Succulent and Spiny:

The Bahamas' Quest for a Sustainable Lobster Fishery

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ABSTRACT

The Caribbean spiny lobster fishery is one of the most important industries in the economy of the Bahamas, and in turn it is one of the largest lobster industries in the world. The natural geography of the Bahamas makes its waters into a lobster haven that Bahamian fishermen have successfully exploited over the past few decades. In 2009, in order to safeguard the industry's future and earn a higher margin, the government and the lobster processors together sought sustainability certification for their product. However, they came up short. The international assessors deemed the data on the health of the lobster stocks to be too minimal, and the legal structures to protect the lobster from over-harvesting to be too weak. In response, the government, together with the World Wildlife Fund, set up a program called the Fishery Improvement Project to get the country's lobster industry on the right track. Under the auspices of the Fishery Improvement Project, the government, local and international NGOs, the processors, and the fishermen themselves are contributing to improving the availability of information on the lobster and to crafting new laws to control the industry. Despite successes in improved communication and stock assessments, there are many obstacles to be overcome: differences of opinion, the spread-out nature of the country, and the limited resources available to enforce the laws. Through interviews with fishermen, government officials, processors, and scientists, this thesis tells the story of how the Fishery Improvement Project began, what it has accomplished, and where the lobster and the humans who harvest them might go from here, when the program wraps up and the fishery reenters the sustainability certification process.

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For Julie Victor

Introduction

A blue oval lurks in the seafood aisle of the grocery store. Inside it is a white checkmark, forming the top and tail of a cartoon fish. "Certified sustainable seafood," the label proclaims. It is the logo of the Marine Stewardship Council, and it aims to guarantee that the purchase of that particular cut of salmon or cod has arrived on the shelf in a manner that doesn't threaten the future of its species. Perhaps some consumers will choose to buy the fish because of this label. Soon, they may not have a choice. Walmart, for example, plans to sell only MSC-certified seafood in the near future.[1] But what does such a symbol mean for the journey that fish took to get inside that package?

The Caribbean spiny lobster, *Panulirus argus*, and the humans that catch it in the Bahamas are trying to find out. Bahamas lobster tails aren't certified sustainable just yet, but the Monterey Bay Aquarium's Seafood Watch deems them a "good alternative" among the options on the US market.[2] They're also fairly easy to find. By value, lobster tails from the Bahamas make up to a quarter of the US market for spiny lobsters.[3]

Shopping for seafood of any kind – and lobster tails in particular – in the Bahamas is a little different from the neatly labeled experience in the United States. Marsh Harbour, the capitol of the island Abaco and the third-largest city in the country, does have a grocery store that wouldn't look out of place in a large American city. But the place to go for what the locals call crawfish tails is the Fish House – formally named Skagg Retail and Wholesale, though no one really uses that moniker. The Fish House consists of a small grocery store out front, and Marsh Harbour Exporters and Importers Ltd., a seafood processing plant, out back. If you come from south of town, or maybe the airport, you stop at the only stoplight – not just on Abaco, but in all of the Family Islands. (That's the local name for the hundreds of islands outside of New Providence and Grand Bahama, the islands with the country's largest cities, Nassau and Freeport.) Take a right at the light and follow the main drag, a dirt road along the harbor, towards the outer tip of Abaco, and then a left past all the shops. Past the marina, you find it: a small white warehouse on your left. The processors themselves are too busy to talk to visitors, uninterested in sharing the tale of where those lobster tails come from. But in the freezer case,

you can buy a package adorned with the image of a magnificent whole lobster framed by four disembodied tails against the background of a crashing wave. There is no MSC label – at least, not yet. But if you're currently willing to forgo the assurance that your lobster dinner won't be harming the ocean, you can take home ten spiny lobster tails, or "crawfish slippers," for $120.

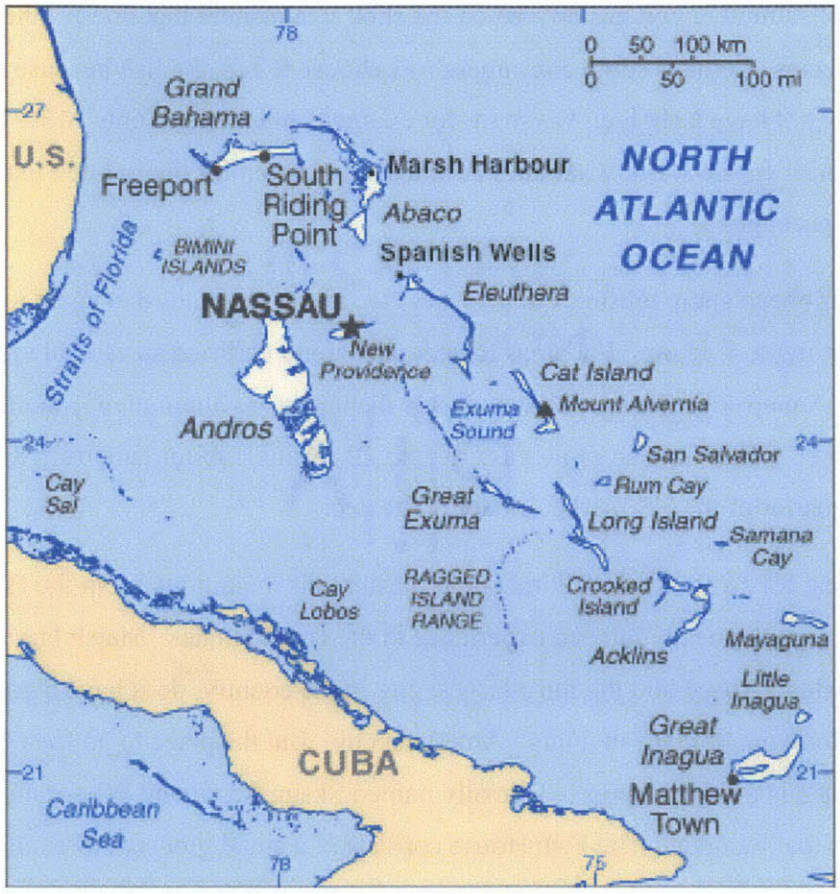

Figure 1. Map of the Bahamas. Modified from Public Domain.

Chapter 1

The Lobster in the Bahamas

Caribbean spiny lobster, along with the rest of their ocean compatriots, tend to ignore any international borders humans impose on the sea. Genetic studies dating back to 1994 suggest that, with the exception of an odd subspecies in southern Brazil, the Caribbean lobster population as a whole travels and mixes well beyond the exclusive economic zones of any one coastal or island nation.[4] Bahamian lobster is so similar to Honduran, Nicaraguan, or Cuban as to be indistinguishable at the level of the DNA. If the lobster roams at will throughout the sea, then it seems unlikely that the efforts of one nation to make its fishery sustainable could have any long-term impact, as long as its neighbors continue to harvest crustaceans without limit.

However, despite what genetics may suggest, the Caribbean is not an evenly distributed pot of lobster. Computer modeling, based on studies of ocean currents and the lobster's lifelong migratory behavior, paints a more nuanced picture. It reveals that, in terms of lobster, certain countries seem to have an unfair geographic advantage. Most of the lobster living along the reefs of Nicaragua, Venezuela, and the eastern Bahamas are natives, although plenty of their siblings will end up in the waters of other nations. By contrast, in the western Bahamas, where much of the country's lobster fishing industry is based, many of the adult lobster immigrated from abroad. The Bahamas' natural geography has thus resulted in a neat lobster-recruiting trick: keep the lobster that are born there while pulling in even more from abroad to supplement the population. Additionally, the central Bahamas is home to a surprising lobster resource – an open-water nursery, where free-floating lobster larvae slowly mature into miniature adults.[5] Cuba, where the spiny lobster is also the most economically important fishery, is the only other Caribbean nation to share these myriad bonuses, but significantly fewer lobster are caught there.[6] "It's better in the Bahamas," the official tourist slogan goes. And the Caribbean spiny lobster appears to agree.

