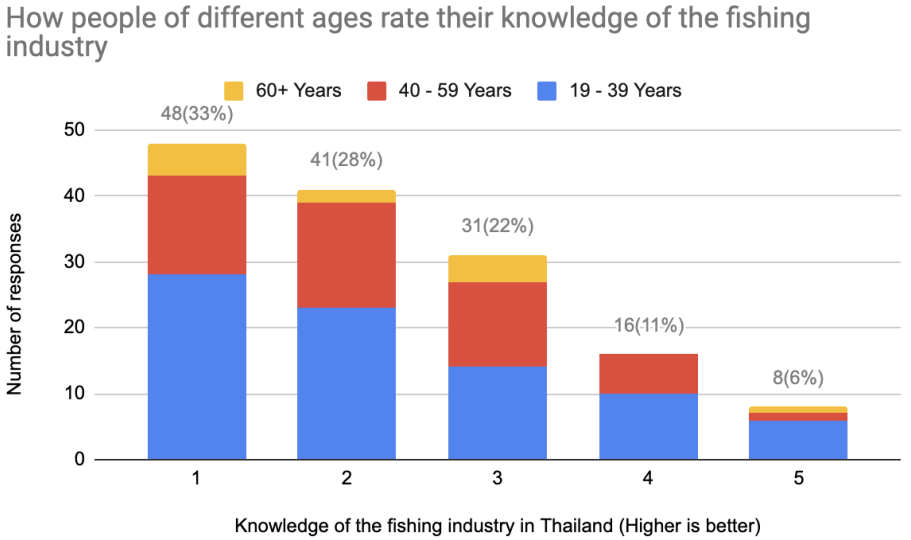

Figure E.1: How people of different ages rate their knowledge of the Thai fishing industry (higher is better).

Appendix F: Interview Transcripts

Fisherman 1

Interviewer: Natakrit Boonrukvanit

Interviewee: To Khun

Date: 18 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

To Khun : I give consent.

Interviewer : For the first question, what is your name?

To Khun : My name is To Khun.

Interviewer : How is fishing important to your life?

To Khun : Fishing is important to my life because it is a job and my main source of income.

Interviewer : How long have you been a fisherman?

To Khun : I have been a fisherman since I was in grade 6.

Interviewer : In the past 5 years, do you think the fish population has been decreasing?

To Khun : The fish population is decreasing.

Interviewer : Is fishing more difficult for you right now?

To Khun : Very difficult, there are fewer fish and the law and policy do not work. Before I could easily find fish at 3 miles but now 3 miles is not enough anymore. Fewer fish and law and policy stop the traditional fisherman but do not stop the commercial fisheries.

Interviewer : Do you think that the commercial fisheries have affected your life as a local fisherman?

To Khun : Commercial fisheries take all of the fish including the juveniles and their nets are very narrow even water cannot pass through it.

Interviewer : Can you give your thoughts on the current regulatory policy that controls fishing gear?

To Khun : The regulation policy exists but it does not get enforced properly.

Fisherman 2

Interviewer: Sutthavee Deelert

Interviewee: Sombat

Date: 19 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Sombat : I give consent.

Interviewer : For the first question, what is your name?

Sombat : My name is Sombat

Interviewer : How is fishing important to your life?

Sombat : It's a necessary part of life because it's the way of life within this community that has existed for many generations, and because it is the only way to make a living.

Interviewer : How long have you been a fisherman?

Sombat : About 20-25 years.

Interviewer : In the past 5 years, do you think the fish population has been decreasing?

Sombat : It decreased significantly, about half of the usual amount (Half-half). In the past, We used fewer nets and still caught many fish. But today, we need more nets because there are fewer fish. In these 3-4 years it has significantly decreased.

Interviewer : Is fishing more difficult for you right now?

Sombat : Fishing is a scrappy career, if there is fish to catch the quality of life will improve. But if there are few fish to catch, it's difficult because spending is concurrent with the amount of fish.

Interviewer : Do you think that commercial fisheries have affected your life as a local fisherman?

