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THE ROLE OF WILD-CAUGHT FISHERIES IN AFRICAN DEVELOPMENT



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CONTRACT INFORMATION

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DISCLAIMER

The authors' views expressed in this publication do not necessarily reflect the views of the United States Agency for International Development or the United States Government.

FRONT COVER: GHANA – 2010: A fishmonger preparing fish for smoking. Photo by Glenn G. Page, SustainaMetrix for USAID

INTRODUCTION

The 2016 Global Food Security Act calls for the U.S. Government to develop and implement a comprehensive, strategic approach to achieve global food security and nutrition, and promote inclusive, sustainable and resilient development. This multi-objective approach should focus on small-scale producers, including fishers, farmers, pastoralists and foresters. Feed the Future, the U.S. Government's global hunger and food security initiative, has primarily focused on terrestrial crops and aquaculture (i.e., fish farming), rather than fishing and fisheries (i.e., harvesting of wild-caught fish). Given the Act's mandate for a more comprehensive approach, what is the role of fishing and wild-caught fisheries in achieving global food security and nutrition goals? How can the lessons learned from farming reforms and other strategies through Feed the Future be successfully applied to fisheries management?

To address these questions, the U.S. Agency for International Development's (USAID) Food Security and Biodiversity Integration Working Group commissioned a research study.¹ As a first step, the research team conducted interviews with key technical staff at USAID's Bureau for Food Security, the Office of Food for Peace, the Bureau for Global Health and the Bureau for Democracy, Conflict and Humanitarian Assistance to better understand their knowledge and perceptions of wild-caught fisheries and the contributions of these fisheries to development. The interviews also helped clarify how lessons learned from Feed the Future could be applied to improve wild fisheries management.

Through these interviews, the research team identified the following key areas of interest and knowledge gaps related to wild-caught fisheries management as a development strategy at USAID:

- The linkages between wild-caught fisheries and poverty reduction, income, nutrition and resilience;
- The potential links between coastal fisheries and the food security and nutrition of inland communities where Feed the Future often works (i.e., the zones of influence);

- Effective ways to improve governance and management of wild fisheries, particularly the role of nutrition-sensitive national fishing policies and local governance;
- The comparative advantages and disadvantages of wild-caught fisheries and aquaculture projects;
- How lessons learned from Feed the Future can be applied to improve wild fisheries management and enhance productivity; and
- Information on successful wild-caught fisheries projects and implementation approaches.

This report summarizes the evidence base related to these key areas of interest. The report specifically focuses on small-scale fisheries in East and West Africa due to their critical role in supporting food security, resilience and nutrition in these regions. This report then presents opportunities and recommendations for intervening in wild-caught fisheries management to improve the livelihoods and food security of the hundreds of millions of people who depend on wild fish for nourishment and income.

¹ This research study was supported by USAID's Office of Forestry and Biodiversity and conducted by the Biodiversity Results and Integrated Development Gains Enhanced (BRIDGE) project. The Smithsonian Institution, a BRIDGE partner, helped conduct this study.

KEY FINDINGS

The 2016 Global Food Security Act recognizes the importance of strengthening agricultural systems, including wild-caught fisheries, and sustainably intensifying their productivity in meeting its goals. Fish is the primary source of animal protein for almost one billion people globally, many of whom live at or below the poverty line and face chronic food insecurity. Fish, particularly when eaten whole, is a significant source of essential vitamins, minerals and fats and an important complement to the carbohydrate-rich diets of many of the world's poor. In many developing countries, fish is among the cheapest and most accessible sources of protein and a preferred part of traditional diets. Furthermore, marine and freshwater fisheries are estimated to employ more than 320 million people globally (Teh and Sumaila 2013, Bartley et al. 2015).

- In Africa, marine and freshwater fisheries employ **93%** of people in the fish production sector, and aquaculture employs the remaining **7%**.
- Women make up approximately **50%** of fish industry workers, with **90%** of them engaged in post harvest activities.
- Fish is a significant contributor to total animal protein intake in many African countries such as Ghana (**63%**), Senegal (**44%**), the Gambia (**49%**) and Sierra Leone (**70%**).
- The World Bank estimates that poor management of wild-caught fisheries leads to **\$83 billion** in lost economic benefits globally and **\$10 billion** in Africa each year.

This review of the current evidence base on the role of wild-caught fisheries in Africa identified **five main findings**:

- Wild-caught fisheries support livelihoods for millions of people and well-managed fisheries can alleviate poverty and strengthen resilience in many African countries;
- Fish is a highly nutritious food that contributes to food security and nutrition for over 400 million Africans in both coastal and inland areas;
- Wild-caught fisheries are at risk of decline, decreased productivity and collapse due to poor management, with serious implications for development outcomes in Africa;
- There is an urgent need to reform and strengthen wild-caught fisheries management; and
- USAID has the tools, experience and knowledge to do so.

As with farming systems, proper management of both small-scale and industrial-scale wild-caught fisheries is key to maintaining and increasing their productivity. When well-managed, wild-caught fisheries can play a critical role in food security, nutrition and poverty reduction in Africa and are an integral part of rural development and equitable resource use. For example, over 90 percent of the catch from small-scale fisheries is destined for domestic consumption, contributing directly to local food supplies (FAO 2015).

Since its launch in 2010, USAID's Feed the Future initiative has made key advances in improving global

food security by helping priority countries improve their agricultural sectors so they can produce enough food to sustainably feed their populations. There is an opportunity to apply the lessons from these terrestrial successes to wild-caught fisheries while positioning Feed the Future to be an international leader in comprehensive global food security. With adequate management approaches and investment, the natural productivity of wild-caught fisheries can be enhanced, leading to larger fish populations and increased catches, higher profitability and improved human well-being.



GHANA – 2011: Fishing port of Tema. Photo by A. Kauffeld, USAID

5 FACTS ABOUT WILD-CAUGHT FISHERIES & AFRICAN DEVELOPMENT



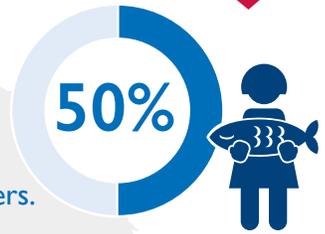
Staff from these USAID operating units asked... ..and the FAB Office found...

How do fisheries contribute to poverty reduction, income and resilience?



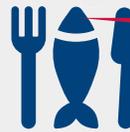
Fisheries support up to 20% of jobs in some countries.

Women make up 50% of fish industry workers.

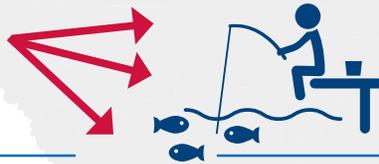


What is the role of fisheries in food security and nutrition?

For **400 MILLION** Africans, fish is an affordable and accessible source of protein.



We are rich in micronutrients!!!



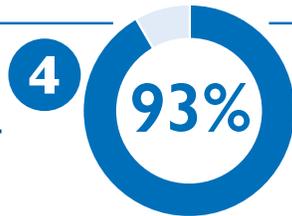
INLAND COMMUNITIES use coastal and lake fish **through established trade routes.**

What are the risks from poor fisheries governance and management?

\$10 BILLION in revenues are lost annually in Africa....

...while **risk of fisheries collapse and job loss** increases without adequate management.

What should future investments focus on – improving wild-caught fisheries or aquaculture?



In Africa, wild fisheries employ **93% of workers in the fish sector, aquaculture employs 7%.**

Both sectors need better management, but...

Fishing is too **Big** to **Ignore.**

What lessons from Feed the Future can be applied to fisheries management?



Successful Feed the Future strategies can be adapted such as...

- ☞ **promote secure tenure for fishing grounds**
- ☞ **strengthen fishing associations**
- ☞ **provide training and extension services**

What are examples of successful fisheries projects and approaches?



Check out **FINDING 5** to learn about **9 strategies** and **4 examples** of successful fisheries management.



FINDING I:

WILD-CAUGHT FISHERIES ARE CRITICAL FOR LIVELIHOODS, ALLEVIATING POVERTY AND STRENGTHENING RESILIENCE

The wild-caught fisheries and aquaculture sectors, and related secondary activities such as fish processing, employ an estimated 10 to 12 percent of the global population (FAO and OECD 2014). Women make up approximately 50 percent of fish industry workers (Monfort 2015). In Africa, marine and inland wild-caught fisheries employ almost 93 percent of those who work in these sectors, while aquaculture employs the remaining 7 percent. Among women engaged in the sectors, 10 percent are fishers (mostly inland) and 90 percent are involved in post-harvest activities, such as on-shore handling, processing and marketing of fish (De Graaf and Garibaldi 2014).

