The Lionfish Effect

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Reflections on Human-Lionfish Relations in The Bahamas

By

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To Abaco, in all its beauty and pain.

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PREFACE

I write these words in the midst of a global pandemic. SARS-CoV-2 has spread to the farthest corners of the planet, upending life for most of the world in ways that were unimaginable not long ago. SARS-CoV-2 found its way into the human population, just as the lionfish found its way to the Americas, as a result of globalized travel, the trade of live animals, and an expanding ecological footprint. In effect, ecologies have been mobilized like never before, bringing their associated risks (novel viruses and stinging fish). SARS-CoV-2 and lionfish are two remarkably different beings—one hardly even considered a living creature, traversing the world and leaving behind a trail of illness and mass death; the other a resplendent venomous fish, killed en masse in celebratory ritual, and blamed for the many complex ills of a regional marine ecology. However, they share similarities in a broader context. Both are unwanted, vilified, and hazardous to human health in the new spaces they have come to colonize. Along with the increasingly common modern-day migrant or refugee, a figure that has been historically conceptualized in parallel with invasive animals and microbes, all three sit in our societal consciousness as "foreign," "other," and a source of contamination (Clarke et al., 2020). These figures pose a risk of contamination to the healthy body, to virgin nature, and to the pure (white) nation. They all illustrate in real time the ways all beings—animal, plant, virus, fungus, and bacteria alike—continually and mutually shape each other in webs of entangled existence—the ways we reconfigure and reassemble each other all the time through physical, ideological, rhetorical, and symbolic encounters. And they all highlight how humans commonly respond when a seemingly threatening figure arrives from distant lands: we declare war.

We will travel through islands and underwater worlds to unearth patterns in human-nonhuman relationships and to interpret these patterns in the context of mass ecological extinction, climate crisis, economic collapse, global pandemic, and growing societal recognition of our culpability in shaping an increasingly inhospitable Earth. We tend to think of viruses, exotic species, and immigrants as invading our bodies, our ecosystems, and our borders. But when we look closely, we see that the processes that lead to these migrations reveal that they do not occur in a vacuum. The host is often as complicit as the visitor, and only through an attention to the broader forces at work in facilitating infection, invasion, and migration will we

come to understand how best to respond to the challenges of an even more challenging world to come. Centuries-long processes of globalization, imperialism, obsessive economic growth, and ecological degradation have been elided in simplified concepts of invader/invaded. When we look closely, we are left with a new understanding of our role in global pandemic, the spread of invasive species, and international migration; we find that humans are often not only the invaded, but more importantly, the invader.

ACKNOWLEDGEMENTS

Abaco has become a part of me. It floats around in my daydreams as a collection of stunning moments and intense sadness, constantly reminding me of the interminable strength, kindness, and beauty of the Abaconian people. I thank everyone who gave me rides, fed me, took me out on their boats, answered my endless questions, told me their stories, pulled urchin spines out of my fingers, taught me how to freedive, spearfish, and filet, and allowed me to shadow their daily lives even when it was a burden to them, without asking for anything in return. Abaconians mimic their surrounding land- and seascapes—they work hard to provide, give generously, and resiliently adapt to life on the ephemeral islands. Abaco and its people have inspired me to do the same, and I have grown as a result.

Thank you to everyone at Friends of the Environment for not only giving me a home but a family in Abaco. You are all incredibly intelligent with a passion for people and the environment, and I admire you. Thank you to the Bahamas Department of Marine Resources, for your long-term support. Thank you to the Bahamas Marine Mammal Research Organization. And thank you to the people of Marsh Harbour, Little Harbour, Cherokee, Sandy Point, Grand Cay, and Hope Town for your support and friendship. You have given me experiences and a sense of connection that I hold sacred and that I will remember for the rest of my life.

This book was not my idea. My advisors Kenny Broad and Amelia Moore were working on a research project around lionfish on Abaco and when my project in Cuba fell through, they passed the idea to me. I was hesitant—I did not care much about lionfish and I was ready to quit the program—I was tired of constantly being broke and on the verge of an existential crisis. But my advisors eventually talked me off the ledge. They told me stories about Abaco, directed me towards readings, encouraged me to push through difficulties, trusted me and my process, and told me exactly what I did not want to hear, right when I needed to hear it. Throughout this journey, they helped me take their ideas and creatively redevelop them as my own, shifting not only the way I think about interspecies relationships, but my worldview in general. Thank you, Kenny, Gina, Amelia and Meryl for being the most supportive and knowledgeable book committee I have ever heard of. Thank you for pushing me to be creative, for insisting that I do work that is impactful and helpful, for giving me unwavering guidance,

and for inspiring me by simply living your lives.

A sincere thank you to the Abess family for making all of this possible. You allowed me to do something I love, with the utmost freedom, for five years. Your vision and care both as people and as an institution inspire me. Thank you, Andee. I say this all the time, but you are my guardian angel and the physical incarnation of sunshine. Thank you for helping me keep my life together, at all times. To all the Abess students, thank you for inspiring me with the work that you do in the spirit of justice and care. A special thank you to Galen for your guidance throughout my time in Miami. Thank you as well to the University of Miami Institute of the Americas, National Geographic, Explorer's Club, and the University of Miami GAFAC fund for funding my work.