Sombat : It does. If a large fishery, Panich [commercial fishing company], comes and uses their generator boat [commercial boat that shines light in the ocean to attract fish], they'll catch all the big and small fish. The fish cannot repopulate; and they will have only caught small sized fish that are unusable. Our boats only catch big fish that can reproduce [before they are caught].

Interviewer : Can you give your thoughts on the current regulatory policy that controls fishing gear?

Sombat : The regulation right now is good. What the government is doing now is determined, isn't it? For example, big boats are required to catch in specific months, aren't they? It turns out to be good; there are more small fish which can lead to the recovery of natural resources according to the regulation. But they have to be strict, don't go soft. If the enforcement is weak, it will return to its original state. So the officials have to be serious about enforcing the law. The problem is that sometimes when the generator boats come, they fish more than they are allowed. That means if it is regulated within 5 miles small fish are safe. If they don't follow the law and enter more than 5 miles they will catch a lot of small fish.

Fisherman 3

Interviewer: Sutthavee Deelert

Interviewee: Yuthana

Date: 19 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Yuthana : I give consent.

Interviewer : What is your name?

Yuthana : [My name is] Yuthana

Interviewer : Why is fishing important to you?

Yuthana : Currently, I am working as a fisherman. I mainly catch mackerel.

Interviewer : How long have you been a fisherman?

Yuthana : I started when I was 13 and now I am 51 years old. For the first few years, I caught shrimp, then caught squid, and finally mackerel.

Interviewer : Has the amount of fish in these past 5 years decreased or increased?

Yuthana : It decreased a lot, especially mackerel, and it decreased for many reasons. Some are due to the newer fishing equipment so that commercial fisheries can catch all the fish, while my equipment can only catch the fish at the bottom of the sea.

Interviewer : Is fishing difficult nowadays?

Yuthana : It is harder than before since the amount of fish is decreasing. Compared to the past I just threw the net and I could catch a lot of fish, but now it is not like that.

Interviewer : Is being a fisherman hard or not?

Yuthana : It isn't difficult. I just do it the same as before.

Interviewer : Can you explain when the big industries changed the fishing method to be more destructive? How have you been affected by them?

Yuthana : At first, it was good, because we also benefited from the new technology. Now their sonar is more advanced than ours and they have 3 sonars. One under the boat and two on the side. They scan up to 500 meters, but I can only catch fish on the seafloor.

Interviewer : How does the commercial fishing industry affect you?

Yuthana : I'm affected because the fish are decreasing, and my tools are old but their tools are newer. My methods are still the same, I only catch fish at the seafloor, but their methods can catch fish anywhere. I mainly catch mackerel, and they can catch everything. If the mackerel are gone, we will have nothing.

Interviewer : Can you explain the fishing regulation?

Yuthana : The regulation about fishing equipment tries to control catching small juvenile fish, but it has no effect now.

Interviewer : Can you explain big industries' equipment?

Yuthana : It is modern equipment, which we cannot blame that much because we also have it in this village. Some of our relatives own commercial fishing boats so I cannot blame them that much because if I blame them maybe I will get in trouble.

Fisherman 4

Interviewer: Pichaya Saidoung

Interviewee: Nattakan SomSopha (Mik)

Date: 19 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States doing a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Mik : I give consent.

Interviewer : For the first question, what is your name?

Mik : My name is Nattakan SomSopha, and my nickname is Mik.

Interviewer : How is fishing important to your life?

Mik : It's my main source of income and I have mouths to feed, if there are no fish we will not have any money because most people in this village are fishermen.

Interviewer : How long have you been a fisherman?

Mik : About 18 years now. I have done it since my father and grandfather's generations.

Interviewer : In the past 5 years, do you think the fish population has been decreasing?

Mik : It has decreased, but it has slightly increased this year (2022). It started to decrease in 2012 and has been like that for 6-7 years, it just started to increase in these past two years.

Interviewer : Is fishing more difficult for you right now?

Mik : It is very difficult because there are fewer fish but I have started to catch more recently.