The exact number of people employed in fishing and secondary activities in Africa is difficult to estimate for multiple reasons, including inadequate government investments and recordkeeping in this sector. Yet, the sector's importance is too large to ignore. In countries where there is adequate data, such as Senegal, the fisheries sector employs an estimated 20 percent of the workforce (Belhabib et al. 2014). Among the poorer countries in the region, such as Guinea-Bissau, Guinea and Gabon, small-scale fisheries can support up to 25 percent of the workforce in coastal areas (Belhabib et al. 2015d).

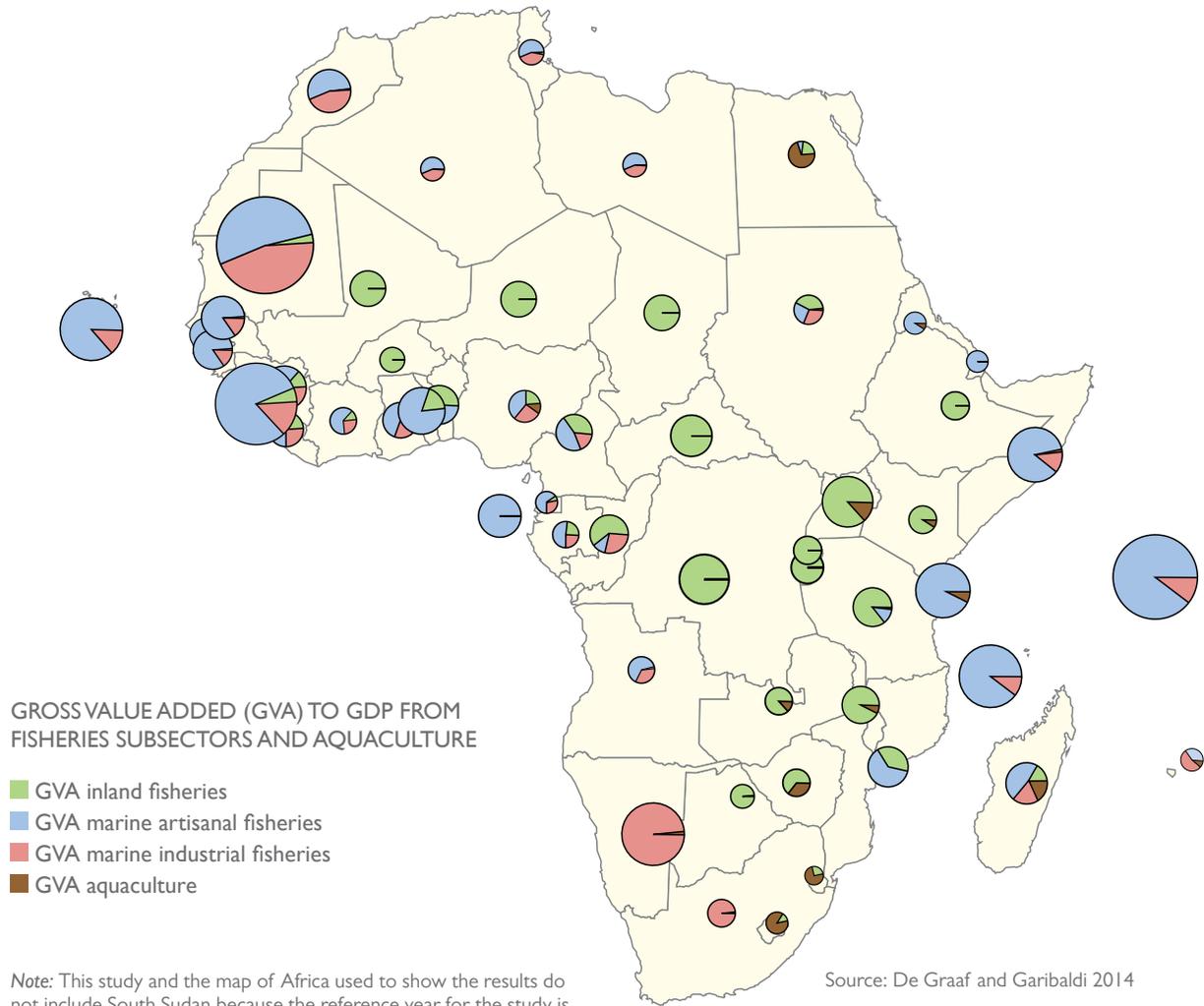
Official figures, when available, tend to underestimate the economic importance of fisheries and supporting activities and the number of people employed in the sector, particularly small-scale fishers (see Finding 3 for more information on the reasons for this discrepancy). For example, an analysis of West African small-scale fisheries found that they employ about 1.7 million

- The wild-caught fisheries sector employs an estimated **20%** of the workforce in Senegal.
- In West Africa, the number of people relying on wild-caught fisheries for food security and livelihoods has increased by approximately **2%** each decade, driven in part by decreasing crop productivity due to climate change.
- Women play a key role in post harvest activities in Africa such as fish processing and trading.
- Small-scale fisheries support up to a quarter of the workforce in coastal areas of Gabon, Guinea and Guinea-Bissau.



MOZAMBIQUE – 2011: A family rests in the shade of nets used to dry fish.
Photo by Christian Smith, USAID

FIGURE 1: CONTRIBUTION OF FISHERIES AND AQUACULTURE TO GDP IN AFRICAN COUNTRIES
 (The size of the pie indicates the relative contribution of fisheries to GDP for each country.
 The pie wedges indicate the gross value added from different fisheries subsectors and aquaculture.)



fishers compared to official figures of one million. In Guinea, the actual contribution of small-scale fisheries to gross domestic product (GDP) was six times greater than official estimates (Belhabib et al. 2015d).

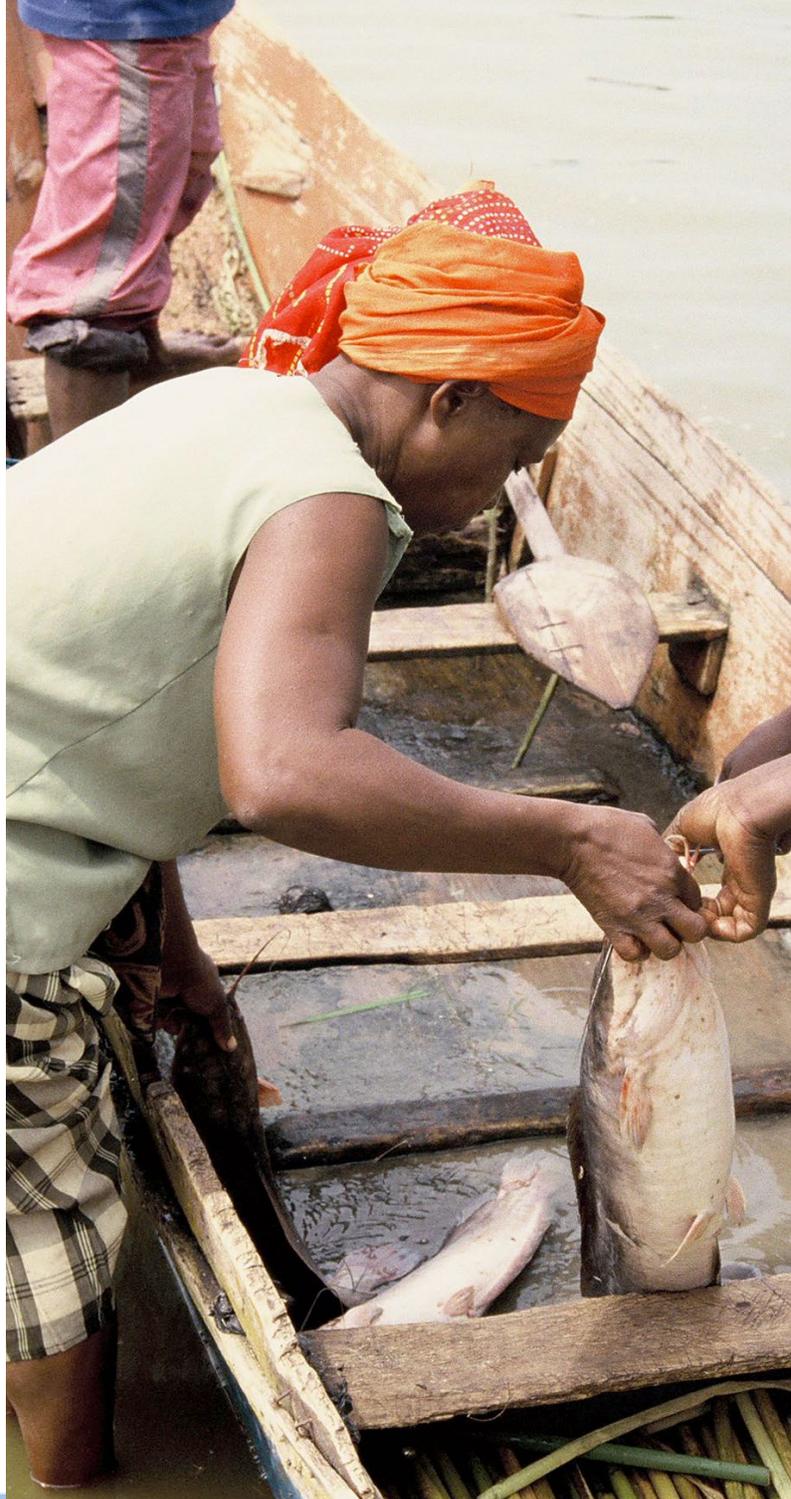
A recent analysis from the World Bank found that poor management of global marine fisheries has led to their overexploitation and substantial losses in fisheries revenues with annual losses estimated at \$86 billion globally and \$10 billion in Africa. The two world regions that suffer the greatest economic losses are Africa and Asia. Fisheries sector reforms that transition fisheries management towards

greater sustainability have the potential to provide access to this lost revenue and can benefit highly vulnerable coastal communities (World Bank 2017).