Although only a recent discovery, the lobster's geographic preferences probably played a role in establishing the Bahamian fishery as a heavyweight both in the nation's economy and in the worldwide lobster market. Perhaps more importantly, the tendency of Caribbean lobster to gravitate towards the Bahamas means that it actually might make sense for a single nation to

strive for sustainability on its own. Armed with this information, it is possible to imagine the Bahamian lobster population – and the fishermen and exporters who depend on it for their livelihood – as a real geographic and biological entity, rather than just a human economic construct.

The origins of a distinctively Bahamian lobster population are rooted in the lobster's peripatetic habits. Researchers have only begun to grasp what routes the lobster larvae follow, thanks largely to the work of lobster biologist Mark Butler, who collaborated on the computer models that revealed the Bahamas as a special lobster haven.

Butler, a professor at Old Dominion University, has devoted his career to the spiny lobster, and it seems impossible to read any scientific literature on the creature without somehow running into his name. When one of his current graduate students refers to him as "one of the exceptional lobster biologists and ecologists out there,"[7] it is hard to disagree, as his career has spanned nearly every aspect of the life cycle of the Caribbean spiny lobster, from how baby lobster move through the oceans to how adults reproduce and what happens when lobster get lethal viral infections.[8] He affectionately terms the animals his "lab rats," and his favorite part of research is scuba diving out in the field.[9] Nearly every picture of him on his lab's website shows him in his wetsuit.[10]

The Caribbean spiny lobster begins its life floating through the ocean. After hatching from their mother's eggs, young lobster live as larvae for a relatively long time, five to nine months.[11] They begin as plankton, the length of three grains of sugar, with a figure eight-shaped body decorated with small, feathery protrusions that will eventually become eyestalks, antennae, and legs. Over time, the back half, known as the hind-body, becomes segmented into an armored tail; the eyestalks grow out; eventually, the antennae surpass them.[12] All the while, these tiny growing creatures travel throughout the Caribbean, not caring to flash their passports as they cross the boundaries of exclusive economic zones.

Until recently, scientists thought that the youngest of lobster drifted freely through the ocean, buffeted by the currents. But in 2011, Butler showed that something else was going on, too. Lobster larvae move up and down in the water column in daily cycles, responding to the

light. For the first two months of their life, the lobster stay close to the surface, but after that they shun the sun and move deeper, meaning they are no longer affected by surface currents. If baby lobster were continually moved along by these surface currents, they would end up at least as far away as 1000 kilometers from home, something like the distance between Boston and Columbus, Ohio. But by moving out of the current's way, they can travel as little as 400 kilometers - only as far as from Boston to Allentown, Pennsylvania. That allows them to stay more easily within the confines of a single country's borders throughout their life cycle.

At the end of the larval stage, lobster begin to settle down in beds of sea grass. There, they undergo a miraculous metamorphosis. Instead of caterpillar to butterfly, lobster larvae shed their blobby shape and trade up into glass-like, transparent versions of their adult form, small enough to perch on a human fingertip. Over the span of a couple years, the tiny glass lobster will turn into magnificent, clawless creatures with probing, gangly antennae and white spots down their tails.[13] Butler much prefers "these colorful, beautiful, delicate, and sometimes brutish-looking spiny lobsters" to the Maine lobster, which he calls "this dull creature with the small eyes and big claws, this Neanderthal-like organism that people refer to as lobster."[14]

The passage to adulthood doesn't mean the Caribbean spiny lobster stays still, however. Well before anything was known about the travels of baby lobster, Jacques Cousteau swam alongside adult spiny lobster in the Florida Keys. His footage shows a human diver paddling along next to the procession, backed by an eerie soundtrack. Occasionally the diver reaches under a lobster to try to grab onto it while the lobster defensively backs away. The lobster overlap head to tail so that when the camera zooms out, the single-file parade looks like a centipede winding its way along the ocean floor.[15] The game of follow-the-leader has a definite purpose; it turns out that lobster can navigate as well, or even better, than homing pigeons, aligning themselves along the Earth's magnetic field to find calmer waters every year in the autumn.[16]

Cousteau's images of the lobster moving slowly and deliberately, delicately prancing leg by leg through the sand, is delightfully alien. Our enhanced understanding of the young lobster's journeys through the sea makes their itinerant lives seem even more wondrous. But unfortunately for the lobster, our search for comprehension of their journeys is not only motivated by scientific curiosity. Like their distant evolutionary cousins in the waters off Maine,

and other relatives the world over, *Panulirus argus* is a hot commodity on the dinner plates of many populations of *Homo sapiens*.

For what seems like such a small country, dotted by isolated and mostly tiny communities on a pearl necklace of hundreds of relatively small islands, the scale of the lobster fishing industry in the Bahamas is astounding. *Bahama Lobster Pirates*, a reality television show about the practices of the local fishermen that debuted on a US-based cable channel in February 2014, opens with a statistic of 100,000 lobster per boat per season, August 1 to March 31. At the end of the show's first episode, covering the opening day of the season, thousands of lobster have already met their end at the hand of only six boats. In a single day, *Water Spout* notched a record-setting tally of 3,265 tails, and even the worst-faring boat, *New Wrinkle*, achieved a catch of 955 tails. Roughly a week later, another boat, *Sea Gem*, led the scoreboard with a cumulative total of 12,941 tails.[17]

The economic heft of the lobster in the Bahamas rivals these lobster tail tallies for impressiveness. Agriculture and fishing constitute the country's third-largest industry, and the lobster is the nation's most valuable food export.[18] Each year, the fishermen's haul is processed and packaged by eleven firms, which collectively export roughly 5 million pounds of lobster tail a year worth $70-90 million – 64% to the US and 28% to France, according to a 2009 report.[19] In the bumper year of 2003, 7.6 million pounds of exported lobster tail fetched over $100 million – a significant slice of the global spiny lobster industry of $1 billion. The catch has slowly declined since then, but over the period from 1997 – 2011, the Bahamas lobster industry led the world for frozen spiny lobster tails, capturing 15.6% of the global market.[20]

Little wonder, then, that when the fishermen on the Bahamian island of Abaco were asked by a local environmental organization what issues were most important to them, they replied that their top concern was the lobster.[21] In particular, they were worried about the overfishing of young, undersize lobster. The organization, Friends of the Environment, distributed notched plastic rulers to fishermen to help them comply with a minimum harvest size of five and a half inch tails. They also held meetings and outreach events. One local Bahamian

says that community meetings about lobster are usually well attended. Even though interest in conservation is not a given for everyone, "it touches them in their pocketbooks," he observes.[22]

At the headquarters of Friends of the Environment, educational materials from the campaign are still available. There is a winsome short cartoon book entitled "Fishing Today For Tomorrow: A Bahamian Spiny Lobster Heroes' Truth," which features spiny lobster convincing a diver to leave their smaller cousins alone, and a word search and maze to drive the point home.[23] There are also buttons with the campaign's logo: Size Matters Pride Campaign, written around a lobster, a ruler, and a small map of Abaco. Online, there is even a music video with jaunty, upbeat Caribbean music, a song entitled "Size Matters," and images of local schoolchildren playing with an adult in the costume of Spike the Spiny Lobster, the mascot of the campaign.[24] Faded "Size Matters" bumper stickers are still visible around the town of Marsh Harbour, Abaco's capital – along the main road, on the door of a coffee shop that sells lobster postcards by a local artist, and on the back of a red truck driving along the highway.

