



FISH WARS

THE CAUSES AND
CONSEQUENCES OF
FISHERIES CONFLICT
IN TANZANIA

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SECURE FISHERIES

Advancing Sustainable Fisheries
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FISH WARS:

THE CAUSES AND CONSEQUENCES OF FISHERIES CONFLICT IN TANZANIA

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EXECUTIVE SUMMARY

Fisheries conflicts are on the rise. Declining fish populations, rising demand for seafood, and efforts to reduce widespread illegal fishing are increasing the risk that conflict over fisheries resources will undermine stability and peace in our waters. Greater understanding of the links between fisheries and conflict are needed to predict where such conflicts may occur and how they can be prevented.

Secure Fisheries is proud to announce the Fisheries Conflict Database. Our goals are threefold:

1. to establish a protocol for collecting event-level fisheries conflict data,
2. to determine whether fisheries conflicts are increasing or decreasing in frequency, and
3. to characterize and quantify the drivers of fisheries conflict.

In our first study, we investigated the frequency, causes, and consequences of fisheries conflict in the United Republic of Tanzania between 1990 and 2017. Tanzania ranks in the top ten African nations in fish catch. Fisheries are important to its economy: fisheries directly employ over 183,000 fishers, and another 4 million people are engaged in boatbuilding, fish processing, and gear repair. The top three fisheries—dagaa, Nile perch, and cichlids—are critical sources of food and income to fishing communities in Tanzania's lakes and rivers. Tanzania's coastal communities also depend on healthy coral reefs for tourism and fisheries revenue.

Tanzania is recognized as one of the most peaceful nations in East Africa: it has not experienced the civil wars that have plagued other East African nations. But stories of fisheries conflicts—often with deadly results—abound.

- In Lake Victoria, border conflicts with Ugandan and Kenyan fishers have led to security operations, widespread confiscation of fishing gear, and imprisonment of hundreds of fishers.
- In Lake Tanganyika, Tanzanian fishers were attacked, abducted, and killed by rebel groups for their fish, their gear, and their boats.
- Along the coastline, illegal dynamite fishing has caused community protests, clashes between fishers and security forces, and territorial fights between tourist hotels and fishing communities.

Are these conflicts becoming more widespread? What are the consequences for fishing communities? And how can we avoid or reduce fisheries conflict?

To answer these questions, the Fisheries Conflict Database collects incidents of fisheries conflict at the level of individual events. We define a Fisheries Dispute Event (FDE) as *an incident in which a fisheries resource is contested, disputed, or the source of conflict between a minimum of two human actors, at a discrete temporal moment, and in a discrete location.*

We reviewed news reports for the occurrence of fisheries conflict. Event-level coding provides the date, location, actors, consequences (e.g., fatalities), and drivers of the conflict. For each FDE, we noted if any of the following drivers were causes of the conflict: reduced fish populations, ecosystem change, weak governance, political marginalization, market access, poverty, illegal fishing, increased fishing pressure, increased fishing efficiency, fishing-ground limitations, foreign fishing, multiple scales of fishing operations, maritime crime, food insecurity, or civil unrest.



Top: fishers pulling in nets on the Tanzanian coast. WorldFish, Samuel Stacey. Bottom: a woman catches small fish and shrimp in a drag net. WorldFish, Samuel Stacey.

Main Findings

- Fisheries conflicts are increasing in both frequency and intensity.
- The two primary causes of fisheries conflict are illegal fishing and declining fish populations.
- Most conflicts over illegal fishing involved Tanzanian—not foreign—fishers.
- Most conflicts were between Tanzanian fishers and government actors.
- Fisheries conflict in Tanzania resulted in 498 arrests, 41 fatalities, and eight abductions.
- Conflict was most intense in inland water bodies that share international borders.
- While women play an active role in the post-harvest fisheries sector, women were rarely involved in fisheries conflicts.

Governments can better mitigate fisheries conflict by managing illegal fishing in a proactive—not reactive—manner. The government of Tanzania has taken important steps to deter illegal fishing in its exclusive economic zone, and it is addressing declining fish populations in Lake Victoria through co-management strategies that engage fishing communities directly. Critically, this report showed most fisheries conflicts start at the local level between small groups of actors. Consequently, one key step in preventing or solving fisheries conflict is to link local knowledge of fisherfolk to technical and governance capacity at the national level. This way, federal policy makers and resource managers can anticipate the conditions that cause conflicts to erupt.

Secure Fisheries plans to expand the Fisheries Conflict Database to other countries in East Africa and the Horn of Africa. As the database expands, we can address larger issues, such as:

- What governance approaches work best to solve fisheries conflict?
- What causes fisheries conflicts to escalate into larger forms of conflict?
- How do fisheries conflicts vary from place to place, and why?

Fisheries conflict is a threat to the stability and health of communities—but that threat is underappreciated. While the negative consequences for resource sustainability from illegal fishing are well-known, we are still scratching the surface of what fisheries conflict *is*, let alone what causes and prevents it. The need is urgent—fisheries are a critical component of livelihood and food security around the world, especially in developing nations. Competition over fisheries resources is inherent and predictable. But violent conflict is not inevitable, and management of that competition is the most effective way to promote resilient and peaceful fishing communities.



Confiscated fishing nets are burned as part of the crack-down on illegal fishing by the Tanzanian government.



I. INTRODUCTION

The past few years have witnessed a growing chorus of warnings about the increasing risks to peace and stability posed by fisheries conflicts. In 2018, Johan Bergenäs, of Vulcan Inc., described fisheries as the next frontier in geopolitical conflict in the South China Sea,¹ and a team of researchers led by Malin Pinsky demonstrated risk that fisheries conflict will increase in response to climate change.² In 2017, Michael Harte, of Oregon State University, predicted that global fish wars will erupt given climate change and rising nationalism.³ Illegal, unreported, and unregulated (IUU) fishing has been both a cause of and an excuse for piracy and kidnap-for-ransom activity off the Horn of Africa.⁴ In 2015, Tim McClanahan of the Wildlife Conservation Society predicted that conflict over fisheries will grow as a North-South imbalance in access to fisheries products increases.⁵ While the world has not recently seen military conflict over fisheries, the infamous twentieth-century Cod Wars between Iceland and the UK showed that nations can be willing to defend coveted fishing grounds with military force.

However, there are few studies about the relationship between fisheries and violent armed conflict. Pioneering work in Southeast Asia by Robert Pomeroy and his team⁶ revealed complex and varied drivers of conflict related to fisheries: education, food security, crime, perceptions of resource health, and existing levels of other conflict were linked to fisheries conflicts that ranged from social tensions to piracy and violence within fishing villages. The key drivers, and even the direction of their influence, varied between countries (Indonesia, the Philippines, Thailand, and Vietnam were analyzed). For example, higher socioeconomic stratification in Indonesia was related to reduced fisheries conflict, while in the Philippines it increased it. Recent research on the effect of armed conflict on fisheries has produced similar inconsistencies. Cullen Hendrix and Sarah Glaser demonstrated that civil conflict reduced fish catch,⁷ whereas Sara McLaughlin Mitchell and Cameron Thies⁸ found that armed conflict increased fish catch.

As interest in social-ecological systems grows, we expect that an increasing number of studies will concentrate on the fisheries-conflict nexus.⁹ Better understanding of the links between fisheries and conflict is needed in order to predict where such conflicts may occur and how they can be prevented. Such inquiry is difficult given the vast list of possible fishery-related drivers of conflict,¹⁰ a significant lack of quantitative data from and about regions experiencing conflict, and methodological difficulties in linking issues of resource scarcity to armed conflict. To advance the field, we need a suite of empirical tests to see if these linkage chains withstand quantitative scrutiny, and a comprehensive set of data to create repeatable studies.

Developing countries are particularly dependent¹¹ on fisheries and their contribution to food security¹² and, consequently, to social stability.¹³ Fish contains high-quality protein, omega-3 fatty acids, and essential micronutrients—calcium, iron, zinc—that support brain growth and nutrition. Developing nations have fish stocks in worsening health but are responsible for more than half of the global trade in fish products, have a higher proportion of fish in their diets, and make up the majority of fishers in the world.¹⁴ Almost 60 million people were employed in the fishing sector in 2016, 14 percent of whom were women.¹⁵ Income from fisheries, especially in the hands of women, is often invested in education for children.¹⁶ When men (and sometimes youth) are productively employed in sectors like fisheries, they are less likely to join militia groups. All of these factors ensure community stability and thus reduce the root causes of armed conflict.¹⁷

Better understanding of the links between fisheries and conflict is needed in order to predict where such conflicts may occur and how they can be prevented.

Fisheries and conflict are linked by a web of feedbacks between certain conditions in the human community and those in the natural resource. The complicated links between fisheries and conflict means impacts can go either way: fisheries can make conflict worse or better, and conflict can make fisheries worse or better. The result depends on other conditions on the ground, and the timing and location of the conflict.

Conflict over fisheries can erupt based on standard Malthusian mechanisms of resource scarcity.¹⁸ When overfishing or habitat damage causes fish populations to decline, the resulting conflict will be systemic and long-term. Fish stocks may crash suddenly and unpredictably, or their decline may be gradual and predictable. In the first case, the shock to livelihoods and food security will be quick. In the second case, fishers will expend more and more effort to catch fewer and fewer fish. Either way, conflict may occur directly, over the shrinking state of the resource, and indirectly as unemployment and food insecurity worsen.

POTENTIAL DRIVERS OF CONFLICT IN FISHERIES



The complicated links between fisheries and conflict means impacts can go either way: fisheries can make conflict worse or better, and conflict can make fisheries worse or better.

Conflict can also relieve fishing pressure when it occurs near fishing grounds. During World War I and II, commercial fishing all but ended in the northeast Atlantic because of the presence of hostile navies. Afterwards, fish stocks that had been in decline saw increases in fish size and catch. Naval blockades can also stifle fishing activity, as witnessed in Yemen and the Somali region.¹⁹ Indirectly affecting fishing, fishers may leave the fishing sector if they are recruited into guerilla groups, as happened in Sri Lanka with the Liberation Tigers of Tamil Eelam. This is most likely to happen in places where rebel groups offer higher salaries than can be earned from fishing.



Cargo dhows at port in Zanzibar. David Stanley.

Conversely, conflict can increase pressure on fisheries by influencing the movement of people or through rising food prices encouraging people to fish. If unemployment increases during conflict and people cannot afford nutritious food like fish, food insecurity and the likelihood of conflict increase.²⁰ When conflicts are far from fishing grounds, fisheries provide attractive employment opportunities for those fleeing the fighting. For example, fishers in northern Sierra Leone fled their civil war into neighboring Guinea and resumed fishing, increasing the pressure on fisheries in Guinean waters.²¹ Additionally, during conflict there is greater likelihood of IUU fishing as governments and enforcement agencies are pre-occupied, causing surveillance to decline. IUU fishing can rapidly and dramatically reduce fish stocks, especially when nations in conflict cannot enforce their maritime borders.²²

Goals of this Report

In this study, we introduce the Fisheries Conflict Database to assess the frequency and causes of fisheries conflict by identifying and quantifying discrete fisheries conflict events. We begin our analysis with data collected for the United Republic of Tanzania between 1990 and 2017. Our goals are threefold:

1. to establish a protocol for collecting event-level fisheries conflict data,
2. to determine whether fisheries conflict is increasing or decreasing in frequency, and
3. to characterize and quantify the drivers of fisheries conflict.

Event Data

We model our data collection after established conflict event projects such as the Social Conflict Analysis Database (SCAD),²³ the Uppsala Conflict Data Program (UCDP),²⁴ and the Armed Conflict Location and Event Data Project (ACLED).²⁵ These data projects have pioneered the collection, organization, and dissemination of conflict event data. Event data describe key variables characterizing a conflict: time and location, actors, type of conflict, violence level, and motivations. Each of these datasets has different strengths and uses. To date, some describe which conflicts involve fisheries, but none explicitly and comprehensively identify those conflicts that are motivated by or involve fishers, fishing communities, or fisheries resources. Event-level data facilitate a variety of analyses: spatial analysis, trend analysis, and causal analysis.

