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How the Shark Finning Industry Continues to Cause Transboundary Environmental Harm

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Abstract

This thesis paper traverses the practice of shark finning, one of the most lucrative fishing practices and dually the largest threat to shark species' populations. The process of systematic injury to sharks and the trade of their fins takes place all over the world, and while clearly detrimental to the wellbeing of each individual shark, it is even harsher on environments in which these keystone species are vital to the survival of the ecosystem around it. Chapter 1 of this paper explores several reports and studies encapsulating the most prevalent problems and negative externalities within the shark-finning industry, both in the United States and around Southeast Asia. Chapter 2 focuses primarily on the ecological impacts that sharks have in their respective environments but also highlights the importance of species diversity and conservation, a theme developed in this chapter and referenced throughout the paper. Chapter 3 subsequently delves into the economic data behind shark-finning, the trade and transportation of fins, and the strong ties to commercial fisheries. The dimension of these animal resources that do not have a specific dollar value will also be addressed. Chapter 4 then pursues an examination of the environmental ethics behind the practice of finning. The roots of this practice are based in ancient Chinese tradition, so sociological and cultural consideration will also be fully granted as well as stressed in this section. Chapter 5 centers around policy recommendations and possible alternatives that are not only geared towards protecting the most vulnerable species of sharks, but more importantly aim to eliminate shark-finning and fin trade altogether to pursue a completely different approach.

Key words: species conservation, illegal trade, environmental politics, cultural tradition, ecological diversity, Chinese economics, trade ban, commercial fishing

Table of Contents

Introduction: Far from *Fin* – a Short History

Imagine a young royal person during the Tang dynasty – they are consistently offered the greatest selection of the finest foods in China, and more often than not, royalty is subject to dinners, banquets, and meetings. They arrive at an event one evening, and when dinner is served, every person of the royal family begins eating their bowl of shark fin soup. One of the most popular dishes at the time culturally, they are urged by their family to try it. The broth itself is flavorful, but the fin itself only has a gelatinous texture. Elder royalty around them converse about this new delicacy, how the strength of the creature nearly overtook those who captured the fish on the table in front of them. First a meal, then a medicine, the traditional usage of shark fin will wind up embedded within Chinese culture from the Ming period onward (Clarke, Milner-Gulland, and Bjørnal 2007, 307). Now fast forward to about 2006 – a middle-aged citizen in China is going to eat at a local restaurant, and the first thing that appears on the menu is a selection of fish, including *yú chì*, translated literally to fish wing (Ibid., 308). What many people living in China did not understand at the time was that this soup component was not just fish, but literal shark, derived from worldwide trade fed by commodified business.

Figure 1, Animation of Shark Finning (WildAid Campaign), 2018

It was around this time that activists began speaking out against shark fin consumption. For example, Yao Ming, a world-renowned basketball player, began his campaign in China to help raise public awareness of this issue, successfully aiding in an overall increase in shark education and decreases in shark fin prices between 2012 and 2013 (McCarthy 2015). Despite educational measures on the practice of shark-finning reaching across the globe, there is still much that happens when it comes to underground trade and illegally smuggling in product to countries such as China. Move forward in time, finally, to 2020 – a man going through Chinese customs is attempting to smuggle many tons of dried shark-fin into the country. Customs seizes his containers through risk assessment and finds that he has carried approximately 8.6 million dollars' worth of dried, endangered shark fins from Ecuador to China (Hong Kong Customs and

Excise Dept. 2020). While this was one of the largest to-date customs busts, smuggling on smaller scales continues at rather unknown rates across Southeastern Asia, within the United States, and transnationally.

The practice of shark finning has undoubtedly sustained itself from the Ming Dynasty to the present day, and this paper will seek to understand and analyze environmental, cultural, and economic impacts of the fin trade. Chapter 1 will aim to break down data from several articles, notedly the United States' first report on the status of living marine resources. Chapters 2, 3, and 4 will cover biological basics on shark species and their keystone presence, explain the economics behind trade and transport of fin meat, and dive into the dual ethics of practice and culture, respectively. Chapter 5 will pose suggestions, comparisons, and reasonings behind policy ideas centered around implementing an alternative to shark fin as food – one that will tick all the boxes by engaging in environmentally friendly practices while providing economic stability.

Chapter 1. Sinking Species

As the introduction of this paper clearly shows, shark finning is nowhere near a new practice, and whether or not campaigns take place in China to try and educate citizens on what is really in "fish wing" soup, international trade will continue to be driven by external factors and lucrative markets. The process of finning on the commercial level, in general, includes catching the shark and separating the fin(s) from the body, after which the shark is often discarded back into the ocean to bleed out or become a meal for another animal. If the meat has enough market value, the body of the shark may be kept and further processed. The commodification of shark fin also has a direct impact on ecosystem services outside of the wellbeing of the shark itself. The services create four categories, each attributed to provisions, regulations, support systems,

and cultural aspects, respectively (Millennium Ecosystem Assessment Panel & Board 2005, vi). Provisioning services include the resources we use for sustenance, such as food, water, and fuel. Regulating services cover a broad range, including but not limited to regulation of climate and disease. Supporting services like nutrient cycling and photosynthesis are crucial to maintaining ecosystems as well. Finally, cultural services envelope aesthetics, recreation, education, and spiritual ties (Ibid.). When species of shark continue to be hunted and killed for their market value, ecosystem services are greatly deteriorated – all four services can be seen to be affected by the loss of shark populations - cultural, provisioning, and even regulation and supporting services. Culturally, shark has been an important part of Chinese history, tied to royalty and ideas of *bu* foods, which Chapter 4 will explain in more depth. Provisioning can be seen where sharks provide food for other larger animals within their habitats, as well as for certain groups of indigenous people who rely on the meat for sustenance. Even more recently, sharks have been found to help lessen the impacts of climate change, counting towards regulation services. Sharks also are found to be able to indirectly assist with the ongoing balance of photosynthesis of plant life, further covering supporting services. As more sharks are put onto the endangered list as their numbers dwindle, surrounding ecosystems and species are also greatly affected by this change. If not properly regulated, endangered and extinct shark species can result in the potential weakening and collapse of major ecosystem support services which rely on diversity within habitats. Sharks aid in controlling populations of other species through a trophic cascade, which balances ecosystems and allows for proper cycling of different materials. Diverse ecosystems are increasingly resilient, proving to be living examples of how sustaining biodiversity within shark populations is key when it comes to understanding and protecting ecosystem services, a topic that will be further touched upon in Chapter 2. As the fin trade increases, loss of biodiversity

along with physical shark resources could result in the slow collapse of marine ecosystems which so many rely on for their livelihood, whether it be through tourism or trade commerce. The next section will take a look at the rise in fin trade starting back from the lifting of Chinese regulations in the 1980s, and how the spiral of trade links and cultural diffusion increased demand and lucrativeness of shark fin.

Figure 2. Traditional Shark Fin Soup, 2018

Some of the earliest cohesive documentation of international shark fin trade provides more insight as to when major growth in the market occurred internationally. Right around 1987, the economic conditions in China and other nearby southeast Asian countries were liberalized by the government, and therefore the immediate demand surged in a short period of time (Dockerty 1992, 2-3). As the trade market was then expanded to countries such as the United States, shark fisheries began popping up, and finning became easier through more advanced fishing by-catch

methods. The popularity of shark-fin soup accelerated outside of Southeast Asian countries for the same reason that it became so popular within China – a sense of significant status and privilege leading the wealthy to try the most exotic dishes at formal events. Today in New York City, there are almost two dozen restaurants that serve shark, or claim to serve imitation shark. From Brooklyn to Chinatown, places such as Mottsu and Mr. Chow continue to serve up this dish most likely due to the traditional ties to Chinese culture, but more importantly for its price point, despite the 2014 ban in New York preventing sale, trade, possession, or distribution of shark fin (Animal Welfare Institute 2021). Longlines, gillnetters and purse seiners were already beginning to cause damage to pelagic shark populations in the mid 80's, being cited in this paper as harvesting shark fins with little effort involved, resulting in a highly lucrative by-catch from a cost to benefit ratio (Ibid.). By 1990, it was already established that about three types of shark fisheries existed: local or those of developing countries, wide range offshore directed fishing, and fisheries within developed countries who follow the trends of consumption such as the United States (Ibid., 1). While the relative value of shark fin is species and practice-dependent per sourced area, they typically run high, as Dockerty reports a kilogram going for $117 when the article was written in 1992 (Ibid., 2). A recent source from just last year lists the average price of shark fin at a staggering $450 per pound (Shark Allies 2021). This near $200 jump in fin price from a few decades ago can hardly be surprising when we pan back to Dockerty's paper and the catch data laid out from as early as 1984. The tables providing information from the Export Market Information Library via the Department of Trade listed fin data that represented two alarming trends – millions of imports and exports that risked depleting multiple areas of shark species, coupled with inconsistencies in data reported by some of the countries within the study. No imports of shark fin were found from Japan's trade figures, yet several other countries

noted exports of fin to Japan. Furthermore, the countries that reported imports from Japan had numbers higher than what Japan reported as exporting to said countries. (Dockerty 1992, 19). Theoretically, these discrepancies should not occur, yet they point us to one of the first major problems within the finning industry: misreporting collected data due to knowledge gaps, which is an essential puzzle piece in discussing trends in the fin trade. This problem of misreporting and underrepresenting data will be touched upon through the rest of this chapter and within policy recommendations of Chapter 5. Dockerty makes some important points in the discussion of these early shark fin findings. Firstly, there is the question of if shark populations being overexploited in specific regions are causing a direct shift or switch in resources more abundant somewhere else. This point is important to consider, as commercial fishing vessels are able to easily travel farther distances to increase catch, whereas the local communities focused on hunting for sustenance may not have this option or ability. Another question relevant to ponder is why nations are being increasingly attracted to the finning market in the first place – it may be due to the decrease of other resources and increase of regulations for fishing other species (Ibid., 21). The end of Dockerty's paper gives crucial recommendations for monitoring trade effect on sharks, including furthering research in the global utilization of shark, the value of fins compared to the rest of the shark meat, and a region-by-region analysis that takes a species-by-species approach. These suggestions are progressive in nature, and there are several organizations that have compiled data in the past few years that are working to tackle these questions and provide more concrete numbers per country of shark imports and exports. The rest of the chapter will aim to highlight some of these organizations and their critical findings in regard to catch data and shortcomings in today's research.