Fishermen generally sell their catches to processors, who prepare the lobster tails for export. The processors, too, are concerned about the future of the lobster and their industry in the Bahamas. In 2007, a representative of a lobster processing plant approached the Bahamian government with a proposal.[25] It was about certification by the Marine Stewardship Council, an organization whose website announces its mission: "to use our ecolabel and fishery certification program to contribute to the health of the world's ocean by recognizing and rewarding sustainable fishing practices."[26] Lester Gittens, the government official who reviewed the proposal, says, "I thought it would be a good thing to pursue. The principles for the MSC certification are based on [a] code of conduct for responsible fisheries, and those are very much in line with what we are trying to achieve in the Bahamas."

While the health of the Bahamian ocean may have been on the mind of the parties to the conversation, economics were probably also in play. "The main thing that I think stimulated the processors that are involved now is the possibility of a better price on their lobsters internationally," Gittens says.[27] Aside from a better price, there were also fears that a lack of certification could shut the important industry out of the market. Early in 2006, for example, Walmart, one of the American companies that buys Bahamian lobster, announced that it would only buy MSC-certified seafood within three to five years;[28] as of early 2012, 76% of Walmart's

seafood products had the blue oval of MSC approval or something similar, and by June of that year, all suppliers were supposed to be at least on the way to becoming certified.[29]

In 2009, the Bahamian government and the World Wildlife Fund split the cost of an MSC pre-assessment, a requirement before entering full assessment.[30] But despite the will of the government, the industry, and an international non-governmental organization to work together, the immediate results were discouraging. The fishery was found wanting by the MSC's standards, primarily because of a lack of data on the size and health of the lobster stocks.[31] It isn't possible to tell if a harvest is sustainable without a baseline.

The patchy data on lobster stocks doesn't deter the *Bahama Lobster Pirates* official website from making a striking claim: "Based on current catch numbers, the Bahamian lobster fishing industry is thriving, and is in no way in danger of being overfished. This is solely due to the careful, highly regulated efforts made by the Bahamas Department of Fisheries and the strict adherence to the law by local fishermen."[32] Obviously, international assessors in 2009 wouldn't have agreed with that statement. Has something shifted in the past five years? What about the laws crafted and enforced by the government and followed by the fishermen might lead to such confidence in the lobster industry's safety?

Chapter 2

Society and the Lobster

Spiny lobster have incredibly rich social lives. But unlike human interactions, which rely so heavily on vision, lobster build their personal networks on the basis of smell. "Lobsters respond primarily to the world through olfaction," Mark Butler, the lobster biologist, says.[33] Chuck Derby, a biologist at Georgia State University who specializes in understanding how crustaceans interpret the chemical signals of their world, added that in a marine world where vision becomes unreliable in cloudy waters, smell is the only way to make sense of the environment. Spiny lobster can sniff out predators, prey, and each other. And they do so not only with their antennae, but with their whole bodies, which are covered in chemoreceptors that are designed to detect particular chemicals. "It's not what we're used to," Derby says. It would be like tasting the floor through our bare feet.[34]

Lobster's uncanny olfactory capabilities are so good that they can detect disease, like the dogs and cats in nursing homes that seem to be able to sense the presence of cancer. Researchers found in 2006 that lobster pick up chemical cues from sick members of their species and actively avoid them, a behavior that is unknown in other wild animals. Unlike our human tendency to scoot as far away as possible from the person on the bus with the hacking cough, though, lobster's extraordinary sensory talents allow them to determine that a lobster with a particular viral infection is sick even before the disease it causes manifests in an obvious physical way.[35] A nifty trick of self-preservation, perhaps, except that avoiding sick lobster when the housing market is slim can lead to lobster being stuck out in the open or being forced to live nearer to the den of a deadly octopus.[36]

But when the lobster aren't sick, the Caribbean spiny lobster likes living with a lot of friends, unlike its solitary, clawed cousin up north.[37] That can be an advantage for defending a lobster lair from the jaws of a hungry grouper.[38] But now that humans have noticed the lobster's social tendencies, the gregarious nature of the lobster can also be a disadvantage. Once one lobster finds shelter, more will tend to come join it. So now, fishermen provide a home for the lobster, managing to congregate the lobster in such a way that it's easy to come and pick them off, one by one. Rather than traditional wooden traps, they use large sheets of corrugated metal,

perhaps four feet by six feet, that rise two feet off the sea floor, supported by wooden planks along their sides. These structures are called casitas, or "condos" in the Bahamas, and they create a deceptively safe shelter for the lobster and many other species.[39]

When the fishermen come calling to check on the structures, the lobster's friendliness turns out to be their undoing. Divers flip over each condo, revealing a teeming mass of lobster underneath. It looks a little like turning over a large stone in the garden and finding ants, worms, and roly-poly bugs writhing away from the light. The lobster begin to scatter, but are not the fastest of creatures. Still, to make the most of the harvest, the fisherman must work quickly. He (it is almost always a "he") hooks the lobster under its tail with a metal rod, upending it so that it dangles, head down, in the water. Then, lightning-fast, the diver flips the hook around and stabs the lobster through its underside. Each lobster is hooked, floated, and stabbed in quick succession, and when each lobster under the seemingly welcome shelter has been dispatched, the diver collects them up, holding them by their antennae in an upside-down dead crawfish bouquet.

Once the diver returns to the boat, the crew will rend the tail from the rest of the body. The unit of measure for a day's catch is not the number of lobster, but the number of commercially salable tails. No one, apparently, can make anything of the head. One imagines graveyards of discarded lobster heads strewn underneath the seemingly calm waters. The tails get loaded into giant plastic bags, twisted shut, and stored downstairs in a walk-in freezer, if the boat is large enough.[40]

Ian Hall, the producer of *Bahama Lobster Pirates*, the reality television show that displays this fishing technique in its full glory, now lives in Florida but was born and raised in the Bahamas. At the age of seven or eight, he would sail out to spear lobster. In those days, fishermen would nab and spear two or three lobster at a time by free diving, without any gear, using a stick with a small noose on the end called a Hawaiian sling to lasso the lobster around their tails. From the age of twelve through his high school years, Hall went out to sea for the first month of the lobster season to help with the operation before school started.

Hall traces the development of the condo to about 35 years ago. At that time, Cubans fishing illegally in Bahamian waters used tractor trailer tires to concentrate the lobster in one spot. Next came used car hoods.[41] Similar dumping of our industrial leftovers persists today

around the world in more modern attempts to shore up coral reef species by creating "artificial reefs" of human-made junk.[42]

In the 1980s, both condos and more traditional traps, familiar from fishing communities that harvest cold-water lobster, became more widely used.[43] Unlike in traps, the lobster are free to come and go from a condo, but they (and other animals) find it a cozy place to rest, and make a home there with many more lobster than would fit in a single trap. Traps are still used in the Bahamas, but only rarely. Buddy Pinder, a part-time lobster fisherman on the island of Abaco, guesses that 80% of lobster are caught from the condos.[44] Angee Doerr, a graduate student at the University of California Davis who is studying the socioeconomic and ecological impacts of condo fishing in the Bahamas for her doctoral work, estimates that there are over a million condos presently in use.[45]

The tale crafted by *Bahama Lobster Pirates* suggests that condos have really helped the lobster. "Since we've been using them, the number [of lobster] has increased dramatically in the Bahamas," says Crazy Lou, one of the captains on the show.[46] Ian Hall, the producer, agrees. "It's encouraging, how much better it's done than 20 years ago." Hall says that the condos provide nurseries for "all those little baby lobster." "It's definitely increased the number of lobsters," he asserts.[47] Buddy Pinder thinks that "it probably should be the only way to catch them." He even suggests that placing the condos in deeper water could allow for a year-round harvest, rather than a season, since lobster like to spawn in a water depth of 40 to 90 feet according to his observations.[48]

