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In Search of Sharks: Reimagining Shark Conservation in Baja California, Mexico's Artisanal Fisheries

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IN SEARCH OF SHARKS:

Reimagining Shark Conservation in Baja
California, Mexico’s Artisanal Fisheries

Chloé Evans

Candidate, Master of Advanced Studies (2022-2023)
Marine Biodiversity and Conservation
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Abstract

Elasmobranchs (sharks and rays) have been both culturally and socioeconomically significant in Baja California, Mexico, for over a century. Artisanal shark fisheries in Mexico account for approximately 40% of the national catch, and artisanal fisheries account for up to 80% of elasmobranch fishing activity in Mexican waters, according to data collected in 2011. Yet, there seems to be a behavioral change among artisanal shark fishermen for various reasons, resulting in a shift in shark conservation that needs to be explored. Collaboration between fishermen and local scientists is important when reimagining shark conservation among artisanal fisheries in Baja.

Background/Problem Statement

Mexican artisanal shark fisheries account for approximately 40% of the national catch and comprise up to 80% of the elasmobranch fishing effort (Cartamil et al.) Mexico has been a geographical hotspot for elasmobranch fishing nations worldwide; in 2007, it had the sixth-largest elasmobranch catch, equaling 4.3% of the total world catch (Cartamil et al.).

Artisanal fisheries are small-scale traditional fisheries using limited amounts of capital, energy, and small fishing vessels. The fishing trips are short and close to shore. They provide an essential food source for local consumption and employment, with the Pacific coast of Baja California as the most critical region, contributing 62% of national landings. Artisanal shark fisheries have grown significantly over the past two decades, contributing more than 25% of the world's catch and accounting for half of the fish used for direct human consumption (Cartamil et al.). This has resulted in overfishing pressure on shark populations, making sharks one of the world's most threatened species in artisanal fisheries. Worldwide overfishing of several species has caused population declines mainly because of their slow growth and low reproductive rates (Sosa-Nishizaki et al.). A lack of socioeconomic data has curtailed sustainable shark fisheries management in Mexico, and artisanal fishermen are often vilified and left out of the shark conservation conversation.

Fishermen's perspectives and voices are lacking in the shark conservation narrative. If conservationists are to successfully apply policies and management measures aimed at sustainability, fishermen need to be involved in the conversation. A mutual understanding between scientists and fishermen can make these fisheries management policies work more smoothly while also helping scientists gain a deeper knowledge of shark ecology in the region. This, in turn, leads to better, more sustainable conservation outcomes where both sharks and those who depend on them are considered.

Objectives and Deliverable

The main objective of this project is to write an investigative journalism article to uplift fishermen's voices, build capacity and coalition in Baja California, Mexico, and educate the general public on a complicated shark conservation issue. This information will aid in building capacity for Mexican scientists and fishermen working towards shark conservation objectives.

The project's deliverable includes an investigative journalism article using ArcGIS StoryMaps as the platform.

Methodology

I toured eight different fishing camps and landing sites along the Northwestern Baja California Coast for this project. To achieve the goals of this project, I connected with several fishermen, where I gained first-hand knowledge about the fisheries and developed a personal experience at various camps. I informally interviewed fishermen to understand better their perspective on this region's artisanal shark fishing industry. With the assistance of local scientists, I developed a working relationship and open communication with the fishermen, where I focused on relationship building rather than a transactional information exchange. I aim to pitch my story to environmental and oceanographic magazines focusing on social and environmental justice.

In Search of Sharks: Reimagining Shark Conservation in Baja California Mexico's Artisanal Fisheries

I am hopping from one foot to the other, my hands shoved into my pockets, and my jacket hood cinched tightly, all in a futile attempt to keep warm. There is abandoned fishing gear scattered about. Two shepherd dogs bark at us protectively. The sky is a brooding gray, and the wind whistles in my ears. It is 7 AM on a chilly April morning on the Pacific coast of northern Baja California, Mexico. I am perched on the edge of a cliff at a remote artisanal fishing camp, staring out at the vast ocean below, attempting to imagine exactly how the fishermen maneuver their pangas twice a day down the narrow dirt ramp leading to the edge of the shore—decades of practice, no doubt. I hope to catch a local fisherman to ask him questions about his line of work, but due to high winds and rough seas, there are no fishermen to be found. I am disappointed; I came to Baja *in search of sharks* and the fishermen who catch them. But the weather and large ocean swell are a stark reminder that fishing for a living in the remote stretches of the Baja California desert is not for the faint of heart.