One of the most recent studies released on shark catch data collected from 2007 to 2017 globally is from TRAFFIC, an NGO focused on the trade of wild animals and plants with a concentration on biodiversity conservation (Okes and Sant 2019). Within this study, it is found that Indonesia has the highest mean catch per year, that of 110,737 metric tons of sharks and rays (Ibid., 3). TRAFFIC notes the broad distribution, migratory nature, and occurrence in fishery territories making sharks even more vulnerable along with other biological setbacks such as slow growth and late maturation age, which Chapter two will explain in more detail. TRAFFIC calls for cohesive regional and international co-operation to manage fisheries, with a proactive stance on catch trends and analysis. Unfortunately, more often than not, sharks are only categorized generally and not down to the species-specific level when caught during commercial fishing – in 2017 only 38 percent of reported catches were down to the species level (Ibid., 4). This results in a skew of knowledge gaps, even when tracing species that are caught the most. We do know that, according to TRAFFIC, 103,520 metric tons of Blue shark were globally reported as being caught in 2017, as well as 632 mt of Silky shark (Ibid., 7). It is noteworthy to point out that the amount of Blue shark caught in 2013 declined by about 16 percent in 2017, and this is yet to be understood as preferential switching to a different species, a large decline in Blue shark populations, or a mixture of both. Silky shark catches also fell during this time, and TRAFFIC claims that this is more likely to be due to population decline. Trade data also shows that Pelagic Thresher sharks were only reported species-specifically in the Southeast Pacific, leaving out significant data from other countries landing them despite this species being CITES listed (Ibid., 16). Bigeye Threshers were primarily reported in the Southeast Pacific as well, whereas Common Threshers were reported from Northeast Atlantic and the Northwest Atlantic, by France and the United States, respectively (Ibid., 17). This lack of communication and improper

scientific recording of shark catch data is one of the primary reasons that many species are severely threatened by commercial fishing – if there isn't a clear record, conservationists have a much more difficult time extrapolating the data and turning it into effective measures or policy that can do the work to protect shark species. Along with the intricacies of trading come the complexities of categorizing meat and fins by code. TRAFFIC cited most of the meat codes as describing the sharks as fish, fish fillets, frozen, fresh, or chilled. Dogfish were also kept separate in text from the rest of the sharks, an oddity that aligns with them being a targeted species only very recently considered under the protection of CITES listings. Finally, the fin codes were only available from 2012 – each describe the shark fins first and foremost as fish. Since these codes are outdated, there is an extra layer of ambiguity when it comes to researching shark identification and categorizing bycatch data based upon the code specifics. These data discrepancies of large catches, coupled with the threatened status of many shark species being finned, perpetuates the continuation of widespread economic sale and trade. Within CITES most recent paper on the conservation of sharks listed in their boundaries, analyses showed that from 1970 to 2018, oceanic shark and ray abundance has declined by 71%, directly correlated to fishing pressure and increased catch rates (Fowler et al. 2021 4-5). Parallel to the TRAFFIC data, the country with the highest amount of meat importers in the CITES study was Brazil, with upwards of 17,000 metric tons per year of shark fin, usually dried. Hong Kong was the biggest importer overall, averaging 8,624 metric tons of shark fin per year from 2000 to 2019 (Ibid., 15-16). The species most endangered are the ones being commercially caught at the most alarming rates – and despite organizations around the world trying to come up with regional shark plans, it seems that fisheries and trade regulations continue to slip through the cracks of management. CITES recognizes in their paper that there is a need to strengthen Regional Fisheries

Management Organizations; it is not enough for only some of the RFMOs to work on the big picture concerns, such as promoting transparency and enhancing monitoring and surveillance (Ibid., 28). RFMOs are also showed to have fractured management status of several types of sharks, including but not limited to threshers, makos, porbeagles, hammerheads, and silky. This CITES study briefly notes that the difficulty in measuring their contributions to reducing shark catch is high – yet there is no urgency in their writing about seeking new methods of management. CITES shortcomings and suggested alternative plans for shark protection will be further explained in Chapter 5. Although the overall data in this study is portrayed to suggest a downward trend in quantity of shark caught per year, there are plenty of discrepancies within the data that are not written up by the CITES committee but highlighted within other studies.

Within more recent years, there has been even more collective evidence pointing towards large data mismatches in many regional markets, not including the illegal smuggling that happens without official knowledge. Indonesia serves as a prime example, being the largest landing country of shark and ray catches between the years of 2007 and 2017 (Prasetyo et al. 2021, 2). It was reported that about 86 percent of all Indonesian fisheries that were surveyed caught sharks as by-catch or by accident, which is ironic considering that these resources are then taken away from fishing communities that rely on the shark meat exclusively (Ibid., 2). The equipment used ranges from gillnets to longlines to even trawlers, which can all be damaging to the surrounding ecosystem on account of bycatch of other species and disturbing local plant life. On average, the discrepancies found in this study between the fin products alone traded in Indonesia was off by 54.4 percent, an estimated 43.6 million US dollars wholly unaccounted for. While other countries such as Singapore were under-reporting, Hong Kong was found to be over-reporting (Ibid., 5-7). Discrepancies of this size, as well as unreported exchanges in the

trade process, allow for much more by-catch product to be sold and consumed domestically as well, further driving the market for shark fin. Prasetyo also stresses the importance of policy and management objective cohesiveness, citing a fishing technology switch in the Arafura Sea as one simple example of a change that led to a direct increase in shark and ray bycatch (Ibid., 7). This idea of failed policy management is demonstrated as well in the United States with multiple loopholes in the Shark Finning Prohibition Act of 2000. The act itself makes it unlawful to remove any of the fins of a shark and discard the carcass of said shark at sea, and to have possession of or land the fin without its corresponding carcass (Jennings 2019, 421). Not only this, but a rebuttal was added to clarify violation if the weight of the fins on board the vessel exceeds five percent of the total weight of the shark meat. Unfortunately, the specific wording of this act made it very easy for traders and fisheries to get around it, using strategies including shark fins being transferred between vessels at sea, as well as mixing and matching shark parts to obtain the most monetary value within the allotted fin-to-carcass ratio (Ibid., 422). Even with the implementation of the Shark Conservation Act of 2010 replacing the fin-to-carcass ratio, imports of shark are still allowed into the United States. Loopholes such as these make it nearly seamless for traders and fishermen to continue their practice with little net loss. Not only this, but once species of shark are dried and ready for transport, it is much harder to visually inspect fins of species and obtain accurate findings without DNA analysis, which is not always readily available or affordable (Ibid., 429-30).

Another critical consideration to make when it comes to sharks and ecosystem resources is that humans view them in a consistently anthropocentric way. Sustainable shark fisheries, therefore, are built on the commodification and ideals surrounding a maximization of usage and enjoyment for humans, by humans. Within the United States first official study of the status of

living marine sources, the main problem is stated as "…a critical lack of data on shark numbers, biology, distribution, life history, and harvest. Without this data, it is difficult to address shark problems" (United States National Oceanic and Atmospheric Administration 1991, 40). The report also states that finning has been criticized, but that is the extent to which the term is brought up. Unfortunately, even in the most recent U.S. report, studies still show a lack of general knowledge of personnel within fisheries when reporting shark catches, making it even harder for researchers to determine which species are the most threatened. Size limits that were imposed in United States shark trade were counted as "… largely ineffective, and a reduced bag limit [of shark] is not achieved" (United States National Oceanic and Atmospheric Administration 2009, 145). Despite these regulations and more that were put into place within the early 2000s, bycatch of sharks, especially small coastal ones, crawls upwards with the advancements of fishing technologies. Even though nearly all of the small coastal species in the study were classified as "not overfished" (Ibid., 140), it is almost glossed over in the report that the number of sharks counted make up only a small portion of the actual number killed due to bycatch being frequently discarded (Ibid., 143). It is noteworthy to also point out that in both of these U.S. reports, spiny dogfish are listed separately from sharks, as seen within trading codes as well, although they are part of the shark family. These sharks, too, have a relatively unknown count in terms of percent changes in population, and while the most recent report lists the population as "rebuilding", the species has fluctuated heavily with respect to landings since about 1965 (Ibid., 107). Even with the Shark Fin Sales Elimination Act of 2019, dogfish fisheries are not included, a potentially masked attempt at sustaining the fisheries yet simultaneously allowing these fins to be sold and consumed (Jennings 2019, 429). From the multiple analyses conducted in this chapter, it is clearer to understand that shark populations continue to decrease

due to mass human error, whether it be inconsistent data counts that add up to millions of dollars, or open-ended policies that allow for the continued success of the shark market.

Chapter 2. The Importance of Keystone Conservation

Sharks play large parts in the socioeconomic spheres of both the Unites States and multiple Southeast Asian countries, and economic motivation will be continually expanded upon in Chapter 3. Yet both coastal and open ocean sharks play a very important role outside of economics, having both direct and indirect impacts on humans and countless other species through the successful maintenance of biodiversity within their marine communities. Sharks have ecological importance in their respective environments, and conservationists are especially concerned regarding the fragility of species' diversity as time passes and human pressures increase (Domingues, Hilsdorf, and Gadig 2017, 502). Sharks are what are known as keystone species; the removal of a single keystone species from the ecosystem could lead to detrimental consequences for the rest of the species whose lives intertwine and rely on related processes and resources, as mentioned in Chapter 1. Likewise, the protection of ecosystems that harbor keystone sharks can help to stabilize and even increase shark populations. Evidence from a study completed in Australia just a few years ago in 2018 shows the potential for environmental re-growth with the implementation of marine protection areas known as MPAs (Speed, Cappo, and Meekan 2018, 308). This study focuses on the grey reef shark and opens up by expressing the increasing evidence of the importance of shark trophic roles – sharks can affect the diet, morphology, and physical conditions of their prey; they can easily change food chain structure and even aid in reef recovery rates (Ibid.). The complexity of environmental factors makes it difficult to pinpoint exactly how sharks are shaping their reef communities, but scientists in this study demonstrated that through the active protection of MPAs, the shark populations from 2004

to 2016 successfully increased (Ibid., 312). This Australian coral reef ecosystem was able to recover shark species potentially through density-dependent feedback as well, due to the migration and competition that the sharks were enabled to participate in under ecosystemic protection. The vulnerability of sharks cannot be overlooked – longer life spans, slower growth, and longer gestation periods all contribute to unguardedness of shark species, which will be covered later in this chapter. There are still several large gaps in the knowledge we have on shark biology, especially pertaining to oceanic sharks, as these are highly vulnerable to several bycatch methods, and many obtained via bycatch are simply not reported (Camhi, Pikitch, and Babcock 2009, 6). As this chapter evolves, it is important to keep in mind this general lack of knowledge on many species, which further increases the necessity for protection and preservation. Also, important to note is the fact that several countries do consume shark out of necessity as opposed to commercially fishing, and this factor will be expanded upon in regard to fishing practices and ethicality. An emphasis on genetic conservation will be upheld through the information outlined, with respect to shark biology.