"Condos do a lot of good in terms of providing shelter and protection," Doerr agrees. "They also make the lobster a lot easier to catch." Until recently, no one has really researched this potentially double-edged impact of the condos on the lobster.[49] The government official who first became part of the effort to certify the lobster industry as sustainable, Lester Gittens, is trying to change that. When not working in the Department of Marine Resources, or representing the government in the newly formed Spiny Lobster Working Group, Gittens is a Ph.D. student studying with Mark Butler. His dissertation project aims to address the effect of the condos on lobster biology and fishery sustainability in his own country. He and other scientists have noticed that condos do exactly what they're supposed to – aggregate the lobster. Now, he's studying whether condos do this to a greater extent than their natural habitats or more

traditional wooden traps, and how this might affect the lobster. If condos bring more lobster together, does it make it harder for them to find food, or make it easier for them to transmit diseases to each other? Do they result in more juvenile lobster being harvested?[50] Although the results aren't in yet, Gittens' work might change how fishing is conducted in the Bahamas. Angee Doerr's research has already confirmed fishermen's suspicions that in areas where condos are placed close to the lobster's natural reef habitat, lobster have a dangerous preference for the man-made habitat over the coral one. That finding indicates that the government might need to regulate the condos, or at least where they are placed.

The impact of condos on the lobster may not be fully known. But the impact on the humans who fish with them is noticeable. Although the government has considered setting up a licensing program for the condos, according to Doerr, for now there is only one regulation on the use of condos in the Bahamas.[51] Like traps in the Maine lobster fishery, individual companies may invest hundreds of thousands of dollars in the off season to build the condos, which generally need replacing every five years. Unlike in Maine, however, once the structures are dropped in the water, they are no longer anyone's personal property. They belong to all Bahamians.[52] That makes fishing is a relatively easy career to pursue. "It's seen as a hard job, but it's actually easy," says Buddy Pinder, who has 35 years of lobster fishing experience under his belt. "There's a low overhead – you just need a boat, and can make a lot of money." He thinks the same amount of lobster is being caught now as in the past, but that more people are taking up the trade as a result of the recent economic downturn. It hit the economy as hard in the Bahamas as it did in the US, and with tourism revenue down, more people have turned to lobstering as a source of income. The overall effect, Pinder says, is that each fisherman now gets "a smaller piece of the pie."[53]

As competition has intensified, at least a few lobstermen blame the combination of this unique Bahamian law and the condo fishing method for the rise of modern-day pirates of the Caribbean – the lobster pirates that provide Ian Hall's television show with its name.

Many fishermen view pirating as a serious problem. There's nothing to stop anyone else from fishing your condo. The captain of *Summer Place*, the pirate boat featured on the television

show, proclaims gleefully in the first episode, "If you ain't working your trap, someone else could be!" The only protection is to try to place the condos such that you'll remember where they are but no one else will guess. That's not so easy, because experienced fishermen know the currents and the underwater shape of the shallow floor of the Bahama Bank, where most of the condos are dropped. Thus, finding one often leads to a jackpot of many. The waters are so clear that any fisherman can see all the way to the bottom and spot condos while sailing by. One boat on the show spent the first day of the season looking for eight of their condos. Two of them were gone, three gave a decent catch, and three were wrecked.[54]

Despite the grumbling of the crews of boats that set their own condos rather than pillaging those laid by others, the pirates aren't actually breaking the law. Ian Hall thinks that the government wouldn't do anything about it even if they were. "There's no way the government is going to police fighting" over lobster resources, he says. "It's a free for all."[55]

Everyone on the show, with the exception of the crew of pirate boat, and many of the show's fans seem to agree that pirating is a scourge of society. They also seem to imply that a disregard for personal property is inherent in Bahamian culture. One elderly fisherman on the television show proclaims, without too much worry evident on his face, that "everybody else got so many laws."[56] A commenter on the show's Facebook page uses a written imitation of the lilting Bahamian accent to emphasize how prevalent "thiefing," or stealing, is. "Unfortunately t'iefin' is a fact of life in The Bahamas – both on and off the water."[57] Over lunch in Marsh Harbour, on the island of Abaco, one part-time resident, who spends her summers in her native Minnesota, relates to me that someone once told her that "laws are mere suggestions in the Bahamas." All of her companions at the table murmur agreement.[58]

There is something striking about the people who assert that the Bahamas is a lawless nation. Some of them are wealthy Americans with second homes on these tropical isles; others are native Bahamians. But all of them are white. Although the population of the Bahamas is 90% black and 8% white, all of the fishermen on the show – save two members of the pirate crew – are white Bahamians.[59] By contrast, almost everyone working in the tourism industry in Nassau, catering to the whims of rich international tourists, is black. Despite positions of power in the national government more accurately reflecting the racial composition of the nation, in some ways it feels as though the country is still under the shadow of a past in the slave trade.

And Angee Doerr's surveys of fishermen on six Bahamian islands suggest that race and class play a large rule in attitudes towards the method of condo fishing.[60]

The spread-out nature of the Bahamas – both geographically and culturally - is known as the "Family Island Dynamic." Although there are only 351,000 people in the Bahamas, they are scattered among 700 islands in a swath of ocean the size of Afghanistan. And despite relatively easy connections by plane, boat, or telephone, each island is its own microcosm. While Marsh Harbour, for example, has the bare amenities a city-dweller might seek, it is hardly sprawling and bustling like Nassau, which supports a large enough population for a semi-public transportation system. Yet to visitors from the southern part of the island of Eleuthera, Marsh Harbour is a big city. "There's even a KFC!," one of them notes in awe.[61]

Doerr says the differences run even deeper. "All the islands are completely different," she says, explaining that each island was settled independently and evolved separately, leading to stark variations in class, race, and religion. Even a brief visit to some of the smaller islands conveys a sense of the dynamic. When browsing through business listings or chatting with locals in Abaco, the port of one of the ships on *Bahama Lobster Pirates*, nearly everyone you meet has a last name of Pinder or Albury. One Nassau native tells me that outside of his hometown, most young people have to go far off-island or even out of the country to avoid marrying a cousin. And in Spanish Wells, a small isle off of Eleuthera's northern tip, home to the four remaining "non-pirate" ships on the television show and the heart of the Bahamian lobster industry, Pinders own large seafood processing factories, run the government, and play an outsize role in the actual fishing.

Doerr's two-hour-long interviews with hundreds of fishermen on these islands reveal that the communities of Abaco and Spanish Wells are relatively wealthy and white, and that their members feel very strongly that the condos they set are their own private property. These were some of the "very island-specific beliefs about whether condos are good or bad, private or shared" that she found in her study. By contrast, fishermen on Andros, who fish the condos placed off their coastline by the fishermen from Spanish Wells, feel that condos set by outsiders don't stake a personal claim to the lobster that, geographically speaking, should belong to natives of Andros. "They believe that Spanish Wells fishermen shouldn't be down there," Doerr says. Given these attitude differences about the condos, Doerr is particularly intrigued by the show's use of the

word "pirate." According to her, most people she has spoken with in the government view the condo system itself as "loosely legal at best."[62]

However, it is difficult to say where the condos might actually fall on the scale of legality, because the Fisheries Law hasn't been updated since 1977, a mere four years after Bahamian independence from Britain and well before condos were as popular as they are today.[63] The legal structure hasn't kept up with the modern, international realities of today's fishing practice and gives the Department of Marine Resources minimal powers to enforce fishing regulations for Bahamian and foreign fishers. There was a draft law from 1998 that apparently never went anywhere;[64] a 2009 report states the law is currently undergoing revision.[65] But in 2013, local news reports made much of the fact that British consultants were holding public meetings to consider changes to the 1977 statute.[66]

Enforcing the current law is yet another major difficulty, given a sprawling country of far-flung islands and next to no information on where the fishing is taking place. The land area of the Bahamas is a little smaller than that of the state of Connecticut, scattered in an Exclusive Economic Zone equivalent to the size of 1.5 Californias, and fishing vessels could be anywhere.[67] Part of Gittens' PhD project is to develop a satellite imaging method to study the distribution of condos in the water, something that can't be done visually at sea level. "The Exclusive Economic Zone is humongous," he says. "We don't know how many condos there are or where they're located."[68] That makes regulation, already difficult in law, nearly impossible in practice.