Lastly, I thank my parents. Your support has allowed me to take risks, explore my inner being, and act on my intuitions—I cannot think of a more priceless gift. You decided to start your lives anew in a foreign land, so that I could live the life I have lived—full of adventure and opportunity. I am forever grateful.

INTRODUCTION

The Indo-Pacific lionfish is the highest-profile marine invasive species in the world. In The Bahamas, lionfish have developed particularly high population densities and are thought to pose a significant threat to the nation's marine biodiversity and native fisheries given their insatiable appetite for other fish. Differing dominant narratives surrounding the lionfish issue in The Bahamas show that this invasive fish is not only an environmental issue, but also an undoubtedly political one. In *The Lionfish Effect: Reflections on Human-Lionfish Relations in The Bahamas*, author Shireen Rahimi explores the dominant discourses surrounding perspectives of the lionfish invasion and efforts to promote their killing and consumption in The Bahamas, as well as how different groups there (including foreign tourists, Bahamian nationals, and Haitian immigrants) encounter and relate to these invasive animals.

The author explores these themes in the aftermath of Hurricane Dorian, a storm which exposed the cracks in the foundation of the social, economic, and governance structures of The Bahamas. The issue of lionfish reveals how societies are adapting to novel ecosystems given new understandings of the human role in driving large-scale planetary change and how these adaptations are mediated by class, race, and the flow of power. Understanding how societies are adapting to disturbance today can inform alternative ways of relating to nature, equipping human societies with greater resilience against the disturbances of the future.

CHAPTER 1

INTRODUCTION

The official story goes something like this: *The Indo-Pacific Lionfish (Pterois volitans) is the most widespread marine invasive species the world has ever seen. A popular aquarium fish, lionfish were likely introduced into Florida waters by aquarium hobbyists in the mid-1980s. Since then, because of its voracious predatory behavior, astonishing fecundity, and broad habitat distribution, the lionfish has spread across the Western Atlantic and Caribbean—all the way from North Carolina to Venezuela—wreaking havoc on coral reefs and other marine ecosystems. Imagine the scene: a swarm of lionfish float motionlessly over a barren coral reef otherwise devoid of all life—one that has met its fate because of the merciless invasion of the destructive lionfish. Eradicating this fish isn't possible, but managing it is—we must kill and eat every single one we can.*

As with most complex environmental problems, the story of lionfish is a fascinating one. It conjures vivid images in the mind's eye; a few small fish are carried across the world by humans, released into an ocean far from their home, find mates in the right place at the right time, and slowly spread through waters that span almost a quarter the length of the Americas. And, as with most complex environmental problems, the story of lionfish is a layered story, far more complex than it might seem. Moving through then, beyond questions of ecology and biology, I seek to tell a multi-faceted, mixed-medium, localized, and yet untold story—not of generalized lionfish "invasion," but of lionfish-human encounter. I pay attention to the less obvious combination of forces, such as the unregulated trade of living beings, environmental degradation on a regional scale, the role of dominant narratives from science and media, and the practices of local fishers that have shaped the real-world consequences of the spread of lionfish, both above and below the water.

Lionfish are an environmental problem because they eat small fish at an extremely high rate (Morris et al., 2008); fish that would otherwise grow big enough to support healthy marine ecosystems, sustaining coastal human communities and economies. They are also dangerous—the venomous sting from the dorsal fin of a lionfish is extremely painful. Every sharp, hollow

spine on the lionfish besides the caudal spine (Fig. 1-1) contains a venom gland. When the spine penetrates flesh, the integumentary sheath covering the spine is depressed and venom is injected from this gland into the victim (Morris et al., 2008). Stings most often result in intense pain and swelling, lasting numbness, and—for even the toughest fishers—one or two days out of work. In extreme cases, stings can result in no reaction at all, or in the case of small children, the elderly, and those with preexisting health conditions, death (Morris et al., 2008). This makes the fish potentially hazardous and inconvenient to fishers, tourists, and most anyone who is ocean inclined. Therefore, places with a heavy dependence on fishing or coral reef tourism as a source of income are most at risk of being negatively impacted by the presence of lionfish. This includes the island of Abaco.

Fig. 1-1 The lionfish, showing venomous and nonvenomous spines (Siew, 2019).

Situated in the northeastern Bahamas, Abaco is a good place to ask questions about lionfish: a long, slender strip of low-lying limestone covered in tall Caribbean pine trees and palms, fringed with glassy turquoise waters, and favored by North American fishing tourists for its relatively bountiful waters.[1] The lives of Abaco residents are irrevocably intertwined with the ocean (Bethel, 2000; Craton, 1992).