The artisanal shark fishing industry is knotty and complicated; conservation here requires a multidisciplinary approach to unravel it. What I discovered in Baja California is a subtle but important shift in shark conservation: through deep understanding, compassion, and collaboration, we can protect both sharks and the people whose livelihoods depend on them most.

A Brief History of Shark Fishing in Baja California, Mexico

Just over a decade ago, a team of scientists traveled throughout the Baja California peninsula collecting elasmobranch data focusing on species, gear type, season, and fishing camp locations. What Omar Santana-Morales, Luz Erandi-Saldaña, and Oscar Sosa-Nishizaki, found, in collaboration with Daniel Cartamil and Dovi Kacev, was that many fishing camps in the region are targeting sharks in some capacity. To understand the data, I needed to travel back in time even further.

Since the 1970s, Mexico has been a world leader in shark landings, and it all began over a century ago when shark fins were exported to China from La Paz, Baja California Sur, in 1888. In the 1930s, Mexican fishermen began exporting the dried fins to Chinese restaurants in San Francisco, California. Simultaneously, the United States Army, desperately needing a natural source of Vitamin A to fortify soldiers fighting in WWII, turned to sharks and their livers. The liver was exported from Guaymas in Northwestern Mexico to the port of Los Angeles, California. Initially, 40 tons of shark were caught per year, but in 1941 the catch increased to 8,910 tons and later decreased to 5,154 tons in 1948 when a synthetic form of Vitamin A was developed. By the 1960s, shark meat became a staple in Mexican diets, including the famous Baja fish taco. Many argue over its origin in Baja, but it's commonly agreed upon that the original was prepared using angel shark meat in a small, rustic stall next to Mercado Negro in Ensenada. Sharks quickly became an essential, low-cost source of protein for coastal families and large cities throughout Mexico. Local scientists agree that the high demand for shark meat has decreased since then, but it is still consumed throughout Mexico today, sustaining coastal communities and inland towns.

Popotla Fishing Village

Popotla, the last landing site in Mexico before reaching the United States border and the first fishing camp on my list to visit, is a noisy and bustling place. I arrive at 9 AM and am met by two local scientists, Omar Santana Morales and Daniel Diaz, my expert guides throughout my fieldwork. We walk through rows of vendors and nearshore restaurants selling freshly caught sea urchins, spider crab (known locally as a martian crab for their strange appearance), Dungeness crab, and rockfish. Omar and Daniel brief me on the complexity of this particular site. Due to its unique location just south of the United States border and the cartel's influence over the fishermen here, it is a dangerous place. We are to be cautious and mindful about taking photos; the fishermen are wary of scientists, my guides say, just as I start to notice the locals eyeing me suspiciously. Western scientists have visited the camps and collected data that often results in stricter fishing regulations, which the Mexican government says comes from pressure from the United States. Few women work here, and those who do are not foreigners. I realize that I will have to break down a few barriers throughout my trip, but for now, I stay close to Omar and Daniel and follow their lead. I am grateful for their expertise and the decades of trust they've built with the fishermen at this camp.

We arrive on the beach and survey the scene. Everyone seems to be frozen with anticipation, patiently awaiting the arrival of the pangas, a modest-sized, open, outboard-powered fishing boat standard throughout the artisanal fisheries in Baja. The area springs into action with the arrival of the first panga, and one after the other, the fishermen return from their early morning trips out at sea. They expertly drive the pangas full speed ahead onto the shore, and like a calculated assembly line, the fishermen pass off coolers of rockfish and crabs while the pangas are hitched to the back of a 4x4 truck. Their catch makes its way to the cleaning station, where the crabs' pincers and back shells are swiftly detached and tossed to the side. The rockfish are gutted and cleaned. Crows and gulls circle overhead. And street dogs beg below, patiently awaiting the seafood scraps. That's when I spot it, a large shark with a long tail being hauled onto the cleaning station.

We make our way over, and I smile at the fisherman preparing to clean and filet the shark. Unsure about the species, I ask him what it is. Happily, in a thick Mexican accent, he begins to tell me this is a broadnose sevengill shark, a deep-water species caught incidentally by gillnets, which form a single wall of netting anchored on the seabed and are designed to catch fish that swim into it. He opens the shark's mouth and shows me its sharp pointed rows of teeth. I'm tempted to touch one with my fingertip to feel its razored edges, but I refrain; I don't want to be disrespectful. 'Can I take a few photos?' I ask in Spanish. 'Yes, gringas often want to take photos with the sharks.' I wonder out loud what they will do with the meat. He smiles and exclaims, "***Fish tacos, of course.***" "***Of course.***" I smile back.