The shark species that scientists are aware of are broken down into several categories; we will focus largely on oceanic sharks, as well as pelagic sharks minus the rays. Oceanic sharks typically live partly to mostly away from continental landmasses, whereas the term pelagic indicated a highly mobile species (Ibid., 14). Habitat specifications dependent on water surface level split up pelagic sharks into depth categories, making it more difficult to assess certain species who inhabit unusual or hard-to-reach environments. Estimates have put the semi-pelagic percentage of fish at 2.8, and oceanic not much smaller at 2.7 percent (Ibid., 15). This is an extremely low diversity rate, compared to other types of cartilaginous fish that reside on the shelves and slopes of the ocean. In terms of long-term survival, the impact that shark-fishing

poses on oceanic species is highly destructive –not only for the species itself, but also in terms of the negative ecological impacts that species loss has on the functioning marine ecosystems (Ibid., 22). This is a negative externality that is highly overlooked among fisheries targeting species other than shark as well. Open ocean sharks are almost always apex predators, consuming anything from teleost fish to squid to larger marine mammals. A disruption in the ecosystem with the extinction of a shark species could have severe consequences on fish populations, which in turn has the potential to destroy a healthy, balanced ecological community. Blue sharks as well as silky sharks are two species extremely affected by fishery practices that either target the shark specifically or obtain it as bycatch (Ibid., 123). Sometimes, essential data on the most vulnerable species is missing, adding to many of the data and statistical incongruencies expressed in Chapter 1. Yet this is not the case with the blue shark, one of the major components of the fin trade and best studied of the pelagic sharks. We know much about this species, from migratory patterns to reproductive variations (Ibid., 141), but blue sharks are still being exploited at unprecedented rates, with relatively little concrete data on true population sizes. This fact is presented by research concerning the blue shark and oceanic longline bycatch. In the Northwest Atlantic, a specific study cited the steady decline of catch rates of blue shark over the course of nearly 20 years; yet in the North and Southeast Atlantic, the blue shark catch rates stayed relatively consistent and stable, hovering around 1.5 sharks/1000 hooks for Japanese longline fisheries from 1971-2003 (Montealegre-Quijano and Vooren 2010, 168). In the Southwest Atlantic, data proved even higher, with a stabilization at about 9 sharks/1000 hooks until 1996. The large spatial scale of blue sharks, and pelagic sharks in general, makes the collection of data more difficult, but this study was completed monitoring two commercial longline fishing vessels, which made data recovery much more reliable and consistent. The total number of sharks caught

was over 4500 – small juveniles were a major proportion of the catches, while adults were rarely caught, pointing to the shark's late biological maturation and hence their increased vulnerability (Ibid., 170). Despite the research that is being completed, there are still shortcomings in the connections between shark data and how it is used to further preserve and protect wildlife. Just because we may know a substantial amount about a particular organism or environment does not mean that it is being utilized and implemented in the correct ways. For example, spatial congruency is a feature that many researchers would utilize to target areas with high concentrations of species – yet within marine ecosystems, this method becomes more complex to use, mainly due to the highly migratory nature of shark species. One study was able to identify and compare several shark distribution global maps and found low spatial congruency as a result of their research (Derrick, Cheok, and Dulvy 2020). Low spatial congruency means that the biodiversity hotspots that were studied often did not correlate in the physically overlapping ways that researchers thought them to originally. This translates to the area of focus for further conservation planning being too small to be realistically bringing about change. The congruency of richness of threatened species was found to be, therefore, relatively low across hotspot definitions (Ibid.). Without pointing out specific flaws in the research systems, such as the authors of this article, there can be no change in how we recognize shark species' growth and resilience in ever-changing ecosystems. Defining conservation based on these hotspots alone can be problematic in the sense that it limits further research by prioritizing these hotspot areas above other less-researched areas, and secondly homogenizes the environments and possibilities of shark diversity. Creating space for research in areas that expand, not shrink, conservationist thinking is something that will be taken into consideration and implemented later in this paper.

Sharks are just as important in the regulation sector of ecosystem services as they are in provisioning, and that is due to their position as apex predators. Apex predators are those at the top of the food chain, essentially controlling the interconnection of species dietary needs through its own foraging skills. These species can initiate trophic cascade due to their consumptive effects on prey; they can alter genetics within other species of plants and animals through abundance control, engineer ecosystems as a result, and can even promote rapid nutrient turnover (Hammerschlag et al. 2019, 370). Sharks have the power to reduce infectious diseases in organisms relying on density-dependent transmission and may be able to also provide molecular antibody information to aid in human diseases (Ibid., 379). There is a twofold process to environmental regulation which includes not only that of animals, but also plants, which in turn have the potential to mitigate climate change by indirectly increasing the net primary production of carbon sequestration by decreasing herbivore foraging. Trophic cascades are demonstrated in Hawaii, where scientists discovered that tiger sharks were having a positive effect on the population of sea grass beds (Keefer 2016 297). This is due to the sharks self-sustaining the turtle population, which grazes heavily on the seagrass. When the turtles are not as concentrated, the sea beds are free to grow and sequester carbon dioxide in the process. A similar study conducted in Shark Bay, Australia, gives more insight as to how the top predators are able to positively affect their marine ecosystems since 1997. Tiger sharks and 14 other shark species were monitored and caught to measure size and abundance in the localized area (Heithaus, Wirsing, and Dill 2012, 1041). It is shown that the surrounding populations of animal species respond heavily to predator activity, creating refuge in what would otherwise be a foraging habitat (Ibid., 1046). Behavioral states of animals can also change relatively quickly with the loss of top marine predators, a concern that becomes more and more prevalent with the decrease of

stable shark populations. A more recent study has confirmed that in general, apex predators have the surprising power and potential to mitigate heatwave effects. Experiments carried out in Japan's streams utilized the sculpin fish, a primary predator of the multitrophic communities found in the streams. The algal populations within these streams were the main focus, as the sculpin were able to prevent macroinvertebrates from processing too much leaf litter, effectively aiding in stabilizing the algal communities which aid in combatting fluctuations in water temperature (Ross et al. 2021 7). The important intersection of species diversity and climate mitigation cannot be overlooked, as these examples of effective trophic functionality demonstrate the positive effects that apex predators have on their respective environments.

One of the reasons shark populations are especially vulnerable to population decrease via finning through commercial fishing is due to the intricacies surrounding fertilization, litter sizes, and gestation periods. The first large difference between species within fertilization is the style of reproduction. Oviparity, meaning fertilized eggs that are surrounded by an egg case and deposited in the environment, is exhibited by some shark species (Camhi, Pikitch, and Babcock 2009, 26). These egg sacks contain the nutrients that an embryo requires for its development and protect the embryo physically for a longer duration of time. In contrast, pelagic sharks are often viviparous – these pups are birthed alive instead of surrounded by a case. Out of the two types, sharks in this category are placental viviparous species, meaning the embryo eventually forms a pseudoplacenta with the uterine wall and draws on the mother directly for nutrients and possibly gas exchange (Ibid.). Depending on the type of fertilization and reproduction, sharks and pups can be more or less vulnerable to fishing methods; those that are encased versus birthed alive could potentially have greater physical barrier protection, whereas the pelagic sharks that are already heavily targeted are the ones who birth their pups into the open. The second factor that

complicates conservation measures is litter sizes, which vary extensively between species. Pelagic sharks that are on the highly vulnerable end of the spectrum tend to have smaller litter sizes, such as the Pelagic and Bigeye threshers which average only about two young per litter (Ibid., 28). There are still large gaps in the knowledge scientists have of species-specific fertilization and litter sizes; these missing puzzle pieces point to a need for an emphasis on species identification for effective conservation based on the individual data sets of pregnant sharks. Thirdly, the varying lengths of gestation periods adds increased pressure on multiple shark species where young may only be born every few years. Some sharks even experience biannual birth cycles, of which data is even more difficult to obtain under the premise of geographic migration (Ibid., 39). Resting periods in multiyear cycles, along with segregation geographically during different stages of reproduction, coupled with the sheer size of species makes physically handling and tracking sharks even more difficult. For these species that give birth irregularly, survival of their young is crucial to the continued existence of the species itself. A final concern of shark species correlates with the high degree of variation in maturation age and size. The longer the maturity period, the more vulnerable sharks are to human bycatch methods (Ibid., 44). The age of sexual maturity for many species is unknown, furthering the risk of increased bycatch at vulnerable life stages.

While shark species are most often targeted for their fins, this does not mean that the body is never consumed. In certain instances, sharks can actually be recognized as an important provisioning service for middle and low-income families. For example, in Madagascar there are many traditional fishers who will catch sharks to market their fins and rather than discard the shark body, will bring the meat back home to family and friends (Baker-Médard and Faber 2020, 4). Middle and low-income families benefit in this way by receiving a rather inexpensive protein

source, and traditional fishers use the entire shark, which is a rather sustainable fishing practice and one that specifically prevents food waste. In Western Ghana as well, there is a large community culture of fishing that supports hundreds of thousands of fishers, whose work is their most important livelihood strategy (Seidu et al. 2021 3). Interviews were conducted with 85 different fisher people, and the data was overwhelmingly telling in that 80-100 percent of their income is generated from shark fishing. More than 80 percent of fishers and traders in the communities also consumed shark (Ibid., 13). In Mexico, too, there are writings from as far back as the late 1970's describing the procedural doings and risks of pelagic shark-fishing for the people of Teacapán. Weeks' worth of absence from families, physical injury, and even loss of life is tied to the uncertainty of bringing back any catch at all (McGoodwin 1979, 331). The act of shark-finning in this way is very much life-or-death, especially in the instances where crews do not have upgraded equipment or effective catch methods. Sustenance hunting, in this way, becomes a full-body experience, where shark are not just caught as bycatch to trade, but caught as a means of survival.

Sharks as food, an ecosystem service that may seem counterintuitive to this paper as a whole, does play its own important role when it comes to species conservation. There is a growing need for recognition of "… the interconnected relationship between poverty alleviation, food security, food sovereignty, and marine conservation" (Baker-Médard and Faber 2020, 5). Conservation in general tends to focus on colonialized concepts of species protection, and while this may work well for developed countries, it can crush those who do not partake in commercial fishing or seek only to provide for their community or family. Food security, too, becomes an issue when looking at the decrease in shark populations from finning globally. Despite the shark-fin trade, there is very little intersectional trade going on to ensure the prioritization of lower-

income families experiencing low food availability (Fabinyi, Dressler, and Pido 2016, 178). The over-exploitation of one shark species by commercial fishers interested in sharks from a sole market perspective could mean that local families, such as those in Madagascar, Ghana, and Teacapán will have to resort to another resource for subsistence food. The management of small-scale fisheries on a more intimate level through LMMAs, or locally managed marine areas, is a recent conservation strategy centered around community decision-making that has prospective value in bringing together more closely shark management with food sovereignty (Baker-Médard and Faber 2020, 6). By integrating these two sectors, species protection within specific continental areas can be addressed in a manner that will allow fishers to understand the real-time effect of their catches.