Abaconians are heavily dependent on the ocean for their livelihoods (Broad & Sanchirico, 2008). The island's relatively healthy fish populations and coral reef ecosystems, miles of picturesque, uncrowded, white sand beaches, underwater caves, and proximity to mainland United States (about 180 miles) make Abaco an appealing tourist destination for North American fishers, divers, boaters, and families looking for a slightly off-the-beaten-path, nature-oriented island vacation. Tourism is a major industry on Abaco. The island is one of the most popular tourist destinations in The Bahamas, a country which receives about 70 percent of its total $13.02 billion USD GDP[2] from that sector, and in which over half of jobs are tourism-related (US Department of State, 2022).

Given the extent of the tourism industry and the resulting tourist demand for seafood and other ocean-related services, many Abaconians make a living through direct interaction with the ocean that surrounds them—and that means many frequently encounter lionfish during their day-to-day activities. These are the fishers, dive operators, tour guides, boat captains, educators, and marine scientists who call Abaco's waters their place of work, as well as others who simply enjoy the ocean recreationally as spearfishers, boaters, bathers, snorkelers, and swimmers. Further, through government, NGO, and media messaging, as well as real life experience, most living on Abaco have given the lionfish problem some thought regardless of their occupations or hobbies. Because The Bahamas' lucrative tourism industry is centered on ocean-related activities, any ocean-related issues that might come up for the island become important for the nation. As a result, the appearance of lionfish in the waters of Abaco, as in the rest

[1] While some fish stocks in The Bahamas are steadily declining to alarmingly low levels, the country's fisheries are generally relatively abundant compared to those of neighboring Caribbean Island states. This is because of the country's small population size relative to its total length of coastline. The Bahamas is therefore seen as a prime fishing destination. It is also often discussed by foreign scholars as an example of what the Caribbean "used to be"—an apparent reference to the contrasting state of Haitian and Jamaican waters, which have been "fished-out," and which also align with notions of Bahamian superiority within the greater Caribbean region (Moore, 2019).

[2] For 2019 according to World Bank (*The Bahamas*, n.d.).

of The Bahamas, Caribbean, and southeastern U.S., has been treated as an important problem in need of attention.

Before we continue, I ask you to let go of everything you know about lionfish. We move past media, science, and policy narratives around lionfish to uncover an unconventional story about what happens when a postcolonial island meets a strange fish. This story questions mainstream narratives to dig deep into the ways humans, lionfish, native fish, and coral reefs interact; the ways knowledge flows from fish to scientists to policy makers to fishers, then back to fish; the combination of events that prepare landscapes for "invasion;" the ways race and politics form a prism through which we view other organisms; and the ways my own subjective experiences as a scientist, artist, and child of immigrants shape the questions I ask.

And the questions I ask lead us to unexpected places. We find out what it looks like when humans and lionfish meet (Haraway, 2013b)—underwater, online, and at the dinner table; what responses to lionfish look like, from the slightest pang of anxiety in a spearfisher's chest at the sight of a lionfish drawing closer, to the organization of yearly lionfish tournaments to encourage mass-scale lionfish culling and consumption; how these responses, adapting to the presence of a new environmental hazard, are mediated and shaped by complex social, political, economic, and ecological histories. And, taking a step back, what we learn from this rich story of interspecies encounter about the way we as humans respond to environmental challenges. These real-world lessons help us respond to the "lionfish" of the future: the many strange encounters that inevitably await us on an increasingly inhospitable planet. This is a story of not what is right and wrong about human-lionfish relations, but of the implications of interspecies relations in the context of our contemporary world and its no-longer-certain future.

Chapter map

In Chapter 2, we begin our journey into human-lionfish worlds through in-depth analysis of human-lionfish perceptions on Abaco. We look at how fishers and others who encounter lionfish on Abaco perceive lionfish and their effects on marine ecosystems. I show how the dominant discourse surrounding lionfish, passed on to laypeople through the authoritative knowledge-spreading institutions of scientists, NGOs, government agencies, and the media work to shape social consciousness around this environmental problem, and the ways counternarratives persist in their midst. I also use these findings to examine the cultural politics that emerge from the Abaconian engagement with lionfish, paying close attention to the ways in which histories of exploitation, marginalization, conditional belonging,

foreign immigration, and racial tension—which have shaped the national Bahamian discourse in general—shape or mirror the national discourse around invasive species, and in turn marine science research, policy changes, NGO activities, and market dynamics associated with the lionfish problem.

In Chapter 3, we explore the ways people act with lionfish—what lionfish-human encounters look like in real time, how are they infused with affect, and how lionfish are processed, commodified, and regulated. We see how human-lionfish interactions differ in distinct socio-economic contexts. For example, we find that wealthy, recreational spearfishers relate to the fish differently than resource poor Abaconians who spearfish to feed their families. We examine these observations to provide context-specific insight into how people adapt to the possibility of new fisheries and to understand how actors reflect on their acts of killing, and what these reflections can tell us about multispecies relationships in general.