In a 2014 study, “The Value of African Fisheries,” researchers with the Food and Agricultural Organization of the United Nations (FAO) estimated the value added by the fisheries and aquaculture sectors to be more than \$24 billion in 2011 (De Graaf and Garibaldi 2014). Marine small-scale fisheries contributed the most value (\$8.1 billion or 34 percent) among the various fisheries sectors, followed by marine industrial fisheries (\$6.8 billion or

28 percent), inland fisheries (\$6.3 billion or 26 percent) and aquaculture (\$2.8 billion or 12 percent). Figure 1 illustrates the gross value added from fisheries and aquaculture in Africa; the gross value added from small-scale (artisanal) fishing activities is particularly significant in Senegal, Ghana, Mauritania, Sierra Leone, Guinea, Tanzania and Mozambique (Figure 1).

Healthy wild-caught fisheries also contribute to community resilience by providing nourishment for many people who would otherwise go hungry during times of food insecurity and livelihood shocks. For example, the total number of people relying on fisheries for food security and livelihoods in West Africa has steadily increased by about 2 percent per decade as local populations move to coastal areas in response to climate stressors that negatively impact crop productivity (Belhabib et al. 2015d). A World Food Programme analysis in northern Ghana illustrates the role of wild-caught fisheries in household food security and resilience. Among Ghanaian households that earn their income from crop cultivation, pastoralism and fisheries, those that sustained their livelihoods through fishing were more likely to have adequate food consumption due to their regular access to fish (Hjelm and Dasori 2012).



UGANDA – 2010: A woman helps to unload a fishing boat.
Photo by USAID

In Africa, women play a key role in post-harvest activities ranging from fish processing to trading in local markets. In coastal West Africa, women own boats and gear that they allow fishermen to use in exchange for access to their catch. It is also common for West African women to finance fishing operations run by men (Monfort 2015). Women also directly engage in fishing activities conducted from the shore through gleaning, where they collect fish, shellfish and other aquatic foods for consumption and sale (Belhabib et al. 2015). Gleaning by women is largely under-reported or not reported in government statistics, although it can contribute significantly to household food security.

FINDING 2:

FISH IS A HIGHLY NUTRITIOUS FOOD THAT CONTRIBUTES TO HEALTHY COMMUNITIES IN BOTH COASTAL AND INLAND AREAS

Fish is an important dietary component in many African countries, averaging 21 percent of animal protein consumed on the continent. It is also an affordable and accessible source of protein for approximately 400 million Africans (Ayilu et al. 2016, World Bank 2012). Among the countries with the highest contribution of fish to total animal protein intake are Ghana (63 percent), Senegal (44 percent), the Gambia (49 percent) and Sierra Leone (70 percent) (World Bank 2012, FAO 2014, Belhabib et al. 2015). Fish, including fish sauce, is also often a preferred food or condiment within traditional diets in many African countries (FAO 2016).

Fish is also an important source of energy and protein, comparable to or better than many terrestrial types of meat (USDA 2016). Wild fish, especially small fish species that are eaten whole or as fish sauce, provide a range of important nutrients, including calcium, iron, phosphorous, sodium, zinc and vitamins A, B-12, D and E. In East Africa, small pelagic fish is used to make weaning foods for children (Kirema-Mukasa 2012). When compared with chicken, goat, beef and soybeans, fish is a better source of many essential

vitamins and minerals (Table 1). In addition, wild-caught fish is higher in vitamins A and D when compared to some farmed fish such as catfish, which is a common fishery and farmed species in Africa (Table 1). Other studies have shown that although aquaculture fish products may be a cheaper option, they often have lower nutritional value than wild caught fish products. Lower nutritional value can make aquaculture a sub-optimal substitute for domestic wild-capture fisheries (Thilsted et al. 2016, Pauly and Zeller 2017).

- Fish accounts for an average of **21%** of animal protein consumed in Africa.
- Fish is an affordable and accessible source of protein for approximately **400 million** Africans.
- Freshwater fisheries are an important source of local, low-cost and highly nutritious food in Africa.
- A recent global analysis found that many of the continent's freshwater fisheries are fully exploited.
- Intra-regional fish trade in Africa is important to nutrition and food security in inland areas.



Fish is a primary source of essential nutrients for pregnant mothers and children, especially nutrients like DHA, an omega-3 fatty acid that is critical for early brain development (Swanson et al. 2012). Experts advise that pregnant women consume a minimum of 200 mg of DHA per day (Koletzko et al. 2007).

KENYA – 2013: Rosemary Onyango Oduol supports her four children through her business of drying and selling small fish, called omena. Photo by Riccardo Gangale, USAID

TABLE 1: NUTRITIONAL VALUE OF COMMONLY LANDED AFRICAN FISH SPECIES AND COMMONLY CONSUMED TERRESTRIAL FOODS*

Nutrients per 100 g	Sardine ¹ (wild)	Croaker ² (wild)	Tilapia ³	Catfish ⁴ (wild)	Catfish ⁵ (farmed)	Chicken ⁶	Goat ⁷	Beef ⁸	Soybean ⁹
Energy (Kcal)	208.0	104.0	96.0	95.0	119.0	111.0	109.0	198.0	147
Protein (g)	24.6	17.8	20.1	16.4	15.2	20.3	20.6	19.4	13.0
Total lipid (fat, g)	11.5	3.2	1.7	2.8	5.9	2.7	2.3	12.7	6.8
Calcium (mg)	382.0	15.0	10.0	14.0	8.0	10.0	13.0	12.0	197.0
Iron (mg)	2.9	0.4	0.6	0.3	0.2	1.0	2.8	2.0	3.6
Magnesium (mg)	39.0	40.0	27.0	23.0	19.0	23.0	0.0	19.0	65.0
Phosphorous (mg)	490.0	210.0	170.0	209.0	204.0	198.0	180.0	175.0	194.0
Potassium (mg)	397.0	345.0	302.0	358.0	302.0	238.0	385.0	289.0	289.0
Sodium (mg)	307.0	56.0	52.0	43.0	98.0	75.0	82.0	68.0	15.0
Zinc (mg)	1.3	0.4	0.3	0.5	0.5	1.2	4.0	4.6	1.0
Riboflavin (mg)	0.2	0.1	0.1	0.1	0.1	0.1	0.5	0.0	0.2
Niacin (mg)	5.2	4.2	3.9	1.9	2.1	7.9	3.8	4.8	1.7
Vitamin B-6 (mg)	0.3	0.3	0.2	0.1	0.2	0.4	0.0	0.4	0.1
Folate, DFE (ug)	10.0	15.0	24.0	10.0	10.0	7.0	5.0	6.0	0.0
Vitamin B-12 (mg)	8.9	2.5	1.6	2.2	2.9	0.4	0.0	0.4	0.1
Vitamin A, (IU)	108.0	41.0	0.0	50.0	1.0	45.0	0.0	0.0	180.0
Vitamin E (mg)	2.0	1.3	0.4	0.0	0.8	0.2	0.0	0.4	0.0
Vitamin D (IU)	193.0	27.0	124.0	500.0	9.0	0.0	0.0	1.1	0.0
Fatty acids, saturated (g)	1.5	1.1	0.6	0.7	1.3	0.7	5.3	5.3	0.8
Fatty acids, monounsaturated (g)	3.9	1.1	0.5	0.8	2.6	0.8	1.1	4.8	1.3
Fatty acids, polyunsaturated (g)	5.2	0.5	0.4	0.9	0.1	0.7	0.2	0.5	3.2
Cholesterol (mg)	142.0	61.0	50.0	58.0	55.0	65.0	57.0	62.0	0.0

Wild-caught catfish is higher in calcium and vitamins A and D compared to farmed catfish. Wild-caught sardines are higher in many nutrients than soybeans.