It is clear that sharks provide, as well as exist as, ecosystem resources for people both wealthy and poor across the globe. The vitality of these marine ecosystems relies on sharks as keystone species, which play an important role in holding communities of animals together in sustainable, diverse ways. Removing shark species from the ocean can cause major structural changes in the food-chain between prey, predator, and competitors, while also skewing top-down control structures, replacement of species, and overall density of scavengers (Filho and Sales 2017). Reducing shark populations decreases the mortality of meso-predatorial species as well, which may drastically affect ecosystemic balance. Long-term survival and reproductive differences, along with gaps in biological knowledge, often complicate the process of shark species protection. Further, pelagic sharks are especially prone to becoming bycatch via commercial fishing practices, whether by longlines, trawls, or gillnets, where the catch is prized primarily for its fins and the body is discarded, of which survival rates are still relatively unknown (Ibid.). Two different experiments carried out in the Gulf of Mexico and Gulf of

Alaska showed that for pelagic longlines, the mortality rate heavily increased with the increase in line soak time (Camhi, Pikitch, and Babcock 2009, 465). Almost all 103 sharks in Mexico were discarded when caught, which is an alarming detail pointing towards the ease of which bycatch is seen as discardable. The differences in catch methods can heavily influence shark mortality, a factor that commercial fisheries do not pay attention to when hunting and catching. While specific countries do utilize sharks and the entirety of their body meat as low-income food necessities, sustainable practices will not be able to continue if shark species are continuously hunted without further research. Species management needs to be prioritized with respect to the importance of sharks in their environments and to the impoverished who rely on shark meat for sustenance.

Chapter 3. Shark Economics & the $100 Bowl

Shark fin is voraciously sought after by fishermen due to the high price that fins are fetched for across the global market. As we will expand upon in Chapter 4, shark continues to have a high cultural importance, especially for Southeast Asian countries, which is the main reason that the commodification of shark species has not declined significantly since the practice first started. While sharks have a price on the table, they also have a price in their natural habitats due to the expansion of global ecotourism as an economic resource. Countries that rely heavily on tourism for economic gain may see sharks as a resource that need to be kept alive, insofar as people will pay to watch them. This chapter will aim to interpret the range of economic value that is placed on sharks, both dead and alive. The hunt for and consumption of shark fin and other parts of the body will be addressed in terms of remunerative agency, and ecotourism shall also be touched upon as a more recent, alternative form of economic gain.

Environmental economics plays a vital role in the continuation of shark-finning practices. In *Applied Economic Perspectives and Policy,* authors Lusk and Norwood focus on three different types of economics, including production, welfare, and consumer, which we can apply to sharks in a variety of different ways. In terms of production, this is almost always being maximized through bycatch finning with little regard to shark welfare. It is important to recognize that "… existing cost-benefit analyses of animal welfare policies are speciest: they only consider the benefits and costs of the policy to *people*" (Lusk and Norwood 2011, 468). While animal well-being is now more often being taken into consideration during commercial practices, sharks are far removed from this realm of ethicality due to our predispositions against many species of sharks as menacing, powerful animals who only have the power to destroy. Animal welfare is also a public nonrival good, which makes it more difficult in terms of arranging policy coordination and regulations (Ibid., 474), which can be applied especially to pelagic shark populations. Negative externalities, or the unchecked consequences of an action pertaining to the environment, are most clearly seen within these types of animal environmental economics. Negative externalities are not included in pricing nor the estimated costs of production and are most often seen afterwards as the result of overfishing shark populations. These can look like reef ecosystems being depleted, invasive species populations multiplying, and institutional increases in the supply of shark fin harvests, to name a few. Since there is so much information that we lack in terms of shark population data, many of the decisions made in commercial fishing industries are carried out with little to no further research, increasing chances of negative externalities occurring. This includes populations living symbiotically with sharks, populations controlled by shark predation, and other species that may be affected by a change in bycatch levels. Negative externalities could result in the destruction of entire ecosystems if

proper research and precautionary measures aren't put in place, which include policy measures that will be illustrated in Chapter 5.

As far as pricing shark goes, it is all about the quality of the fins – shark-fin soup can go for upwards of $100 USD per bowl (Osseweijer 2007, 106). Various factors that are taken into consideration include percentage yield of fin, how said fin is processed, the general appearance, including but not limited to color and cleanliness, and the texture or tenderness of the fin (Ibid., 107). A key example of shark catch and trade is found within Indonesian territories, beginning to surge around the 1980s when the Chinese market for fins opened up. There are primarily two different types of fishermen there: those who travel far out to sea for the bigger catches, and those who stay in closer to shore for the smaller sharks (Ibid., 117). Despite both groups noting smaller catches and a decrease in fin size, often correlating with an overexploitation of a shark species (Ibid., 118), profitability and mobility was recognized by the fishermen overall, meaning they will continue to move cross-regionally for fins, as long as their endeavors remain monetarily valuable. This mindset is not unique to Indonesian territories – even within United States territories such as Hawaii, fishermen continue the practice of shark-finning due to it being an "… essential part of their crew's income, particularly when fishing was slow or market prices for the target species depressed" (McCoy and Ishihara 1999, 81). The additional money that shark-finning brings in for fishing crews may be just enough to incentivize the continuation of the practice to maintain the desired level of income; more notably, however, is that lower prices fetched for fins do not necessarily discourage finning activities. As long as the number of sharks caught and finned increases to make up for lower market values, Hawaiian crews can continue finning while maintaining income levels.

The demand for fins outside of mainland China has not ceased to grow and change, especially over the last few years as to who imports and exports the most amount of shark. WildAid commissioned several interview-type studies to be done in countries with the top numbers in the past growing years, and responses show patterns of consistent ideals despite fluctuations in trade. Hong Kong imports, for example, have dropped 52 percent between the years of 2011 and 2017 (Vallianos et al. 2018, 9). Yet shark fin is noted as more recently being labeled as other marine products, aiding in the miscalculations of data that plays a central role in the endangerment of species through poor regulatory practices. In 2017, the Hong Kong Shark Foundation found that out of 375 restaurants surveyed, 98 percent still offered shark fin on their menu (Ibid.). An even greater surprise came earlier in 2016 when Macau saw its shark re-exports rise from 88,029 kg to 143,396 kg in one year. Local wedding banquets serve fin about 70% of the time, and Macau is filled with tourists from the mainland, often urged by popular restaurants to try their signature shark fin soup (Ibid.). Turning to Indonesia, interview field research conducted in 2017 indicated that while it was the world's largest producer of shark fins in 2015, most lower and middle-class Indonesians in the specific areas studied had not or rarely tried shark fin soup due to its high price point. Disparities within communities and local income show the detachment from the higher end consumer markets and lack of accessibility (Ibid., 11). Similar reasoning was found in Vietnam, where 45 percent of the 86 percent of people interviewed in 2017 who did not plan on eating shark fin said that it was due to it being too expensive (Ibid., 12). An emerging market that consumption occurs in, Thailand, also brings about serious concerns when it comes to the shark market. Between 2012 and 2016, the country exported 22,476 tons of shark fin and other processed fin products (Ibid., 15). In a 2017 study survey, 61 percent of Thai individuals said that they would consume shark fin in the future due to

their curiosity; 55 percent of these same individuals said they would not consume shark if it was illegal (Ibid.). The irony in many of the interviews from this comprehensive WildAid study is that respondents lack adequate awareness of how shark fin trade affects shark populations. Without the proper knowledge, people will continue to eat what is on their plate - or in this case, in their bowl – not having to bear the full consequences of their actions.

Due to the difficult nature of shark species identification post-death, it becomes easier for fishers to catch and sell shark species on the market in high, often mixed quantities, regardless of whether they are endangered or not. The highly lucrative nature of fins for consumption - in China, specifically – accounted for over 80 percent of the world's shark trade, and countries close to the borders may easily reap benefits within the Chinese market. Taiwan, for example, has a fairly large bycatch rate of shark, yet not every shark caught and put on the market is the species that it seems. A study published in 2016 used dynamic DNA testing to perform species identification of sharks caught in Taiwanese waters, revealing nine species that are not found in Taiwan's waters, as well as about 22.1 percent of the species tested being of a threatened species, meaning categorically endangered or vulnerable (Chuang et al. 2016). Geographical differentiation of these sharks, as well as the range of bycatch found within the study, further encapsulates the demand for shark fin and the economic agency that catch has over regards to species endangerment. Adjacent to Taiwanese mismarking of sharks is the underreporting of shark catch and trade through Hong Kong. Taiwan is just one of the many countries that exports fins here, in which they are subsequently re-exported to other destinations for sale and consumption. Hong Kong had received the highest volumes of shark fin imports from Spain, Taiwan, Indonesia, the United Arab Emirates, Singapore, and Japan between the years 1998 and 2013 (Shea and To 2017, 335). Data collected from these countries' exports through the food and

agricultural administration, particularly Japan, Singapore, and Taiwan, shows frequent underestimation of traded amounts of shark fin, which not only increases trade profit revenue for the respective countries, but also misrepresents the actual number of fins being exported and makes it increasingly difficult to gauge accurate trade data and existing population numbers.

The highly lucrative nature of fins for consumption - in China, specifically – accounted for over 80 percent of the world's shark trade, and countries close to the borders may easily reap benefits within the Chinese market. Yet there has been positive recent work, specifically by WildAid, to reduce shark demand in China through public awareness campaigns, such as Yao Ming's that was mentioned in the introduction of this paper. Airlines in China, including their largest, China Southern, began to ban shark fin shipments, along with hotels as prestigious as the Ritz Carlton (Vallianos et al. 2018, 7). These companies realize the market power that they have, and their decisions to stop carrying shark fin products in these "higher class" establishments are big steps in decreasing the overall demand for shark fin, as they are some of today's temporary models of social status in China. Despite these more recent steps taken in China, the value of fins globally is not decreasing, but seems to be merely shifting to other countries, as is the demand for shark meat. The most recent study available, released by the World Wildlife Fund in 2021, puts the 2012-2019 trade value globally at a startling USD $1.5 billion of shark fin alone (World Wildlife Fund For Nature 2021, 7). Spain was the largest exporter and importer in the shark meat trade from 2009 to 2019, with well over $500 million in exports; Italy took the top spot for import values, with an intake of just over $340 million (Ibid., 13). Shark meat, as it becomes more popular, continues to rely on strong trade networks to economically benefit from transactions. As more fin-attached regulation came into play, countries began supplementing fin sales with shark meat, specifically to the growing markets in Brazil and Italy. WildAid cites the

global imports of shark meat increasing 42 percent between 2000 and 2011 (Vallianos et al. 2018, 16). Shark meat trade has received far less attention than the fin trade, and this may have to do with the fact that many places label shark meat as other items. For example, in Brazil, shark is labeled as cação, which is an inexpensive meat to be sold in supermarkets, or it may be labeled as another type of fish such as swordfish or grouper for a larger profit. Processed shark is very difficult to identify, as established through trading cases within this paper, and further WildAid surveys in Brazil found that most people purchasing cação did not realize that it was shark meat (Ibid.). Despite the growing demand in Brazil, it only managed the second highest import value, surpassed by Italy, most likely from its strong trade ties with Spain. As aforementioned, Spain was still the dominating power from 2009 to 2019 in fresh and frozen shark meat trade, with about $536 million USD in exports and $289 million in imports, along with a huge trade network consisting of 65 import and 85 export links (World Wildlife Fund For Nature 2021, 10). This diagram below shows the most distinctive links across the globe being between Spain, the United States, Vietnam, Brazil, the UK, South Africa, New Zealand, Japan, Italy… sharks have very little safe space to roam in the wild as a result of the increased interconnectedness of shark trade outside of China. The economic success that shark-finning brings transnationally is due to these intricate connections between countries, coupled with the failure of larger organizations such as CITES in enforcing their implemented policies, a topic that will be further covered within Chapter 5.