Interviewer : Is it difficult to work in the fishing industry?

Mik : It is very difficult for many professionals because we might have to face a sea storm. Sea natural disasters are very dangerous for us.

Interviewer : Do you think that commercial fisheries have affected your life as a local fisherman?

Mik : It has a great effect on us because they catch all of our fish. The amount of fish that they catch in a day is almost the same as we catch in a year. If possible, instead of making the commercial fisheries go and catch outside of the 3 nautical mile range, I want them to start fishing at the 7 nautical mile range because our fishing boats usually don't go that far. I do not want commercial fisheries to poach all of the fish.

Interviewer : How does commercial fishing affect your lives?

Mik : To be honest, it doesn't have a large effect on our lives but they catch all the fish, including the juvenile, while we only catch grown-up fish.

Interviewer : Can you give your thoughts on the current regulatory policy that controls fishing gear?

Mik : By law, commercial fisheries are forbidden to have light generators. They can't catch the fish themselves; they have to use a light generator to lure fish. We can't fight them. We only have nets.

Fisherman 5

Interviewer: Sutthavee Deelert

Interviewee: Taworn

Date: 19 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States doing a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Taworn : I give consent.

Interviewer : What is your name?

Taworn : My name is Taworn.

Interviewer : How is fishing important to you?

Taworn : I live by the sea every day, and fishing is my only job. I don't have land to farm. So, I have been doing this since I was a kid.

Interviewer : How long have you been fishing?

Taworn : I have worked as a fisherman since I was 11 [to] 12 years old, I'm now 56 and my daily income is around 300-500 [THB].

Interviewer : Has the amount of fish decreased or increased?

Taworn : The amount of fish is decreasing, but this year the amount of fish is increasing. Many fishermen have already sold their boats or sunk their boats because they don't have enough money to invest, repair their boats, or hire employees, but most people in the village fish as a family.

Interviewer : Is fishing more difficult for you right now?

Taworn : Fishing is not that hard, but not that easy either. In the past, for shrimp, the net price was around 200 THB, but now, it's getting more expensive and it's around 450 THB.

Interviewer : How does the commercial fishing industry impact you?

Taworn : In general, boats have many different sizes for mackerel boats. For the black net boats, they go fishing for the entire night, and for the mackerel boats, they start fishing at 3 or 4 A.M. Some days, we might not catch anything significant, some days we catch 1000 kilos, and some days we might only catch 4 to 10 kilos of fish.

[Camera lost power, interview concluded.]

Fisherman 6

Interviewer: Natakrit Boonrukvanit

Interviewee: Nho

Date: 18 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Nho : I give consent.

Interviewer : For the first question, what is your name?

Nho : My name is Nho

Interviewer : How is fishing important to you?

Nho : Fishing is important because our family have been working as fishermen since my father's generation, and also this job is our only source of income.

Interviewer : How long have you been a fisherman?

Nho : I have been working as a fisherman since I was a kid by learning from my dad.

Interviewer : Has the amount of fish increased or decreased within the past 5-10 years?

Nho : The amount of fish is decreasing, but for this year the amount of fish has increased compared to the past 5 years.

Interviewer : How does the commercial fishing industry affect you?

Nho : The big industries are catching small fish so we don't have big fish to catch anymore because we only catch big fish.

Interviewer : Do you know about the laws governing commercial fishing/industrial fishing?

Nho : For the big industries, they need to sail out beyond 3 nautical miles because the 3 nautical miles near the shore is an area for local fishermen to fish.

Interviewer : What are your opinions on current fisheries in terms of the big industry?

Nho : For big industries, they use trawls which will damage squids, squid eggs, etc. on the sea bed.

Interviewer : Are there more trawl boats?

Nho : The boats which are used to trawl are decreasing. For our equipment, we use selective fishing gear and we mostly catch mackerel.

Fisherman 7

Interviewer: Natakrit Boonrukvanit

Interviewee: Kittisak Sangcharensi (Kret)

Date: 18 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Kret : I give consent.

Interviewer : For the first question, what is your name?