Another fisherman has arrived, a friend of Omar's who is willing to talk to me. Through his Ford pick-up truck window, with a panga in tow and the tide lapping steadily at our boots, I forget about the noise, the heat, and the wind, as I absorb first-hand knowledge about the ecology of angel sharks, shovelnose guitarfish, makos, and threshers. I am fascinated by his detailed understanding of their movement patterns and sexual and age disparity. After entertaining my shark-related questions, he explains that they no longer target sharks; Instead, they aim to catch more lucrative and abundant species like lobster, rockfish, and yellowtail, his favorite. This is a noticeable shift from previous research findings, where Omar and the others concluded just over a decade ago that sharks were one of the primary targets of this camp. The fisherman says he has been in the industry for over 30 years. His father was a fisherman, and now his teenage son, who sits in the passenger seat beside him, is also a fisherman. I am amazed by the wealth of knowledge that must exist between the three generations of men. I thank him for his time and walk away, drawing a family tree of fishermen in my mind.

"***They've had difficult experiences,***" explains Omar as we walk away from the man and shark. Western journalists and biologists came, took photographs of their shark catch, collected data, and never shared the information with the fishermen. They painted a picture of Baja fishermen ruthlessly hunting sharks to extinction. However, here in Popotla, the fishermen are friendly, family-oriented people who seem far more interested in fishing for less dangerous and challenging species. After several hours at the camp, I only saw one dead shark.

Traveling Down the Coast

Omar and Daniel arrange for us to travel to several more camps along the Baja peninsula, where I could meet several more fishermen, many with decades of experience. I am both nervous and excited. It is not easy to approach people I've never met and ask them intimate and sometimes controversial questions about their fishing experiences in a language I learned fluently as a child, but that has grown rusty in my adulthood.

The fishermen are polite, explaining their gear, methods, and species type in detail. I'm listening intently and taking detailed notes when an active fisherman in his 40s explains that they rarely, if ever, catch sharks because they fish with a hook and line rather than gillnets. I'm surprised because I've learned that circle hooks also catch sharks, but not as fatally as the much straighter J-hooks. A shark caught on a circle hook has a greater chance of survival if it is subsequently released. They also help prevent turtle bycatch. The fisherman shares that on the rare occasion,

they catch a mako or thresher shark that is already dead on the line, they keep it for themselves to eat and enjoy in their homes.

Most older fishermen I talk to say that there used to be up to four times as many fish in the ocean when they first started fishing decades ago. That angel shark and shovelnose guitarfish have almost completely disappeared, and there is more focus on catching crabs, sea cucumbers, urchins, and lobsters. But the younger fishermen, with one or two decades of experience, paint a different picture. Although some say the fish are smaller, they haven't seen a significant change in shark catch – and fish catch in general. This phenomenon is called “shifting baselines,” and scientists see it in other marine species and ecosystems worldwide.

However, the market for shark meat appears to exist in some capacity. When we visited Mercado Negro in Ensenada, we saw several filets of angelito and mako sharks. Omar suggested that the angel shark filets were larger than most angel sharks landed in the area, so he suspects there is a mislabeling issue in the market. White shark is often labeled as “mako barroso” or brown mako. Other species of shark are labeled as swordfish. Most alarmingly, blue sharks, largely caught by industrial fleets, are labeled as bacalao or “salted cod,” a regional delicacy locals enjoy during the Christmas holiday, and consumers have no idea they are purchasing shark meat. Because of this, shark numbers are now at an unprecedented low in Mexico, with some species suffering up to an 80 percent loss of their original population. However, I am surprised by what appears to be yet another notable shift in the lack of fishing camps specifically targeting sharks.

Over beef machaca burritos later that evening, I ask Omar and Daniel about the changing state of shark stocks and why some fishing camps no longer target them. Several reasons are given. Overfishing seems to be a top reason for declining shark numbers, and Pacific industrial fleets targeting blue sharks, for example, appear to be the culprits. The effects of climate change and pollution from the Tijuana River are also mentioned. Omar suggests that sharks are not finding enough food and have left the area. At the same time, Daniel also says they are finding more sharks than ever in Laguna Manuela, a fish camp near the Baja California Sur border. There is also a rise in technology among fishermen. Many now have access to cellphones, social media, and subsequently access to conservation stories circling the internet. As fishermen become more aware of the conservation status of sharks, it is possible there is a correlation between this learning and their behavior. Omar agrees with my suspicions that some fishing camps appear to be moving away from targeting sharks, partly because the fin-trade ban imposed a few years ago caused the value of sharks to plummet. Mexican authorities will take pangas and fishing gear if fishermen are caught finning here. I make a mental note to press him further on this topic on our long drive through the desert to Punta San Carlos tomorrow.