II. TANZANIA

The United Republic of Tanzania is located in the African Great Lakes region of eastern Africa and is bordered by Uganda, Kenya, Mozambique, Malawi, Zambia, Rwanda, Burundi, and the Democratic Republic of the Congo. Germany colonized the region in the late 1800s and was succeeded by British rule after World War I. Tanganyika (the mainland of Tanzania) gained independence in 1961, followed by independence for the Zanzibar Archipelago in 1963. Tanganyika and Zanzibar united to form Tanzania in 1964. Today, about 55 million people call Tanzania home. Sixty-one percent of Tanzanians are Christian. The 35 percent who identify as Muslim are most highly concentrated on the Indian Ocean coastline and Zanzibar Archipelago, where they make up 95 percent of the population.²⁶ Despite its having a diverse ethnic population, Tanzania's first president, Julius Nyerere, successfully promoted unity among the 120 tribes by enforcing Kiswahili as the national language.²⁷

FIGURE 1: MAP OF TANZANIA

showing first administrative districts and major bodies of water.



Administratively, Tanzania is a presidential constitutional republic with federal headquarters in the inland capital of Dodoma. There are 34 first administrative districts throughout the country, including offshore islands (Figure 1). While the official language is Kiswahili, English is common and taught in secondary and higher education. Tanzania's largest city, coastal Dar es Salaam, hosts its international airport and is a major center of commerce. Tourism is an important part of the Tanzanian economy, and Serengeti National Park, Mount Kilimanjaro, and the beaches of Zanzibar draw visitors from around the world.

We began the Fisheries Conflict Database in Tanzania for several reasons. First, Secure Fisheries operates fisheries projects in Tanzania: our research in Lake Victoria²⁸ on fisheries–aquaculture interactions, and a regional information-sharing initiative to stop IUU fishing in the Western Indian Ocean (Project Caught Red-Handed²⁹). Second, Tanzania has a large number of freshwater sources plus a large maritime space. Finally, while Tanzania has faced armed conflicts throughout its statehood, its more recent history is not as conflict-plagued as that of other neighbors in East Africa such as Somalia, Burundi, Rwanda, or the Democratic Republic of the Congo. Thus, conflicts over fisheries could be isolated more easily from larger forms of conflict.

Tanzania's State of Conflict 1990–2017

Shortly after Tanganyika and Zanzibar unified, the Tanganyika African National Union and the Afro-Shirazi Party (Tanganyika's and Zanzibar's sole political parties, respectively) united to create the Chama Cha Mapinduzi (CCM), or "Party of the Revolution." CCM has remained the party in power from 1960 to the present, winning the 1995, 2000, 2005, 2010, and 2015 general elections. Since 1992, when Tanzania first permitted multiparty elections, Chama Cha Wananchi (CCF) has been CCM's primary opposition party. The CCF has nationwide support, but it originated in Zanzibar and its supporters are predominately Muslim. Violence erupted in 1995, 2000, and 2005 after the CCF lost close elections to CCM candidates. The CCF accused CCM politicians of controlling the election. Since 2010, Tanzania has allowed Zanzibar to share power between CCM and CCF.

Tanzania is recognized as one of the more peaceful nations in East Africa: it has not experienced the civil wars that have affected other east African nations (Box 1). The UCDP reports, since 1989, zero occurrences of state-based violence, two instances of non-state violence (both actors were militia groups from neighboring civil wars), and eight instances of one-sided violence where

civilians were victimized. ACLED records just over 700 events of armed conflict since 1997. Of these, the majority are either violence against civilians (typically involving an unidentified armed group) or riots/protests predominantly involving political groups. A little more than one-third of these events involved a fatality on at least one side, and of these only one-quarter involved more than five fatalities. Tanzania has also experienced violent spillover from its neighbors. Most instances of intense violence involve cross-border groups such as Hutu rebels or Burundian refugees.

BOX 1: THE WARS NEXT DOOR

The **Burundian Civil War** (1993–2005) was the result of a collapse in the transition of power and the subsequent eruption of long-standing ethnic tension between the Hutu and Tutsi. Though the Hutus are the ethnic majority (85 percent), Burundi has historically been governed by the Tutsis (15 percent). The German Empire colonized the Kingdom of Burundi in 1887 and governed through the preexisting monarchical power structure, reinforcing the assumed supremacy of the Tutsi minority. Following independence in 1962, the Tutsi monarchy briefly returned before Tutsi military regimes took over. Ten years after independence, the simmering ethnic tension came to a boil when the Burundi Workers Party, a Hutu group, began a campaign of attacks targeting Tutsis. The military regime responded with a large-scale operation against Hutus, killing an estimated 150,000–300,000 people in what became known as the Burundi Killings of 1972.³⁰ Ethnic turmoil continued to fester, and in 1987, President Pierre Buyoya attempted to create a national dialogue on the issue. Hutus viewed Buyoya's actions as an indication that the Tutsi reign was almost over, which exacerbated frustrations with the 1988 election results that failed to produce change. An uprising by Hutu militias in the northeastern communes of Marangara and Ntega killed hundreds of Tutsi families, but the army responded aggressively, killing approximately 20,000 Hutus in the region and displacing 50,000 people.³¹

Tensions erupted again on October 21, 1993, when Burundi's first Hutu president, Melchior Ndadaye, was assassinated in a military coup during his first 100 days in office. In the year following the murder, the Hutu Front pour la Democratie au Burundi responded by killing 50,000–100,000 people in what a 1996 UN Security Council report concluded were acts

of genocide against the Tutsi minority.³² Ndadaye's assassination set off a 12-year civil war between the Burundi Guardians of Peace, a pro-government paramilitary organization, and Hutu militias, the National Council for the Defense of Democracy–Forces for the Defense of Democracy (FDD), and the Forces of National Liberation (FNL).

Approximately 300,000 Hutu refugees crossed the border into Rwanda in 1993, sharpening already tumultuous ethnic conflict there. The **Rwandan Civil War** (1990–1994) was already in its third year of fighting between the Rwandan Patriotic Front, a rebel group made up of Tutsi refugees exiled to Uganda, and the Rwandan Armed Forces, connected to the Hutu-led government.³³ The situation in Rwanda descended from war to ethnic extermination on April 6, 1994, when a plane crash killed Rwandan President Juvénal Habyarimana and Ndadaye's successor, Cyprien Ntaryamira, catalyzing the 100-day **Rwandan genocide** (April–July 1994).

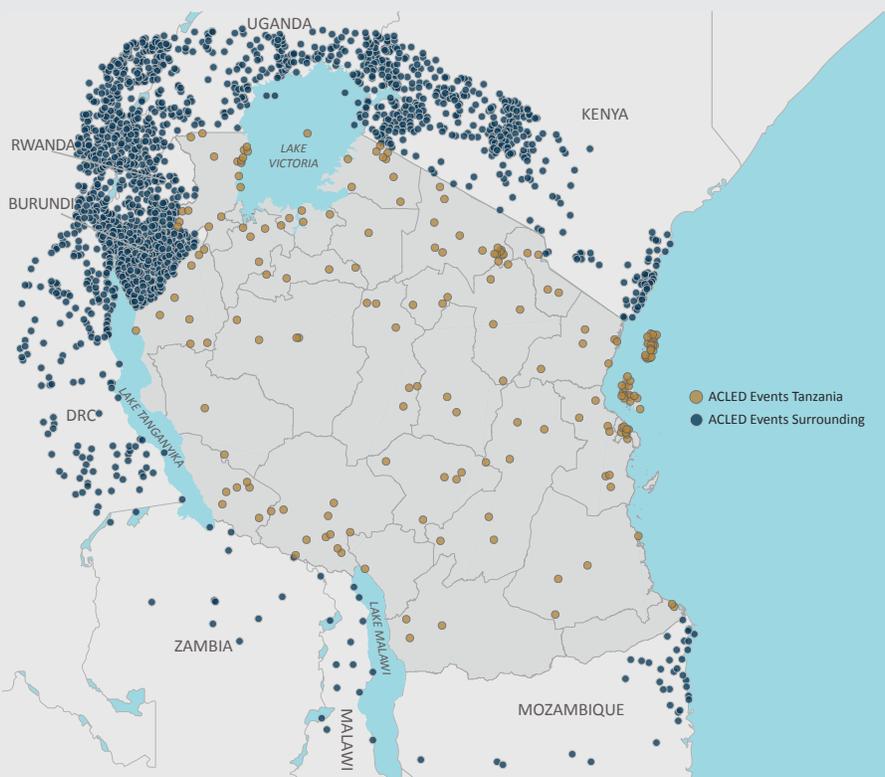


FIGURE 2: MAP OF TANZANIA SHOWING ARMED CONFLICT, 1990-2017. Yellow dots indicate armed conflict in Tanzania. Blue dots are armed conflict in surrounding countries.

The uprising resulted in the deaths of over a half million people and the displacement of over 4.5 million.³⁴ Conflict in Rwanda caused an influx of refugees in Burundi at the same time it was dealing with its own civil war.

In 1996, global attention turned to other events and foreign aid slowed to a trickle. Burundi closed two of its camps and told refugees to return to Rwanda. Instead, the refugees in Burundi went south into Tanzania. Tanzania closed its Burundian border in April after its refugee population reached 550,000. In December 1996, Tanzania announced the 550,000 Rwandan refugees it was holding had to return, and they forcibly emptied camps. Refugees who left voluntarily found their country, now led by a Tutsi-run government, fighting in the **First Congo War** (1996–1997). Eastern Zaire had been destabilized by the conflict in the Great Lakes region (Burundi and Rwanda) after approximately 1.5 million Rwandan refugees had settled there.³⁵ Among these refugees were Hutu militants who used refugee camps for protection and resources and aligned themselves with the local Mai Mai militias. The camps in Zaire became politicized and militarized, threatening to launch attacks against the Tutsi-led Rwandan government. Rwanda responded by invading Zaire in 1996. On top of the already intense pressure on the government to bend to the wave of democratization that was sweeping through Africa at the time,³⁶ the Rwandan invasion was the final factor to mobilize Congolese against their corrupt and ineffective government. The leader of the Tutsi forces, Laurent-Desire Kabila, and his supporters fought their way to Kinshasa, where he became president after President Mobutu fled.

Kabila alienated his Ugandan and Rwandan allies and expelled their forces. Tension between President Kabila and the Rwandan/Tutsi presence in the east led to the **Second Congo War** (1998–2004), which resulted in the deaths of 3.9 million people, making it one of the world's deadliest conflicts since World War II.³⁷

As the Second Congo War was ramping up, efforts were being made in Burundi to reach a peace agreement, but two Hutu rebel groups refused to participate. Less than a month after the Arusha talks closed, 20 Tutsis were killed in the Titanic Express massacre. Five hundred rebels were killed in their own attack against the Tutsi army in December 2001. In September 2002, the Burundian army killed 173–267 civilians in what became known as the Itaba massacre.

In July 2003, Hutu Domitien Ndayizeye took over as president of the transitional Burundian government. President Ndayizeye signed a cease-fire agreement that included making FDD a political party and integrating Hutu rebel fighters into the majority Tutsi army.

In 2004, FNL killed 160 Congolese Tutsi refugees in a United Nations camp near the Congo border. A UN envoy was sent to investigate the attack, increasing UN intervention in Burundi. A few months later, the UN and Burundian government officials began to disarm thousands of Burundian soldiers and former rebels.

In 2005, Pierre Nkurunziza, of the FDD, was elected president of Burundi by the two Hutu-dominated houses of parliament. His swearing-in ceremony in August 2005 has come to signify the end of the Burundian civil war.

Impact on Tanzanian Fisheries

From 1993 to 1998, almost 1.3 million refugees from Rwanda, Burundi, and the Democratic Republic of the Congo crossed the border into Western Tanzania, stressing the country's economy and resources and altering the region's ethnic composition.³⁸ Salehyan and Gleditsch found that "civil war in one country significantly increases the likelihood that neighboring states will experience conflict."³⁹ In this study, we found fisheries conflict was higher on the northern end of the famously narrow Lake Tanganyika, which Tanzania shares with Burundi and the Democratic Republic of the Congo (see results page 14).