Kret : My name is Kittisak Sangcharensi, and my nickname is Kret.

Interviewer : How is fishing important to your life?

Kret : It is our life, our source of income. If there are no fish we would not have any money. We live with the fish and the sea.

Interviewer : How long have you been a fisherman?

Kret : I started fishing when I was 13 and I'm now 40. I have done it since my parents' generation.

Interviewer : In the past 5 years, do you think the fish population has been decreasing?

Kret : Five years ago, there were barely any fish, but before that, there was plenty of fish. During the past five years, there are barely any fish, but it has slightly increased over the past two years. I do not know how or why the fish disappear; maybe due to climate change. The fish appear more when it rains in the sea. We cannot blame anyone. The commercial fisheries blame the traditional fisherman for catching the grown-up fish, and the traditional fishermen blame the commercial fisheries for catching the juvenile fish. But in my opinion, it is climate change.

Interviewer : Is fishing more difficult for you right now?

Kret : It was difficult, some days we don't have any profits. Some people think that fishing is an easy job. But it is not. We have both broken nets and losses; we can earn a few thousand a day and afford to live comfortably, but we can't leave for four or five days when there is wind and waves. Commercial fisheries can catch millions of fish per day.

Interviewer : In order to go out and fish, how much do you have to spend?

Kret : My family has three people, we only need 1500 THB to survive in one day. We pay 1100 THB for gas and 100 THB for benzene, and the rest is for our food. If we had a big boat it might cost 2000 THB due to having to pay the workers.

Interviewer : Can you compare the range of a large catch and a small catch? How many kilos is the difference between the two?

Kret : Some days, we might catch a thousand or a hundred [metric] tons of fish, but some days, we might only catch tens [of kilos] of fish.

Interviewer : How does commercial fishing affect your lives?

Kret : I think if they followed the regulation it would not affect our lives.

Interviewer : Can you give your thoughts on the current regulation of fishing law and policy?

Kret : I think they are too strict with traditional boats. The local boat are not rich. I can only feed my stomach day by day. The law imposes that we have to float the net only and that's it. It affects us a lot. If we are going to use a bigger net than the one used, it doesn't catch anything. Also, a law said that children under the age of 18 are prohibited from working, but if the child has not been trained since he was young, the child will not have the skill to continue traditional fishing. It's good to enforce the law, but don't be too tight, otherwise, it won't work.

[Additional comments]

Kret : Just now, since the big ships came in, how did this happen [?]? They [commercial boats] registered one boat but there are three. They set the nets from the ground to the water and get tens of thousands of kilos of fish. It affects us a lot. They bring lights to lure the fish, three miles and seven miles out. They [the government] comes to manage the small boat again and will not allow the small boat to go out, making them stay here [3 nautical miles offshore]. It's difficult. But until I catch a big fish, how many children has it given birth to? In this village, there are many black net boats and big boats. If the law comes out to limit fishing to the mother fish, it's good. We have 18 fish for 1 kilo. We can hardly catch them anymore. But they are still stuck in hundreds of kilograms. They [commercial boats] shot the sonar down here and they know what fish it is and how many kilos. They knew they caught the young fish, and we caught the mother fish. When they catch all the baby fish, will we still have mother fish to catch? Perhaps Piya [Thedyam] enforced the law too strictly. Sometimes it's a double-edged sword. I was also affected. I'm not saying that Piya is not good. But when closing the bay, big ships benefit. We let it pass [?] before ten thousand kilometers, but when they [commercial boats] come, they catch all the fish. Maybe the law is too strict for small boats. The small boat is just sustenance.

Fisherman 8

Interviewer: Pichaya Saidoung

Interviewee: Chu

Date: 19 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Chu : I give consent.

Interviewer : What is your name?

Chu : My name is Chu.

Interviewer : How fishing is important to your life?

Chu : Fishing is my lifelong job and I live by the sea too.

Interviewer : How long have you been a fisherman?

Chu : I have been a fisherman since I was a kid, for 20 years.