*Source: USDA 2016. Food items were searched using the 'Standard reference' option: 1 NDB number: 15088, Fish, sardine, Atlantic, canned in oil, drained solids with bone; 2 NDB number: 15020, Fish, croaker, Atlantic, raw; 3 NDB number: 15261, Fish, tilapia, raw; 4 NDB number: 15010, Fish, catfish, channel, wild, raw; 5 NDB number: 15234, Fish, catfish, channel, farmed, raw; 6 NDB number: 05113, Chicken, roasting, meat only, raw; 7 NDB number: 17168, Goat, raw; 8 NDB number: 13047, Beef, grass-fed, ground, raw; 9 NDB number: 11450, Soybeans, green, raw.

The importance of wild fish to nutrition and food security extends beyond coastal areas. In many African countries, wild-caught fish collected from coastal waters is dried, processed and transported inland to provide nutritious food to communities hundreds of miles away from where it was caught. Participation in intra-regional fish trade is an integral part of the daily lives of many people in western and eastern Africa. A recent analysis of the West African informal artisanal fish trade found that it is

often undertaken by disadvantaged populations, particularly women, and provides important social and economic benefits (Ayilu et al. 2016). While a portion of a fisher's catch is sold locally, another portion is often processed and traded to surrounding communities or middlemen/women. Processed fish (salted, dried, fermented and smoked) has traditionally been traded between countries in eastern, western and southern Africa (WorldFish 2015).

Intra-regional fish trade continues to be important today, taking place largely at the informal level (WorldFish 2015). While detailed information on quantities involved in intra-regional trade is limited, existing data suggest that a number of trade routes provide fish to inland areas. For example, in western Africa, the major coastal fishery resources are concentrated in the north, from Morocco through Mauritania to Senegal and Guinea-Bissau. In southern Africa, these areas are mainly located off the coasts of Namibia and Angola. Many major fish-consuming countries, on the other hand, are in the Gulf of Guinea area, where population densities are higher and marine resources relatively lower. Figure 2 shows some important routes along which processed fish is traded in western Africa (ICSF 2002).

In addition to marine coastal fisheries, commercial freshwater fisheries in eastern and southern Africa are based in the Great Lakes and minor water bodies, which are home to various fish species including perch, native tilapia, lungfish, catfish and salanga (a small, indigenous species). Fisheries in Lake Victoria, the largest lake in Africa, provide livelihoods for over three million people and generate \$500 million in revenue annually (World Bank 2016). Figure 3 illustrates trade routes of freshwater fisheries products in eastern and southern Africa (Kirema- Mukasa 2012). No information was available on trade routes from coastal eastern Africa to inland regions, but it is known to occur.

Hundreds of millions of people worldwide benefit from the nutrition and livelihoods provided by freshwater fisheries. A recent global analysis found that many freshwater fisheries in Africa and Asia are fully exploited. Productive freshwater fisheries are often located in areas of low food security, highlighting their importance in providing a local, low-cost and highly nutritious food source for vulnerable communities (McIntyre et al. 2016). Sustainable management of freshwater fisheries to increase their natural productivity is critical to ensuring food security in these areas.



MOZAMBIQUE – 2009: A fisher looks towards Lake Niassa over his drying fish racks. Photo by Caroline Simmonds, USAID

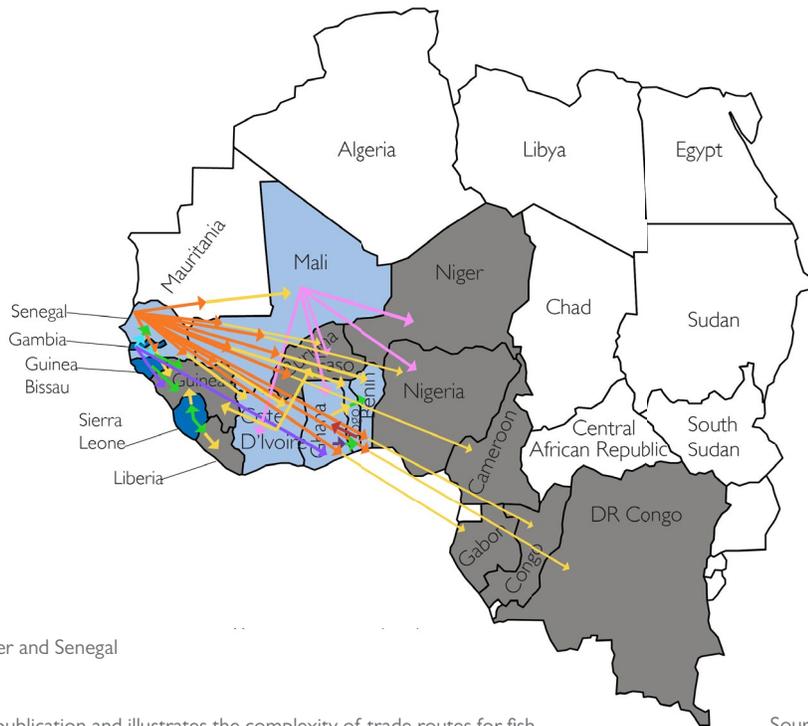
FIGURE 2: REGIONAL TRADE OF PROCESSED FISH PRODUCTS IN WEST AFRICA

Movement of Fishery Products

- Smoked Marine Sardinella
- Cured Marine Fish
- Smoked Marine Bonga Shad
- Smoked Marine Skates
- Dried Marine Shark Products
- Cured Freshwater Fish
- Smoked Freshwater Fish

- Only importer
- Importer and exporter
- Only exporter

*2017 FTF countries: Ghana, Mali, Niger and Senegal



Note: This information is from a 2002 publication and illustrates the complexity of trade routes for fish products in West Africa. A 2016 publication (Ayilu et al.) notes that fish trade in West Africa continues to be important, is not well understood, is mostly informal and is often undertaken by women.

Source: International Collective in Support of Fishworkers 2002

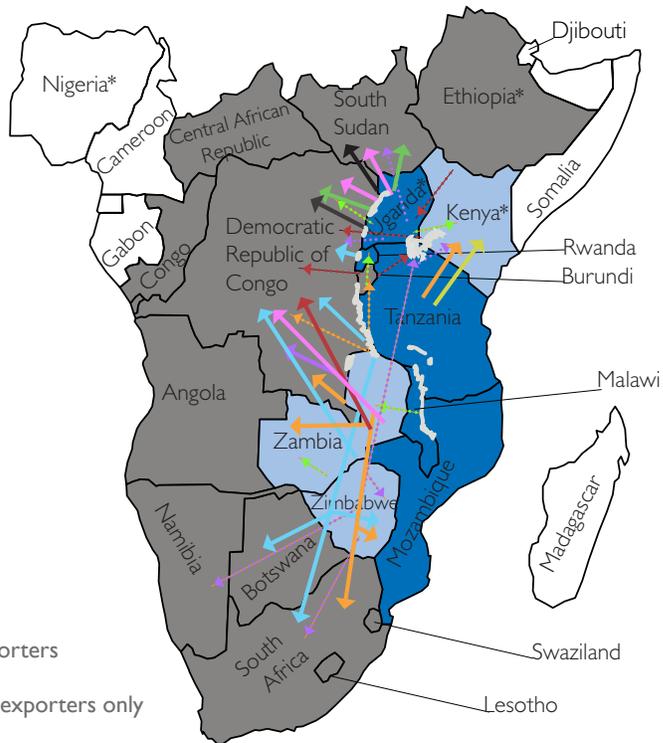
FIGURE 3: REGIONAL TRADE OF FRESHWATER PRODUCTS WITHIN EAST AFRICA.

Movement of Fishery Products

- Tanganyika Perch
- Nile Perch
- Tilapia
- Dagaa
- Chisense
- Ragoogi
- Muziri
- Kapenta
- Catfish
- Lungfish
- Alestes
- Bagrus

- Great lakes
- Only importer
- Producers, importers and exporters
- Producers and exporters only

*2017 FTF countries: Ethiopia, Kenya, Nigeria and Uganda



Source: Kirema-Mukasa 2012

FINDING 3:

THE RISK OF FISHERIES DECLINE, DECREASED PRODUCTIVITY AND COLLAPSE DUE TO INADEQUATE MANAGEMENT HAS SERIOUS IMPLICATIONS FOR DEVELOPMENT OUTCOMES

The overexploitation and mismanagement of fisheries has led to diminishing economic benefits and reductions in their natural productivity. The World Bank estimates that African countries are losing about \$10 billion in revenues each year, an amount referred to as the “sunken billions” (World Bank 2017). Country policies have continued to prioritize industrial fishing activities over small-scale fisheries and local livelihoods, providing subsidies and incentives to maintain industrial fleets, even in the face of stock decline. The Sea Around Us project, which analyzed the marine fisheries catch from 1950 to 2010 for coastal nations, estimates that due to inadequate management, the annual fish catch has been gradually falling since its peak in 1996; the rate of decline is three times greater than FAO’s figures (Pauly and Zeller 2016).