Tanganyika was used to traffic militias, refugees, arms, and food. Many of the fishers in the region halted their fishing efforts to take advantage of the better paying transportation jobs. Those who continued to fish were afraid of bandits or militias that might try to steal their boats and of militaries or other security forces that might mistake them for rebels and open fire. Desperate refugees resorted to banditry to acquire fishing gear and meet basic needs, and the millions of displaced people who moved toward and around the lake during the 1990s massively overfished Tanganyika's fishery.

Fisheries in Tanzania

The Tanzanian Ministry of Agriculture, Livestock and Fisheries estimates that fisheries directly employ over 183,000 fishers, and another 4 million people are engaged in secondary fishery jobs such as boatbuilding, fish processing, and gear repair.⁴⁰ Tanzania produced over 367,000 metric tons (mt) of wild-capture fisheries products in 2016⁴¹ and ranks in the top ten African nations in fishery capture production. The vast majority of that production (85 percent) is from inland freshwater fisheries. According to FAO Food Balance sheets, fish and fishery-derived products account for about 20 percent of all animal protein consumed by Tanzanians. Overall, the annual fish consumption of about 5.5 kg per person is far below the global average of 20 kg per person.⁴²

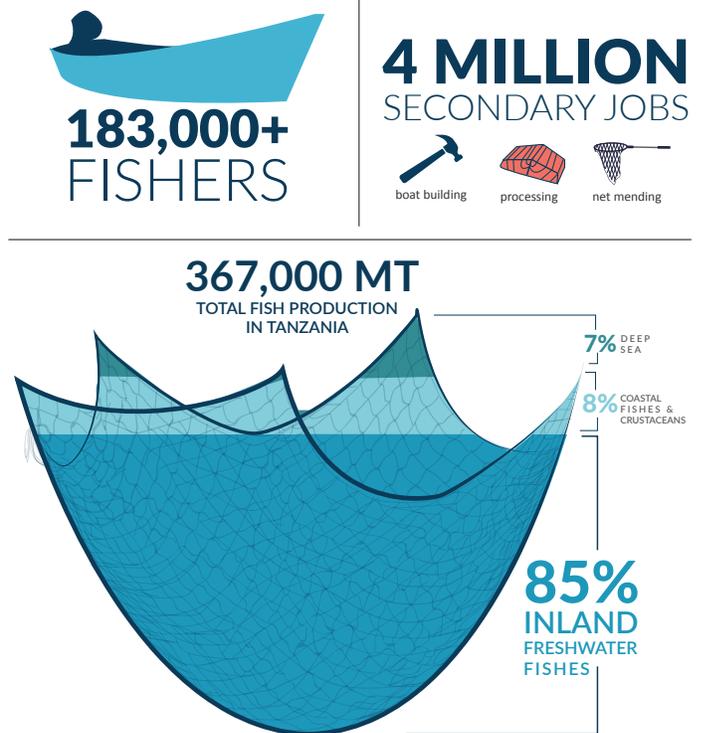
Along the coast of Tanzania, over 43,000 fishers are engaged in small-scale, artisanal fishing for marine fishes.⁴³ The Tanzanian coast hosts coral reefs, mangroves, seagrass beds, and estuaries that support rich and diverse fisheries for coastal fishes such as emperors, snappers, groupers, sweetlips, and parrotfish (Box 2). Coastal fishes and crustaceans (like shrimp) accounted for about 8 percent of all fish caught in Tanzania, or about 24,000 mt, in 2016. These fishes are caught using handlines, gillnets, and drag nets and are important contributors to subsistence fishing and therefore food security in the country. In coastal Tanzania, dynamite fishing has plagued reef areas and has been blamed for habitat destruction and threats to the long-term health of coastal fisheries.

BOX 2: PARROTFISH

Parrotfish (family Scaridae) are a globally-distributed family of tropical coral-reef fishes that contains over 100 species of brightly colored fish. These fish have a suite of intriguing characteristics. They are chiefly algal and coral grazers that contribute to the creation of sand in coastal areas and maintain reef health by constraining algal growth. They exhibit sequential sex changes: fish that begin life as female may change into large, brilliantly colored males to promote breeding success. At night, they sleep inside large mucus bubbles that protect them from predators.



Tanzanian Fisheries AT A GLANCE



The deep-sea waters in Tanzania's outer exclusive economic zone (EEZ) are home to migratory tunas, billfishes, and sharks that are highly prized by the global market but account for less than 10 percent of all wild-capture fisheries in the country. In fact, some distant-water fishing nations take advantage of the rich migratory fisheries in Tanzanian waters, although the amount of foreign fishing in Tanzanian waters is relatively small.⁴⁴

Inland fisheries in Tanzanian lakes, rivers, and reservoirs are an important source, producing over 300,000 mt of fish each year.⁴⁵ Tanzania has thirteen major lakes, including the African Great Lakes of Victoria, Nyasa/Malawi, and Tanganyika. These water bodies are typically surrounded by smaller satellite lakes that are important for small-scale fisheries. Tanzania is also covered by an extensive river network containing over 600 dams that create drinking-water and fishing reservoirs.

While there are many hundreds of freshwater fish species throughout Tanzania, only a few are key contributors to food security and income. The small silver cyprinid (*Rastrineobola argentea*), known locally as *dagaa*, comprises a full third of all inland fish caught in Tanzanian waters. This fish contributes widely to the income of women fish-traders, and its

high omega-3 and protein content make it an important source of nutrition. It is also used for feeding farm animals and is widely exported to regional nations. In fact, dried dagaa from Lake Victoria fed rebel groups in the DRC during their civil war.

Nile perch is the second-highest catch, by weight, and most of it comes from Lake Victoria. This large fish, introduced to the lake in the mid-1900s, is an important source of income but, as a non-native predatory species, is likely responsible for the elimination of hundreds of species of cichlids in Lake Victoria.

Cichlids (Box 3), a famous tribe of fishes that have evolved beautiful colorations that make them attractive to the aquarium trade, are the next largest component of freshwater catch in Tanzania. Cichlids in Lake Victoria have faced declining population numbers due to predation and eutrophication in the lake. In Lakes Tanganyika and Malawi, their populations are healthier.

BOX 3: CICHLIDS—

by Les Kaufman, University of Boston⁴⁶

Cichlids (family Cichlidae) are incredibly useful to the people who live around the African Great Lakes. They are the base of a fish soup that is an important home remedy. They are caught in the same nets as dagaa and used in similar ways: sun-dried and turned into a protein additive for animal feeds. Economically, their greatest utility is indirect, as food for the introduced Nile perch, which appear to grow fastest when foraging on these colorful little fishes.



Cichlids have evolved rapidly and recently into hundreds of forms. Their diversity is a major contributor to overall diversity in lakes, making cichlids a bellwether of environmental health. All play some role—rarely understood—in maintaining the ecological machinery that supports human lives. In the case of Lake Victoria, this means the food security and other essentials of 30 million human lives.

The reason Lake Victoria's cichlid populations have suffered is itself an important story that announced itself in the early to mid-1980s, when the lake and its fish community underwent a massive shift. Prior to this shift, 80 percent of the fish in the lake were cichlids. The other 20 percent consisted mostly of dagaa, catfishes, electric fishes, minnows, tetras, and two native species of tilapias. During the first half of the 1980s, a sudden shift occurred, and 80 percent of the fish in the lake became Nile perch (an introduced species), plus lesser amounts of introduced tilapias and the native dagaa. Cichlid biomass plummeted and many species disappeared. However, the surge in Nile perch created a lucrative export market that local people now depend on.

Along with this shift in fishes went a radical change in water quality. The lake and most of its feeder streams had been quite clear-flowing in the past, but after the shift most of the surface waters of the lake sported a near-permanent algal bloom, while deforestation and erosion had the rivers choked with silt. What caused this huge change, a decidedly mixed blessing? Some evidence points to changes in nutrient loading from the land and predation by Nile perch. Some evidence points to changes in the prevailing winds that normally mix the lake waters. The bottom of the lake went anoxic (low oxygen), triggering a massive loss of cichlids. Either way, the big shift was probably driven by human activities (introduced fishes, burning of grasslands, poor soil stewardship, and/or climate change), and it could easily have sprung from both local and global human actions.

The great scientific importance of cichlids is enhanced by a second reason that some people care: they simply like these fishes. Around the world, tens of millions of people keep tropical fishes in aquaria. These fishes' endangered status has also attracted the attention of conservationists worldwide. A captive breeding program, led by professional aquarists and recently joined by home aquarists, has maintained several vanished and vanishing haplochromine cichlids for more than a quarter century. Called the Lake Victoria Species Survival Program, it is dedicated to better understanding Lake Victoria fishes and safeguarding the remaining species. So, all of these tiny, rainbow-colored fishes actually do matter: as a world heritage resource for illuminating evolution, as objects of endearment, as a global conservation priority, as a stethoscope for diagnosing the lake ecosystem, as the base for a favorite soup, and as the choice prey of one of the most economically valuable food fishes in the world: the Nile perch.

III. METHODOLOGY

Defining Fisheries Conflict

The Fisheries Conflict Database is a collection of reported incidents in which a fisheries resource is the source of conflict. Specifically, we define a Fisheries Dispute Event (FDE) as *an incident in which a fisheries resource is contested, disputed, or the source of conflict between a minimum of two human actors, at a discrete temporal moment, and in a discrete location*. Actors may be individuals or groups, and groups may be organized or spontaneous. Temporal moments and locations may be estimated or unknown, but for an FDE to be identified, the action must occur within bounded time and space. We collected data on the occurrence and causes of FDEs in Tanzania from 1990–2017 by coding articles from news outlets.

Fish Wars Cycle Model

The Fish Wars Cycle,⁴⁶ developed by Robert Pomeroy and others, provides a foundation for understanding key drivers of fisheries conflict. In this schematic, conflict around fisheries is perpetuated by three top-level components (called “elements” by Pomeroy): competition over fisheries, fisheries and non-fisheries conflict, and fisheries scarcity (Figure 3). Each top-level component is defined by a host of quantifiable variables that contribute to the levels of each. For example, competition over fisheries is affected by the presence of both commercial and small-scale fishing fleets. Conflict is affected by user-group violence and crime targeting fishers. Fisheries scarcity is affected by IUU fishing and poor resource governance.