Interviewer : In the past 5 years, do you think the fish population has been decreasing?

Chu : The fish have decreased a lot, there are still a few left to be caught.

Interviewer : Why has the fish decreased?

Chu : There are a lot of reasons, including more fishing boats and more demand for fish but, the fish population remained the same.

Interviewer : Is fishing more difficult for you right now?

Chu : For me, it is not difficult, but during monsoons it will be more difficult to sail very far from the shores.

Interviewer : How does commercial fishing affect your lives?

Chu : It does not affect me that much because people have to do their jobs, so it does not affect me that much.

Interviewer : Can you give your thoughts on the current regulation of law and policy?

Chu : [No comment]

Fisherman 9

Interviewer: Pichaya Saidoung

Interviewee: Odd

Date: 19 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Odd : I give consent.

Interviewer : What is your name?

Odd : My name is Odd.

Interviewer : How is fishing important to your life?

Odd : It is important because it is my main source of income and I have a family to feed.

Interviewer : How long have you been a fisherman?

Odd : Since my grandparents' generation. I have been a fishermen for 8 to 9 years.

Interviewer : In the past 5 years, do you think the fish population has been decreasing?

Odd : At first, there were a lot of fish, and then they started to disappear, but in the last year there have been some fish. Personally, I think it's because of the regulation on fishing gear for small fish.

Interviewer : Can you give your thoughts on the current regulation policy?

Odd : I do not agree with the current regulatory policies because they keep changing and are to the advantage of traditional fishermen.

Fisherman 10

Interviewer: Pichaya Saidoung

Interviewee: Toei

Date: 19 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about fishing practices in Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Toei : I give consent.

Interviewer : What is your name?

Toei : My name is Toei.

Interviewer : How is fishing important to your life?

Toei : It is important to my life because it is a way to feed my family and I have been doing it ever since [I was young]. In this village, it is very hard to find other professions.

Interviewer : How long have you been a fisherman?

Toei : I have been a fisherman for around 6 to 7 years.

Interviewer : In the past 5 years, do you think the fish population has been decreasing?

Toei : There are little and lots of them throughout the years alternately.

Interviewer : Why has the number of fish decreased?

Toei : Since the current regulation is enforced, catching fish in the 3 nautical mile range is better than ever because traditional and commercial fisheries catch fish in different areas.

Interviewer : Is fishing more difficult for you right now?

Toei : If you've been a fisherman for your whole life it is not difficult.

Interviewer : How does commercial fishing affect your lives?

Toei : Commercial fisheries sometimes fish inside our range. During that time, they might place crab and shellfish nets in our areas.

Interviewer : Can you give your thoughts on the current regulation of law and policy?

Toei : At first, it was very good, but now it is very hard for the small boat to survive because the law is not being regularly enforced. I am waiting for another resolution that's about opening the bay, closing the bay. It's good that the commercial ship can't enter so we can still make a living.

Fisherman 11

Interviewer: Natakrit Boonrukvanit

Interviewee: Kittidet Thedyam

Date: 19 January 2023

Interviewer : Hello, we are students from Chulalongkorn University, and we are here with WPI students from the United States working on a project about the fishing practices at Ban Thung Noi. Before the first question, we ask for your consent to show your name and face for this project.

Kittidet : I give consent.

Interviewer : What is your name?

Kittidet : My name is Kittidet Thedyam. I am a fisherman.

Interviewer : How is fishing important to your life?

Kittidet : It is a job and I work to provide for my family, for me it is not a complicated career because I have been doing it since I was a kid and continue the same work as my father. If you ask me how long I have been a fisherman, I would say I've been doing this for 12 years. I started sailing when I was 12 years old.

Interviewer : In the past 5 years, do you think the fish population has been decreasing?

Kittidet : In the past 2 years, it actually increased because the regulation helped a little, but not because of nature or anything. It increased because of the regulation that controls the fishing gear, so there was more fish, but not that significantly. Compared to the past, the fish today is less than half of what it used to be.

Interviewer : Comparing fishing in the present to the past, is it difficult to catch the same amount of fish?