Puerto San Carlos

We are driving down a long, winding gravel road. Small boulders are playing pinball with the underbelly of Daniel's SUV. I'm grateful in this moment that we are not in my small Subaru. The day before, we acquired a flat on a seemingly “smooth” dirt road; this one is far more treacherous, and my nerves are shot. We are miles from the nearest auto repair shop. There is no cellphone reception, and Daniel is guiding us with a handheld GPS device. We have a two-hour drive, roads permitting, to Puerto San Carlos, where Omar promises we will meet an older

fisherman who loves to catch big eye thresher sharks. It has been three days since I saw the broadnose sevengill shark in Popotla, and the shark scarcity is drumming up more questions than answers in my mind.

When we finally arrive at the remote fishing village, we are greeted by a surprise; barbed wire fencing, security cameras, guard dogs, and what appears to be a trench dug out around the fence line. Omar says this is unusual and asks me to wait in the car while he greets the armed guard. Eventually, I see both men soften in conversation. After a few minutes, Omar reports that this fishing camp has experienced some trouble with the Mexican cartel, which often forces fishers to sell their catch to the criminal group at below-market prices. They are drawing a line in the sand and resisting. We will need a permit or an escort to enter the camp. Omar's fisherman friend is set to arrive "sometime soon," according to the guard, so we decide to wait, and I take this time to ask Omar about his shark conservation projects.

"Fishermen are releasing live white sharks," Omar says. My jaw drops in surprise. I am eager to know more. He explains that two years ago, he asked a few fishermen he has built a strong rapport with if they would be willing to release white sharks caught incidentally as bycatch for a small payment. Omar would pay them 350.00 Mexican pesos, or about \$20.00 US dollars, if they sent him a video of live white sharks being released. The fishermen happily agreed, and over the last two years, nearly a dozen white sharks have been released from gillnets. Even more interestingly, the fishermen now release the sharks without payment and continue sending him videos of their successful conservation efforts. A compensatory-based conservation approach, where fishermen receive payments if they share videos of protected species safely released, could be an interesting and feasible solution to protect both sharks and fishermen's livelihoods. Examples of this type of socioeconomic program have proven successful in other shark fishing communities like Lombok, Indonesia.

"Los Pescadores comenzaron a liberar tiburones blancos después de haber participado y colaborado en diversas actividades del proyecto como la colocación de receptores o el marcaje de individuos." Through this unique collaboration, Baja fishermen now fully understand the importance of the white shark as a keystone species and apex predator. Protecting sharks protects their livelihood.

Recently, Omar has begun to recruit fishermen to assist with his white shark tagging efforts off the coast of Baja, California, in Isla Guadalupe and Sanora. The fishermen are experts at quickly and efficiently removing the sharks without harm from the nets. ***"En este trabajo colaboramos directamente con pescadores artesanales quienes nos avisan de la presencia de tiburones blancos al ser capturados incidentalmente."*** It is through direct collaboration with the artisanal fishermen that Omar and his team can complete this work so successfully. Their expertise regarding white shark movement patterns and gillnet removal is key to an effective shark tagging operation, and Omar is grateful to have their involvement and knowledge.

"Esperamos crear una red de pescadores monitores comunitarios en toda la costa del Pacífico de Baja California y región de Sonora." Omar hopes to develop and implement a fishermen-based, long-term community monitoring program where fishermen and scientists continue working together to protect and conserve white sharks. He also plans to implement workshops

and training programs where fishermen in Sonora are taught how to avoid dangerous white shark interactions when they fish underwater on scuba for callo de hacha, a prized sea scallop in Mexico. He hopes to provide fishermen with an overview of the data collected thus far, the research they plan to conduct, and training in shark identification, tagging, and reporting protocols so they can be included and involved throughout the research process.

Small mindset shifts through education, outreach, and coastal community collaboration can help develop and manage sustainable fishing across the coast of Baja. The future for sharks might seem grim, but people like Omar are working to change that. His research has paved the way for unique partnerships and collaborations, all working to conserve sharks and those who fish for them.