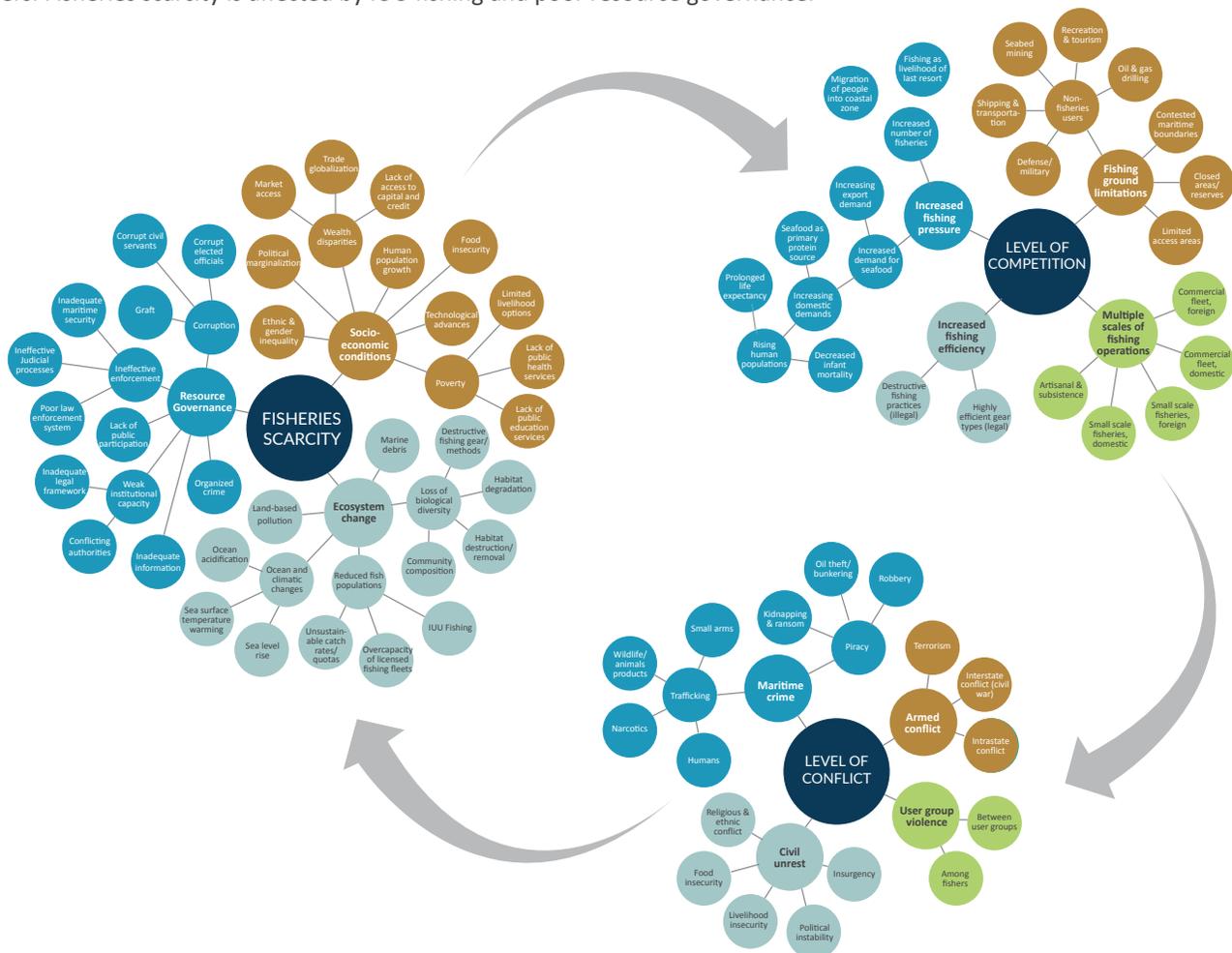


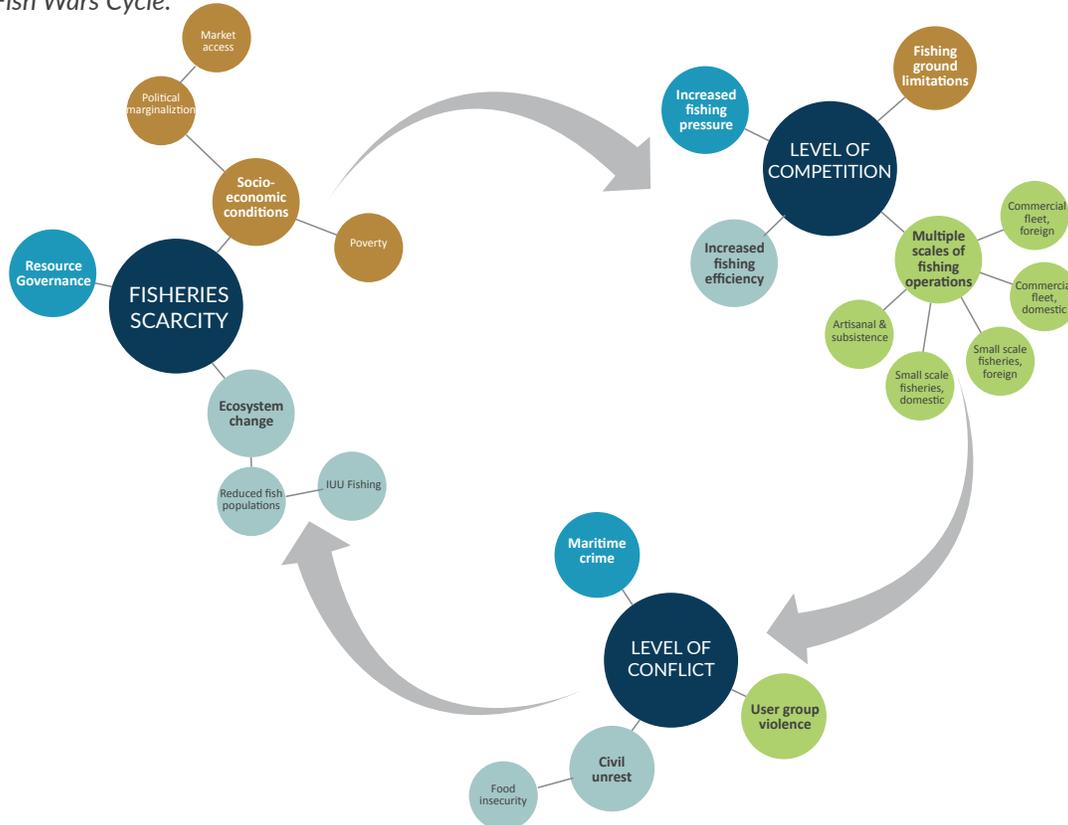
FIGURE 3: THE FISH WARS CYCLE

The three top-level components or elements (scarcity, conflict, and competition) are connected through a feedback loop (arrows) and influenced by a suite of driving variables (bubbles). Reproduced with permission from Figure 1 in Pomeroy et al. (2016).

The Fish Wars Cycle is a series of hypotheses describing potential links between variables. In different fisheries, these variables may be more or less present, and the variables may change over time. Fisheries with low levels of nearby poverty and inequality may face significant ecosystem-level factors, such as climate change, that overwhelm regulatory ability to minimize fisheries scarcity. Likewise, communities with high levels of competition over fisheries may manage that competition through effective governance and thus short-circuit the Fish Wars Cycle.

We adapted this cycle by choosing the drivers of greatest interest to our project and those that are most readily quantified and defined by an endogenous coding rubric. We therefore narrowed the number of variables we investigated accounting for coverage of diverse drivers from each of the three top-level components (Figure 4).

FIGURE 4: FISH WARS CYCLE, REDUCED MODEL. *Select variables contributing to fisheries conflict in a reduced model of the Fish Wars Cycle.*



We selected the following drivers for exploration.

1. **REDUCED FISH POPULATIONS:** real or perceived declines in fish stocks
2. **ECOSYSTEM CHANGE:** eutrophication, climate change, pollution, loss of biodiversity
3. **ILLEGAL FISHING:** fishing in violation of local laws, including with banned gear, for endangered species, or without formally issued licenses
4. **WEAK RESOURCE GOVERNANCE:** corruption, weak institutional capacity, organized crime, inadequate information, lack of public participation
5. **POLITICAL MARGINALIZATION:** targeting based on political, ethnic, religious, economic, or other social identity
6. **MARKET ACCESS:** supply or demand from international markets, access to markets to sell goods
7. **POVERTY:** limited livelihood options, lack of public health or education services
8. **INCREASED FISHING PRESSURE:** increased human population or number of fishers, demand from external markets
9. **INCREASED FISHING EFFICIENCY:** destructive practices like dynamite fishing or poisoning, technological advances in fishing gear



Dagaa make up a third of all inland fish catch in Tanzania, and are a major source of income for women. Sarah Glaser.

10. **FISHING-GROUND LIMITATIONS:** border conflicts, closed areas, marine parks
11. **FOREIGN FISHING:** presence of fishers from another country, whether licensed or not
12. **MULTIPLE SCALES OF FISHING OPERATIONS:** conflict between different fleets such as artisanal and industrial fishing vessels
13. **MARITIME CRIME:** piracy, kidnap for ransom, theft of gear or resources
14. **FOOD INSECURITY:** lack of access to reliable sources of sufficient and nutritious food (fisheries or otherwise)
15. **CIVIL UNREST:** targeting of fishing villages by insurgencies for strategic reasons

Data Collection Approach

To systematically characterize and quantify fisheries conflict, we developed a protocol based on the following steps:

1. Define a Fisheries Dispute Event (FDE).
2. Conduct a systematic search of news-based print publications archived in the Lexis Uni database. For this report, searches were limited to water bodies in Tanzania (including lakes, rivers, and marine waters extending to the 200 nm EEZ boundary) for 1990–2017.
3. Catalog those articles that contain a description of fisheries conflict.
4. Record FDEs from each catalogued article using a comprehensive codebook (including date, location, actors involved— noting women actors, conflict drivers, and measures of violence such as arrests or deaths).
5. Record aggregate conflict information from articles that do not contain a defined FDE but contain information describing fisheries conflict.
6. Assign a Fisheries Conflict Intensity score to each region in Tanzania for each year based on a catalog of FDEs plus aggregate information recorded in Step 5.
7. Check data for quality and consistency across data enumerators.

During Step 4, we categorized levels of violence associated with each FDE with a violence score of 1–3 based on the type of conflict and the number of arrests, injuries, abductions, sexual assaults, or fatalities.

Step 5 expanded data collection beyond event coding of FDEs. During initial protocol creation, we recognized that many instances of fisheries conflict were described in aggregate, and not discrete, terms. For example, an article might describe “hundreds of arrests for illegal fishing over the past three years.” Such a report does not meet our definition of an FDE, but we did not want to ignore or exclude it. Consequently, we recorded this information as a Fisheries Dispute Aggregate (FDA) at the level of an administrative region and year. Finally, FDAs and FDEs were combined and each region-year unit in our database was assigned a Conflict Intensity Score ranging from 0–3. Not to be confused with the FDE violence score, the FDA Conflict Intensity Score is a measurement of the aggregate severity of a conflict from the perspective of fisheries stakeholders at a region-year level.

IV. RESULTS

Fisheries Dispute Events

From 1990–2017, we recorded 129 Fisheries Dispute Events (FDEs). FDEs are incidents in which a fisheries resource is contested, disputed, or the source of conflict between at least two actors at a discrete place and time. FDEs described a diversity of conflicts:

- The federal government frequently banned fishing—by foreign trawlers for dodging taxation, by domestic fishers for using harmful gear, or to control rebel movement during civil wars—resulting in protests and reduced livelihoods.
- Regional governments forcibly relocated fishers out of national parks.
- Bandits—often members of rebel groups—attacked Tanzanian fishers and stole boats and gear, and sometimes abducted or murdered them.
- Domestic fishing groups banded together to protest the presence of foreign fishing vessels in their waters.
- Tanzanian fishers clashed with Ugandan and Kenyan fishers over poorly defined fishing grounds, often escalating to involve police or military action.

These incidents are increasing in frequency over time (time-based linear trend, $p = 0.002$, Figure 5). In fact, the regression line translated into a threefold increase in FDEs between 1990 and 2017. While we found no FDEs documented in the early 1990s, starting around 1996 annual FDE occurrence grew (with significant variability) throughout the following decades. Noticeably, we did not document any FDEs in 2015, a year which coincided with a general election.

This rising trend, while statistically significant in our analysis, comes with important caveats about reporting and detectability. In general, media coverage and the number of media outlets has increased over time; thus, our ability to detect fisheries conflict increases over the period of examination. That being said, our approach follows that of other conflict event data sets that use media reports to assess annual frequency of events (see page 02). We therefore urge conservative interpretations of this trend and we plan to investigate ways to account for increases in reporting in future iterations.

The drivers of fisheries conflict were defined by those factors that motivated actors involved in the conflict (Figure 6). Illegal fishing was the most common driver of fisheries conflict in the events we evaluated: it occurred in 83 of 129 FDEs (64 percent). The depletion of fish stocks—either real or perceived—was the next most common driver, occurring in 64 cases (50 percent). Surprisingly, changes in gear efficiency was a common cause of conflict (60 events, or 47 percent): usually, conflict over net mesh size or competition between different sectors over their use of gear—including dynamite—originated conflict. Grounds limitations—areas closed to fishing either permanently (such as marine parks) or temporarily (such as in response to sudden events)—were the fourth most common driver of conflict (47 events or 36 percent). Weak governance, such as corruption or poor enforcement, was part of a fisheries conflict in 28 percent of all cases. In many cases, several drivers were present in one conflict.