Kittidet : Very difficult, even though the technology of fishing gear has become more advanced. But we still catch less or the same amount of fish because the resources are decreasing.

Interviewer : Can you compare the amount of fish in the past and the present?

Kittidet : In the past, I used 1 pack of 8 nets to catch fish up to 500 kg but now I need to use 15 nets that can only catch around 300 to 500 kg, and some days they might not catch anything. In the past, this situation never happened. The worst thing that could happen might be just selling at lower a cost but now I have to pay the workers daily wages instead of monthly wages.

Interviewer : Ever since you became a fisherman, do you think it is difficult to be a fisherman?

Kittidet : It is not difficult for me, but I just feel like it is not fair because the law has many flaws. For example, the law never controls what size of the fish can be caught but they control the size of the boats and type of fishing gear. If they implement the control of the size of the fish, it will solve the fishing industry's problems both commercially and locally.

Interviewer : Since the start of your life as a fisherman, have there been more commercial fisheries?

Kittidet : It [the number of commercial fishing boats] used to increase a lot but it does not increase that much anymore. But technology has

improved a lot, like a sonar that lets the fisherman know the specific fish route that lets us know where to catch the fish. But there hasn't been an increase in fishing boats that much.

Interviewer : Do you think that modern fishing technology affects your life?

Kittidet : If we had better technology, we could catch more fish. We wouldn't be afraid of getting lost and the problems of wind and waves. In the past, I needed to look at the stars and the clouds. But its cons is that we would forget our own basis and might take all the fish that we can take and might think it is not enough. With tools, I probably wouldn't have much. But by going to sell my own stuff, I made it possible to live. The fishing capacity of the big boat got higher. But there's nothing wrong with that development. Just set regulations for the size of aquatic animals [that can be caught].

Interviewer : Can you give your thoughts on the current regulatory policy that may have a loophole and might be a problem for the Thai fishing industry?

Kittidet : I think we need to focus on the policy instead of arguing between commercial or traditional. That will not benefit any side. But people that make that decision keep finding various excuses. I'm not sure if it is because of the capitalist group. If we keep blaming each other, it won't do anything. I thought that there was only one truth. I wonder why in Thailand the fish population is decreasing but the other countries that strictly enforce these regulations and have technology do not run out of fish.

[Additional comments]

Interviewer : Other than regulations that control the marine life population, do you have anything more to comment on?

Kittidet : I think that the law that determines the tools is probably not relevant. I think that Section 57 of the law determines the size of the species allowed to be caught is of utmost importance. It will solve other things by itself. It will be very good.

Sponsor Interview

Interviewer: Natakrit Boonrukvanit

Interviewee: Piya Thedyam [Piya Thedyam currently holds the position of president of the Local Fisheries Association Ban Thung Noi at the community level, and the president of the Association of Thai Folk Fishermen Association at the national level.]

Date: 19 January 2023

Interviewer : What is your name?

Piya : My name is Piya Thedyam.

Interviewer : How is fishing important to your life?

Piya : Fishing is not only important to me but also important from community to country. If there are no aquatic animals to catch, it will affect Thailand's GDP and all economies that relate to seafood and tourism.

Interviewer : How long have you been fishing?

Piya : I started to be a fisherman when I was in grade 4 by practicing with my dad and mom. After I graduated grade 6 I started to be a real fisherman.

Interviewer : What do you think about the amount of fish that are being caught compared to the last five years?

Piya : It is not just these five years. Five years ago relates to Royal Ordinance on Fisheries 2558 when Thailand got a yellow card [sanctions] from the EU [European Union]. Thailand needs to amend the law/regulation since from 2558. We can see that the amount of fish is

decreasing such as mackerel decreased by ten times. Thailand used to catch 140,000 ton of mackerel, but in 2020 Thailand could only catch 18,000 ton of mackerel.

Interviewer : Has fishing become more difficult compared to in the past?