Conclusion

Throughout my time here in Baja, I start to understand that the value of working in conservation lies in strengthening the relationship between coastal communities and local scientists.

I am learning so much from the fishermen as they share decades of knowledge and observations. It requires listening with empathy and setting aside my biases and judgment about how I value animals and nature. For Baja's artisanal fishing communities, respect for nature has always been a key part of their identity; they have protected wildlife through their local wisdom to capture the marine life needed, not just what they wanted. The fish they catch today means they have money to buy fuel to fish tomorrow, pay for their children's schooling, and feed their families.

I've also had to set aside what I thought I knew about sharks. The main threat to shark species worldwide is overfishing, and the artisanal shark fishermen of Baja California play a small role in the species' diminishing numbers. But a moratorium on shark fishing could complicate the situation, where opportunities are often limited for fishermen due to the need for retraining or the absence of necessary markets and infrastructures. Many scientists agree that sustainable shark fishing practices are possible, and there seems to be a willingness to shift away from fishing endangered species in Baja, like the white shark. These solutions come with their own challenges, but they are worth exploring in this part of Mexico.

Baja fishermen must be an essential part of the solution. Local scientists propose sustainable management and fishing practices, such as modifications in gear type, seasonal closures during periods of reproduction and migration, better regulations, and socioeconomic compensatory payments for the loss in income. The fishermen's engagement in Omar's shark tagging project and the release of white sharks for a modest compensatory payment demonstrate that fishermen are engaged and want to play a role. A mutual understanding between scientists and fishermen can make these fisheries management policies work more smoothly while also helping scientists gain a deeper knowledge of shark ecology in the region. This, in turn, leads to better conservation outcomes.

Conservation can be a long and arduous journey, especially when the goal is to have thriving marine ecosystems and coastal communities. It's also a continuous learning process to understand that there are ways to proceed without sacrificing the well-being of people to achieve conservation goals. As I drive back to San Diego, California, along Baja's ruggedly beautiful

coastline, I start stitching together new conservation ideas that involved protecting sharks and respecting the traditional fishing practices of these communities. The more I immerse myself in this work, the more I realize that there is always hope, and we still have time. I came to Baja in search of sharks, but I left with so much more.

If I can convince the world of anything, it's that sharks are worth protecting, but the people catching them are too.

END

Link to Deliverable: <https://arcg.is/1jSbre>

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Fishermen's perspectives and voices are lacking in the shark conservation narrative. If conservationists are to successfully apply policies and management measures aimed at sustainability, fishermen need to be involved in the conversation. A mutual understanding between scientists and fishermen can make these fisheries management policies work more smoothly while also helping scientists gain a deeper knowledge of shark ecology in the region. This, in turn, leads to better, more sustainable conservation outcomes where both sharks and those who depend on them are considered.

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Since the 1970s, Mexico has been a world leader in shark landings, and it all began over a century ago when shark fins were exported to China from La Paz, Baja California Sur, in 1888. In the 1930s, Mexican fishermen began exporting the dried fins to Chinese restaurants in San Francisco, California. Simultaneously, the United States Army, desperately needing a natural source of Vitamin A to fortify soldiers fighting in WWII, turned to sharks and their livers. The liver was exported from Guaymas in Northwestern Mexico to the port of Los Angeles, California. Initially, 40 tons of shark were caught per year, but in 1941 the catch increased to 8,910 tons and later decreased to 5,154 tons in 1948 when a synthetic form of Vitamin A was developed. By the 1960s, shark meat became a staple in Mexican diets, including the famous Baja fish taco. Many argue over its origin in Baja, but it's commonly agreed upon that the original was prepared using angel shark meat in a small, rustic stall next to Mercado Negro in Ensenada. Sharks quickly became an essential, low-cost source of protein for coastal families and large cities throughout Mexico. Local scientists agree that the high demand for shark meat has decreased since then, but it is still consumed throughout Mexico today, sustaining coastal communities and inland towns.