Along with limited information come limited human resources. Gittens is dedicated to the lobster project on several fronts, both as a researcher and as a government official. But since he is the only government official working full-time in any capacity on the regulation of the lobster industry, that also means that the government itself has capacity issues. "Things get done on Bahamian time," says Wendy Goyert of the World Wildlife Fund, who is working with the Bahamas on making the lobster industry sustainable. "Things get done a little more slowly."[69]

That is, if they get done at all. Cindy Pinder, Buddy Pinder's wife, relates a story of having the local Department of Marine Resources agent on her husband's boat and telling him

about illegal hauling of bonefish, an Abaconian specialty. The official responded that he knew, but didn't appear to plan to do anything about it.[70] Whether from a lack of will or a lack of capacity, the government can't realistically catch all, or even many, of the fishermen who are reeling in lobster that are too small or out of season.

Currently, there are no quotas, limits, or targets to ensure a sustainable fishery.[71] The Bahamian law instead suggests guidelines like the closed season during the summer and a minimum size limit of a five and a half inch tail. Such provisions are a good start, but without enforcement, they have little force. And despite the efforts of education campaigns like "Size Matters" on Abaco, almost everyone has a recent story of the system gone wrong. A burly winter resident recalls seeing a cooler on the side of the road with undersize tails just after "Size Matters" started. One native Bahamian tells me it's not uncommon to find lobster for sale disguised as "summer crab" before the lobster season opens on August 1. A friendly British shark researcher confides, "My neighbor comes back with some awful small looking lobsters sometimes. What can you do?"[72]

The fishermen themselves appear to support the laws – after all, the "Size Matters" campaign was their own suggestion – but grow frustrated that others don't follow the regulations and that there is so little enforcement. "If you're going to rob the bank and no one's going to stop you, might as well rob the bank," Buddy Pinder says. "I know people fish shorts [undersize lobster], even if I don't see them fishing shorts."[73] Even Cindy, Pinder's wife, who says she and her husband make a conscious effort to follow the law, admits that sometimes they'll accidentally catch "shorts" and then just have them for dinner at home or with friends, since they can't sell them.[74] Doerr says fishermen acknowledge that there's no point in collecting them, since fish buyers won't purchase undersize lobster, but that they also say that smaller lobster taste the best.[75]

A 2013 report on the state of the fishery asserts that "monitoring of average tail size at processors has shown a significant decline in the capture of undersized lobster."[76] Cindy Pinder seems skeptical. She believes that the exporters are making up numbers and that restaurants are probably buying undersize tails even though they're not supposed to.[77] Even from my own limited experience of the fishery, it seems difficult to match the ideal careful effort of measuring and sparing undersize lobster with the sense of urgency evident on the television show. The

boat captains toss about competitive barbs while their crew harvest a significant number of lobster by speedy hooking and spearing in an attempt to bag as many tails as possible a day. Are the divers experienced enough to spot a lobster that's too young by eye? Or are the unacceptable tails quietly harvested and kept for consumption at home instead of for sale? A commenter on the Facebook page of *Bahama Lobster Pirates* wonders the same thing: "I hope our fishing laws are being respected."[78]

Regrettably, while enjoying an incredibly succulent herb-basted lobster tail on my last day in Marsh Harbour, I lack a ruler to see if the lunch I'm enjoying is actually up to code.

Aside from pirating and undersize fishing, non-Bahamians are viewed as another serious threat. The fishery "is hugely plagued by poachers from other countries," Hall says. "Their boats go into Bahamian waters when the season hasn't even started, and raid, rape, pillage the whole area."[79] Doerr describes the Dominican fishing strategy as "clear cutting the ocean floor." On the rare occasions when a vessel is caught, she says, they have been found with large quantities of every conceivable salable species aboard.[80] Often, the limited resources of the Bahamas National Defense Force are easily exploited by boats who watch the patrol leave before swooping in.[81] Chuck Pinder, a de facto leader of the lobster fishing fleets in Spanish Wells, the heart of the industry, wrote a letter to the local *Tribune*. He begged the government to do something about pirate boats hiring Dominicans, whom he thinks shouldn't be able to clean out lobster condos since they aren't Bahamian citizens. "There is a new underwater predator that is a natural born killer destroying everything it comes across," he writes. "And that is the Dominican divers who are allowed to dive on commercial Bahamian fishing vessels."[82]

Gittens himself admits that illegal, unreported, and unregulated (IUU) fishing remains one of the greatest hurdles to sustainability.[83] The government appears to be trying. As a result of negotiations between the governments of the Bahamas and the Dominican Republic in October 2012, many Dominican ships were removed from service on a temporary or permanent basis.[84] Similarly, a 2012 report states that the government had recently stepped up efforts to reduce poaching,[85] and a news item from February 9, 2014, reported that the captains and crew of four Bahamian boats were arrested and fined $12,000 between February 5 and 7 for using

fishing equipment in restricted areas and catching undersize lobster.[86] Additionally, new innovations, like a smartphone app to report IUU fishing, are being tested.[87] But the scale of the problem is unknown.

It is easy to become distracted by the threats of others: pirates, those who fish shorts, and foreigners scooping "Bahamian lobster" out of the ocean. These may well be serious pressures on the health of the lobster, but apportioning blame to others detracts from self-examination of fishing practices. That's the message from the evident decline of another local marine resource – a mollusk known as the conch. Conch are more iconic than the lobster in the Bahamas, even appearing atop the country's colorful coat of arms. Yet the Bahamas is the only Caribbean country without some sort of protective, closed season to allow the conch population to replenish itself. And the current harvest rule allows fishermen to legally harvest conch well before they become sexually mature, a common practice since there's just as much meat on teenage conch as on adult ones. Meanwhile, little conch are frequently used as bait for other catches.[88]

Most conch caught in the Bahamas are also consumed there,[89] perhaps resulting in the lower interest in their conservation, at least among the actors who are driving the lobster industry's sustainability efforts. But some citizens have taken matters into their own hands and set up an organization, Community Conch, to conduct population surveys of the conch.

Their researchers obtained maps of where the fishermen told the government they're collecting conch, then spoke to the fishermen to refine the locations where they would conduct their surveys. Next, they dove or towed a net to cover a field 6 meters wide and 1000 meters long and counted how many adults and juveniles they came across. In two weeks of their study, they found only three mating pairs, a dismally low number. Not surprisingly, the density of conch is much lower closer to human-inhabited areas. In each commercial fishing area, the density of conch was about 10 conch per hectare. But scientists have found that at densities of conch lower than 50 per hectare, the conch won't mate. All the information they received pointed to massive overfishing. Fishermen reported taking about three times the sustainable level – but the data are so unreliable that it's impossible to know how close that number hits to the real toll.