Piya : The difficulty is due to technology. At first, they [fish] used to be abundant in the Thai sea, but the difficult part is with fishing equipment and transportation. For now, catching fish is hard but the technology and transportation are easy. The amount of fish is decreasing but the amount of boats is increasing.

Interviewer : Is the life of fishermen hard?

Piya : It's easy in terms of food and food stability because we get to make a living and have food. We will never lack food during our time as fishermen. But the difficulty is the insecurity when dealing with the number of fish we can catch each day. In the sea, it is impossible to calculate how many fish we can get and how much we will be able to sell.

Interviewer : With the start of the modern era came larger fisheries. How do they affect your life?

Piya : It affects not only me, but also affects society on a macro level and all over the world in terms of food insecurity and access to resources. Originally local fishermen and big industries had no conflict with each other, but since the amount of fish is decreasing, they compete for resources and fishing areas, and these effects cause disparity. It's hard on the level of community relations. At the national level, the unity of the people in this nation is divided into two sides, which are traditional and industrial fishing communities that are clearly divided into government and community sectors. It's not an insult, but it's something that proves that small-scale fishermen have no say in the council. Including politics, the political system is not conducive to small-scale fishermen at all. It's all

difficult.

Interviewer : What are the big issues in regulation that are still a problem?

Piya : The reason that the aquatic creatures dropped is due to three reasons, first there are laws that are not seriously enforced, or not continually, and government officials are seeking benefits from this. The second element is the subject of tools that do not consider the effect of catching fish, which means that every tool in Thailand can catch any type of animal, big or small. Finally, there are management issues such as quota systems and sizing of aquatic species. I think today the solution to sea survival and food security at the global level is to determine the right size of aquatic animals for them to breed, spawn, and multiply. That is sustainability that can be tangible.

Interviewer : What are your opinions on the laws governing fishing gear, regardless of local fishermen and large industries?

Piya : New Law or Royal Decree 2015 is a problem at many stages, such as the definition of a traditional fisher that does not allow access to freedom of fishing. For example, it is forbidden for local fishing boats to fish too far offshore. Section 57 is to determine the size of aquatic animals which does not specify the size of each species. Another interesting and still problematic issue is the quota system ratio, because the law mentions the quota system that is already in place and able to catch 100 percent [?]. In reality, it really didn't follow that. I think many things are still a problem, such as renewing the boat tax. But the main issue is to determine the size of aquatic animals and what fishing gear negatively affects nature. We can classify catching techniques into two type which is collective fishing, i.e. all types of aquatic animals can be caught in the Gulf of Thailand. The second is segregated fishing, with 85 percent of the country using this method. The two tools that affect nature the most are double trawling, which destroys aquatic habitats and catching endangered species. Second, the small hole gill nets. These nets would also be used with generator boats [light boats] to lure

juvenile aquatic animals and surround them with the mall hole gill nets. This causes all kinds of aquatic animals to come in, such as mackerel, blue crabs, juvenile banana squids, and spotted mackerel. They are two tools that I think should be urgently corrected.

Interviewer : And is there a law regulating these two tools yet?

Piya : The trawler is a state-controlled tool. The government states that they will not allow double trawl boats to exceed more than 2000 boats, but the problem is these kinds of boats can catch as much as they want because they give quota for days, not determined by the kilo. Even though there are controls, there are many loopholes in the laws.

Interviewer : From our background research, local fishermen choose to use selective fishing gear, right?

Piya : Overall in Thailand, 90 percent use segregated fishing, but a small number follow the big boats using trawls and lights.

Interviewer : Do people in this village pay attention to preserving the environment?

Piya : The people in this village focus on catching aquatic animals with separative techniques. There are no destructive tools in the village. But they also focus on the creation of different types of fishing equipment.

Interviewer : Can local fishermen actually use paired trawls?

Piya : Yes, But there are rules that anyone who uses a high efficiency tool, even if it is a small boat, will be categorized as an industrial boat. Additionally, seven other types of equipment that are considered commercial fishing, whether small boats or large boats, are trawling, anchovy trawling, double trawling, single trawling, anchovy light-generating trawl boat, shellfish trawling, and pan-crop trawling will be counted as commercial fishing by means of tools. Even a two-ton boat would be classified as commercial fishing when using these techniques.