In Chapter 5, I examine the ways that lionfish and undocumented Haitian immigrants after Hurricane Dorian are perceived and discussed, and the patterns that emerge from the juxtaposition of these two instances of societal response. We see how reactions to and perceptions of lionfish following their arrival to the island parallel with reactions to and perceptions of Haitian immigrants after Hurricane Dorian, and how these reactions at times result in violent consequences for those involved. On the flip side, we see how Abaconians' anxiety around Haitian immigrants is perhaps oversimplified by reporters and social scientists to sensationalize or oversimplify a complex situation. I illustrate that flora and fauna (including humans) do not flow across boundaries in a vacuum—they are directed and regulated through political and economic processes, using societal narratives and symbols to drive perceptions and therefore action. This is an exploration of the ways humans react to unanticipated changes in the environments they depend on for their livelihoods, and how an understanding of the patterns that emerge from these reactions can be used to understand the ways we make sense of other aspects of our rapidly changing, interconnected, globalized world.

In all the abovementioned chapters, I insert images that I captured to illustrate and drive the themes and findings I discuss in my textual analysis. In both the process of creating and discussing these photographs here, I build upon theory from visual anthropology, rejecting the idea that images are inferior to the written word in representing ethnography, and embracing the inherent subjectivity of film and photography to help produce a particular truth (Pink, 2020).

In Chapter 6, I conclude by summarizing the findings of my research. I direct my discussion of these findings towards uncovering new ways of understanding a familiar problem. Understanding lionfish can help us come up with more effective, innovative solutions to the problems these animals pose. Understanding lionfish can help us realign our priorities in addressing invasive lionfish while resisting the influence of emotional appeals, late capitalist designs, and sensationalist narratives. I aim to provide straightforward, practical insight on the lionfish problem that can potentially be used to reimagine research and policy design at local and national scales.

I interpret the entirety of my personal experiences through a self-reflexive, narrative-driven, naturecultural lens—a theoretical framework that allows me to move beyond more limited, disciplinary forms of ethnography to conduct a highly interdisciplinary and self-reflexive analysis of the process and conclusions of my knowledge-creating activities (Malone & Ovenden, 2016; Subramaniam, 2014b). I use this theoretical framework to lend consideration to the ways in which gender, race, class, sexuality, history, and nationality shape the knowledge, practice, and results of this study, and to reflexively study the ways in which my personal experiences and lived identity play a defining role in the process of knowledge production. I also apply this analytical method to compare the diverse theories and methods I use, explore the advantages and disadvantages of each theoretical approach and the gaps that exist between them, and reflect on any other ways in which my personal research experience may shed light on greater questions of anthropology, fieldwork, and our rapidly changing understanding of human-animal relationships.

The purpose of this book is to challenge dominant narratives around lionfish, as a way of challenging dominant narratives in our understanding of a changing world more generally. The story we have been told by science and the media might not be playing out the way we expected it to. By considering diverse human and animal perspectives, this book tells a multi-faceted story about human-lionfish encounter and calls into question the human tendency to jump to simplistic conclusions. Problematizing this tendency towards reductionism allows for the formulation of more reasonable solutions—solutions in which we efficiently use scientific attention and resources to accurately and rationally determine which introduced species are most detrimental and in need of management, which can be closely monitored, and which can be, rather than disproportionately villainized, adapted for positive benefits to humans and other beings. Understanding the ways we discuss and relate to lionfish helps inform solutions that address environmental threats in proportion to their detrimental impact on ecosystem balance and collaborative, multispecies thriving.

In pursuit of this goal, the story in these pages highlights the importance of understanding the perspectives of science and governance on human-natural problems, while at the same time paying equal attention to the everyday, material realities of the living beings implicated in these problems. This is an important exercise to practice on a rapidly transforming Earth. Understanding how to adapt to future scenarios of planetary change will mean understanding what real people and life forms did in response to the environmental challenges they encountered—not what the science predicted might happen. Our reactions to a strange fish tell us about how we will react to a strange future, a future that awaits us on the other side of climate scenarios, land use change, and extinction rates—when we are no longer adapting to an unfamiliar fish, a strange aspect of our familiar world, but rather a fundamentally unfamiliar version of "nature" itself.

A brief history

First, let us familiarize ourselves with our destination. The Bahamas is a mosaic of 700 islands. Within this mosaic, coral reefs, mangroves, sandy beaches, estuaries, underwater caves, pine forests, coastal hammocks, and shallow sandy banks merge into one beautifully complex island tapestry. The islands are filled with fish of all imaginable kinds, iguanas, medicinal plants, hundred-year-old corals, fruit trees, boisterous parrots, goats, chickens, and coconut palms, all of which arrived in the islands from other places, some more recently than others. It has also been home to many people—indigenous Lucayan populations, and later the Spanish colonizers who committed colonial genocide against them. Then, British loyalist settlers, their slaves, and the descendants of both, Haitian immigrants arriving from colonial times to today, and expatriates from around the world—all of whom arrived from other places, some more recently than others. Before all this in-migration, The Bahamas formed when Pangaea Earth cleaved apart and formed the Atlantic Ocean basin, where tiny sea animals thrived, then died and settled to the sea floor in successive layers over millions of years. These layers eventually formed The Bahamas accretionary platform, an estimated 3.5-mile-thick layer of limestone that makes up the Bahamian islands of today. For this reason, in the case of The Bahamas (from the Latin *baha mar* or shallow seas), there is no way of knowing how many times it has been underwater, as sea level is always changing. As Campbell (1978) writes, "These are the ephemeral islands;

there is no permanency here, no certainty except that the land will eventually return to the sea and no doubt later be resurrected."[3]