Community Conch has expanded its education and survey programs to several islands in the Bahamas, and has made many suggestions to the government about ways to make the conch survive longer – protected areas, closed seasons, better knowledge of the conch's biology, co-ops of restaurants and fisheries promoting sustainable rules. But so far, the response has been lukewarm at best.[90]

Falon, a young Bahamian recently returned from a master's program in Florida, works for a local organization involved in the Community Conch project. She expresses her frustration and the bitter fights she has with her own family over common sense matters to save the conch. They're just recreational fishers, but when she's out on their boat, she finds herself tossing the smaller conch back overboard when they're not looking, leading to heated arguments later. "They know better," she says, "but they say 'if it's just me, it's not a problem.'"[91]

Chapter 3

Lobster Threats

Blatantly ignoring common-sense fishing regulations is one way that humans can negatively impact the health of marine resources like conch and lobster, yet the threat of hooking and stabbing isn't the only human-inflicted peril in a spiny lobster's life. Recently, they've also fallen prey to other human-wrought changes in their environment. One of these is the virus that drives lobster to the avoidance behaviors so out of character with their usual social selves. The virus is unique to the Caribbean spiny lobster, hence its name, *Panulirus argus* virus 1, or PaV1 for short. And it is, so far, the only virus known to affect lobster of any kind in the whole world. Don Behringer, a professor at the University of Florida, discovered it by accident during his graduate work with Mark Butler. While studying how the density of the lobster population in a given area affects their growth, he noticed some sickly lobster that had unusual creamy white blood. That strange blood turned out to be the manifestation of a viral infection. Since then, PaV1 has turned into the focus of his laboratory's study. Now, in collaboration with Chuck Derby, he hopes to identify the chemical signal that sick lobster send out and healthy lobster pick up that tells them to avoid an infected roommate. If it turns out to be specific to the disease, rather than a general marker of poor health, that could reveal something about how long the virus and its associated avoidance behavior have been around. Behringer is also working to understand more about the virus itself. It seems to have some similarities to herpes-like viruses, but also could be an entirely new kind of virus.

The virus probably isn't a threat to the fishing industry, since it abounds in young lobster but seems to be latent in adult lobster. Behringer says he's surely even eaten a few lobster with the virus, and it probably doesn't hurt humans at all. Instead, humans and their fishing practices might be making the lobster sick, contributing to the spread of the disease through the common practice of baiting traps with juvenile lobster. Unlike the traditional idea of bait, the young lobster are not there to be eaten, but rather to attract their fellow lobster with the siren song of a bit of company. But confining young lobster can also help to increase the rate of transmission of the disease. So far, the virus doesn't seem to be too prevalent in the Bahamas.[92] Population patterns suggest the Bahamas lobster are somewhat separated from other Caribbean lobster

geographically, if not genetically, but the virus is yet another human-spread change that could influence the health of the lobster and the industry.

Humans on Caribbean coasts are changing the lobster's habitat in other ways, too. Perhaps one of the most bizarre threats facing the lobster is competition with an invasive species that is originally native to the Pacific: the lionfish. Known on the American mainland as a beautiful addition to aquariums, lionfish are generally regarded as pests around the Caribbean. Somewhere between six and ten fish were released into the wild off the coast of Florida in the 1980s and since then they have sprouted to become a plague throughout the ocean. They eat a lot and breed an astonishing amount. In their native Indo-Pacific, lionfish mate but once a year, but in the Caribbean, with no predators or pathogens to bother them, they can spew forth up to 30,000 eggs every four days.

In 2011, a scientific paper reported that lionfish were making their way into many marine habitats – including the lobster's human-made condos. That prompted Jocelyn Curtis-Quick, the lionfish expert at the Cape Eleuthera Institute, to ask how they might be affecting the lobster's sheltering habits. Curtis-Quick and her team of researchers built miniature condo-like structures in the lab and populated them with lobster and either lionfish or a native fish, the graysby. When trapped with the lionfish, the lobster spent about half as much time in its shelter as it would normally (15% of the 24 hour period as opposed to 30%). Although only a small-scale study, Curtis-Quick's work suggests that the prevalence of lionfish could be driving the lobster out into the open, where they are more likely to be snapped up by predators like octopi (and less likely to be taken by human predators relying on the concentrating power of the condos).[93]

Still, despite the impact of the virus and the lionfish, lobster are hardy, resilient creatures. More direct human intervention – fishing – is probably still the greatest threat to the livelihood of the lobster in the Bahamas. How much of a danger, though, remains to be determined.

In general, fishermen don't appear to be worried about the lobster's demise. Ian Hall and his television show insist the lobster industry is doing well.[94] Buddy Pinder says this year's haul might suggest otherwise, but he's still not concerned about the long-term outcome of the fishery. The 2013 season has been abysmal – he calls it "one of the worst seasons" that he knows of. Still, according to his observations over 35 years on the water, there's a roughly seven year cycle

of lobster catches that just happened to bottom out last year. "It will come back next year," Pinder insists.[95]

However, fishermen's observations aren't enough to verify sustainability. The lack of scientifically-collected information on the lobster population's abundance was one of the main reasons that the Bahamas' initial attempt at sustainability certification failed. In contrast to the generally cheery assertions of Hall and Pinder, a 2009 report suggested the fishery hit its peak in 2001 and has been declining since.[96] But the available data was skimpy, and the problem of illegal and unreported fishing meant that it was difficult to estimate how many lobster were really being harvested from the sea.

To come up with more reliable numbers, the government and the World Wildlife Fund, who had also split the cost of the pre-assessment report, joined forces to set up a new kind of effort, the Fishery Improvement Project (FIP), for the spiny lobster fishery of the Bahamas. The idea for the international FIP program emerged from another WWF project, the Major Buyer Initiative, which involves large commercial groups like Walmart, Kroger, Cysco, and Sodexo to help put pressure on fisheries to improve their standards. The Bahamas is a major source fishery for these companies, according to Wendy Goyert, the head for FIP programs in the Caribbean and the Americas at WWF. So it makes sense that the Bahamas lobster FIP was one of the first to launch. The goal is for the country to do most of the legwork of improving its sustainability itself, which requires deep involvement of all the stakeholders in a given industry. "We want to step away and say, you guys have done this" when they achieve certification, says Goyert.[97]

The first major step on the path towards sustainability under the auspices of the FIP was to conduct the Bahamas' first formal stock assessment. A stock assessment measures how many lobster are being caught relative to how many lobster might actually be living underneath Bahamian waters. Lester Gittens, on the government side, teamed up with Paul Medley, a fisheries scientist, to collect the data and crunch the numbers for the 2010 assessment, followed by a 2012 revision and a 2014 version due to appear in June.

Paul Medley is quick to agree to speak about his work on the Bahamian spiny lobster stock assessment. There is only one problem – he's in Pakistan, and he's worried about the

internet connection. A video call is out of the question, but his Skype avatar shows a cartoon version of himself – a white man with graying hair, glasses, and a goatee, sporting a white t-shirt with a green recycling symbol, khaki pants, and sandals. He's standing, apparently underwater, in front of a coral reef, and holding a fishing rod, whose hook has managed to land a small green fish swimming in the foreground.

Originally from Britain, Medley has been living in Turks and Caicos, a Caribbean country neighboring the Bahamas, since the 1990s. He moved there to work on coral reef management problems. Until that point, he had been doing fisheries research in academia in the UK. When he began the project on Turks and Caicos, it was "almost an epiphany," he recalls. "It was the first time I felt like I was working on real things." Since then, his expertise in fisheries management modeling has taken him from Caribbean isles to eastern Africa, and now, at least briefly, to Pakistan, where a friend he met in Barbados requested his help on a UN project. "For me it's about making a difference. I couldn't have ended up in some big lab somewhere," he says. But the Caribbean is one of his favorite places to work, because he feels that the fishery is developed enough that his skills can actually make an impact. "The Caribbean is just at a cusp moment – they have the capacity to collect the necessary data, but they lack the expertise for mathematical modeling," Medley's specialty. His sense of adventure and taste for challenge probably help, too.