FIGURE 5: FISHERIES DISPUTE EVENTS IN TANZANIA
1990–2017

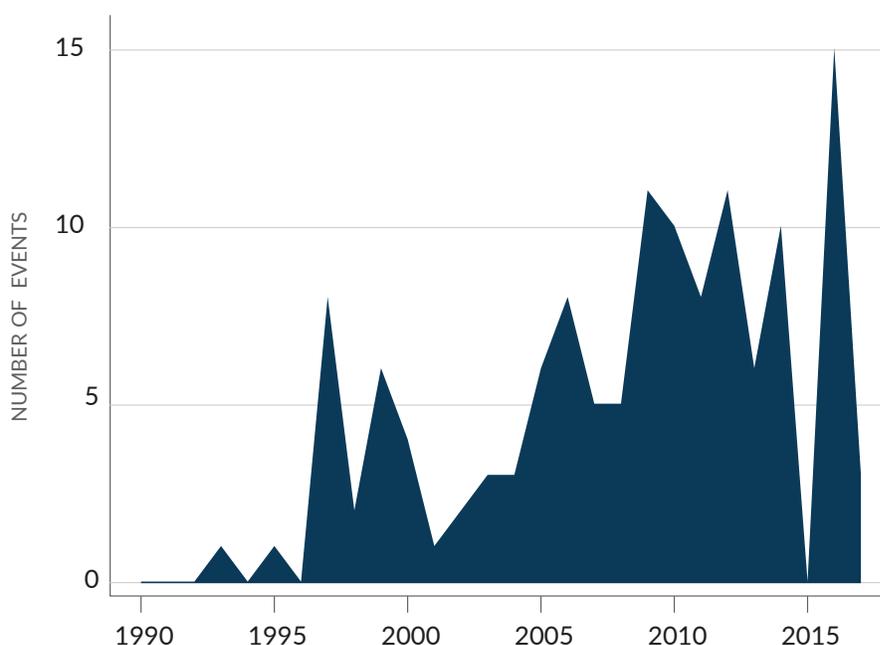
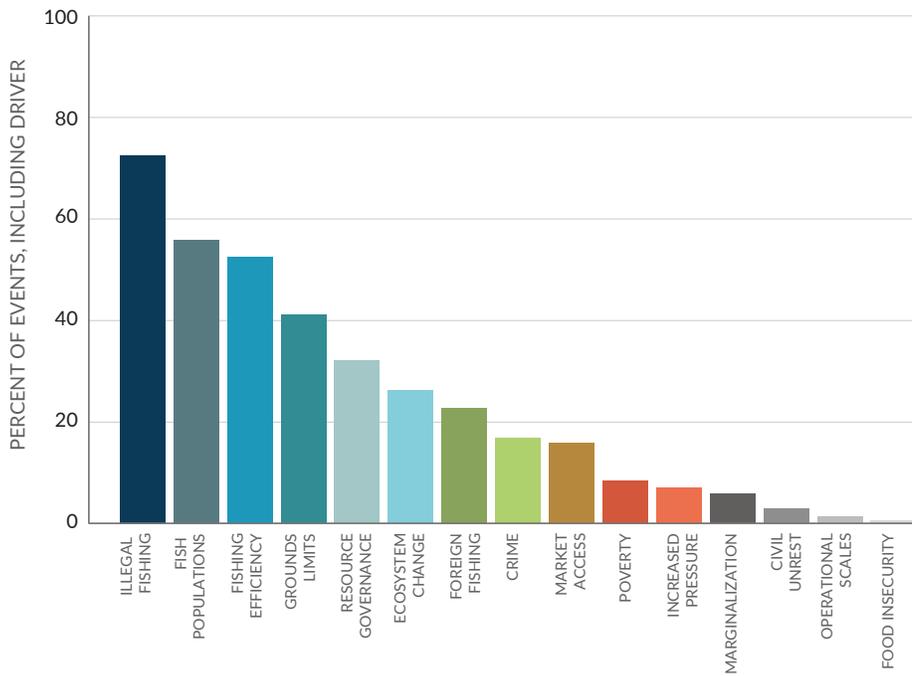


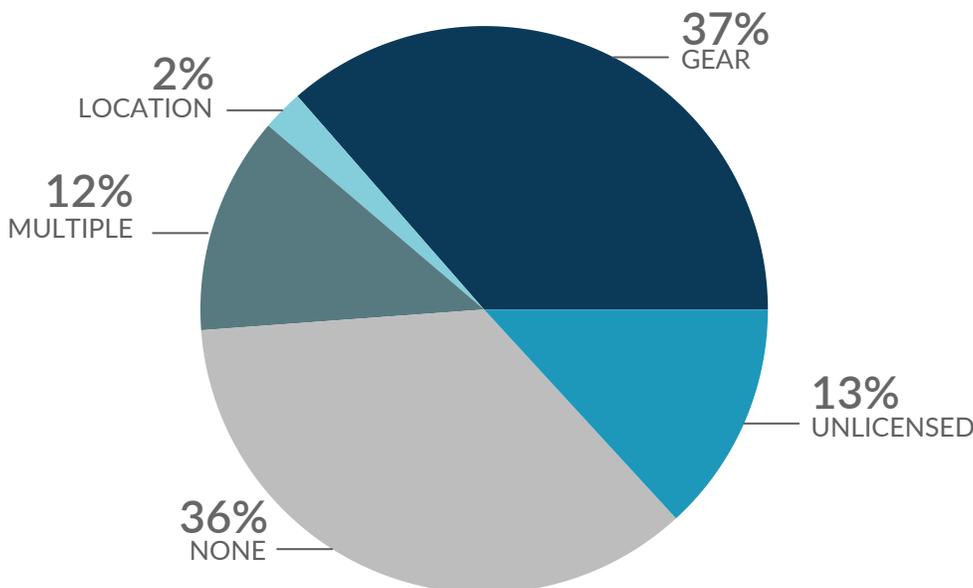
FIGURE 6: DRIVERS OF FISHERIES DISPUTE EVENTS IN TANZANIA 1990-2017



Several of the drivers we hypothesized were important were only minimally present in the cases we examined: poverty, food insecurity, ethnic or political marginalization, and conflict between different operational scales (i.e., artisanal and industrial) were not common drivers of conflict.

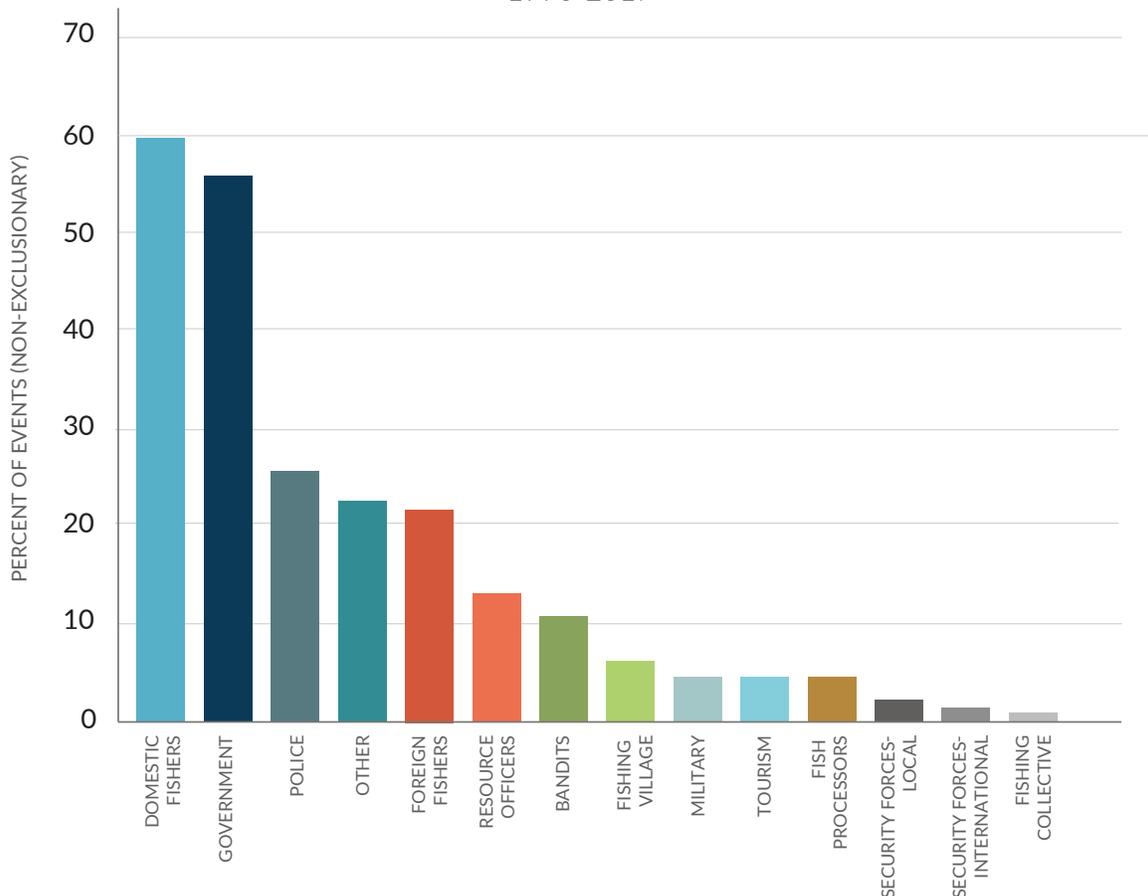
The overwhelming commonality of illegal fishing as a driver of fisheries conflict is not surprising. We disaggregated the type of illegal fishing into several categories: using banned fishing gear, fishing without a legal license, and fishing in a closed area (Figure 7). The use of banned gear represented 56 percent of all events involving illegal fishing, whereas lack of a legal license was a driver in only 20 percent of all events involving illegal fishing. Additionally, of events that involved illegal fishing, only 21 events involved both illegal fishing and foreign fishers. This suggests the vast majority of conflicts over illegal fishing involved domestic fishers.

FIGURE 7: ILLEGAL FISHING EVENTS BY TYPE



Our definition of an FDE requires conflict between at least two actors. Domestic fishers were the most common actor in a conflict event, being present in 60 percent of all events (Figure 8). Altogether, government actors (international, federal, regional, and local) were part of 56 percent of all FDEs, and foreign fishers were the fifth most common actor. The category of Other includes a variety of actors such as students, filmmakers, and NGOs.

FIGURE 8: ACTORS INVOLVED IN FISHERIES DISPUTE EVENTS IN TANZANIA
1990-2017



We assessed the levels of violence associated with each conflict event on a scale of 1 to 3. Events earning a 3 were least common, whereas events earning a 1 or 2 represented 87 percent of all FDEs (Figure 9). Violence levels were assessed accordingly: verbal only (1); nonviolent direct action (arrests, bans; 2); action with physical violence (3). Arrests were the most common consequence of an FDE, occurring in 28 percent of all events and resulting in 498 arrests (Figure 10). Forty-one fatalities occurred in 10 events (8 percent of all FDEs), and 50 injuries were reported in 12 events. Sexual assaults were not reported, and eight abduction events occurred.