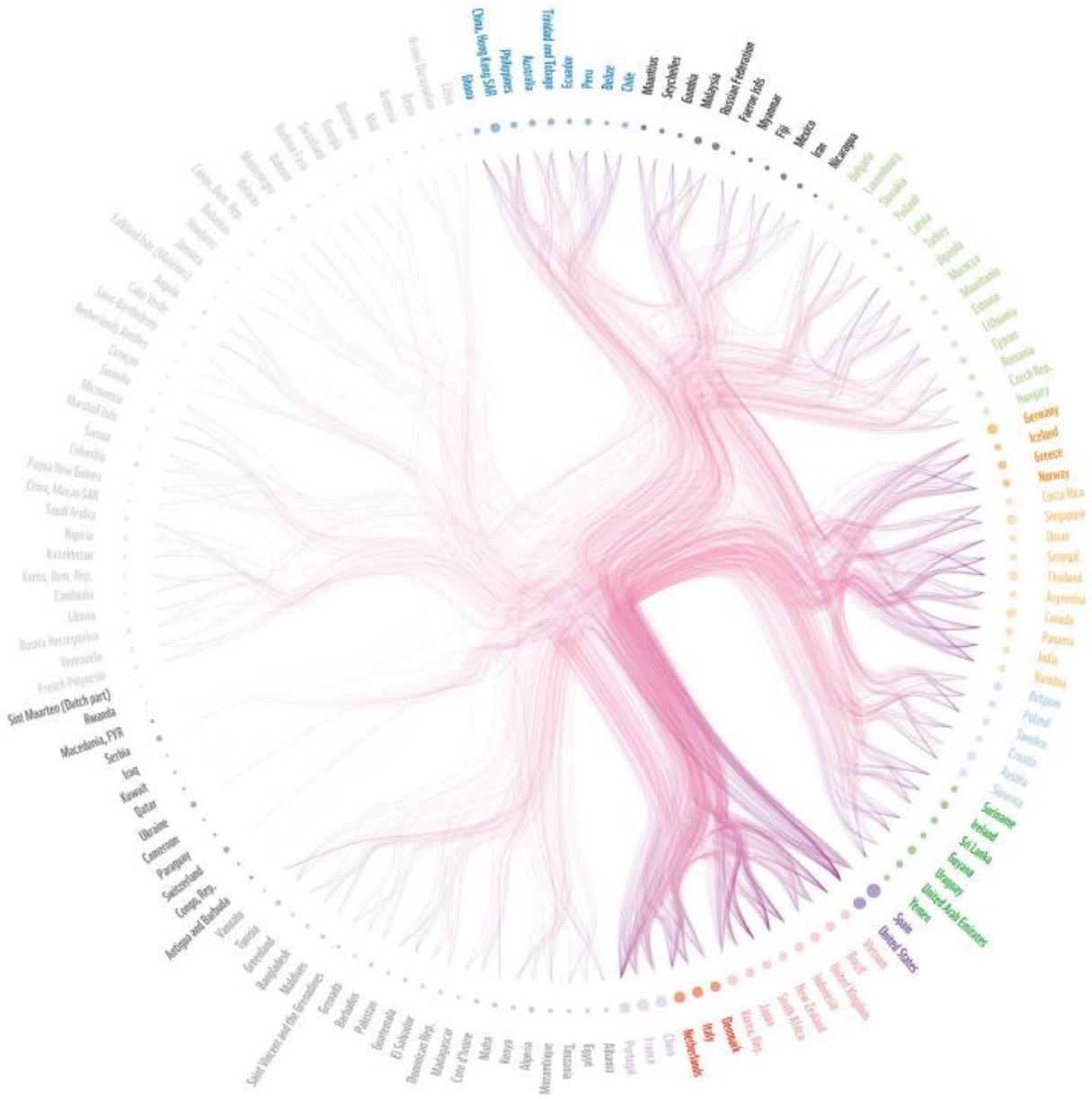

Figure 3, Trade Links Between Traders by Volume, 2021

A surprising addition to the economic value that sharks bring to the table is through ecotourism, in which travelers are able to get a rather close-up experience with the animals in their natural habitats. While successful ecotourism largely depends on how management of

operations is carried out with respect to conservation measures, there is growing potential for this niche market to overtake the shark-finning industry in terms of monetary value. Within the last twenty years, there has been approximately a 30 percent increase in visitors at shark-watching sites; the economic benefits of this increase can be seen at the local level of ecotourism sites, where profits importantly stay and circulate within the immediate community (Techera and Klein 2014). Ex-fisherman who are used to receiving a mere average of 75 cents per kilogram of shark could switch to an ecotourism role and receive a fixed wage, albeit still relying primarily on side-payments such as foreign tips, forgoing the previous side-hustle of selling shark body parts aside from the fins. Ecologically, shark watching places a large emphasis on the value of conservation and education, as was touched upon in Chapter 2 and will be further encapsulated at the end of the paper within policy recommendations.

Ecotourism, in short, consists of responsible travel practices and experiences to and in natural areas supporting environmental conservation through sustainable practice and environmental education (Sutcliffe and Barnes 2018, 27). There is evidence that ecotourism increases participants' knowledge and intention to engage, while other evidence shows little changes in attitudes. This fluctuation of available data on ecotourism necessitates a deeper dive into the different perspectives and attitudes towards shark ecotourism as a whole. The first case study looks at a site off the coast of Brazil called Fernando de Noronha Archipelago – ecotourism is the main economic activity on these islands, and at least 20 shark species are known to exist in these waters (Pires, Garla, and Carvalho 2016, 32). Interviews took process over the range of five different economic sectors of Noronha, covering everyone from restaurant owners to dive operators to environmental management authorities. Tourists were either given questionnaires to answer themselves or were interviewed face-to-face at the airport; fishers were

interviewed at port, and many other people based on availability (Ibid., 33). The economic value for the tourism activity was calculated through the travel cost method, covering fishing, diving, and shark diving. The travel cost method covers mobility cost, the distance traveled, the amount of time spent on the trip, and determines the recreational value of the site at large. An average of 63,258 tourists visited Noronha per year between 2011 and 2013, and local scuba companies as a result totaled 24,551 dives annually during this time period (Ibid., 34). According to the travel cost method and the data collected by the study, the total recreational use of Noronha was about $90 million USD, and the economic benefit generated by tourism services and taxes was $73.8 million USD annually. Shark diving provided income and revenue for those residents that were employed by dive operators; $81,147 USD was given to those employed by the shark diving business, and dive operations as a whole constitute $2.5 million USC annually of the tourism income for Noronha. This study points specifically to the projected estimates and potentials of shark ecotourism as a means for economic gain outside of shark finning, stating that Noronha has exceeded past values in other shark-diving areas such as South Africa (Ibid., 37). Fishers in Noronha benefitting the least from shark-diving have a chance to make a new earning by promoting shark encounters and the non-lethal use of sharks for ecotourism to generate a wider economic impact for themselves.

Community action and collaboration is crucial for the ecotourism sector of shark conservation to flourish. A great example of ecotourism methods and action can be seen in the community of Seychelles, where the whale shark has been a prominent figure animal in their Marine Ecosystem Management Program, known as SEYMEMP. The project not only recognizes the limited existing resources available for this shark species, but also set up a workshop to further develop a nationwide shark-monitoring network (Rowat and Engelhardt

2007, 110). The potential for economic value to the community of Seychelles is upwards of $4.99 million USD in the short season of around 14 weeks. Using figures from past data, the study was able to determine an accurate direct projected value for the whale shark tourism sector of $2.02 million a year, with earnings directly towards the project totaling around $58,800 (Ibid., 112). The involvement of the community of Seychelles in the beginning years of the project development and beyond has been noted by increases in shark sightings and newsletter addresses. Real impacts are achievable in shark conservation communities, especially when research and resources are available and utilized such as those in Seychelles.

The number of tourists that do participate in shark-watching "… should be considered in the context of their impact. As a form of ecotourism, shark watching is important because it can lead to increased awareness and support for conservation, although this depends on how ecotourism operations are managed and implemented" (Cisneros-Montemayor, Barnes, and Al-Abdulrazzak 2013, 5). Much like underreporting fin catch and exports to other countries harms shark populations, data discrepancies within the number of tourists visiting a specific site could also be harmful in that too much physical stress on an environment may alter shark species populations directly, or indirectly affect a species that sharks rely on for food sources.

Chapter 4. Ethics of Finning and Chinese Culture

With any and all food embedded into a traditional culture, it is important to learn and understand the history, main uses, and higher significance of the animal itself. As touched upon in the introduction of the paper, shark fin has long been a central staple of royalty within China and branched out to common folk as a popular dish with the lifting of Chinese trade restrictions around the early 1980s (Fabinyi 2011, 87). The reasonings and stimulations behind the consumption of shark-fin soup, specifically for Chinese people, are intrinsically tied to cultural

beliefs, and this chapter will aim to explain traditional practices, while providing counterarguments in relation to health benefits and further explore the ethical quandaries of shark-finning.

In traditional Chinese medicinal practice, seafood consumption is very common due to the gravitation towards *bu* foods, which are typically those with strengthening or proposed tonic-like properties (Ibid.). Sharks are seen as an exotic, rarer food in this instance, one which has the potential to promote health in one's body. Not only this, but sharks are also inherently powerful animals, and within Chinese traditional beliefs, this power was transferred from shark to emperor as one consumed it. Wild animals are also considered to have more *bu* than non-wild animals, for they are purer and less polluted in Chinese culture. Fish in general are seen to be linked to prosperity simply based on the character of fish, *yu*, being the same as the character for abundance (Ibid., 88). The embedded idea that shark-fin has a high amount of culturally and bodily significant *bu* and is a fish of abundance and power in itself, leads to the continuation of fins being used in traditional Chinese medicine and in the popular dish of shark-fin soup, served during weddings, banquets, holidays, and other important social occasions to primarily royalty. Especially within early China, banquets were extremely public displays of social status and wealth. Shark-fin, being a symbol of richness in both the literal and figurative sense, was served primarily for the elite, which draws on expressions of economic power. During the time of rapid economic growth, establishing this social rank in China was imperative for members of elite society to maintain their prestige and standing (Ibid.). Emphasizing the rich versus the poor through food is a cultural tradition that can be seen through serving a multitude of exotic animals as food, including birds' nests, which does not have a distinct taste (Wu and Cheung 2002, 44), much like shark-fin itself. When Chinese elite citizens began to crave authentic dishes of other

countries, more exotic animals would be imported from places such as Taiwan, which was analyzed in previous chapters as a significant contributor to the fin trade. Sharks are herein seen as indicators of social relations, a symbol of caste or social status, "… and as a metaphor through which the mechanism of self-construction with regard to ethnicity and identity can be discerned" (Ibid., 102). This explicable association between food and how people think of themselves and others cannot be understated, and this important lens will be upheld through the rest of the chapter.