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Popotla, the last landing site in Mexico before reaching the United States border and the first fishing camp on my list to visit, is a noisy and bustling place. I arrive at 9 AM and am met by two local scientists, Omar Santana Morales and Daniel Diaz, my expert guides throughout my fieldwork. We walk through rows of vendors and nearshore restaurants selling freshly caught sea urchins, spider crab (known locally as a martian crab for their strange appearance), Dungeness crab, and rockfish. Omar and Daniel brief me on the complexity of this particular site. Due to its unique location just south of the United States border and the cartel's influence over the fishermen here, it is a dangerous place. We are to be cautious and mindful about taking photos; the fishermen are wary of scientists, my guides say, just as I start to notice the locals eyeing me suspiciously. Western scientists have visited the camps and collected data that often results in stricter fishing regulations, which the Mexican government says comes from pressure from the United States. Few women work here, and those who do are not foreigners. I realize that I will have to break down a few barriers throughout my trip, but for now, I stay close to Omar and Daniel and follow their lead. I am grateful for their expertise and the decades of trust they've built with the fishermen at this camp.

We arrive on the beach and survey the scene. Everyone seems to be frozen with anticipation, patiently awaiting the arrival of the pangas, a modest-sized, open, outboard-powered fishing boat standard throughout the artisanal fisheries in Baja. The area springs into action with the arrival of the first panga, and one after the other, the fishermen return from their early morning trips out at sea. They expertly drive the pangas full speed ahead onto the shore, and like a calculated assembly line, the fishermen pass off coolers of rockfish and crabs while the pangas are hitched to the back of a 4x4 truck. Their catch makes its way to the cleaning station, where the crabs' pincers and back shells are swiftly detached and tossed to the side. The rockfish are gutted and cleaned. Crows and gulls circle overhead. And street dogs beg below, patiently awaiting the seafood scraps. That's when I spot it, a large shark with a long tail being hauled onto the cleaning station.

We make our way over, and I smile at the fisherman preparing to clean and filet the shark. Unsure about the species, I ask him what it is. Happily, in a thick Mexican accent, he begins to tell me this is a broadnose sevengill shark, a deep-water species caught incidentally by gillnets, which form a single wall of netting anchored on the seabed and are designed to catch fish that swim into it. He opens the shark's mouth and shows me its sharp pointed rows of teeth. I'm tempted to touch one with my fingertip to feel its razored edges, but I refrain; I don't want to be disrespectful. 'Can I take a few photos?' I ask in Spanish. 'Yes, gringas often want to take photos with the sharks.' I wonder out loud what they will do with the meat. He smiles and exclaims, "*Fish tacos, of course.*" "*Of course.*" I smile back.

Another fisherman has arrived, a friend of Omar's who is willing to talk to me. Through his Ford pick-up truck window, with a panga in tow and the tide lapping steadily at our boots, I forget about the noise, the heat, and the wind, as I absorb first-hand knowledge about the ecology of angel sharks, shovelnose guitarfish, makos, and threshers. I am fascinated by his detailed understanding of their movement patterns and sexual and age disparity. After entertaining my shark-related questions, he explains that they no longer target sharks; Instead, they aim to catch more lucrative and abundant species like lobster, rockfish, and yellowtail, his favorite. This is a noticeable shift from previous research findings, where Omar and the others concluded just over a decade ago that sharks were one of the primary targets of this camp. The fisherman says he has been in the industry for over 30 years. His father was a fisherman, and now his teenage son, who sits in the passenger seat beside him, is also a fisherman. I am amazed by the wealth of knowledge that must exist between the three generations of men. I thank him for his time and walk away, drawing a family tree of fishermen in my mind.

"*They've had difficult experiences,*" explains Omar as we walk away from the man and shark. Western journalists and biologists came, took photographs of their shark catch, collected data, and never shared the information with the fishermen. They painted a picture of Baja fishermen ruthlessly hunting sharks to extinction. However, here in Popotla, the fishermen are friendly, family-oriented people who seem far more interested in fishing for less dangerous and challenging species. After several hours at the camp, I only saw one dead shark.

Traveling Down the Coast

Omar and Daniel arrange for us to travel to several more camps along the Baja peninsula, where I could meet several more fishermen, many with decades of experience. I am both nervous and excited. It is not easy to approach people I've never met and ask them intimate and sometimes controversial questions about their fishing experiences in a language I learned fluently as a child, but that has grown rusty in my adulthood.

The fishermen are polite, explaining their gear, methods, and species type in detail. I'm listening intently and taking detailed notes when an active fisherman in his 40s explains that they rarely, if ever, catch sharks because they fish with a hook and line rather than gillnets. I'm surprised because I've learned that circle hooks also catch sharks, but not as fatally as the much straighter J-hooks. A shark caught on a circle hook has a greater chance of survival if it is subsequently released. They also help prevent turtle bycatch. The fisherman shares that on the rare occasion,

they catch a mako or thresher shark that is already dead on the line, they keep it for themselves to eat and enjoy in their homes.