This drumbeat of impermanence reverberates throughout the history of the Bahamian islands, from the days of Pangaea to the present moment. The modern incarnation of The Bahamas arose from the sea 70,000 years ago. Following many plants and animals before them, the first indigenous Lucayans arrived on Bahamian shores from the neighbouring islands of Hispaniola and Cuba sometime between 500 and 800 CE (Campbell, 1978). In 1492, Christopher Columbus set foot in the Americas for the first time in San Salvador, Bahamas, and by 1520, every Lucayan had been enslaved and removed from The Bahamas (Campbell, 1978). The islands then went through a 150-year period of abandonment until, in 1648, a group of British Puritan and Republican adventurers sailed to The Bahamas from Bermuda, which had become overpopulated, in search of political freedom and economic opportunity. They named the island they arrived on "Eleuthera" from the Greek adjective eleuthero's, meaning "free" (Collinwood, 1989). This was the supposed starting point for the development of "civilization" in The Bahamas. The religious convictions of these early explorers persist to this day, as The Bahamas are characterized as a decidedly "Christian nation."

The adventurers were soon joined by unwanted, "troublesome" slaves sent from the mainland United States, and eventually, British loyalists and their slaves, fleeing the United States following the British defeat in the Revolutionary War of 1776 (Collinwood, 1989). All these immigrants found, upon arrival, that conditions in The Bahamas were not conducive to the preferred mode of business as usual: the colonial plantation system implemented throughout the Americas, which used slave labor to convert natural resources into accumulated wealth for European masters. The settlers found that large scale agriculture could not last long on the thin, nutrient poor soil of The Bahamas—an early sign of impermanence. The untenability of the plantation system meant many slaves were subsequently freed or kept as domestic servants, as there was no use for them. This led to a series of revolts by Afro-Bahamians against their overseers from 1788 onward, which, along with diseases like malaria, pushed many of the white settlers into the barrier cays off Great Abaco's[4] eastern shore. As a result, there was an early separation by race on Abaco, which can be seen to this

[3] See Moore (2015) for a discussion of the characterization of The Bahamas as "ephemeral islands" in an era of planetary crisis.

[4] The main, large island of Abaco is called "Great Abaco," which along with the rest of the smaller, fringing islands (like Elbow Cay, Man-O-War, Grand Cay, and Green Turtle Cay) make up the "Abacos."

day in the difference between the mostly white settlements of Hope Town, Man-O-War, and Green Turtle Cay on the barrier cays to the east, and the mostly-black settlements of Sandy Point and Fox Town on the Abaco mainland (Craton, 1992; Reaser, 2004).

The unique geophysical conditions of The Bahamas resulted in a cultural, economic, and political reality that set the island nation apart from its Caribbean neighbors. The relatively early and widespread emancipation of slaves on Abaco meant Afro-Bahamians were afforded earlier and easier opportunities for assimilation and eventual equality. This led to retention of fewer cultural, linguistic, and religious traditions brought from Africa in comparison to other Caribbean nations (Collinwood, 1989). Further, because it proved impossible to create a plantation economy on The Bahamas, the economy developed in stark contrast to its coffee, sugar, and tobacco exporting neighbors to become commercial and extractive in nature (Johnson, 1996).

This economic system eventually embraced financial servicing and a parasitic dependence on tourism from external nations as its main sources of revenue—an economic structure that persists to this day.

Slaves freed in colonial Bahamas became not truly free, but rather controlled and marginalized by the white hegemonic class through economic and political means. But eventually, as the number of black Bahamians on the islands slowly grew to outnumber whites, black Bahamians began to organize politically. In the 1950s, two political parties formed, one made up of the descendants of English colonizers, who retained economic control of the country, called the United Bahamian Party, and the other representing the black Bahamian majority, called the Progressive Liberal Party (PLP). In 1967, Lynden Pindling of the PLP became the first black Premier of The Bahamas and eventually achieved peaceful independence from Britain in 1973 (Collinwood, 1989; Craton, 1992). The PLP's black majority rule was, among other things, intent on protecting The Bahamas for Bahamians, which led to a series of restrictions on immigration, work permits, and property ownership laws intended not only to benefit native Bahamians, but also to secure economic and citizenship opportunities for black Bahamians. These opportunities were seen as critical to protect, as they had been historically unavailable to them up until that point and were now seen as threatened by the significant numbers of white immigrants arriving from the United States and black immigrants arriving from the wider Caribbean, the majority of whom were coming from Haiti (Craton, 1992). These early reactive and protective racializing political impulses can be found to persist in the Bahamian government's immigration policies to this day.

While independence and political control eased the economic restrictions placed upon black Bahamians until that point, the control of the Bahamian economy by wealthy financiers who drive tourism development and investment in the country—resulting in tourism infrastructure that is not intended to benefit resident Bahamian communities and a dependence on external nations for tourism revenue that undermines the economic resilience of the nation—has been exponentially expanded by the PLP and subsequent parties in power (Collinwood, 1989). This has meant a steady increase in the country's GDP, but questionable long-term benefits and economic security for everyday Bahamian citizens.