Despite their importance to local food security, nutrition and livelihoods, small-scale fisheries generally remain understudied and poorly managed. In part, this limitation is due to the decentralized and disparate nature of these fisheries and the fact that, in most countries, much of the commerce surrounding small-scale fishing activities occurs through the informal economy. Recently, there has been greater awareness that small-scale fisheries are far more important to food security, nutrition and livelihoods

- The contribution of wild fish to food security may be much higher in many African countries than previously documented, according to the Sea Around Us project’s reconstructed catch estimates.
- Small-scale fisheries contribute an estimated **25%** of the global catch.
- A recent study found that at least **10%** of the global population could face fatty acid and micronutrient deficiencies due to a decline in fisheries – West African fisheries are among the most at risk.
- Aquaculture has made only a limited contribution to food security in East and West Africa due to constraints such as a short supply of feed and limitations in technological inputs.

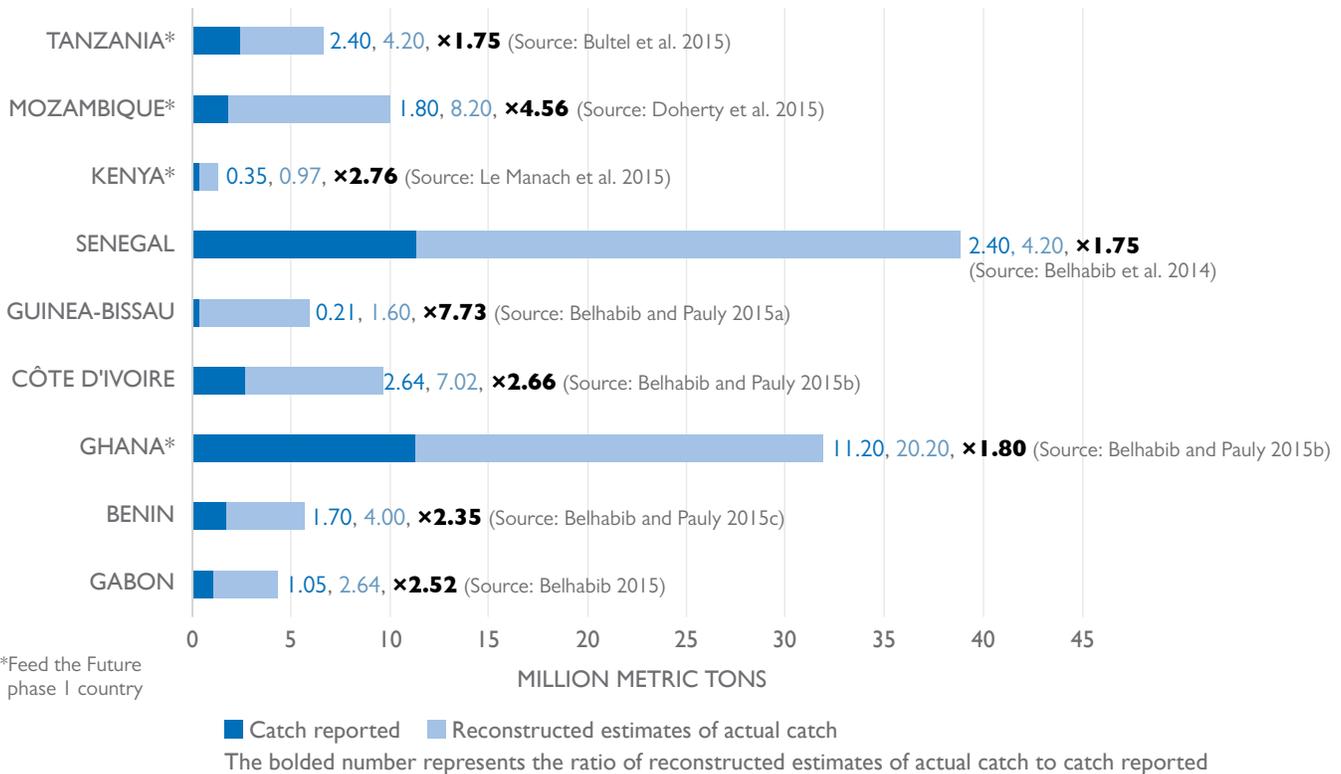
than previously believed, contributing up to 25 percent of the global catch (Pauly and Zeller 2016). A lack of wild-caught fisheries statistics for many African countries makes it difficult to calculate accurate production statistics, which are necessary for sustainable and resilient management. This lack of accurate, official fisheries statistics is best illustrated by the Sea Around Us project, which reconstructed catch estimates to account for small-scale fisheries and compared these reconstructed

catch estimates to official catch data reported to the FAO. Reconstructed catch estimates that include small-scale fisheries in East and West Africa are up to seven times higher (Guinea-Bissau) than official country statistics as reported to FAO (Figure 4).

These higher catch estimates highlight two important points. First, they illustrate that the contribution

of wild fish to human well-being in these and neighboring countries is much higher than originally documented. Second, these estimates suggest the natural productivity of these waters is much higher than previously thought. With proper attention and management approaches, this natural productivity can be further increased, leading to higher catches and profits, improved nutrition and more secure livelihoods.

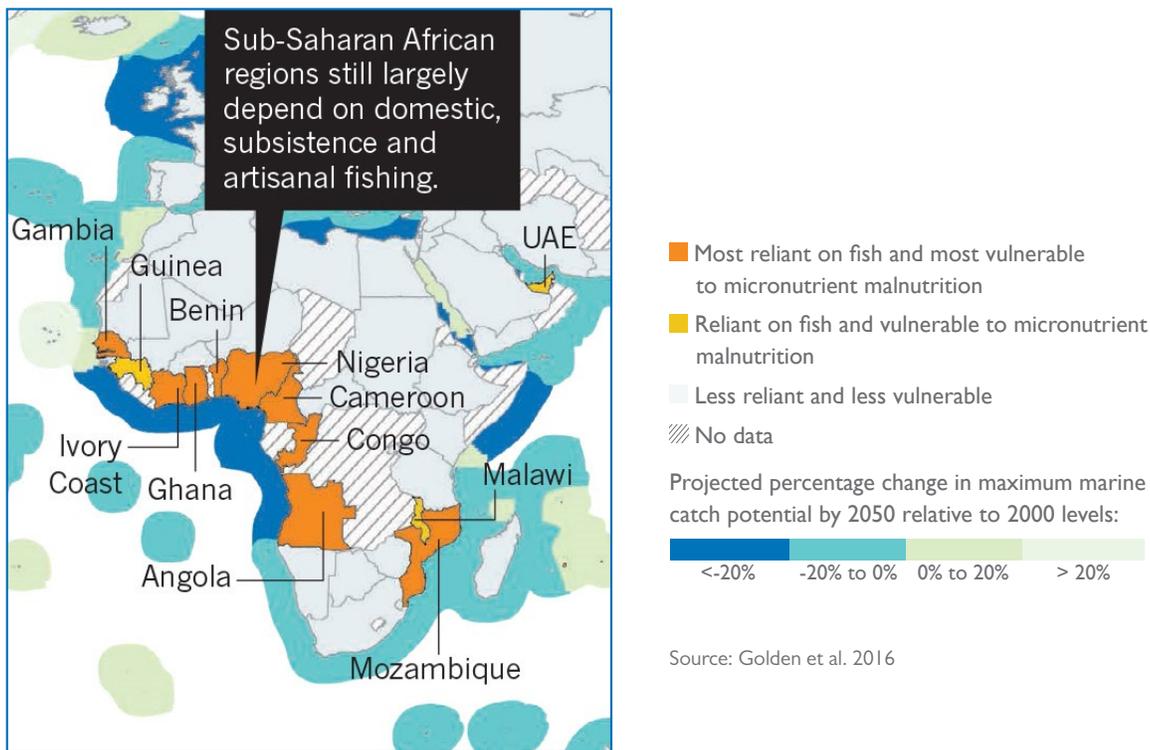
FIGURE 4: CATCH RECONSTRUCTIONS FOR SELECT AFRICAN COUNTRIES FROM 1950 TO 2010



Ineffective governance of fisheries can lead to conflict and insecurity. For example, starting in the early 1990s, the Somali Coast Guard has been unable to defend the country's exclusive economic zone, leading to increased incursions by foreign fishing vessels. To protect their sovereignty and defend offshore fisheries, Somali fishers started to seize foreign fishing vessels and hold them for ransom, leading to violent conflict in the area. Other African countries that have seen an increase in piracy in recent years include Nigeria, Sierra Leone and Benin. A recent paper on wildlife decline and social conflict quotes a Senegalese fisherman who succinctly describes the situation, saying, **"In 10 years' time, people will go fishing with guns...we will fight for fish at sea. If we cannot eat, what do you expect us to do?"** (Brashares et al. 2014).