Most older fishermen I talk to say that there used to be up to four times as many fish in the ocean when they first started fishing decades ago. That angel shark and shovelnose guitarfish have almost completely disappeared, and there is more focus on catching crabs, sea cucumbers, urchins, and lobsters. But the younger fishermen, with one or two decades of experience, paint a different picture. Although some say the fish are smaller, they haven't seen a significant change in shark catch – and fish catch in general. This phenomenon is called “shifting baselines,” and scientists see it in other marine species and ecosystems worldwide.

However, the market for shark meat appears to exist in some capacity. When we visited Mercado Negro in Ensenada, we saw several filets of angelito and mako sharks. Omar suggested that the angel shark filets were larger than most angel sharks landed in the area, so he suspects there is a mislabeling issue in the market. White shark is often labeled as “mako barroso” or brown mako. Other species of shark are labeled as swordfish. Most alarmingly, blue sharks, largely caught by industrial fleets, are labeled as bacalao or “salted cod,” a regional delicacy locals enjoy during the Christmas holiday, and consumers have no idea they are purchasing shark meat. Because of this, shark numbers are now at an unprecedented low in Mexico, with some species suffering up to an 80 percent loss of their original population. However, I am surprised by what appears to be yet another notable shift in the lack of fishing camps specifically targeting sharks.

Over beef machaca burritos later that evening, I ask Omar and Daniel about the changing state of shark stocks and why some fishing camps no longer target them. Several reasons are given. Overfishing seems to be a top reason for declining shark numbers, and Pacific industrial fleets targeting blue sharks, for example, appear to be the culprits. The effects of climate change and pollution from the Tijuana River are also mentioned. Omar suggests that sharks are not finding enough food and have left the area. At the same time, Daniel also says they are finding more sharks than ever in Laguna Manuela, a fish camp near the Baja California Sur border. There is also a rise in technology among fishermen. Many now have access to cellphones, social media, and subsequently access to conservation stories circling the internet. As fishermen become more aware of the conservation status of sharks, it is possible there is a correlation between this learning and their behavior. Omar agrees with my suspicions that some fishing camps appear to be moving away from targeting sharks, partly because the fin-trade ban imposed a few years ago caused the value of sharks to plummet. Mexican authorities will take pangas and fishing gear if fishermen are caught finning here. I make a mental note to press him further on this topic on our long drive through the desert to Punta San Carlos tomorrow.

Puerto San Carlos

We are driving down a long, winding gravel road. Small boulders are playing pinball with the underbelly of Daniel's SUV. I'm grateful in this moment that we are not in my small Subaru. The day before, we acquired a flat on a seemingly “smooth” dirt road; this one is far more treacherous, and my nerves are shot. We are miles from the nearest auto repair shop. There is no cellphone reception, and Daniel is guiding us with a handheld GPS device. We have a two-hour drive, roads permitting, to Puerto San Carlos, where Omar promises we will meet an older

fisherman who loves to catch big eye thresher sharks. It has been three days since I saw the broadnose sevengill shark in Popotla, and the shark scarcity is drumming up more questions than answers in my mind.

When we finally arrive at the remote fishing village, we are greeted by a surprise; barbed wire fencing, security cameras, guard dogs, and what appears to be a trench dug out around the fence line. Omar says this is unusual and asks me to wait in the car while he greets the armed guard. Eventually, I see both men soften in conversation. After a few minutes, Omar reports that this fishing camp has experienced some trouble with the Mexican cartel, which often forces fishers to sell their catch to the criminal group at below-market prices. They are drawing a line in the sand and resisting. We will need a permit or an escort to enter the camp. Omar's fisherman friend is set to arrive "sometime soon," according to the guard, so we decide to wait, and I take this time to ask Omar about his shark conservation projects.

"Fishermen are releasing live white sharks," Omar says. My jaw drops in surprise. I am eager to know more. He explains that two years ago, he asked a few fishermen he has built a strong rapport with if they would be willing to release white sharks caught incidentally as bycatch for a small payment. Omar would pay them 350.00 Mexican pesos, or about \$20.00 US dollars, if they sent him a video of live white sharks being released. The fishermen happily agreed, and over the last two years, nearly a dozen white sharks have been released from gillnets. Even more interestingly, the fishermen now release the sharks without payment and continue sending him videos of their successful conservation efforts. A compensatory-based conservation approach, where fishermen receive payments if they share videos of protected species safely released, could be an interesting and feasible solution to protect both sharks and fishermen's livelihoods. Examples of this type of socioeconomic program have proven successful in other shark fishing communities like Lombok, Indonesia.