The history of The Bahamas started with genocide, then was followed by an unconventional manifestation of a slave economy, the emergence of settlement communities segregated by race, and finally an independence movement that claimed victory for black Bahamians while in many ways upholding the status quo and economic and social structures of colonial rule. This history, unique to the region, has resulted in comparably unique racial dynamics. I came to understand that race relations in The Bahamas are complex, nuanced, and unintuitive—quite different from what I had grown up experiencing in the United States. Many people I spoke with about race on Abaco dismissed the topic as unimportant and irrelevant (implying a racial harmony on the island). And yet, the topic of race came up frequently in my conversations with people across the demographic spectrum, and people seemed comfortable discussing the topic head on in a way that has only recently become more mainstream in the United States.

Interestingly, expressions of racial solidarity did not fall along the lines of white/black. One interlocuter expressed to me that he felt that Abaco is characterized more by xenophobia—a distrust of "outsiders"—than racism, as black Bahamians typically show solidarity with other Bahamians (whether white or black) over those of Haitian descent, with whom they share African ancestry.[5] The origins of these racial dynamics can be found

[5] As I discuss in more detail in Chapter 5, The Bahamas illustrates important differences between the terms "xenophobia" and "racism." I use xenophobia here to denote negative feelings, such as dislike, hatred, and fear, against "foreigners," or any being that comes from another place (Harris, 2002). Racism, on the other hand, is the oppression of people based on race, in which power is given to the oppressors to make and enforce decisions, allocate access to resources, define reality, and set standards of what is deemed appropriate behavior (Bivens, 1995). In the case of The Bahamas, some might argue that anti-Haitian sentiment can be defined as xenophobia, as black Bahamians who share Haitians African ancestry participate in this antagonism alongside white Bahamians. Further, Haitians are seen as foreign in large part due to massive cultural and linguistic differences between the two nations, one being colonized by France and the other by Britain. I would argue, in line with

in the Bahamian government's historic stance on restrictive immigration measures as discussed above, as well as earlier efforts by European slaveowners in The Bahamas to demonize the Haitian slaves that were arriving with their French masters in the aftermath of the Haitian Revolution of 1791 to 1804, out of a fear that these Haitian slaves would introduce Bahamian slaves to the "dangerous" concept of freedom (Nicolls, 2010).

These problematic features of modern Bahamian society were brought into bold relief during the most recent drumbeat of impermanence to strike The Bahamas: Hurricane Dorian. In September 2019, one of the largest Atlantic hurricanes to make landfall in recorded history hit the islands of Abaco, Grand Bahama, and Eleuthera, resulting in thousands of reported casualties. What followed was an unimaginably chaotic scene of death by drowning and family separation, houses torn to shreds by wind alone, confusion, fear, government incompetence, and a tremendous influx of foreign aid. In a matter of two days, the commercial center of the island of Abaco was completely flattened. For the surviving Haitian immigrants on the island, fear set in about whether seeking disaster aid would lead to their deportation. Fears that had been salient for undocumented Haitians in the Bahamas were now heightened and not without reason. And for the Abaconian economy, almost entirely dependent on the arrival of overseas tourists, life seemed to stop in its tracks. Abaco, swept away by winds of impermanence, was suddenly left to survive on the organization, ingenuity, and collaboration of local communities, some government assistance, and in large part the philanthropy of foreign nations.

This Bahamian landscape, its history marked by a constant certainty of change, was, at some point, fittingly made home by the lionfish—a creature that serves as an apt metaphor for the planetary consequences of anthropogenic forces and the large-scale movement of beings across geographic and imaginary borders. The story of lionfish in The Bahamas is an ideal case study for the ways humans make sense of environmental change. The ways we think about lionfish are paralleled by the ways we think about other types of change, such as the new reality of the Anthropocene, the demographic-shifting forces of immigration, and hurricanes which, because of climate change have become stronger and more frequent than ever before. *In other*

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the work of several scholars on this topic (Louis, 2019; Nicolls, 2010; Perry, 2017), that this anti-Haitian sentiment is both xenophobic and racist, as Haitians are racialized as "blacker" and "more African" than Bahamians, and the ways in which they are stigmatized and marginalized in Bahamian society is carried out through institutional systems of oppression, namely the citizenship documentation process and the labor-contract system.

words, the way we relate to lionfish tell us less about lionfish and more about ourselves.

Theoretical context

I approach these questions while grounded in a synthesis of diverse theoretical perspectives spanning the fields of anthropology, biology and ecology, political ecology, and philosophy. Here, I review the theoretical approaches through which I make sense of my experiences and observations, and the shifting tides that are revolutionizing the theories coming out of these fields.