Interviewer : Why don't the villagers choose to use destructive tools?

Piya : The main part of it is because of gathering and creating an understanding of local wisdom that has been passed down for many generations of parents that has played a part in making it to be like this.

Interviewer : How does the fishermen's income compare to the old days?

Piya : Around 2/3 [decrease]. Let's divide the income into thirty thousand, twenty thousand are gone, leaving only ten thousand. Because the number of days that we can catch aquatic animals is less than before, the only thing that supports us is that the selling price of the catch has increased. The fewer aquatic animals there are, the less the fisherman will have to make money to spend and the increase in the price of many aquatic animals is so some fishermen can still survive. But to talk about improving the living conditions would be harder because of the decrease in the number of aquatic animals, so to talk about improving living conditions is out of the question.

Interviewer : Can you compare the damage between local fishermen and big industry in terms of destroying nature?

Piya : There are too many problems to address and they are very difficult to talk about, so I'm going to talk about the important topics. For example, a mackerel net in 2014 can catch up to 140,000 tons. We multiply it by 100 baht and that is a lot. Now we can only catch up to 18,000 tons. We caught a lot of mackerel but now with less mackerel, we lost over a hundred thousand million baht. If we look at the catching juvenile fish issue, one kilogram of juvenile fish sells for 10 baht, but only three hundred thousand tons were caught. At that time, it was three hundred and ninety thousand tons, so round it up to four hundred thousand tons. The aquatic animals that trawl can catch in a year can earn up to four thousand million baht but if we let them grow up, we can earn ten times more than catching them as juvenile fish like juvenile mackerel, squid, and spotted mackerel. We thought that catching this juvenile fish will increase the GDP of our country but after thinking carefully, this can be the budget of the country. This is the money it

[catching juvenile fish] earns according to the economic record of the Department of Fisheries each year, destroying the value of fish in the Thai seas. We can say that most people do not know that the aquatic life in Thai seas is decreasing because they import fish from overseas. So after deep investigations, we found out that we lost a lot of value, and you can see that the economy at the community, provincial, and tourism levels has disappeared a lot.

Sponsor Tour of Fishing Gear

Interviewer: N/A

Interviewee: Piya Thedyam

Date: 19 January 2023

1. This net contains a seashell which the octopus will go into.

2. There are four types of equipment that can catch the spotted mackerel, but three of them can catch only spotted mackerel:

   The first piece of equipment is the floating hook which will mainly catch spotted mackerel. The second piece of equipment is the fishing rod which fishermen will use for fake bait or real fish. If it is a real fish, the fish will swim so the spotted mackerel will eat it. The third one is the rail hook, which will be a long line of boxes. One box contains 1000 baits which is a distance of 4 nautical miles, or approximately 8 kilometers. The distance between each one is five meters per box. The time for using this equipment is setting it at 5 p.m. and retrieving it at 7 p.m. so the spotted mackerel cannot see whether the bait fishermen put in is still alive or not because the sea water is getting dark. But if fishermen use live bait, this technique can be used in both daytime and nighttime.

3. This one is used for catching squid [cuttlefish and soft cuttlefish]. If we want to catch cuttlefish we should put this on the sea bed. If we want to catch soft cuttlefish, this should float in the middle of sea level. It is up to what fishermen want to catch, they can choose.

4. This mackerel net will mainly catch mackerel, but it can also catch other species that are near the size of mackerel.

5. Four-finger threadfin/Indian salmon's net will mainly catch threadfin, but the disadvantage of this equipment is that the fishermen must use it in the windy season.

6. This is a shrimp net, or three layer net. When shrimp come into the net they will stuck and cannot escape.

7. This is a crab net, the net hole is around four inches.

8. For catching squid, fishermen will use green light to lure the squid and catch it with the bucket

9. This is bait for catching banana squid, the fishermen should act like the bait is alive so the banana squid will eat the bait.