Shark fin has been used in traditional Chinese medicine as both tonics and rejuvenators and seen as one of the prime animals to connect vitality and the human body together. While shark is considered one of the eight treasured foods from the sea for the noble and emperor (Man, Wu, and Wong 2014, 1015), there was little research done during the earliest periods of shark-finning - and still little extracted up until the 21st century - about the amount of mercury present in shark fins, and how much can be safely consumed. Research published in 2014 poses key health risks that come with the increased intake of shark, including a fact that may not be taken into consideration by fishermen during the finning process: biomagnification of Mercury in sharks, especially those at the highest trophic feeding levels (Ibid., 1016). Exposure to mercury at high levels can lead to gastrointestinal, nervous system, and kidney issues; methyl mercury intake may cause neurological development struggles, vulnerable especially to very young children and babies (Ibid.). This particular study examined fins from Hong Kong, Beijing, Shanghai, Haikou and Wenzhou, coastal cities around China, in which 62 shark fins total were obtained and researched. Many of the levels of mercury that were found in the fins varied dependent on fin height, but nonetheless exceeded the maximum level for several countries. Large shark fins from Shanghai and small fins from Wenzhou contained 600 and 700 μg/kg,

respectively, of total mercury, which exceeded Japan, USA EPA, European Community, Health Canada, and Australia and New Zealand levels of permissibility (Ibid., 1020). These health considerations are multiplied when paired with the fact that shark is a staple in Chinese dishes, potentially raising citizens' proposed intake levels to be much higher than the average projected within the study (0.0014 kg/day for adults and 0.0007 kg/day for children) (Ibid.). While the study focused solely on dried fins, and therefore did not identify the species of each shark fin, the findings are nevertheless important to consider when coupled with the reality of the amount of shark fin being consumed in present day cities in and around China. Shark fin is not only found in soup, either, as WWF includes many dishes native to specific importing countries, such as Schillerlocken, smoked spiny dogfish in Germany; Sinagol, a Malaysian dish cooked with juvenile sharks – or ceviche de tollo, chopped smooth-hound shark from Ecuador (World Wildlife Fund For Nature 2021, 29).

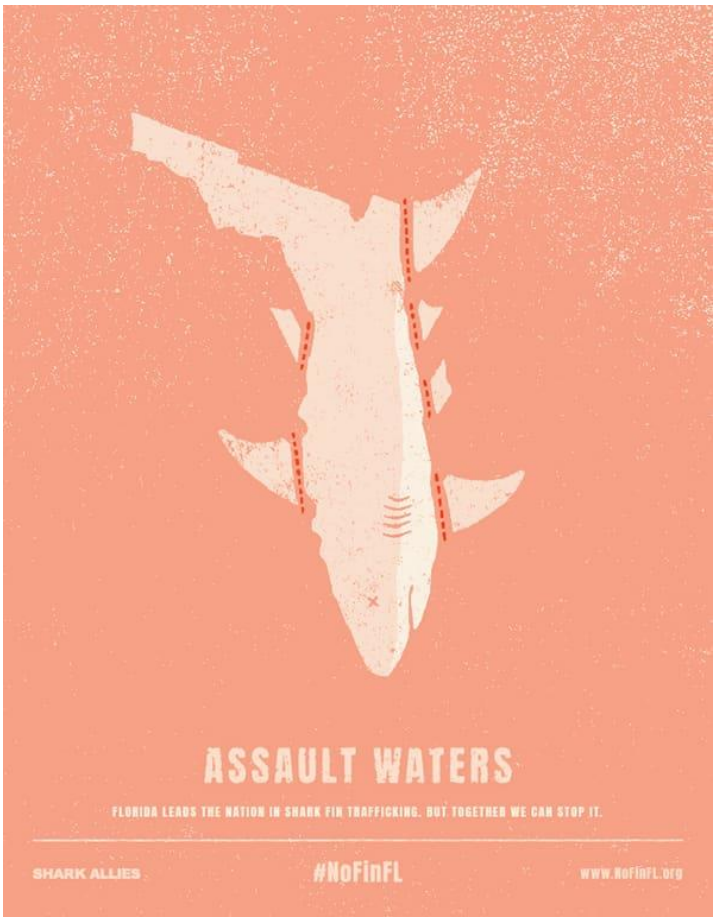

Figure 4, Assault Waters (Shark Allies Campaign), 2020

Environmental ethics is inherently intertwined with the practice of shark-finning, tying in many of the previous notions peppered throughout this paper. The idea that nature, specifically sharks in our case, are more than we perceive them to be – that they are an invaluable part of the ecosystem around us, balancing countless species populations while existing simply because they can, and deserve to. This idea that sharks should have autonomy is demonstrated by philosopher Tom Regan in his rights view moral theory, in which every creature essentially has a life that is worth something, regardless of what it is worth to others (Regan 2004, 148). Regan expands his theory outside of the human species to include animals as well, and this viewpoint is critical to understand when it comes to recognizing that humans

place value on things and use them as such, as demonstrated at the beginning of this chapter. Furthermore, our anthropocentric point of view amidst shark-finning puts humans at the top of the food chain, with no other animal being equal. Regan believes in getting rid of scientific testing on animals, along with commercial animal agriculture and commercial/sport hunting and trapping (Ibid., 143). Animals face subjugation underneath humans, so the elimination of animals from the equation would be wholly beneficial to their well-being and would prove a major success for decreasing mortality rates in vulnerable populations such as sharks. Regan firmly stands by the idea that all humans and animals have inherent value, and we have it equally no matter the species (Ibid., 148). In this light, sharks among other fish would not be caught by the millions through bycatch. In Regan's eyes, trying to treat animals under scientific or commercial lenses humanely does nothing to right the fundamental wrong – there needs to be an absolute shift in perspective when it comes to which species deserve life.

An argument that continues to puncture the world of animal ethics has to do with fish sentience, and questions of fish intelligence and pain have circled around the animal welfare community for decades. Yet the sense of pain in fish has been supported by evidence from many studies; a zebrafish study performed a decade ago was highlighted by the Director of the Humane Society Institute for Science and Policy. The fishes' reactions to noxious stimuli in the experiment proved them to take action to relieve the pain of their injections (Balcombe 2016, 2). Although this study may seem miniscule in comparison to shark-finning, the prospects of fish such as sharks having perceptions and feeling pain in many ways changes the ethical angle that the fishing industry is viewed on as a whole. There needs to be a recognition that many of the senses that fish and sharks specifically feel are inherently different and may also look different from our typical viewpoints of pain and pleasure, such

as their electroreception system enabling detection of hidden prey for foraging (Ibid., 3). Not only have the physical perceptions of fish been engaged in studies, but the feelings that fish experience are also being increasingly monitored and explored, specifically play behavior in large wrasses and groupers that approach divers and receive strokes or pets, or cleanerfish caressing their fish clients for extra pleasure (Ibid., 4). Looking into the problem-solving minds of rays, sharks' Chondrichthyan relatives, gives added data that supports acute capacities to complete tasks. The rays in the study were able to discover on their own how to draw food out of a plastic PVC pipe about 8 inches long – some created a suction with their bodies, while others used their fins to make a current, and one even blew jet streams with its mouth to force the food out (Ibid., 5). Balcombe goes further and mentions the applicability of individual recognition and how sharks are known to recognize divers and receive gentle strokes, putting them into a hyper-relaxed state of tonic immobility (Ibid., 7). The lives that sharks live, while contrasting ours in so many ways, seems to find its very intersection at the emotional level, albeit only a few lucky humans are able to experience these types of experiences furthering the case for fish sentience, pain, and pleasure.

More recently, a new point of view has arrived in which animals are recognized as experiencing different states of welfare, which encompasses subjective experiences and attributes (Mellor 2019, 1). Foundations of sentience in this viewpoint rely on internal structure-function interactions, sensory inputs, neurobiological development, and experiences of both negative and positive effects, to name a few of the different categories. The study recognizes that sentient and insentient species and their phylogenetic distinctions have become blurred, especially as the conversation has opened up to invertebrates. Sharks are technically classified as vertebrates, as their backbone is made of cartilage; yet shark species

are often still left out of the conversation in regard to animal ethics, despite several strong indications of them being sentient beings, such as specialized receptors enabling sharks to detect the weak electromagnetic fields of their prey (Ibid. 5). The fact that fish such as sharks may have different, yet coalescent, signs of feeling and sentience is further drawn out by Professor Safina in his 2016 article arguing for the pain of fish being expressed in different ways than humans that does not follow the strict rules laid out by a neurobiologist that same year. Whereas the neurobiologist infers that the noxious stimuli do not feel like anything to a fish, Safina counters this with an experience of his own. While actively feeding a blue shark some chunks of meat, a stinging lion's mane jellyfish from underneath his boat was bitten by the shark on accident. Instead of continuing to eat, the shark was said to have shaken its head and quickly spit out the stinging jelly (Safina 2016, 3). Observing sharks within the natural landscape to obtain a better understanding of their perceptions of stimuli is one way that scientists could further investigate the role of shark behavior with respect to sentience.

Another key portion of the ethics puzzle when it comes to fish in general is a human bias towards mammals, as they are the most similar to us (Mather 2019, 1). Mammals are written and spoken about in a positive manner, from the smallest fox to the largest elephant, and our increased research and extended care towards these species leaves out critical vertebrate species such as sharks. Anthropomorphic tendencies of human beings also complicates the relationship that the general public has with sharks. Past studies have listed characteristics that we humans base our judgement on animals upon, including cognitive complexity, brain size, expansiveness of learning abilities, awareness, and feeling pain (Ibid., 2). Vertebrates look less and less like humans as the phylogenetic tree becomes more complex, and this is especially seen in fish, as they do not produce facial expressions that

humans associate with both awareness and cognitive complexity (Ibid., 3). Sharks are often not seen under this scope of physical and emotional understanding, and even if we try and mold sharks into these categories created by humans, there is a risk that potential behavior and ecological understanding will be further limited from clouded generalization of shark species.