A multispecies approach

A central, and quite critical, theoretical lens I use to interpret my findings is the thorough critique and rejection of the traditional dualisms deep-seated in intellectual thought, such as human/nonhuman and nature/culture, elaborated by several scientists and humanists (Derrida, 2008; Fuentes, 2010; Haraway, 2003; Haraway & Proctor, 1998; Latour, 2012). My work is based on the understanding that the Western conception of humans and nature as occupying separate realms is a false dichotomy. Worldviews held by many indigenous communities for millennia are proving to be more useful for making sense of what is becoming increasingly clear to practitioners working in real world naturecultural contexts: humans and nonhuman forms are inextricably mixed-up. This has led practitioners to advocate for new frameworks proposing that the world is more than multicultural: it is multinatural, consisting of ecologies that can change and evolve, and can be sensed and valued in many ways (Bingham & Hinchliffe, 2008; Latour, 2004), as well as more-than-human (Whatmore, 2006). The resulting view is of the planet made up of lively collaborations between both living and nonliving actors (Lorimer, 2012) and "literally filled to the brim with different creatures" (Collard et al., 2014, p. 323) of which only one happens to be humans.

I put on my dive gear, walk out into the ocean, dodging sharks chasing after schools of bonefish, and creep up to an underwater boat wreck teeming with fish, rays, and three resident lionfish. As I approach, they slowly come closer, allowing me to observe them closely for long periods of time, while every so often, I come up for air and to adjust my position further away from these inquisitive, yet venomous creatures. I note the way they follow me with their eyes, stay close to the bottom and to structures, and glide along at a

slight angle with schools of small prey fish, pretending to be uninterested in their preparation to strike.

I closely observe the lionfish I come across to see what they can tell us about the human-lionfish relationship that the humans in this relation cannot. What if, in this frightening age of unprecedented extinction, we decide to resist the temptation to colonize and dominate nonhuman others, and instead embrace the vulnerability of sharing our lives with them, as venomous and scary as they may be (Parreñas, 2018)? Multispecies scholars answer questions like this by immersing themselves in the entangled relations between humans, animals, plants, and microorganisms that bring one another into being through their relations (Concha-Holmes, 2015; Smart, 2014; van Dooren et al., 2016). They lend attention to the forms of knowledge that nonhuman beings can contribute to holistic understandings of human-natural systems. Adopting a multispecies approach meant spending hours underwater, watching spearfishers kill, avoid, and ignore lionfish, and watching lionfish behave in response. By allowing for an epistemological pluralism (Kirksey & Helmreich, 2010), attendant to diverse forms of expertise from diverse forms of life, the authority of science is opened to nonhuman ways of knowing, and lionfish become driving characters alongside humans in this story of how species intertwine.

Multispecies scholars draw on long histories of relational thinking from North and South American indigenous peoples (Kohn, 2013; Whitehead, 2013) and pay particular attention to power inequalities of different individuals and groups of living beings, as well as histories of race, gender, and colonialism (van Dooren et al., 2016). These scholars assert that new awareness of how our species is entangled with others is critical to understanding the world better and how to survive its current era of intensifying processes of ecological, social, and biological destruction (van Dooren et al., 2016; Tsing et al., 2017). The bulk of studies on fish-human interactions come from maritime anthropology, a field that has focused mostly on understanding how a community is defined—socially, economically, and culturally—by living off the fruits of the sea. These studies describe fisher narratives, fishing economies, forms of traditional ecological knowledge, and social organization structures around the act of fishing (Moore, 2019). In this book, I use the more exploratory, affective focus of multispecies studies to investigate what can emerge when humans, fish, and their shared landscapes become entangled in the uncharted Anthropocene.

The new subfield of natureculture similarly builds upon the rejection of the modern western dichotomy of humans and nature. Emerging out of insights from the field of feminist science and technology studies (FSTS),

natureculture draws on diverse disciplines[6] to focus on the ways categories of gender, race, class, sexuality, and nationality shape scientists, science culture, and the use of the scientific process to understand the nature and implications of socio-ecological relations (Haraway, 2003; Lorimer, 2012; Subramaniam, 2014b). Naturecultural work considers knowledge an active engagement with the systems and individuals being studied. Practitioners are immersed in the material, historical, political, and economic contexts they are studying and aim for an experimental, constantly reflexive practice that allows for inductive reasoning and emergent, unrestrictive insights (Subramaniam, 2014b). As with multispecies studies, naturecultural work calls for a shift from the human-centric approach to understanding human-nonhuman relations—all nonhuman beings are considered dynamic, living actors that possess agency and unique stories to be told (Puig de la Bellacasa, 2010; Subramaniam, 2014b).

Using the natureculture approach helps me pay close attention to the ways science has shaped public narratives, and thereby social and environmental policy change, around invasive species such as lionfish (Cardozo & Subramaniam, 2013; Comaroff & Comaroff, 2001; Keulartz & Van der Weele, 2008; Larson, 2008; Subramaniam, 2014b). Studies have shown that discourse in invasive biology and ecology connect the concept of "invasive" with "harmful", making it a moral issue. While the projection of moral claims onto the scientific process has been central to science throughout history, feminist studies of science and technology have shown that moral judgements have no place in the scientific process, as they transcend the role of science to describe and explain the consequences of environmental change (Brown & Sax, 2004; Hall, 2013; Subramaniam, 2014b). Subramaniam has used an explicitly naturecultural lens to explore the ways these discourses circulate through, and effect change in, socio-ecological assemblages involving introduced species. I draw on a naturecultural approach to attend to the ways scientific knowledge about lionfish has been distilled into dominant discourses, and channeled through media outlets, the halls of government, school classrooms, fishing communities, and the homes of everyday people to tangibly impact human-fish-seascape realities.