"Los Pescadores comenzaron a liberar tiburones blancos después de haber participado y colaborado en diversas actividades del proyecto como la colocación de receptores o el marcaje de individuos." Through this unique collaboration, Baja fishermen now fully understand the importance of the white shark as a keystone species and apex predator. Protecting sharks protects their livelihood.

Recently, Omar has begun to recruit fishermen to assist with his white shark tagging efforts off the coast of Baja, California, in Isla Guadalupe and Sanora. The fishermen are experts at quickly and efficiently removing the sharks without harm from the nets. ***"En este trabajo colaboramos directamente con pescadores artesanales quienes nos avisan de la presencia de tiburones blancos al ser capturados incidentalmente."*** It is through direct collaboration with the artisanal fishermen that Omar and his team can complete this work so successfully. Their expertise regarding white shark movement patterns and gillnet removal is key to an effective shark tagging operation, and Omar is grateful to have their involvement and knowledge.

"Esperamos crear una red de pescadores monitores comunitarios en toda la costa del Pacífico de Baja California y región de Sonora." Omar hopes to develop and implement a fishermen-based, long-term community monitoring program where fishermen and scientists continue working together to protect and conserve white sharks. He also plans to implement workshops

and training programs where fishermen in Sonora are taught how to avoid dangerous white shark interactions when they fish underwater on scuba for callo de hacha, a prized sea scallop in Mexico. He hopes to provide fishermen with an overview of the data collected thus far, the research they plan to conduct, and training in shark identification, tagging, and reporting protocols so they can be included and involved throughout the research process.

Small mindset shifts through education, outreach, and coastal community collaboration can help develop and manage sustainable fishing across the coast of Baja. The future for sharks might seem grim, but people like Omar are working to change that. His research has paved the way for unique partnerships and collaborations, all working to conserve sharks and those who fish for them.

Conclusion

Throughout my time here in Baja, I start to understand that the value of working in conservation lies in strengthening the relationship between coastal communities and local scientists.

I am learning so much from the fishermen as they share decades of knowledge and observations. It requires listening with empathy and setting aside my biases and judgment about how I value animals and nature. For Baja's artisanal fishing communities, respect for nature has always been a key part of their identity; they have protected wildlife through their local wisdom to capture the marine life needed, not just what they wanted. The fish they catch today means they have money to buy fuel to fish tomorrow, pay for their children's schooling, and feed their families.

I've also had to set aside what I thought I knew about sharks. The main threat to shark species worldwide is overfishing, and the artisanal shark fishermen of Baja California play a small role in the species' diminishing numbers. But a moratorium on shark fishing could complicate the situation, where opportunities are often limited for fishermen due to the need for retraining or the absence of necessary markets and infrastructures. Many scientists agree that sustainable shark fishing practices are possible, and there seems to be a willingness to shift away from fishing endangered species in Baja, like the white shark. These solutions come with their own challenges, but they are worth exploring in this part of Mexico.

Baja fishermen must be an essential part of the solution. Local scientists propose sustainable management and fishing practices, such as modifications in gear type, seasonal closures during periods of reproduction and migration, better regulations, and socioeconomic compensatory payments for the loss in income. The fishermen's engagement in Omar's shark tagging project and the release of white sharks for a modest compensatory payment demonstrate that fishermen are engaged and want to play a role. A mutual understanding between scientists and fishermen can make these fisheries management policies work more smoothly while also helping scientists gain a deeper knowledge of shark ecology in the region. This, in turn, leads to better conservation outcomes.

Conservation can be a long and arduous journey, especially when the goal is to have thriving marine ecosystems and coastal communities. It's also a continuous learning process to understand that there are ways to proceed without sacrificing the well-being of people to achieve conservation goals. As I drive back to San Diego, California, along Baja's ruggedly beautiful

coastline, I start stitching together new conservation ideas that involved protecting sharks and respecting the traditional fishing practices of these communities. The more I immerse myself in this work, the more I realize that there is always hope, and we still have time. I came to Baja in search of sharks, but I left with so much more.

If I can convince the world of anything, it's that sharks are worth protecting, but the people catching them are too.

END

Link to Deliverable: <https://arcg.is/1jSbre>

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