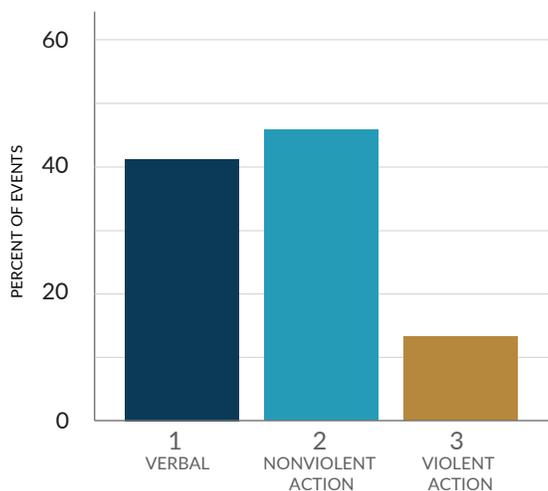


FIGURE 9: LEVELS OF VIOLENCE ASSOCIATED WITH FISHERIES DISPUTE EVENTS

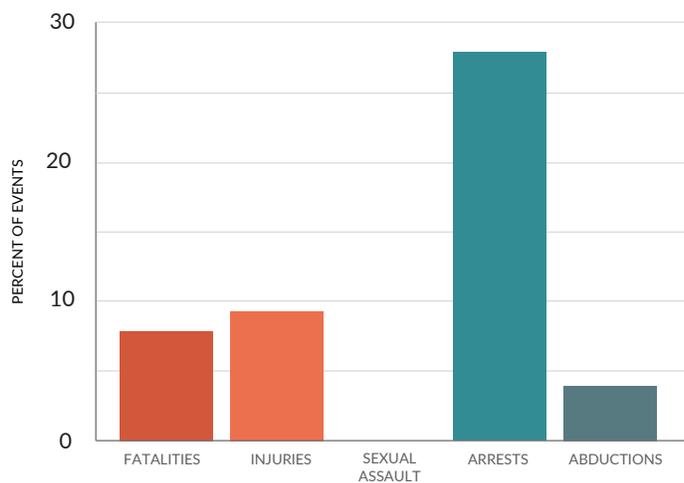


FIGURE 10: TYPES OF VIOLENT OCCURRENCES DURING FISHERIES DISPUTE EVENTS

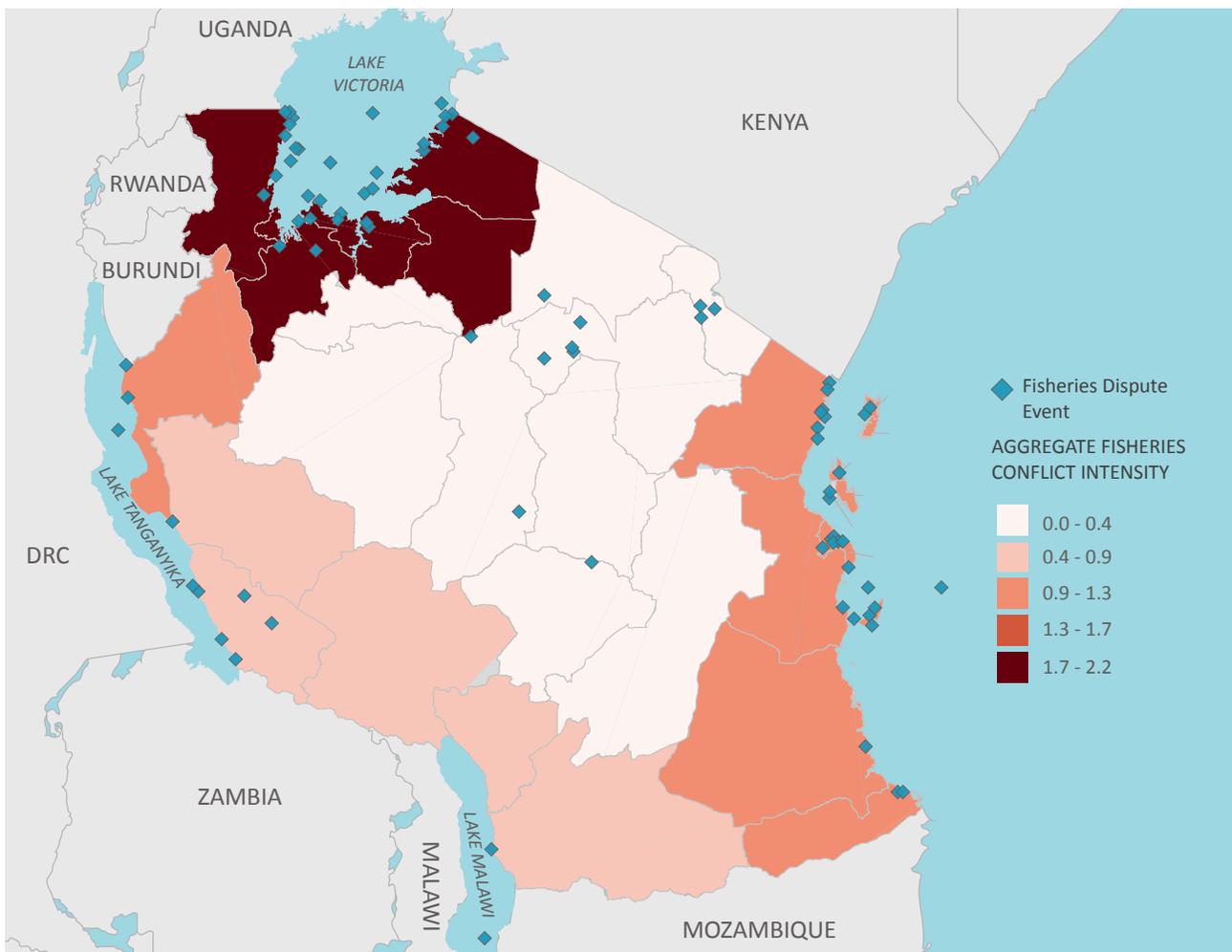
We investigated the role of women in fisheries conflict by accounting for their involvement in FDEs. Twelve of the events (or 9 percent) included a woman as an actor on one side of a conflict, and sexual assault was not reported. Only one event was driven by female gender identity: in 2014, women in the Mara district near Lake Victoria were targeted for body parts in ritual killings believed to increase fish catch.⁴⁷

Fisheries Dispute Aggregates

FDEs were geolocated as precisely as possible and had a strict definition of occurring in a discrete place and time. However, news reports contained a considerable amount of information about fisheries conflicts that did not meet our definition of an FDE. We recorded such information and catalogued it by region (the first administrative district in Tanzania) and year. For example, information about “hundreds of arrests for illegal fishing along the coast of Tanzania between 2014 and 2015” did not constitute a discrete FDE, but it did shed light on the causes and consequences of conflict in coastal regions during a two-year period. Our aggregate measure of fisheries conflict intensity combined these qualitative statements with our quantitative measures of FDEs to assign each region-year unit a measure of Fisheries Conflict Intensity ranging from 0 to 3.

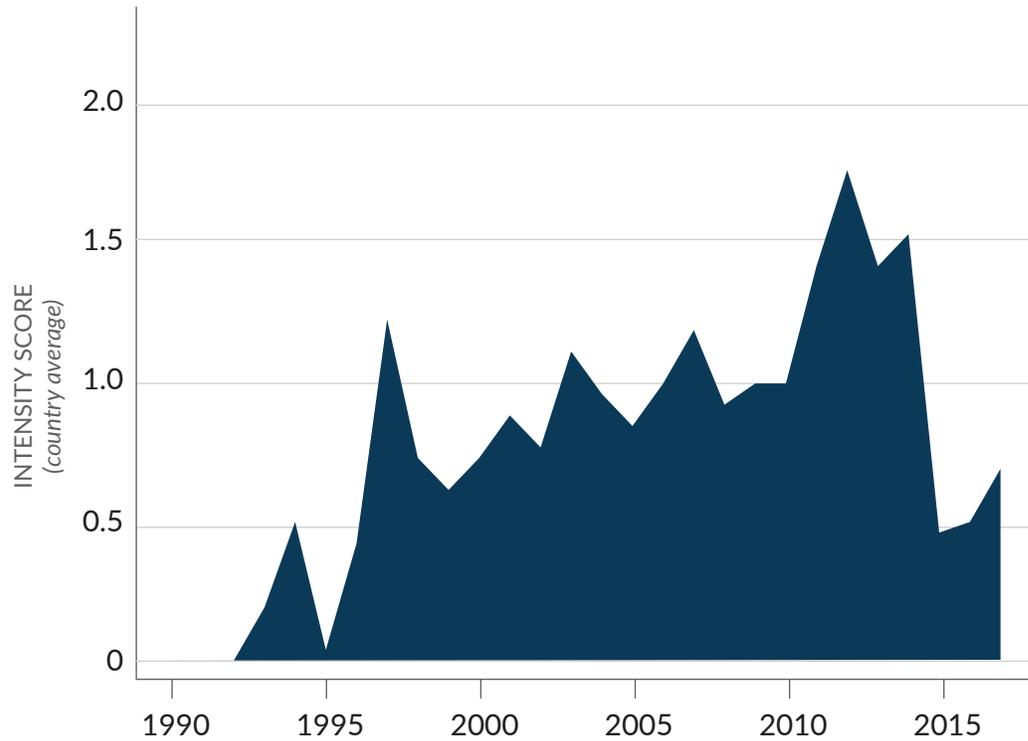
Fisheries Conflict Intensity was averaged over the 28-year duration of the study for each region (Figure 11). The center of Tanzania had very low levels of fisheries conflict over this period. The highest levels of conflict were in the regions surrounding southern Lake Victoria. Regions around northern Lake Tanganyika (bordering Burundi and the Democratic Republic of the Congo) and all coastal regions were the next highest in conflict intensity. Southwestern Tanzania, specifically those regions bordering southern Tanganyika and Lake Malawi (Zambia and Malawi, respectively), had lower levels of conflict.

FIGURE 11: FISHERIES CONFLICT INTENSITY BY REGION
 Averaged over 1990-2017. Diamonds represent the location of individual Fisheries Dispute Events



Our measure of Fisheries Conflict Intensity also shows an increase over time (Figure 12). While strongly correlated with the number of FDEs in a given year ($p = 0.0003$), the two metrics were calculated independently (i.e., the number of FDEs in a year did not factor into the conflict intensity score). The intensity score accounts for aggregated information at the regional and annual level.

FIGURE 12: FISHERIES CONFLICT INTENSITY IN TANZANIA
averaged over all regions



V. DISCUSSION

The news-based print search and FDE coding stages of the fisheries conflict database were intentionally conducted chronologically. This process allowed pressures imposed on a fishery to be traced over three decades. The resulting waterbody narratives helped to develop a broad network of contextual drivers that might otherwise have gone unnoticed. This method provided a convincing argument for employing a holistic social-ecological perspective when working to understand feedback linkages between the human and natural systems.

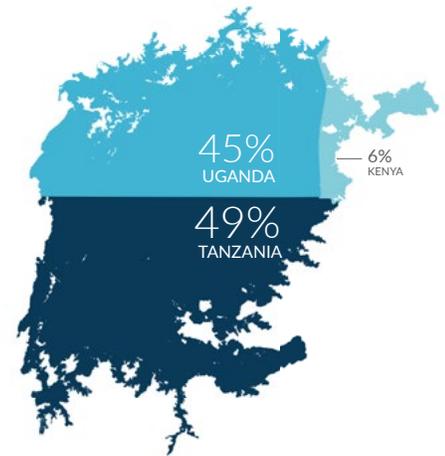
Lake Victoria

The stability of the Lake Victoria Zone is closely tied to the health of its Nile perch stocks. Non-native to Victoria, the Nile perch was introduced to the lake in 1954. Today this fish provides a multimillion-dollar export industry to Tanzania, Uganda, and Kenya, who control 49 percent, 45 percent, and 6 percent of the lake, respectively. While the Nile perch has brought prosperity to the region's fishing industry, it has had devastating impacts on native fish populations and the artisanal fishers who relied on them.

In the early 1990s, the primary threat to the lake's ecosystem was industrial pollution and raw municipal sewage. Pollution concerns were never properly addressed, being overshadowed by more pressing matters, so Victoria's water quality and fish stocks declined steadily for decades. This ecological degradation was exacerbated by the rapidly growing population in the region, the depletion of wetland zones, and the destruction of shoreline vegetation that had kept the soil and pesticides of surrounding agricultural lands out of the lake.