MOZAMBIQUE – 2013: A boy who lives in the Gorongosa National Park buffer zone prepares his fishing rod for his next cast. Photo by USAID

FIGURE 5: VULNERABILITY TO MICRONUTRIENT MALNUTRITION FROM FISHERIES DECLINE



Declining catches in poorly managed fisheries, especially small-scale fisheries, have serious implications for human health. A recent analysis found that at least 10 percent of the global population could face fatty acid and micronutrient deficiencies due to a decline in fisheries (Figure 5). A number of African nations, including Mozambique, Ghana, Senegal, Nigeria, Cameroon and Ivory Coast, are among the most vulnerable due to their high reliance on fish as a source of nutrition. Furthermore, West Africa's fisheries are among the highest at risk for decline, with projections of a 20 percent decrease in the maximum marine catch in 2050 compared with 2000 levels (Golden et al. 2016).

Although aquaculture has increased throughout Africa, most notably in Egypt, it has made only a limited contribution to food security and economic development in East and West Africa. This is partially due to the short supply of feed and limited management and technological inputs needed for successful aquaculture projects (Brummett and Williams 2000, Golden et al. 2016, Dickson et al. 2016). In addition, aquaculture does not always contribute to overall food security; for instance,

several pounds of wild fish may be needed to produce one pound of higher trophic fish such as salmon and grouper. While effectively managed aquaculture may be able to supplement wild fisheries to some degree, it will not be able to replace the quantity and quality of food provided by wild fisheries in Africa. Also troubling is that despite significant improvements and advances over the past few decades, aquaculture still has a number of negative impacts on the environment. These impacts may include aquaculture's reliance on wild fish as seed stock, habitat destruction to clear areas for fishponds and environmental pollution due to water discharge from fishponds (Naylor et al. 2009, Shpigel et al. 2016, Tacon and Forster 2003, Tacon and Metian 2008). In addition, some farmed fish are of lower nutritional value when compared to wild-caught fish, especially small species that are eaten whole and provide essential vitamins, minerals and fats (Thilsted et al. 2016, Pauly and Zeller 2017). For instance, farmed catfish provides lower levels of calcium, magnesium, vitamin A and vitamin D than some commonly consumed wild fish species (Table 1). Aquaculture is also constrained in many African countries by water scarcity and a lack of suitable sites.

FINDING 4:

THERE IS AN URGENT NEED TO REFORM AND STRENGTHEN WILD-CAUGHT FISHERIES MANAGEMENT

Similar to the other agricultural sectors, the fisheries sector in Africa faces substantial barriers and challenges to conserving ecosystems and sustaining fish production. Key challenges include the lack of secure tenure over fishing grounds, inadequate governance at the national level and weak institutions (AUC-NEPAD 2014). In Africa, like much of the world, a focus on maximizing production and revenue over the short term, rather than sustainability, has heavily influenced fisheries policy and contributed to overexploitation and decreased productivity.

In some African countries, fuel subsidies and the lack of secure tenure or managed access to fishing grounds have distorted market systems and allowed fishers to expand their fishing range. These factors, combined with weak institutions, the lack of extension services, inadequate enforcement and management capacity at both national and local scales and illegal fishing have resulted in overexploitation (Campredon and Cuq 2001). Post-harvest losses are also high in Africa, with estimates ranging from 20 to 25 percent and as high as 50 percent in some areas (FAO 2016).

Fishers and fishing communities are often among the most marginalized populations, both geographically and politically. Many fishers and fish processors are poor, with few rights of tenure, and are often excluded from decision-making processes. Fishing associations and small-scale processors often lack access to basic financial services, extension services and knowledge about proven management practices.

- Factors that contribute to poor wild-caught fisheries management in Africa include lack of secure tenure to fishing grounds, inadequate governance and weak institutions.
- Post-harvest losses range from **20** to **25%** in some African countries and are as high as **50%** in some areas.
- Many national governments in Africa do not invest adequately in managing their wild-caught fisheries.

In general, national governments in Africa do not invest adequately in managing their fisheries. In Ghana, for example, the government's spending on fisheries management is less than two percent of average investments made by Organization for Economic Co-operation and Development countries in their own fisheries (Republic of Ghana 2011).



MOZAMBIQUE – 2013: A boy fishing with his friends on the riverside of Pungué River. Photo by USAID

FINDING 5:

USAID HAS THE TOOLS AND KNOWLEDGE TO REVERSE FISHERIES DECLINE

Improved management can enhance the natural productivity of Africa's fisheries. Strategies to improve fisheries management in Africa include the following that can be adapted from the farming sector:

- Promote policies that secure tenure and access to fishing grounds for small-scale fishers (similar to land tenure for smallholder farmers), which is critical to the sustainable use of fisheries resources. These policies should be coupled with safeguards that ensure sustainable fishing levels to prevent over-extraction of resources. Appendix I provides examples of fisheries tenure.
 - Strengthen fisher associations, which function similar to farmer associations, and facilitate public-private partnerships to improve access to financial services and markets while promoting sustainable use.
 - Improve the productivity and profitability of fisheries through the use of proven management practices to increase fish populations and enhance resiliency and sustainability (i.e., an ecosystem-based approach to management).
 - Promote effective extension services, disseminate proven management practices and technologies and support local communities by providing training and resources so they can take responsibility for key aspects of fisheries management, such as fishing vessel/craft registration, licensing, data collection and enforcement. Providing training and resources to local-level stakeholders is critical for establishing effective decentralized fisheries governance arrangements.
 - Incorporate wild-caught fisheries into agricultural research strategies to harness scientific innovation and technology to improve fisheries management. Potential focal areas for research on African wild-caught fisheries include collecting detailed information on the intra-regional fish trade including specific species, quantities, participants and trade routes, such as through the use of DNA barcoding; quantifying the contributions of inland small-scale fisheries to local food security and nutrition, especially among the most vulnerable households; and analyzing options and best practices for nutrition-sensitive fishing policies.
- Other strategies to improve the management of Africa's wild-caught fisheries include:
- Promote policies that reduce, eliminate or redirect subsidies that distort the market and drive overfishing. For example, fuel subsidies can be redirected to help small-scale fishing associations establish catch documentation and traceability systems and improve value chains. Other subsidies contribute to both overfishing and overcapacity by subsidizing industrial fishing, often at the expense of small-scale fishers. For instance, the United Nations estimates that fishing subsidies that contribute to overfishing may total \$35 billion.
 - Promote participatory and transparent decision-making and co-management of fish resources to enhance sustainability and democratic processes.
 - Decrease post-harvest loss through strategies that improve cold chain storage and transportation, reduce spoilage of fish and promote the use of appropriate drying and processing technologies.
 - Encourage host country governments to increase their investments in wild fisheries management as part of their agricultural commitments.

Examples of successful fisheries management projects that have incorporated some of the above recommendations include the following:

- USAID’s Fisheries Improved for Sustainable Harvest (FISH) project (2004-2010) implemented an ecosystem-based approach to fisheries management in the Philippines to restore and “grow” the natural productivity of fisheries. Project results included a 13 percent increase in fish stocks over an area one-third the size of New Jersey, as compared with baseline. In one site, Danahon Bank, increases in fish stocks led to a 76 percent increase in profits for the fishers (USAID 2014).
- Building on the successes of the FISH project, USAID’s Ecosystems Improved for Sustainable Fisheries (ECOFISH) project (2012-2017) worked with local governments and the Philippines Department of Agriculture’s Bureau of Fisheries and Aquatic Resources to improve fisheries management in eight Marine Key Biodiversity Areas. The project also focused on developing a variety of market-based initiatives to improve economic opportunities for small-scale fishers. Project achievements include a 24 percent increase in fisheries biomass within select fisheries, a 12 percent increase in employment or better employment in focal areas and improved management of 1.8 million hectares of municipal marine waters, an area slightly larger than Connecticut and Delaware combined (USAID 2017).
- Periodic fisheries closures are a popular and effective fisheries management tool. In southwest Madagascar, 29 fishing villages in the Velondriake region came together to participate in the management of an octopus fishery and formed the Velondriake locally-managed marine area, an area of approximately 1,000 km². Over a 10-year period, villages closed up to 20 percent of their fishery for a period of two to seven months and self-enforced the closed areas. The closure of fishing grounds had benefits for fishers when the fishing areas were re-opened, with significant increases in octopus landings and catch per unit effort. Short-term closures that focus on fast-growing species can have significant benefits for local fisheries; these rewards are dependent upon the compliance of fishers with closed areas (Oliver et al. 2015). This model has been implemented around the world with similar success (McClanahan et al. 2010, Cinner et al. 2005, Johannes et al. 2002).
- USAID Senegal’s COMFISH activity (2011-2016) enhanced the participation and capacity of small-scale fishers in the co-management process to improve the sustainability of fisheries. The project worked with women fish processors to increase their role in the fisheries sector and to become strong voices for more sustainable fishing practices. COMFISH helped revitalize the Network of Women in Artisanal Fisheries, an organization that lobbies for women’s participation in decision-making processes. Through the project, the women understood the importance of sustainable fishing and refused to accept immature and illegal fish for processing (USAID 2015).