Natureculture is also useful to this study in that it places a unique methodological emphasis on the use of experimentation and iterative self-reflection to understand how practitioners' subjectivities shape their scientific framings and methodologies. This framing allows me to account for the fact that in studying socio-ecological relations, I and others like me are inevitably situated within our own personal context, and to deny this context does not imply objectivity, but rather a lost opportunity for more a

[6] The world itself is not disciplinary (Subramaniam, 2014b).

complex and rich analysis of the findings (Subramaniam, 2014b). I integrate naturecultural self-reflection into my analysis, illuminating the ways in which my own personal experiences and subjectivities influenced the ways I formulated questions, designed a data collection process, interacted with informants, conducted data analysis, and framed my results. Science is inevitably subjective.

Transparently discussing my subjectivity as a researcher and interrogating the ways it influences the work I create, makes for more thoughtful and rigorous scientific inquiry.

The question that guides my reflective journey is: what do I have to do with it? What does it look like when an Iranian American woman, a child of immigrants, who grew up in a diverse, working class suburb, spent formative years in New York City, then matured in the (sub)tropics—no stranger to what it means to be on the outside, or not quite "from here"—goes to the northernmost island in The Bahamas to inquire about a definitely not "from here" fish? My experiences shape the information I gather, the words of fishermen that I choose to take note of, the moments I carry with me long after I leave, and the stories I choose to recount in these pages. The form that my subjectivity takes is one that is open to marginalized people and narratives. This is why I draw ideas and inspiration from the work of Black American intellectuals—as Canty (2016) has pointed out, those who are marginalized often question the mainstream, and provide more diverse, obscure, and imaginative perspectives to the social-environmental problems that affect the whole of society. My subjectivity is also open to diverse forms of knowledge, and to questioning the patterns in thinking that our species can be so prone to replicating blindly and to our own demise. I am asking, how can we live differently, how can we care for all life, even if that means sometimes taking it? There must be a way!

Political ecology

To imagine alternative ways of living, we must pay attention to the ways in which humans and nature encounter, influence, and co-constitute each other. This inevitably requires an engagement with the political. These human-nature influences are forms of power, which flow through institutions across scales, shaping human knowledge about, relation with, and action on the environment. Tracking the ways these flows of power are channeled through governments, private companies, NGOs, etc. is important, to avoid the common mistake of formulating solutions to social ecological problems in a way that perpetuates the very same movements of power that have caused environmental problems in the first place. I use a political framing

throughout this work—the world, its beings, and all our relations (Wall, 2013) are inevitably caught up in political associations and must be dealt with as such.

The political lenses through which I analyze my results draw heavily on the field of political ecology. Political ecology came about in the 1970s when scholars felt a void in the research disciplines of the time, where ecologists for the most part studied the environmental realm in isolation from human activities, ignoring the political and economic forces at work in environmental concerns. Political ecologists fused disciplines to address this gap, stressing "not only that ecological systems are political, but also that our very ideas about them are further delimited and directed through political and economic process" (Robbins, 2004, p. 11). The field features theoretical principles and structural frameworks for the organized study of human-environment relations, paying close attention to the forces of globalization (Harcourt & Escobar, 2002) and late capitalism[7] (Gibson-Graham, 2002) in shaping modern social ecological realities.

The work of political ecologists pioneered an attention to the role of political forces in shaping human-environment realities, gradually causing a change in the way scientists approach complex environmental problems. Work attending to invasive species has centered on conflict between natural and social scientists around the language used to discuss invasive species. Natural scientists (invasion biologists) tend to use catastrophe metaphors, hyperbole, and other dramatic language to discuss nonnative (or simply ecologically detrimental) species, illustrating the way many invasion science practitioners have allowed bias and value judgments to influence assertions of scientific fact (Carballo-Cárdenas, 2015; Humair et al., 2014; Larson, 2007; Robbins, 2004). Critics say that this type of language delegitimizes potentially useful scientific findings, creating barriers to communication and policy action (Orth & Schmitt, 2018) and promotes an antagonistic relationship with the natural world that is counterproductive to conservation (Humair et al., 2014; Larson, 2008; Selge et al., 2011). Further, scientists are increasingly finding that sociobiological networks, not species themselves,

[7] Capitalism is the landscape of exchange and value that dictates the material terms of our existence here in the West. At its inception, early capitalists were fixated on the accumulation of wealth leading to economic growth and the expansion of industry. This fixation has been foundational to the societal consciousness of nation states around the world for most of modern time. Societies have been obsessed with territorial expansion, industrialization, and economic growth. These conceptions of growth continue into the current day, as late capitalism—the evolution of capitalism to the point where everything is commodified and consumable—has now been exported to every corner of the planet.