In 1994, the gruesome effects of the Rwandan civil war floated down the Kagera River into Lake Victoria. The Rakai village on the Uganda-Tanzania border reported seeing corpses floating by at a rate of one cadaver per minute.⁴⁸ Demand for fish plummeted as rumors of human teeth being found in the stomachs of Nile perch spread through the region.⁴⁹ That year, the price of fish in Tanzanian markets fell by over 60 percent and importing agents from Europe and the Gulf states stopped all shipments.⁵⁰

PERCENT OF CONTROL OF LAKE VICTORIA BY COUNTRY



Tilapia fishers on Lake Victoria. Sarah Glaser.

Lake Victoria communities endured more waterborne hardships in 1995: a cholera epidemic exacerbated challenges posed by water hyacinth, an invasive species that plagued the lake's ecology and economy. Water hyacinth is a free-flowing weed that carpeted the surface of the lake from 1992–1998. Fishing boats were trapped on land, unable to cut through the thick plants, and fish suffocated in the deoxygenated water. The hyacinth invasion was eventually tamed with weevils, but it remains an issue in the region that must be closely monitored.

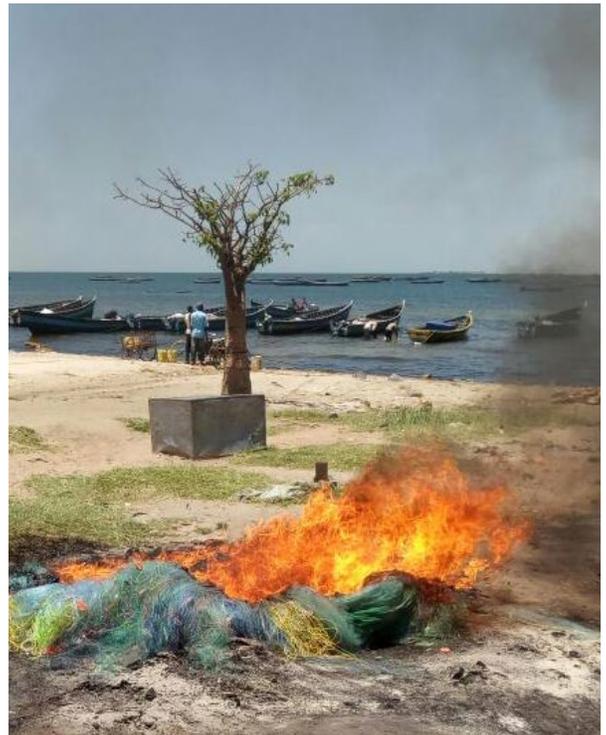
In May 1997, the European Union imposed separate bans on fresh fish imports from Tanzania, Kenya, and Uganda, citing unsanitary standards of capturing, killing, handling, and packing Lake Victoria fish.⁵¹ In January 1998, the EU expanded these bans into a region-wide ban of all fish (frozen and fresh) in response to another cholera epidemic. The ban was lifted on July 1, 1998.⁵²

As the 1998 ban was ending, an alert was sounded that pesticides such as Thiodan, Diazinon, and Tratrix were being used to kill and sell large amounts of fish.⁵³ Chemicals had been imported to Uganda to fight off the water hyacinth invasion but were found to be detrimental to lake ecology. When fishing-net prices increased beyond the budget of most artisanal fishers, these discarded chemicals became a commodity traded among fishers throughout the region. Concerned by the permanent ban threatened by the EU, Uganda and Kenya banned fish exports. Local demand for fish began to dwindle as word of the contaminated fish spread. Some lakeside communities took it upon themselves to punish any chemical fishing they saw, eager to use vigilante justice to return their industry to its status quo, but most villagers were afraid to confront the weapon-carrying chemical fishers. Despite efforts by the Kenyan and Ugandan governments, the EU imposed another ban on the region. The Tanzanian government was outraged to be included in this ban, arguing that they carried out an aggressive joint operation against this fishing method, but officials from Kenya's and Tanzania's Fisheries Research Institutes found that the problem was most serious in Tanzanian waters.⁵⁴ The EU lifted the Tanzanian ban on December 16, 1999.

The foreign demand for Nile perch grew exponentially in the twenty-first century. The cost of fishing gear soon exceeded the budgets of Victoria's fishers. There was a spike in lake insecurity after 2000, as some fishers sought careers elsewhere (banditry), while others were accused of encouraging banditry because pirated gear could be purchased cheaply. Fish-processing factories had lined the shores of Lake Victoria and fishers used whatever method necessary to meet the demand. Fierce competition over fishing grounds created turmoil on the water. In 2009, after months of frequent attacks by company-employed fishers against members of local fishing communities, local fisherman Stanslaus Kitunzi died in a brawl at Kyamukwikwiwi landing site.⁵⁵ That same year, residents of the village of Kashea hacked to death four fishermen who had been found using poison and banned nets to fish.⁵⁶ In 2010, 14 fishermen were murdered on an island in Mwanza District by bandits looking to steal their gear.⁵⁷

Prior to the surge in popularity of Nile perch, fishers were allowed free movement across the lake. To protect their perch stocks, Uganda and Tanzania began to enforce their borders. In 2003, Ugandan and Tanzanian authorities jailed over 250 Kenyan fishers charged with trespassing, fishing with banned nets, or using chemicals to catch fish. More than \$300,000 worth of equipment, including boats, high-powered motors, nets, and hooks were confiscated.⁵⁸ The following year, 85 Kenyan fishers who had been fishing in Tanzanian waters were arrested by Tanzanian armed patrol officers, sentenced to three years in prison, and forced to forfeit their gear.⁵⁹ Kenyan officials who negotiated their release said the fishers' families were starving without them and access to their gear. On the eastern part of the lake, an ongoing rivalry over fishing grounds between Tanzanian and Ugandan fishers was exacerbated by this heightened attention to borders.

The high price of Nile perch has also been connected to the increase in murders of albinos throughout Tanzania from 2006–2012. Traditional Tanzanian witchcraft holds a belief that the body parts of persons with albinism have magical properties. Throughout the Lake Victoria Zone, specifically in Mwanza, Mara, and Geita regions, where much of the demand for and harvesting of organs has occurred, miners and fishers are known to drive this industry, purchasing albino body parts or potions to increase their yields.⁶⁰ The women of the Mara region suffered from a similar witchcraft-driven murder threat in 2014.⁶¹



Confiscated nets are burned on the shores of Lake Victoria as part of the crack-down on illegal fishing by the Tanzanian government.

As the threat of chemical fishing waned, Tanzanian fisheries officials turned their attention to overfishing of immature fish, the increase in motorized boats and fishers, and the smuggling of fish into neighboring countries. From 2010–2015, illegal fishing gear worth over 600 million shillings (about USD \$277,000) was impounded and destroyed in the Kagera region.⁶² Some of the material confiscated included 6,089 gillnets below six inch mesh size, 469 monofilaments, and 317 beach seines. Mwanza and Geita led similar region-wide campaigns. Despite these efforts, a report in 2017 estimated that over 70 percent of Tanzanian fishers continue to use illegal fishing gear that catch immature fish and pose a threat to the long-term sustainability of the resource.⁶³

Tanzanian Coast

The Tanzanian coastline stretches some 1,424 km from its northern border with Kenya to its southern border with Mozambique and includes many small offshore islands and the region of Zanzibar. The northern maritime waters saw the impacts of piracy on commerce and fishing during the mid-2000s, while the central coast was plagued by conflict over access to fishing grounds in marine parks, conflict between Kenyan shrimp trawlers and domestic fishing villages, ecosystem disturbance from hotel expansions, and violent crackdowns on illegal fishing. Dynamite fishing has dramatically affected the integrity and health of the coral ecosystems along the length of the coastline.

Dynamite Fishing in Tanzanian Waters

Dynamite fishing is a destructive fishing practice which has greatly decreased the catch in coastal fishing villages along the eastern coast of Tanzania. Dynamite fishing is also a wasteful fishing method: on average, only 3 percent of the organisms killed by a blast are harvested.⁶⁴ Each blast kills all fish and other living organisms within a 20-meter radius and destroys coral reef habitat.⁶⁵ Coral reef-destroying blasts are frequent along the Tanzanian coast. In 2005, the most frequently targeted areas were off the coast of Kigombe, Pagani, Kwale, and Tanga city.⁶⁶ In 2015, dynamite fishing was practiced in 16 mainland coastal districts and municipalities within Dar es Salaam, Tanga, Mtwara, and Lindi coastal areas, which are cited as being hotspots due to a lack of regulation.⁶⁷

While dynamite fishing has been condemned publicly and officially, local officials have often looked the other way and tacitly allowed it to endure.⁶⁸ Fishers and community members who oppose dynamite fishing accuse officials of corruption, but ultimately have been afraid to speak up for fear of reprisal from government officials or violence from fishers who use dynamite.

According to the Tanga-based Fisheries Law Enforcement Unit, a total of 59 cases involving dynamite fishing were filed by police between 2006 and 2012; however, only 30 of the cases were brought before courts in Muheza and Tanga city. Of the 59 cases, seven “went missing” and the evidence was lost.⁶⁹ The judiciary was singled out as imposing milder penalties on the dynamite fishers than are stated by the law.^{70, 71} More recently, in March and early April 2015, acoustic data uncovered 318 confirmed dynamite blasts.⁷²



Scenes from the Tanzanian coast. Top: fishers in Dar es Salaam. Rebecca Hardgrave. Middle: carrying a trap on the beaches of Zanzibar. Georgie Pauwels. Bottom: women fishing in shallow waters in Zanzibar North.

Dynamite fishing reportedly continued to occur well into 2016 even though the Fisheries Act of 1970 has prohibited dynamite fishing for almost 50 years:

“No person shall possess or use dynamite or explosive or electric devices for the purpose of killing fish or of simply fishing. No person shall possess dynamited fish at sea or lake or river, or at fish-receiving stations or at any place. Evidence on dynamited fish shall be given in court of law by a licensing authority.”⁷³

In July 2005, dynamite fishing was so pervasive that Tanga International School students put on a play depicting the destruction of dynamite fishing.⁷⁴ Dynamite fishing notably destroys wave-blocking corals, and property damage has been caused to Kigombe beach houses.⁷⁵

In April 2011, fisheries officer Hyasint Donald Wariro suffered an acid attack by dynamite fishers that cost him an eye. Prior to the attack, Wariro was set to testify in over 40 cases involving dynamite fishing. Wariro claimed that dynamite fishers who faced cases in court hired two people to execute the acid attack on him by motorcycle.⁷⁶ In addition to this attack, one patrol boat was burned at Kigombe, Tanga.^{77, 78, 79} In November 2012, two German scuba divers had their hearing damaged by a dynamite blast near Maziwe Island Marine Reserve.⁸⁰



A dynamite fishing blast, which while illegal, still occur frequently in Tanzania. World Fish.



A fisher readies his line. WorldFish.

Mafia Island Marine Park (MIMP)

In December 2008, Mafia Island Marine Park (MIMP) patrol boats loaded with soldiers invaded villages said to be practicing illegal fishing. Villagers were physically assaulted during the invasions.⁸¹ As a result of the invasions, fear spread among villagers, which in turn led to food insecurity in fishing communities on the island of Jibondo where people were afraid to fish. Acts of intimidation spread to other villages.⁸² In June 2011, an MIMP patrol boat deliberately rammed into a traditional fishing boat at Juani village, endangering the fishers’ lives, ostensibly to prevent the transportation of a suspected illegal net.⁸³ In another act of force, army officers whipped democratically elected village leaders in public.⁸⁴

Tawariq 1

In 2009, a South African-led joint operation resulted in the arrest of a flagless foreign trawler, *Tawariq 1*, some 100 miles off the Tanzanian coast. The trawler had 70 tons of tuna worth approximately \$900,000 and a crew of 35 from Taiwan, Thailand, Greece, and Kenya. The captain of the vessel, Hsu Chin Tai, was charged with polluting the marine environment by dumping fish remains and ship fuel into Tanzanian waters. The crew was charged on July 23, 2009 for fishing without a license and degrading the marine environment. In addition to the charges, it was noted that GPS fishing tracks had allegedly been erased to conceal the vessel’s illicit activities.⁸⁵



A fisher works on his boat before setting off on Lake Tanganyika. MONUSO, Abel Kavanagh.