DEMOCRATIC REPUBLIC OF THE CONGO – 2011:
Pirogue ferry to Fisherman's Island.
Photo by Nick Hobgood for USAID

CONCLUSION

Healthy, well-managed wild-caught fisheries in Africa are critical to human well-being, economic development, livelihoods and community resilience. They are particularly integral to providing an accessible source of protein and essential nutrients for some of the poorest populations in coastal and inland areas. The decline of wild-caught fisheries can have grave repercussions for these populations, including the loss of jobs and decreased access to a highly nutritious food, which in turn can lead to worsening poverty, poor health outcomes and conflict.

The inclusion of wild-caught fisheries in the Global Food Security Act highlights their important role in complementing Feed the Future's farm-based projects

in meeting USAID's food security and nutrition objectives. A number of successful Feed the Future strategies can be adapted and applied within the wild-caught fisheries context to improve their management and maximize their potential. Such strategies include promoting policies that secure tenure and access to fishing grounds for small-scale fishers, strengthening fisher associations and using proven ecosystem-based management approaches. Improving the status of wild-caught fisheries in Africa can play a critical role in achieving Feed the Future's long-term goals of advancing food security and nutrition through sustainable approaches.

A study of over **25,000 children** in Denmark demonstrated that maternal fish consumption during pregnancy and throughout breastfeeding is associated with better early child development (Oken et al. 2008).

MADAGASCAR – 2008: A boy proudly presenting his fish. Photo by USAID



REFERENCES

- AUC-NEPAD. "Policy Framework and Reform Strategy for Fisheries and Aquaculture in Africa." 2014. https://au.int/web/sites/default/files/documents/30266-doc-au-ibar_-_fisheries_policy_framework_and_reform_strategy.pdf
- Ayilu, Raymond K., Theodore O. Antwi-Asare, Paul Anoh, Amadou Tall, Narcisse Aboya, Sloans Chimatiro, and Seraphin Dedi. "Informal artisanal fish trade in West Africa: Improving cross-border trade." Penang, Malaysia: WorldFish Program Brief (2016): 2016-37.
- Bartley, D. M., G. J. De Graaf, J. Valbo-Jørgensen, and G. Marmulla. "Inland capture fisheries: status and data issues." *Fisheries Management and Ecology* 22, no. 1 (2015): 71-77.
- Belhabib, Dyhia, Viviane Koutob, Aliou Sall, Vicky WY Lam, and Daniel Pauly. "Fisheries catch misreporting and its implications: The case of Senegal." *Fisheries Research* 151 (2014): 1-11.
- Belhabib, D. "Gabon fisheries between 1950 and 2010: a catch reconstruction Fisheries Centre Working Paper 08." *Fisheries Centre, University of British Columbia Vancouver* (2015): 1-11.
- Belhabib, Dyhia, and Daniel Pauly. "Fisheries in troubled waters: a catch reconstruction for Guinea-Bissau, 1950–2010." *Fisheries Centre Working Paper Series 72* (2015a).
- Belhabib, Dyhia, and Daniel Pauly. "Côte d'Ivoire: fisheries catch reconstruction, 1950–2010." *Marine Fisheries Catches in West Africa 2010* (2015b).
- Belhabib, Dyhia, and Daniel Pauly. "Benin fisheries: a catch reconstruction, 1950–2010." *Marine Fisheries Catches in West Africa 2010* (2015c).
- Belhabib, Dyhia, U. Rashid Sumaila, and Daniel Pauly. "Feeding the poor: contribution of West African fisheries to employment and food security." *Ocean & Coastal Management* 111 (2015d): 72-81.
- Brashares, Justin S., Briana Abrahms, Kathryn J. Fiorella, Christopher D. Golden, Cheryl E. Hojnowski, Ryan A. Marsh, Douglas J. McCauley, Tristan A. Nuñez, Katherine Seto, and Lauren Withey. "Wildlife decline and social conflict." *Science* 345, no. 6195 (2014): 376-378.
- Bultel, Elise, Beau Doherty, Adam Herman, Frédéric Le Manach, and Dirk Zeller. "An update of the reconstructed marine fisheries catches of Tanzania with taxonomic breakdown." *Fisheries catch reconstructions in the Western Indian Ocean 2010* (2015): 151-161
- Brummett, Randall E., and Meryl J. Williams. "The evolution of aquaculture in African rural and economic development." *Ecological Economics* 33, no. 2 (2000): 193-203.
- Campredon, Pierre, and François Cuq. "Artisanal fishing and coastal conservation in West Africa." *Journal of Coastal Conservation* 7, no. 1 (2001): 91-100.
- Cinner, Joshua E., Michael J. Marnane, and Tim McClanahan. "Conservation and community benefits from traditional coral reef management at Ahus Island, Papua New Guinea." *Conservation Biology* 19.6 (2005): 1714-1723.
- De Graaf, Gertjan, and Luca Garibaldi. "The value of African fisheries." *FAO Fisheries and Aquaculture Circular 1093* (2014): 76.
- Doherty, Beau, Margaret M. McBride, Atanásio J. Brito, Frédéric Le Manach, Lizette Sousa, Isabel Chauca, and Dirk Zeller. "Marine fisheries in Mozambique: catches updated to 2010 and taxonomic disaggregation." *Fisheries catch reconstructions in the Western Indian Ocean 2010* (2015): 67-81.
- Dickson, Malcolm, Ahmed Nasr-Allah, Daa Kenawy, and Froukje Kruijssen. "Increasing fish farm profitability through aquaculture best management practice training in Egypt." *Aquaculture* 465 (2016): 172-178.
- Doumbouya, Alkaly, Ousmane Tagbe Camara, Josephus Mamie, Jeremias Francisco Intchama, Abdoulie Jarra, Salifu Ceesay, Assane Guèye et al. "Assessing the effectiveness of monitoring, control and surveillance of illegal fishing: the case of West Africa." *Frontiers in Marine Science* 4 (2017): 50.
- FAO. "Implementing improved tenure governance in fisheries – A technical guide to support the implementation of the voluntary guidelines on the responsible governance of tenure of land, fisheries and forests in the context of national food security." 2013. <http://www.fao.org/docrep/018/i3420e/i3420e00.htm>
- FAO. "The state of world fisheries and aquaculture 2014." 2014. <https://doi.org/92-5-105177-1>
- FAO and OECD. "Fishing for Development." 2014. <http://www.fao.org/3/a-i4468e.pdf>
- FAO. "Small-scale fisheries." 2015. <http://www.fao.org/3/a-au832e.pdf>
- FAO. "The state of the world fisheries and aquaculture 2016." 2016. <http://www.fao.org/3/a-i5555e.pdf>
- Golden, C. D., Edward H. Allison, William WL Cheung, Madan M. Dey, Benjamin S. Halpern, Douglas J. McCauley, Matthew Smith, Babu Vaitla, Dirk Zeller, and Samuel S. Myers. "Fall in fish catch threatens human health." *Nature* 534, no. 7607 (2016): 317-320.
- Hjelm, L. and Dasori, W. "Ghana Comprehensive Food Security & Vulnerability Analysis, 2012." 2012. <http://documents.wfp.org/stellent/groups/public/documents/ena/wfp257009.pdf>
- International Collective in Support of Fishworkers (ICSF). "Report of the Study on Problems and Prospects of Artisanal Fish Trade in West Africa." 2002. http://aquaticcommons.org/256/1/rep_WAfrica_artisanal_fishtrade.pdf