Medley has been interested in the spiny lobster fishery for a long time. He traces his involvement back to a 1998 international meeting on the spiny lobster, where he met other scientists who were studying the fishery. Later, from his post in Turks and Caicos, he became a regular member of the Caribbean Regional Fisheries Mechanism scientific working group on conch and lobster, where he came in contact with Lester Gittens. When the time came for the Bahamas to do its stock assessment, Medley seemed like a natural fit. He finds working for "the biggest single lobster fishery in the world" especially exciting, because unlike his project in the Turks and Caicos, where there wasn't enough commitment to data collection, the Bahamas project has a "specific, finite outcome leading to actual management action," he says.[98]

Gittens and Medley wanted to improve upon the only available, and somewhat unreliable, earlier assessment. That study had been conducted based on data collected at a single fishing site. So their first hurdle was to obtain a data set covering the whole country for the 2010 report.

Without the resources to collect the information themselves, they relied on the export data on spiny lobster tails provided by the processors. Unfortunately, this information requires scientists to read between the lines. For example, the processors provide a date of export for their wares, but since the date of export can be anywhere between two and four weeks after the lobster were caught, it's impossible to know exactly when, much less where, the crustaceans met their end. The export data is classified by "size grade," a nebulous measure that encompasses quality of the tail as well as its size, thus obscuring the actual number of pounds of lobster tails shipped abroad. The Department of Marine Resources had previously tried to reconcile the size grade classification with a more precise measure by sampling weights at processing plants from 2005 to 2009, but lack of staff later crippled the effort.

On top of those constraints, Gittens and Medley also had to contend with the glaring lack of data on all the lobster that don't make it through the official channels. Based on interviews conducted with fishermen, a 2011 report commissioned by the government suggested that illegal, unreported catches and "local landings" (that is, those tails that fishermen legally sell directly to hotels or restaurants and not to processors for export) together might account for up to 36% of the lobster catch. The official 2012 stock assessment, authored by Medley and Gittens, states that this number might be pessimistic.[99] "I don't think the illegal landings are that big but they're contentious," Medley says. He's more concerned about the local landings,[100] but in the absence of any data on how many lobster never leave the Bahamas after their tails are rendered from their bodies, the 2012 stock assessment assumes that they are negligible enough to be zero.[101]

After the battle to collect the raw material for his assessment, Medley then did what he could with the data at hand, running computer models to estimate how close the Bahamas were to irrevocably damaging the health of the lobster stock. So far the news is reasonably good. The final 2012 report states: "Overall, there is no evidence from the catch and effort data that the stock is overfished and there is no evidence of a long-term decline in recruitment." However, the report also hedges such optimism. The summary of the stock assessment admits that "it seems unlikely any one stock assessment can be chosen as representing reality with any confidence."[102] The quest for the ultimate answer on Bahamian lobster sustainability is still underway, and as data improves, indicators that might portend a negative outcome could appear. For example, it's

not stated in the report, but Medley says that the fishermen have been exploiting the lobster more heavily in the last 10 years or so, which might end up causing bigger fluctuations in the year-to-year catches. That could be a sign of overfishing.[103] Another omen of trouble could be the average tail size, which has decreased over time as more lobster have been caught. Since 2002, it's stabilized at about 7.5 ounces. But that's not necessarily encouraging, since the catches in general have been declining since then.[104]

Even without definitive answers, the information available now is better and richer than it was in 2009. It might even be good enough to use as the basis of policy decisions. International fisheries scientists who reviewed the 2012 assessment judged it to be "quite good, especially considering data limitations." In particular, they praised the authors for "their ingenuity in supplementing the paucity of Bahamian biological data" with studies on the lobster from nearby countries (Turks and Caicos, Cuba, the US). They made suggestions that seemed possible and useful – like changing the model to calculate the number of lobster, rather than their weight, since that might mask smaller lobster being caught – and those that seemed less realistic, like expanding the government's own monitoring program (unlikely, since the resources to carry it out even in limited form weren't available shortly before the assessment was performed). On the whole, though, they deemed the assessment acceptable for "evaluating management options," and asserted that the management process itself was ready for the next step. They suggested that the next assessment should be carried out in 2014, in order to wait for enough data from a new collection program put together by the processors.[105]

Mia Isaacs, a tall and athletic young woman with graceful features, mocha skin, and black hair pulled back into a businesslike bun, is the president of the Bahamas Marine Exporters Association. On a sunny January day, 70 degrees Fahrenheit, I meet her at J&J and Heritage Seafood, a lobster processor and exporter on a dirt road off of one of Nassau's main drags. I step under the blue awning adorned with an image of a spiny lobster and into the air-conditioned building. Immediately inside the doorway is a narrow hallway with two chairs opposite a window to the processing facility, where workers in hairnets are loading frozen lobster tails into white cardboard boxes. A woman in a hairnet and galoshes comes around the corner with a mop,

and I explain why I'm there. I sit in a chair while someone fetches me a visitor badge (also snazzily adorned with a lobster) and goes to get Isaacs.

Isaacs takes me up a spiral staircase to a conference room for our meeting. The organization she heads is an alliance of eleven processors who export lobster tails to the US, and its foundation as part of the Fishery Improvement Project in 2010 has been a key success of the program so far, according to Wendy Goyert.[106] The processors used to be competitors, but they realized they needed funding for certification. The solution they came up with was to charge a portion on the exported lobster to provide funding for the FIP. "We knew we needed to work together and have strength in numbers. It's really important to have a sustainable resource," Isaacs tells me.[107] That commitment, Goyert says, makes the Bahamas lobster FIP a model for good industry involvement.[108]

Since the inception of the Marine Exporters Association, Isaacs has noted that it has changed the nature of communication in the industry. "It's a huge behavioral change," she says. Communication is difficult because of the geographical spread of the Bahamas, but she believes that BMEA's mere existence has improved it significantly. Now, with the exporters speaking (mostly) as one, a lot more communication takes place, both among the exporters and between themselves and the thousands of fishermen they work with. As a result, she feels that as a processor, she now has a better sense of what the fishermen experience.

Additionally, the effort to improve data collection has been one of the processors' main accomplishments. They have designed new information forms to be appended to every catch in an attempt to introduce traceability into the system. Fishermen must record, among other things, location, size, species, gear type, and days out to sea. The amount of data collected and the stock assessments are "night and day compared to a few years ago," Isaacs states proudly. "It's a long process, but it's very rewarding," she says of the path to sustainability certification.[109]

Isaacs, Gittens, and many others are also involved in another tangible achievement of the Fishery Improvement Project - the successful establishment of the Spiny Lobster Working Group, an advisory body to the government. It includes representatives from the fishing community, scientists, processors, environmental groups, and the government. It has met once so far, in November 2013, to discuss one of the major qualms from the pre-assessment report – namely,

how to control the harvest if lobster stocks dip too low. In the future, the Working Group plans to meet regularly to discuss lingering issues in the industry.[110]

Medley thinks the Fishery Improvement Project's biggest impact has been on how fishermen view the data collection. It was hard to get their cooperation at first, he says. "Fishermen resist anything we do. It's unnecessary government intervention to them." But as the Fishery Improvement Project has continued, it's forced the cooperation of the fishermen – and given them an outlet, like the Spiny Lobster Working Group, to play a role in the discussion. He thinks they're beginning to see the benefits, and finally understand why the government and scientists want all the information they request on how much lobster they're catching, when, and with what methods. Originally, he says, they thought the information was being collected so that they could be taxed.