Lake Tanganyika

Lake Tanganyika is an iconic African Great Lake, hosting 250 species of the colorful and popular cichlid fishes plus another 80 species of fish, many of which are important food items. Famous for being the second-deepest and the second-largest lake in the world (by volume), it lies where Tanzania, Zambia, the DRC, and Burundi meet in northwestern Tanzania. Its location means the fishing communities along its shores have been impacted by the civil wars in Burundi (1993–2005) and the DRC (1998–2004) (Box 1). But before civil conflict overwhelmed the lake, declines in its fish populations were affecting Tanzanian fishers. During the early 1990s, fishers from Lake Tanganyika began migrating to Lake Victoria in search of more plentiful stocks.⁸⁶

The onset of the Burundian civil war overwhelmed concern about environmental issues. In 1995, Burundian soldiers began crossing the border into Tanzania and stealing gear from fishers.⁸⁷ In one incident in 1997,^{88, 89} a Burundian army boat fired on Tanzanian security forces and attacked Tanzanian fishers, stealing 17 motor boats, five canoes, and 29 fishing nets. Three fishers were killed in the incident. Tensions between security forces were exacerbated by the presence of bases for Hutu rebel fighters along the lake in the northern Tanzania district of Kigoma, for which Burundi blamed Tanzanian officials. Accusations of theft and attacks against Tanzanian fishers by the Burundian army continued until 1999, at which point the federal governments of Burundi and Tanzania agreed to improved military cooperation.⁹⁰

Meanwhile, fishing communities in the DRC were severely impacted by the civil conflict. In 1998, 1,500 fisherfolk fled the fishing village of Moba and relocated into Tanzania when DRC rebels took over the village. The fleeing fishers mostly did not resettle in refugee camps, but rather resumed fishing from Tanzanian fishing sites.⁹¹

Throughout the two civil wars, Tanzanian fishers were especially targeted by a variety of rebel groups and bandits who needed boats, fuel, and money.⁹² In 2001, bandits forced several Tanzanian fishing boats to carry engines and other gear off a passenger ferry, an attack which left 17 people dead.⁹³

Such attacks in the Kigoma region continued through the late 2000s. In 2011, bandits from the DRC used heavy firearms to attack fishing boats, getting away with over 13 million shillings' worth of gear.⁹⁴ In 2012, separate attacks resulted in the theft of gear and boats worth over 60 million shillings; one unlucky fisher was abducted in a stolen canoe.^{95, 96} In 2013, bandits from Burundi attacked fishers in the village of Kasanga; the police engaged in a gun battle, killing two bandits.⁹⁷ Fishing communities became outspoken about these attacks, appealing to the government to stop them.⁹⁸ In response, the government increased police and military presence along the northern Tanganyika border.⁹⁹ By 2013, attacks were frequent enough that fishers were afraid to go fishing.

While border incursions continued in the late 2000s, the Tanzanian government began focusing on the health of the lake. In 2010, the Tanzanian Ministry of Livestock Development and Fisheries directed fisheries officers to begin revoking licenses issued to all foreign vessels in Tanganyika's waters. They claimed foreign fishers had invaded the lake, and that the resulting heavy fishing pressure caused abject poverty for Tanzanian fishing communities.¹⁰⁰ In one incident, Tanzanian Marine Police arrested 28 fishers from Zambia for illegal fishing. After high-level negotiations, the Zambians were repatriated. Fishing communities complained regularly about illegal fishing from both foreign and domestic sources, claiming 50 percent of fishing vessels lacked legal registrations. Ultimately, declines in the fish stocks in Tanganyika led to the formation of the Lake Tanganyika Authority in 2008 to coordinate fisheries management and policy between the four nations surrounding the lake.

Lake Nyasa

For more than fifty years, a dispute has simmered between Tanzania and Malawi over ownership of Lake Nyasa, the third-largest lake in Africa and home to over 1,000 endemic fish species.¹⁰¹ Based on an 1890 treaty between Germany and Britain, Malawi claims sovereignty over the entire lake, which it calls Lake Malawi. Tanzania claims 50 percent based on international law.¹⁰²

Tensions heightened in 2011 when Malawian president Joyce Banda allowed a UK-based petroleum company to conduct oil and gas exploration on the lake. In August 2012, a Tanzanian member of parliament accused the Malawian tourism industry and fishers of operating outside their territorial waters,¹⁰³ and news reports cited fear among local Tanzanians that the dispute could escalate to war.¹⁰⁴

In October 2012 there were reports of beatings and harassment of Malawian fishers by Tanzanian security forces. A Malawian fisher, Martin Mhango, told the Inter Press Service that he was dragged to the beach while fishing, detained, and beaten: "They told me that I had trespassed and was fishing on the Tanzanian side. I was told to never fish on their side again." Mhango said he was afraid to cross to the Tanzanian side after this incident, and his income decreased by 50 percent due to reduced harvests.¹⁰⁵

Several fishing families who used to fish freely across both sides of the lake expressed similar fears, though Tanzanian authorities denied that there was any harassment based on trespassing issues. They claimed that two Malawian fishers were among seven people arrested for using banned nets during a crackdown on illegal fishing.¹⁰⁶ The two countries agreed to mediation by a panel of Southern African Development Community former heads of state in 2012, but President Banda said she would go to the International Court of Justice if they failed to reach a resolution.¹⁰⁷ As of 2018, the dispute remains unresolved.

Nyumba ya Mungu Dam

Once an abundant source of fish in northeastern Tanzania, the waters above the Nyumba ya Mungu hydroelectric dam have languished due to pressures from illegal fishing and drought. In the 1970s, the waters produced 25,000 metric tons of fish annually, but this number had dwindled to just 11 metric tons by 2016.¹⁰⁸

Pressure on the dam increased rapidly when the waters of nearby Lake Jipe began to dry up, resulting in about 4,000 fishing families relocating to Nyumba ya Mungu. Exacerbating this pressure, some fishers on the lake use illegal fishing methods such as explosives, banned nets, and poison.¹⁰⁹ Local communities have formed patrol groups to address the issue; in 2008, patrols clashed with illegal fishers after trying to confiscate their gear. The two sides fought with machetes, stones, and clubs, resulting in two deaths and 16 serious injuries.¹¹⁰

In 2012 and 2016, authorities implemented six-month and one-year fishing bans, respectively, to allow stocks to replenish. The bans threatened the livelihoods of some 20,000 fishers,¹¹¹ and fishing reportedly continued unabated at night.¹¹² In August 2016, the Kilimanjaro Regional Commissioner threatened to fire local leaders if they failed to prevent the illegal fishing.



Declining fishing stocks plagues the Nyumba ya Mungu Dam. Peter Caton.

VI. CONCLUSIONS AND POLICY IMPLICATIONS

Fisheries conflict is a threat to the stability and health of artisanal fishing communities—but that threat has been underappreciated. While the negative consequences for resource sustainability from illegal fishing are well-known, we are still scratching the surface of what fisheries conflict *is*, let alone what causes and prevents it. The need is urgent. Fisheries are a critical component of livelihood and food security around the world, especially in developing nations. *Competition* over fisheries resources, like all finite resources, is to be expected. But *violent conflict* is not inevitable, and management of that competition is the most effective way to promote resilient and peaceful fishing communities.

Our research points to several conclusions:

- **THE PREVALENCE OF FISHERIES CONFLICT IN INLAND FISHERIES, CAUSED BY DOMESTIC IUU FISHING, IS SEVERELY UNDERAPPRECIATED.** Today, the international community is highly focused on illegal fishing in ocean waters, particularly by vessels from distant water fishing nations. But the majority of fisheries conflicts, and specifically those involving illegal fishing, involved Tanzanian fishers. Governments and advocacy organizations alike are missing the most significant source of conflict if they do not focus on domestic illegal fishing.
- **IT IS BETTER TO PREVENT FISHERIES CONFLICT THAN TO TRY TO MANAGE IT ONCE IT BEGINS.** Many violent events we examined happened over short time periods and in small, rural fishing villages. The conflicts were often over quickly, but they were in response to systemic problems like resource depletion and illegal fishing. Short-term fixes to long-term problems will not reduce the frequency or intensity of fisheries conflict.
- **THE BEST WAY TO PREVENT VIOLENT FISHERIES CONFLICT IS TO MANAGE COMPETITION OVER FISHERIES RESOURCES BY CHANNELING DISPUTES THROUGH PEACEFUL RESOLUTION MECHANISMS.** Managing fisheries for long-term sustainability is clearly important for economic profit and ecosystem health. But enabling conditions that lead to peace and stability in fishing grounds must also be a key priority for fisheries management.
- **FISHERIES CONFLICT IS RELATED TO THE PRESENCE OF OTHER FORMS OF CONFLICT.** Fisheries conflicts were often caused by unrelated conflict in an area. Tensions spread, or attention was drawn to fisheries resources by conflict actors who needed supplies, food, and income.

Governments can better mitigate fisheries conflict by managing illegal fishing in a proactive—not reactive—manner. The government of Tanzania has taken important steps to deter illegal fishing in its exclusive economic zone, and it is addressing declining fish populations in Lake Victoria through co-management strategies that engage fishing communities directly. Critically, this report showed most fisheries conflicts start at the local level between small groups of actors. Consequently, one key step in preventing or solving fisheries conflict is to link local knowledge of fisherfolk to technical and governance capacity at the national level. This way, federal policy makers and resource managers can anticipate the conditions that cause conflict to erupt.

Fisheries management also provides avenues for cooperation between nations that share fish stocks. The Lake Victoria Fisheries Organization unites the governments and the fishers of Uganda, Kenya, and Tanzania to manage shared fisheries resources, and the Lake Tanganyika Authority unites Burundi, the DRC, Tanzania, and Zambia. This transnational coordination is necessary for clear communication, prioritization of community needs, and supportive governance.

Based on the findings of this report, we recommend the following as ways to prevent fisheries conflict:

- Efforts to stop illegal fishing should be made in consultation with fishing communities and authorities in cross-border agencies;
- Inland fisheries and their stability should be prioritized in national development plans and agendas related to the United Nations Sustainable Development Goals; and
- Short-term fishing bans are a critical tool for emergency fisheries management, but their implementation needs to be predictable and coupled with widespread community information campaigns and efforts to promote alternative livelihood options during the fishing ban.

The drivers and consequences of fisheries conflict found in this report are not unique to Tanzania: they are repeated throughout the world. The Fisheries Conflict Database begins to fill a gap in the quantitative data to integrate drivers of conflict from a social-ecological perspective. The approach outlined here is not specific to Tanzania, and its expansion will help understand the conditions under which conflicts occur.

VII. FUTURE RESEARCH

In its current form, the Fisheries Conflict Database covers only the United Republic of Tanzania. To devise the best recommendations for mitigating conflict and strengthening global fisheries, it is imperative that we develop a complete and universal understanding of what factors drive fisheries conflict. As the Pomeroy et al.,¹¹³ Hendrix and Glaser,¹¹⁴ and Mitchell and Theis¹¹⁵ studies have found, whether a particular driver increases or decreases fisheries conflict—or has no impact—varies by country. The next stage of our research will expand our efforts to code event-level fisheries conflict data to other countries in the region. This larger quantitative dataset can then be used to expand our analysis and test the linkages we have already found.

We have plans to expand the Fisheries Conflict Database to include at least ten other East African countries in the short term. Cross-national analysis will allow us to answer questions such as:

- How does the prevalence and intensity of fisheries conflict vary by governance regime?
- Is fisheries conflict increasing everywhere? If not, why not?
- How do different fisheries management regimes affect the prevalence and type of fisheries conflict?
- Are countries with healthier fish stocks less likely to see fisheries conflict?
- How is fisheries conflict linked to, or affected by, other forms of armed conflict or political violence?

As the coverage of our database grows, the impact of spatial and temporal scale will also help us unravel the complex linkages between these systems.

A fishing line at sunset, Tanzanian coast.



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