- Johannes, Robert E. "The renaissance of community-based marine resource management in Oceania." *Annual Review of Ecology and Systematics* 33.1 (2002): 317-340.
- Kirema-Mukasa, C. T. "Regional fish trade in eastern and southern Africa. Products and markets: a fish trader's guide." Smart Fish Working Paper 013. Mauritius: Indian Ocean Commission, 2012.
- Koletzko, Berthold, Irene Cetin, and J. Thomas Brenna. "Dietary fat intakes for pregnant and lactating women." *British Journal of Nutrition* 98, no. 5 (2007): 873-877.
- Le Manach, Frédéric, Caroline A. Abunge, Timothy R. McClanahan, and Daniel Pauly. "Tentative reconstruction of Kenya's marine fisheries catch, 1950–2010." *Fisheries Centre Research Reports. University of British Columbia, Vancouver (Canada)* (2015).
- McIntyre, Peter B., Catherine A. Reidy Liermann, and Carmen Revenga. "Linking freshwater fishery management to global food security and biodiversity conservation." *Proceedings of the National Academy of Sciences* 113, no. 45 (2016): 12880-12885.
- McClanahan, Timothy R. "Effects of fisheries closures and gear restrictions on fishing income in a Kenyan coral reef." *Conservation Biology* 24, no. 6 (2010): 1519-1528.
- Monfort, Marie. "The role of women in the seafood industry." 2015. <http://www.fao.org/in-action/globefish/publications/details-publication/en/c/358009/>
- Naylor, Rosamond L., Ronald W. Hardy, Dominique P. Bureau, Alice Chiu, Matthew Elliott, Anthony P. Farrell, Ian Forster et al. "Feeding aquaculture in an era of finite resources." *Proceedings of the National Academy of Sciences* 106, no. 36 (2009): 15103-15110.
- Nunoo, F. K. E., B. Asiedu, K. Amador, D. Belhabib, and D. Pauly. "Reconstruction of marine fisheries catches for Ghana, 1950–2010." *Vancouver (Canada): Fisheries Centre, University of British Columbia* (2014).
- Oken, Emily, Marie Louise Østerdal, Matthew W. Gillman, Vibeke K. Knudsen, Thorhallur I. Halldorsson, Marin Strøm, David C. Bellinger, Mijna Hadders-Algra, Kim Fleischer Michaelsen, and Sjurdur F. Olsen. "Associations of maternal fish intake during pregnancy and breastfeeding duration with attainment of developmental milestones in early childhood: a study from the Danish National Birth Cohort." *The American Journal of Clinical Nutrition* 88, no. 3 (2008): 789-796.
- Oliver, Thomas A., Kirsten LL Oleson, Hajanaina Ratsimbazafy, Daniel Raberinary, Sophie Benbow, and Alasdair Harris. "Positive catch & economic benefits of periodic octopus fishery closures: do effective, narrowly targeted actions catalyze broader management?." *PloS One* 10, no. 6 (2015): e0129075.
- Pauly, Daniel, and Dirk Zeller. "Catch reconstructions reveal that global marine fisheries catches are higher than reported and declining." *Nature Communications* 7 (2016): 10244.
- Pauly, Daniel, and Dirk Zeller. "Comments on FAOs State of World Fisheries and Aquaculture (SOFIA 2016)." *Marine Policy* 77 (2017): 176-181.
- Republic of Ghana. "Republic of Ghana Fisheries and Aquaculture Sector Development Plan, 2011 to 2016." 2011. <http://warfp.gov.gh/sites/default/files/FASDP%20Final%20July%202011.pdf>
- Shpigel, M., T. Ben Ari, L. Shauli, V. Odintsov, and D. Ben-Ezra. "Nutrient recovery and sludge management in seabream and grey mullet co-culture in Integrated Multi-Trophic Aquaculture (IMTA)." *Aquaculture* 464 (2016): 316-322.
- Swanson, Danielle, Robert Block, and Shaker A. Mousa. "Omega-3 fatty acids EPA and DHA: health benefits throughout life." *Advances in Nutrition: An International Review Journal* 3, no. 1 (2012): 1-7.
- Tacon, Albert GJ, and Ian P. Forster. "Aquafeeds and the environment: policy implications." *Aquaculture* 226, no. 1 (2003): 181-189.
- Tacon, Albert GJ, and Marc Metian. "Global overview on the use of fish meal and fish oil in industrially compounded aquafeeds: Trends and future prospects." *Aquaculture* 285, no. 1 (2008): 146-158.
- Teh, Lydia CL, and Ussif Rashid Sumaila. "Contribution of marine fisheries to worldwide employment." *Fish and Fisheries* 14, no. 1 (2013): 77-88.
- Thilsted, Shakuntala Haraksingh, Andrew Thorne-Lyman, Patrick Webb, Jessica Rose Bogard, Rohana Subasinghe, Michael John Phillips, and Edward Hugh Allison. "Sustaining healthy diets: The role of capture fisheries and aquaculture for improving nutrition in the post-2015 era." *Food Policy* 61 (2016): 126-131.
- UN News Centre. "Next month's ocean conference eyes cutting \$35 billion in fisheries subsidies – UN trade officials." 2017. <http://www.un.org/apps/news/story.asp?NewsID=56725#.WahAA2eWw3z>.
- USAID. "Fisheries, aquatic productivity and food security." 2014. <https://agrilinks.org/sites/default/files/resource/files/Fisheries%20Aquatic%20Productivity%20and%20Food%20Security.pdf>
- USAID. "Mid-term performance evaluation of the Collaborative Management of a Sustainable Fisheries Future in Senegal Project." 2015. http://www.crc.uri.edu/download/Mid-term_Evaluation_Report_26March2015_English_508.pdf
- USAID. "Ecosystems Improved for Sustainable Fisheries (ECOFISH): Project Synopsis." 2017. http://pdf.usaid.gov/pdf_docs/PA00N64B.pdf
- USDA. "United States Department of Agriculture. Agricultural Research Service USDA Food Composition Databases." 2016. <https://ndb.nal.usda.gov/ndb/search/list>.

World Bank. "Africa program for fisheries." 2012. <http://documents.worldbank.org/curated/en/467181468194349929/pdf/788150WP0Box370r0Fishes00PUBLIC0.pdf>

World Bank. "Reviving Lake Victoria by restoring livelihoods." 2016. <http://www.worldbank.org/en/news/feature/2016/02/29/reviving-lake-victoria-by-restoring-livelihoods>

World Bank. "The Sunken Billions revisited: progress and challenges in global marine fisheries." 2017. <https://openknowledge.worldbank.org/bitstream/handle/10986/24056/9781464809194.pdf>

WorldFish. "Fish trade for a better future program brochure." 2015. <https://www.worldfishcenter.org/content/fish-trade-better-future-program-brochure>

APPENDIX I: TYPES OF FISHERIES TENURE

Type of Right	Key Features
Territorial use rights in fisheries	Allocation of a certain area of the ocean to a single user, usually a group, which then undertakes fishing by allocating rights to users within the group. Usually of long duration and with a high degree of formal and informal transferability within the group. (Use zones, especially designated areas for small scale and industrial use).
Community-based catch quotas	Catch quotas are attributed to a fishing community with decisions on allocation of rights within the community taken on a cooperative basis. They are often used in formalizing traditional access rights in small-scale fisheries. They provide a high degree of exclusivity, divisibility and flexibility.
Vessel catch limits	Restrict the amount of catch that each vessel can land for a given period (week, month or year) or per trip. These instruments are characterized by relatively low or moderate levels for most rights characteristics. They provide limited exclusivity and may not reduce the race for the fish, while providing some degree of flexibility and quality of title.
Individual nontransferable quotas	Provide a right to catch a given quantity of fish from a particular stock, or, more usually, a percentage of a total allowable catch (TAC). Relatively high characteristics of exclusivity and flexibility allow rights users to use their rights in a least-cost way to secure a given quantity of fish. The race for the fish that exists under a competitive TAC is largely eliminated, but the lack of transferability restricts the efficiency of harvesting.
Individual transferable quotas	Provide a right to catch a given percentage of a TAC, which is then transferable. The features of the system allow for appropriate long-term incentives for investment decisions as well as optimizing short-term use of fishing capacities.
Limited nontransferable licenses	By making limited licenses transferable, fishers are provided with an increased incentive to adjust capacity and effort over the short- to long- term in response to natural and economic conditions. They are generally given for a very long duration, but are not divisible.
Individual nontransferable effort quotas	Rights are attached to the quantity of effort unit that a fisher can employ for a given period. They tend to be used in fisheries for sedentary species and are characterized by moderate or relatively high levels of exclusivity, duration and quality of title.
Individual nontransferable effort quotas	Rights are attached to the quantity of effort unit that a fisher can employ for a given period. They tend to be used in fisheries for sedentary species and are characterized by moderate or relatively high levels of exclusivity, duration and quality of title.
Individual transferable effort quotas	Transferability makes short- and long-term adjustment easier and allows for a better use of fishing capacities

Source: Table from FAO 2013



GHANA – 2014: A fisher mends his nets in Ghana's Cape Coast. Photo by Brian Conklin, USAID

USAID's integrated coastal fisheries governance project has assisted the Government of Ghana and key stakeholders in strengthening their capacity to conserve and protect marine fisheries. These fisheries are a critical resource in Ghana, where **60 percent** of animal protein comes from marine fisheries and **2.2 million** people depend on them for their livelihoods. As such, fish play an important role in Ghana's food security. They are often the only accessible and affordable source of animal protein for poor households in urban and peri-urban areas. Fish is also smoked, dried and transported to the rural regions in the northern part of the country, where it is a critical source of protein and micronutrients such as iron, iodine, zinc, calcium, vitamin A and vitamin B.

U.S. Agency for International Development
1300 Pennsylvania Avenue, NW
Washington, DC 20523
Tel. 202-712-0000
Fax. 202-216-3524
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