Together, the more complete data collection by the processors and the agreement on harvest control rules should allow the 2014 version of the model to be more helpful than the 2012 one. Medley and Gittens can now actually test what an export limit of, say, 5 million pounds of lobster might mean for the health of the stocks. Of course, they still don't have all the answers – all that illegal fishing, and all those unreported local landings, still pose a problem. But Medley thinks the new data Isaacs and her colleagues are collecting will be both more detailed and more accurate. The assessment they are working on now is "quite exciting," he finds. That is partly because the model can test actual proposed regulations from the Working Group's meeting for the first time – even if Medley worries that the harvest rule is "not quite as precautionary as I would like." As the data and its relevance improve, perhaps the Bahamas can regulate and fish its way to a lobster industry that science confirms is healthy. "Science is all about changing your mind," Medley says. "Not being too in love with one model and one result."[111] With that attitude, hopefully he and Gittens can find the answer the entire industry is looking for.

Conclusion

When asked about the progress of the Fishery Improvement Project, important actors in the program have positive things to say about how far it's come and its future outlook. In November 2013, Felicity Burrows, the project's administrator, said that after working hard to collect data and with more education programs and regulations in place, the Bahamas is preparing to enter the MSC process in June 2014.[112] "Overall, it's been great," Wendy Goyert confirmed in December. "We really would love to get the fishery into full assessment in the next year. It will probably be the first FIP that started at the beginning to full certification."[113] Another month after that, Mia Isaacs admitted that it would be hard work, but the Bahamas was still aiming to begin the assessment cycle again in the summer of 2014 – for real, this time.[114] As of March, the FIP's website states that they'll begin in October, if all goes according to plan.[115]

Results from elsewhere suggests it's possible for a lobster fishery to be sustainable. Mark Butler certainly thinks it is. He's not sentimental about his "lab rats," and says when people ask him if he eats the creatures he studies, his answer is "hell yeah!" But it's not just a personal taste for a succulent lobster tail that leads him to believe that if handled properly, lobster populations could sustain human appetites for decades to come. "They're hardy, they grow fast. They make a lot of sense to fish."[116] Sheila Patek, who studies crustacean sounds at Duke, concurs, adding anecdotal evidence that in marine protected areas, lobster can bounce back fast, and that she's been in marine reserves that, she says, are "paved with lobsters."[117] Doerr agrees that it's "definitely possible to be sustainable. It's almost certainly sustainable right now. You would have to try really really hard to overfish."[118]

But Butler remains concerned about the present practices of the industry. He describes the current Caribbean strategy as "fishing lobsters like they're cornfields in the Midwest."[119] His comment touches on perhaps the most troubling aspect of fishermen's attitudes towards their prey. Anger over the destruction of condos pales in comparison to the wrath the fishermen seem to express towards pirates stealing what other fishermen see as rightfully theirs – the lobster taking shelter underneath. Those that view the condos as their personal property share something with those who oppose the use of condos, besides their nationality - the sense that any lobster in the ocean is the property of a human Bahamian. Although the numbers suggest that

the industry isn't necessarily in trouble yet, it is not difficult to see how the assertion of a right to the lobster, the feeling that lobster are there for the taking – and always will be – might contribute to their rapid decline. This attitude already appears to have damaged the conch, and the world's oceans have lost healthy populations of many of their finest species to human hubris. The sea has already shown us, quite effectively, that Atlantic cod, right whales, bluefin tuna, and many of their benthic brethren are not an endless fount.[120] They do not belong to us, and treating them as if they do has caused us trouble, time and time again.

Despite these lessons, even the close-to-home story of the conch, conservation is not a priority for most Bahamians. It ranks low on the list of concerns, well below fears about crime and concerns about the poor educational system. Ironically, attention to these two matters might indirectly help the lobster make a better future for itself. It would make the Bahamas a safer place to live, for humans and lobster alike, if the government could afford to invest resources in enforcing the laws it drafts for the benefit of all. And better scientific education of both children and adults could make it easier to explain why collecting data on the lobster fishery is important, and how science can help ensure that crawfishing will remain a Bahamian specialty for decades to come.

These legal and cultural shifts are unlikely to happen overnight. Still, given the special characteristics of the Bahamian lobster industry – its scale and the relative isolation of its lobster population – it seems that if Caribbean spiny lobster are for saving anywhere, the Bahamas might be as good a place as any. Figuring out a way to achieve some semblance of similarity in the lobster industry across many Bahamian isles could do something more, too. It could serve as an example to the Caribbean as a whole, which geographically and culturally faces the same problem of different laws, attitudes, and cultures spread out among the paradise isles in a turquoise sea. Already, regional governments are discussing a course of action. The Caribbean Regional Fisheries Mechanism took up the problem of the spiny lobster in their most recent meeting in February 2014.[121] International cooperation is tricky even for developed countries, but cooperation among the governments of the Caribbean isles will be crucial to the long-term outcome for the spiny lobster. For even if the Bahamas establish and maintain a sustainable lobster fishing industry, the same effort on the part of the humans who make up the lobster industry in multiple countries would likely be necessary to guarantee true sustainability.

For the same reason that the Bahamas have the opportunity to set a positive example for their neighbors, the failure of the sustainability effort would have critical repercussions for our understanding of the oceans and our continual harvest of their bounty. If the lobster really is a hardy critter, as scientists claim, then its demise would hardly be its own fault. Lobster seem to be weathering the onslaught of viruses and lionfish. It would be humans who, through their hunger for succulent meat, would have pushed these spiny critters past the brink. And if that could happen to lobster, it could easily happen to any species in the ocean, no matter how resilient. The sustainability of the Bahamas lobster fishery is thus more than just a quest for a single nation to protect one of its most economically important natural resources. It is a measure of how well we can control our urge to clear the oceans.

Scuttling along the sandy reef bottom, ten striped and spindly legs carry a red and cream-colored armored body through the water. Out in front, two stocky antennae, thorny as rose stems, dance up and down, taking in the smells of the tropical ocean. From the right, there's a whiff of octopus, looking for a tasty crustacean meal. When confronted with such a foe, best to make a rasping noise to drive it off and hurry in another direction, towards the promising scent of a cozy lair and friendly roommates.

It is possible to meet a Caribbean spiny lobster in the Bahamas without going underwater. Aside from a macabre rendezvous through the glass of a restaurant tank, lobster can be found in an aquarium in the capital, Nassau. Their display flanks both sides of the tunnel, their enclosure bounded by the glass on one side and a yellow brick wall on the other three, complete with bricks sticking out by six inches or so to provide regular ledges for the lobster to call home. On each side, a wrought iron trellis extends from the sandy bottom towards the top of the tank, and many a lobster appears to enjoy climbing up the patterned fence. Some hide out on the wall, but most stick to the sand, a jumble of surprisingly large creatures bumping into each other with their antennae both by accident and seemingly confrontationally, curling their spotted tails underneath themselves while resting, and displaying their bellies by crawling on the glass. Despite their gangly limbs and antennae, there is something incredibly graceful in the delicate way they maneuver their bodies, particularly when they leap off a ledge or the trellis and float slowly to the bottom of the tank. Plenty of the lobster reside above the visitors' passageway, too,

providing a spectacular view of their spooky white undersides. For those who take the time to look, the lobster are transfixing.

Even a brief snapshot of the life of the Caribbean spiny lobster can upend everything we think we know about the animals we call lobsters. Yet their incredible adaptations were developed for a world where octopus and grouper, not lionfish, viruses, and above all humans are the greatest predators. They can't adapt fast enough to survive indefinitely in the world the fishing industry has created for them in the past few decades. So whether or not we can enjoy them in the future – as marvels of the natural world or as fixtures on our dinner plates - will depend on whether humans can adapt instead. In a country where the lobster matters so much to the economy, it is in the interest of Bahamians to take responsibility for this resource and not treat it as endless. MSC certification would be a milestone, an international acknowledgement that the country has made strides in properly managing its geographical gift of lobster. But it would not be the endpoint of conservation. In the grand scheme of things, the battle for Bahamian lobster sustainability has only just begun.

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