Further bias has been shown for land mammals on prominent wildlife magazine covers featuring large carnivores such as wolves and bears, as well as in children's books and movies that prioritize charismatic, terrestrial mammals (Ibid., 4). Overlooking species of fish, specifically sharks, neglects an entire marine ecosystem which makes up about 70% of the area on the planet; despite over 20,000 fish species and 130 marine mammals existing, we usually only hear of dolphins and whales as positive, humanistic examples of animals that are worth protecting (Ibid.). There is an ever-increasing role that popular press coverage has in shaping the ways in which people view issues, and a past media content analysis further illustrates the dampening of shark species – only 9 percent of all shark-related media coverage was related to shark conservation in the 2013 USA and Australia media (Schiffman et al. 2020, 4). A study completed in 2020 seeks to further analyze global media shark conservation coverage from 2008-2017, in which straightaway it was found that the information being presented to the public was often oversimplified, biased, and factually inaccurate (Ibid., 5). The most threatened species were not the ones receiving the most amount of coverage; only 20 mentions of species listed as Critically Endangered on the ICUN Red list were mentioned within the media coverage, 15 of those mentions being about angel sharks (Ibid., 6). Shark finning and the shark fin trade were also portrayed as the same issue, being addressed in 67.7 percent of the articles, which can confuse readers and mislead many into thinking that all

shark fin trade and all instances of finning occur simultaneously and interchangeably. Sharks also hold a highly negative public image thanks to motion pictures such as *Jaws* that portray sharks as both frightening and murderous (Ibid.). Shark meat trade was only mentioned in 19.6 percent of the articles, many times being claimed as an insignificant trade source. Furthermore, the study notes a significant bias towards the acknowledgement of policy solutions, including an overwhelming focus on initiatives targeting a shark finning ban and fin trade ban, ignoring other policy strategies such as bycatch reduction, no-take MPA's, and wildlife tourism (Ibid., 10). The failure of global media coverage to expand information and viewpoints on shark conservation and environmental issues, as well as provide sound, accurate data, is a core setback in the way that the general public understands and learns about sharks, contributing heavily to the attitudes and limit-based solutions of readers (Ibid., 11).

Shark-finning, commercial bycatch, and excessive consumption are detrimental to the marine ecosystem environments and the shark species themselves – yet there still can be, and needs to be, room for indigenous people of those underdeveloped countries who truly rely on the catch of shark for sustenance food and trade resources. The quandary of whether to prioritize flourishing of life, such as the sharks, or the flourishing of the people, is centered deeply within an anthropogenetic viewpoint, again, of needing to choose whichever is more like us, more tied to a human existence. Rob Percival introduces a viewpoint that tries to combine the needs of the environment with the needs of humans, and this is through an ecocentric perspective addressing the consumption of animals. Percival cites a definition of a flourishing ecosystem as one in which the recycling of energy and nutrients occurs where the ecosystem's integrity or complexity is not diminished, which therefore unfolds the potential of nature (Percival 2018, 34). He lists sharks as an example of one of the wild-caught species

that humans continue to overconsume, often having further consequences for the environment as we discussed in previous chapters, such as the destruction of coral ecosystems via trophic cascade (Ibid.). The question is asked as to what it would look like for each animal of a species, as sentient beings, to have the opportunity to flourish – this looks like what the UK's Animal Welfare Policy for farm animals outlines. Freedom from hunger, thirst, discomfort, pain, injury, disease, fear, and distress, coupled with the freedom to express normal behavior, is what is allowed for these land animals (Ibid., 36). This outline of policy gives a great example as to how land mammals are progressively seen by humans as needing to be treated fairly and respectfully, yet further draws out the inherent bias to push policy for the species that are the most like human beings. Percival highlights human flourishing as the next section, tying empathy and benevolence to eastern and western traditional teachings (Ibid., 37), which provides a foundational bridge that should be drawn on when viewing sharks and other animals that are consumed in various cultures. Compassionate conservation, in this viewing window, would recognize not only individual animals' well-being, but also the well-being of the people who rely on shark for their own livelihoods, as humans are able to integrate their success and well-being outside of commercial capitalism into the environment around them, furthering an ecosystemic flourishing.

The ethics of shark-finning as portrayed within this chapter focuses on the views that humans have of sharks as a whole. The most damage to species is executed through harmful fishing practices carried out by large companies, yet an equal amount of damage is carried out as proposed by the dismissal of sharks as species worth considering for publication, the value of sentience, and overall existence. The ethics proposed in this paper, while comprehensive of both Chinese and American perspectives, seeks to leave space for indigenous and local

peoples, of whom shark may be their sustenance food that their family or even community relies on during certain seasons of the year. Since their ethics take on a different position within the specific case of sustenance finning, a voice for indigenous folks needs to be promulgated within the activist community and promoted within policy measures, as the next and final chapter will dive into along with recommendations from a variety of conservation viewpoints.

Chapter 5. Cutting the Consequences: Policy Recommendations

When we think about policy and sharks, we can see that there have been numerous steps that the United States, along with other countries, have started to take to try and curtail finning. Nonetheless, none of them are quite strict enough to actually stop the exportation and importation of smuggled fins, prepared in many different kinds of ways and traveling as far as demand will take them. As explained within Chapter 2, several loopholes can be found within US policies against shark-finning, and this combined with the speciesist ethics globally surrounding sharks creates avenues for destruction. This final chapter includes personal recommendations complemented by radical research which provides insight and knowledge into the next best steps towards preservation of all shark species.

Cooperative, Inclusive Management

One approach that has been developed by conservation advocates is to model policies off of those that denounce whaling – namely the International Whaling Commission, including both pro-whaling and anti-whaling nations. The commission includes space for aboriginal subsistence whaling (Gronstal Anderson 2011), which is similar to the subsistence shark-fishing taking place in specific countries mentioned throughout Chapter three. Ingrid

Gronstal Anderson, in her work connecting these policies of whaling with that of sharks, proposes an International Shark Fishing Commission be established along the lines of IWC (Ibid.). Unfortunately, there are many more hurdles to overcome in establishing shark protection regulations. Collection of data on sharks, as posed in Chapter two, is sparce as is, while the IWC has an entire portion of the committee dedicated to collecting accurate scientific data on whale populations. The stigma and cultural significance behind sharks, as well, is much different for many major countries than that of whales; sharks are seen as more aggressive and powerful, hence why they are hunted for their fins. A committee such as ISFC, according to Gronstal Anderson, may need economic incentives to encourage membership and ensure compliance to rules and regulations, as well as a more comprehensive scientific committee than that of the IWC (Ibid.). A committee could also be created that would serve to provide engaging information on the goals and missions of the commission as a whole – getting the public's attention and interest in protecting and preserving shark species is crucial in aiding in slowing down the commercial fishing industries.

Figure 5, Sharks, Sawfish, & Mini Mantas Under CITES, 2016

Another important piece of policy information that Gronstal Anderson shares is the current problematic state of shark listings as written by CITES. The great white shark, whale shark, basking shark, hammerhead shark varieties, thresher shark, silky shark, and more recently the porbeagle shark are the only current sharks listed on the CITES Elasmobranchii listings (Convention on International Trade of Endangered Species 2014). Gronstal-Anderson also points out that CITES has pushed back on several applications for protection of shark species such as the porbeagle, and to her it is unclear whether shark trade would be effectively regulated by CITES, due to them protecting under 10 shark species, coupled with the concerning fact of the "… IUCN finding that thirty-two of sixty-four open water shark species are threatened with extinction due to overfishing" (Gronstal Anderson 2011).

CITES shortcomings have also been documented as recently as this year in Germany in the regulation of customs and screening of dried shark fins. A collection of fins from German customs was DNA tested, much like one of the other cases mentioned within the paper to accurately decipher species, and testing found that only four species of the 11 that were identified were protected by CITES listings, despite all of the shark species analyzed being recognized as at best vulnerable, and at worst critically endangered by the IUCN (Villate-Moreno et al. 2021, 4). Europe does not play a large active role in the consumption of fins, yet transportation routes frequently cross into countries with large ports. The study also recognizes that CITES regulated species may have avoided confiscation despite the dried fin study, which consequently means that endangered species ended up within Hong Kong trading ports (Ibid., 6). Creating a new way to effectively regulate species trade internationally outside of a CITES lens may aid in the successful protection of shark species, both highly threatened and vulnerable.

The threat of fishing to nearly every shark population is substantial enough that regulations in one country alone will not accomplish much. The United States only exports about one percent of the shark fin trade, and imports even less (Ibid.), which is a very small portion when compared to countries such as Hong Kong. For effective policy to encapsulate sharks worldwide, policies are best to be created with a comprehensive, interdisciplinary approach (Zaccaria 2014, 35). This can cover not just sharks, but also indigenous and native fisher people, along with those who are most primarily impacted by the decrease in shark populations. A specific suggestion that has been made within shark fishing conservation is for the United States and the European Union to directly step in and try and negotiate with China about changing its policies. A "fins naturally attached" policy would help to curb wastefulness, as well as reduce the amount of shark deaths that take place due to size limitations of carrying a whole shark on board (Iloulian 2017, 358-59). How exactly the United States and Europe would convince China is more complex – the author of this article suggests that economic reasoning will be the primary argument yet based off of the medical study from Chapter 4 and the cultural view of health in China, medicinal studies could also be used to show the increased effects of chemicals such as mercury, which may alarm those who eat an above average amount of shark. These suggestions set limitations on shark-finning, but do not totally curtail the practice as a whole, which is why there needs to be more comprehensive work done. A possible strategy achieving this goal is implemented by Zaccaria in their thesis on conservation measures which takes a three-pronged approach (Zaccaria 2014, 37). The first effectively calls for increased shark research based on stock and management plans crafted from life histories. To focus on a shark's life is especially interesting, as it makes space for the treatment of sharks in a similar way to marine mammals in that their life

spans are long and variable throughout each species, as described in Chapter 2. Cooperative management through this scientific approach is crucial in obtaining more information about each species' weakest points.

Sustainability and Shark Fisheries

With the tide changing over the past decade in terms of people choosing more sustainable sources for food, one may believe that a sustainable shark fishery would be the best way for the market to carry on in a closed loop fashion. Yet the continuation of said fisheries may be undermining the main goal of shark conservation as a whole, which is the protection and promotion of preservation of shark species, prioritizing the most endangered but still encapsulating those species that are vulnerable. This section of the chapter is dedicated to breaking down the shark fishery argument, analyzing facts and evidence from two different authors' perspectives and seeking to understand which option would be the best for sharks collectively.

Counterarguments to ending or mitigating shark fin sales point to what are known as "sustainable" shark fisheries in the United States (Shiffman and Hueter 2017, 138). Proponents of these fisheries are more often than not focused on obtaining shark meat and fins, in a slightly milder fashion, and continuing the trade from well-managed fisheries under the prompt of sustainability. Within Shiffman and Hueter's article, they argue that of 16 global shark fisheries identified as biologically sustainable, 9 of them involve U.S. fishermen relations (Ibid.). What does it mean to be biologically sustainable? In this instance, going to the source cited showed that sustainability was defined as a mere calculation, the current biomass being greater than that required to obtain the maximum sustainability yield (Simpfendorfer and Dulvy 2017, 97). The view in the source is that only the most productive

species with fast life histories can be managed sustainably (Ibid.), yet as we have analyzed in previous chapters, these life histories are far from being solidified and researched, especially concerning pelagic shark species. When we think about sustainability, we need to understand that the definition cannot simply encapsulate anthropomorphic values and consistencies, as many present-day articles have exemplified; similarly, it cannot stand alone as the term making a shark fishery "good" or "bad". Sustainable practices are still tailored to the humanistic experience, and the practicality that we impose on institutions such as this one play into the overwhelming idea that finning is "bad" in certain locations, such as Chinese markets, but okay in U.S. fishery markets.

A ban on the sale of shark-fins, as told by opponents, would merely regulate the portion of the sliced shark that could be used, forcing waste, therefore playing against the conservation efforts that the ban intends upon. Shiffman and Hueter also argue that a policy such as this one would have a negligible effect on global shark mortality due to the U.S. only exporting one percent of all global shark fin trade, while it also risks illegal markets opening up for smuggling and unregulated trade (Shiffman and Hueter 2017, 139). The arguments against the shark-finning ban have an outward appearance of conserving both fishery jobs and food sources – eliminating the value of legally caught sharks, argued to economically harm fishermen – yet in reality the concept of fisheries as a sustainable enterprise is an anthropogenic ideal, relying on man-made projections of how much bycatch is too much when pushed up against a quota. The United States is one to often demonstrate shark fisheries as a positive alternative for other countries to adapt in place of fishing (Ibid.), yet the purpose of commercial fisheries in developed countries such as the U.S. are still the same in breeding species for consumption with a high market value. There is also the concern for addressing the

internalization of negative externality costs outside of a strict shark-finning ban; penalties for those who are caught smuggling illegal species or an unsolicited amount of shark fin into trading ports still need to be implemented appropriately. This could look like taking one's commercial fishing license away or severely restricting it after a breach in the amount of shark fins landed – it could also incorporate a "fin fine" that would permanently show up on one's fishing record to let companies and other businesses know of irresponsible or undocumented activity involving the trade of shark fins. These small economic pieces would potentially supplement or replace a trade ban to mitigate hidden costs surrounding shark finning, preventing the upheaval of the entire shark fishery system while also ensuring that fair consequences are set in place to restrict fishers who don't act in accordance with the law.

Shiffman and Hueter's point of view comes under fire for several reasons in Porcher's response to the article, where they and their colleagues list several key elements that are misspoken on and need to be reconsidered in the original paper, including sustainability, mortality, and misconception. The paper is claimed to not have provided scientific evidence of the existence of sustainable shark fisheries around the world or in the United States specifically (Porcher, Darvell, and Cuny 2019, 86). When coupled with the analysis of the term sustainability and how that was calculated, I can agree that there was not enough scientific evidence provided to explain the goals and ideals behind what makes a shark fishery sustainable. Furthermore, once the fins have been removed from the shark, it becomes extremely difficult to identify the species that it belongs to and as a result nearly impossible to keep accurate species-specific catch statistics (Ibid.). Mortality is also under speculation, where Porcher argues that the shark-finning ban in the United States actually would have an intended effect when implemented to diminish fin trade in countries outside of the United

States. Setting this strong example for other countries is something that the act seeks to do, and misconstruing shark mortality to be inherently unaffected by the act diminishes the goal for a planet-wide ecological response (Ibid.). Finally, Porcher elaborates on the fact that the act would not contribute to a misconception about shark threats being limited to usage in soup, pointing out that shark mortality has not been lessened despite the decrease in the discarding of shark bodies in line with 'fins attached' regulations (Ibid., 87).

With the analysis of these two outlooks on shark fisheries, it is proposed by me that shark fisheries are inherently unsustainable, and should not be marketed as such, since there is no clear-cut definition of the term as it pertains to a non-anthropogenic display. We need to move away from the idea of transforming agents, in this case sharks, into options that we deem commodifiable. There can still exist a space in which indigenous folks fish and set up a system of true sustainability within their cultures, but this is necessary to also separate from shark fisheries within the United States and other developed countries focusing on marginal profits. Creating a new dialogue of how and when shark fisheries continue to repeat patterns of commercial bycatch would be helpful in illustrating the problems with humans and identifying our systems as sustainable.

Ecotourism & Education

Ecotourism is perhaps the most effective way to continue monetarily benefitting from sharks without killing them. While the benefits of this industry have been illustrated in Chapter 3, there are still negative externalities that need to be considered. Conservation measures such as ecotourism are usually taken up by people who have " … a significantly higher level of self-perceived knowledge of the ecological role of sharks before participating in the tour than members of the general public" (Sutcliffe and Barnes 2018, 29). Those who

do not have preexisting knowledge about the crisis that sharks face amidst commercial finning are much less likely to participate in these conservation projects. This is due to the lack of understanding of how educational and impactful first-hand experiences can be, not only to increase general shark awareness, but also to raise funding for conservation strategies. Although ecotourism programs have the potential to heighten awareness, their needs to be a base knowledge already set in place – an attitude change towards sharks from the general public who doesn't have the chance to indulge in ecotourism experiences.

Public perception of sharks has largely rested in fear due to the occasional attack on humans. A lexicographical and similitude study completed in Portugal in 2021 analyzed people's spoken observations about sharks, and they are firstly, and still, seen as a source of danger (Neves et al. 2021, 5). Other words that come up within the study intrinsically linked to thoughts and perceptions of sharks are including but not limited to teeth, fear, fin, sea, big, movie, blood, bite, and danger (Ibid., 6). It is also interesting to point out that the responses were very gendered, with female participants' organizing around elements of insecurity and danger, and male participants leaning towards naturalistic elements, including features of the shark itself. This is crucial to consider as new programs are implemented – how does the conservation initiative shape itself based off of gendered perceptions? Gearing efforts towards the emotional and physical side of shark conservation means bringing together feelings of panic or fear and intersecting them with concrete reasons as to why sharks are so physically vulnerable to humans through shark-finning and bycatch methods. Further in the study, dolphins and sharks are contrasted in terms of communality, with participants having a much more positive attitude towards dolphin conservation and therefore preferring to donate to said organizations (Ibid., 9). Without a change in communality surrounding sharks and a shift in

environmental education, there will be less of a chance that conservation is seriously considered a pressing topic by the general public. There is also the option to implement further laws protecting sharks underneath a welfare act that specifically governs marine animals. The Animal Welfare Act is a great example of legislation that exists today protecting animals in research and setting minimum standards for care and protection of species involved – violation fines were even quadrupled in 2008 to further protect and advocate for proper animal treatment (Animal Welfare Institute 2018). For sharks, opening up an ethical conversation may include developing a similar act that would consider all fish but focus increasingly on those whose populations are the most vulnerable and under researched, including a large portion of shark species. A Marine Animal Protection Act of this sort would combine the ideas of human behavioral correction of the mistreatment of sharks with conservation of a biologically delicate species.

Sharks are still treated by many as vicious, and as analyzed in Chapter 4, our biased outlook causes us to anthropomorphically move through the world viewing species like sharks as near nothing like us. Due to public concern, scientific research began increasing as early as the 1960's for shark attack prevention (Simpfendorfer et al. 2011, 519). Yet there were few solutions found to protect people except to try and physically keep the sharks away, which is what shark-control programs strove to accomplish in the 90's in Australia, Hong Kong, Hawaii, New Zealand, and South Africa (Ibid.). While many were successful in both prevention and accruing important shark life history data, others had extreme consequences for the environment around it, such as the fluctuation in populations of other critical ecosystem species (Ibid.). A current shark-control program that has been operating since 1962 resides in Queensland, Australia, and integrates the usage of new technologies and public

education to prevent shark attacks and mal-encounters with humans. Queensland's program also ensures that their catch data goes up accurately online for the public to see – from July 2021 to February 2022, there were 329 recorded sharks that were caught (Queensland Agriculture and Fisheries 2022). A little more than 124 of them were recorded as deceased, and the rest were successfully released from the shark nets and baited hook lines used. Queensland is not only transparent with its data, but actively seems to be promoting public shark education through their SharkSmart tips. SHARK, the acronym, has water usage tips for general swimmers, and the page gives extra suggestions for people performing activities such as surfing or diving (Queensland Agriculture and Fisheries 2021). It is important to note that the implementations and efforts to keep sharks from attacking humans, in this case, do not raise awareness to shark finning itself – yet it serves a primary purpose of providing a foundation for humans to be more mindful, more cognizant of the area around them when going out for a swim. This increased awareness takes us back to the essence of ecocentrism introduced in Chapter 4. Empathy for a species that is unlike our own in many ways has to start with education of the public and recognition by each individual that sharks do, indeed, deserve to be treated in a way that does not blame them for their wildness.

Recent work from December of 2021 poses results from one of the largest survey studies done on sharks worldwide, picking up perceptions of sharks that people have and correlating them to preexisting knowledge. Participants logged in from Italy, Spain, Taiwan, the US, South Africa, and even Japan, among many other countries. In their study, it is stated that, "Our work finds a strong positive relationship between knowledge and attitudes especially for the ecologistic, scientific, and moralistic statements [of the survey] while feeling of danger was more pronounced in people with no specific knowledge on sharks"

(Giovos et al. 2021, 6). Many of the participants in the survey were also familiar with marine environments, actively taking part in marine activities and/or projects. Surprisingly, those that did have preexisting self-knowledge were surveyed to have not learned it through higher education such as college, but rather through documentaries, books, and the internet. These forms of high-level engagement may be one of the keys to expanding the general public's knowledge and understanding of the importance of shark conservation. As mentioned previously within this chapter, effective information provided to the public on sharks needs to be engaging and presented in a multitude of accessible ways via visual and listening platforms, as these are what best gain the attention of the general public. With the strong success rates of promoting causes on platforms such as TikTok and Instagram, influencers who have a strong connection to environmentalism and protecting threatened species may be the key to raising awareness on how shark-finning occurs, and where and why the market continues to thrive.

From the largest thresher to the smallest hammerhead, sharks are inherently vulnerable to humanities' exploitative nature, and as the past few decades have shown us time and time again, the shark-finning industry has not ceased to continue its practices for the successful marketing of shark fin. Sharks are imperative to surrounding aquatic ecosystems as apex, keystone predators, aiding in controlling other populations of species while providing ecosystem services to the environment at large, as explained in Chapter 2. The market value of fins has continued to drive the trade networks of a plethora of countries including and outside of China since the 1980's, and the demand for dishes such as shark-fin soup continues to be held in cultural traditions as outlined in Chapter 4. Yet the more that is learned by those who do not understand the full consequences of partaking in the process of shark-finning, the

more of a chance activists and conservationists have at turning the tide of progress. There cannot be work on the governmental side without equal parts work on the side of the public, and vice versa – if we want to understand sharks, a collective is needed that can embrace the good, the bad, and the ugly to form shark-life-changing ideas and frontiers to protect those species that we have left. Simultaneously, taking into consideration indigenous nations' voices and necessities for subsistence fishing is crucial to maintaining practices that are ethical in scope. As much as we may think that we need sharks to complete dishes, they need us even more to be their voices and supporters amidst the murky commercial conditions they're up against. Negating the shark from the soup has the power to protect hundreds of thousands of individuals – and our oceans will certainly benefit from humankind aiding one of its most essential members.

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