FISHING FOR NUTRITIOUS AND RESILIENT FOOD SYSTEMS

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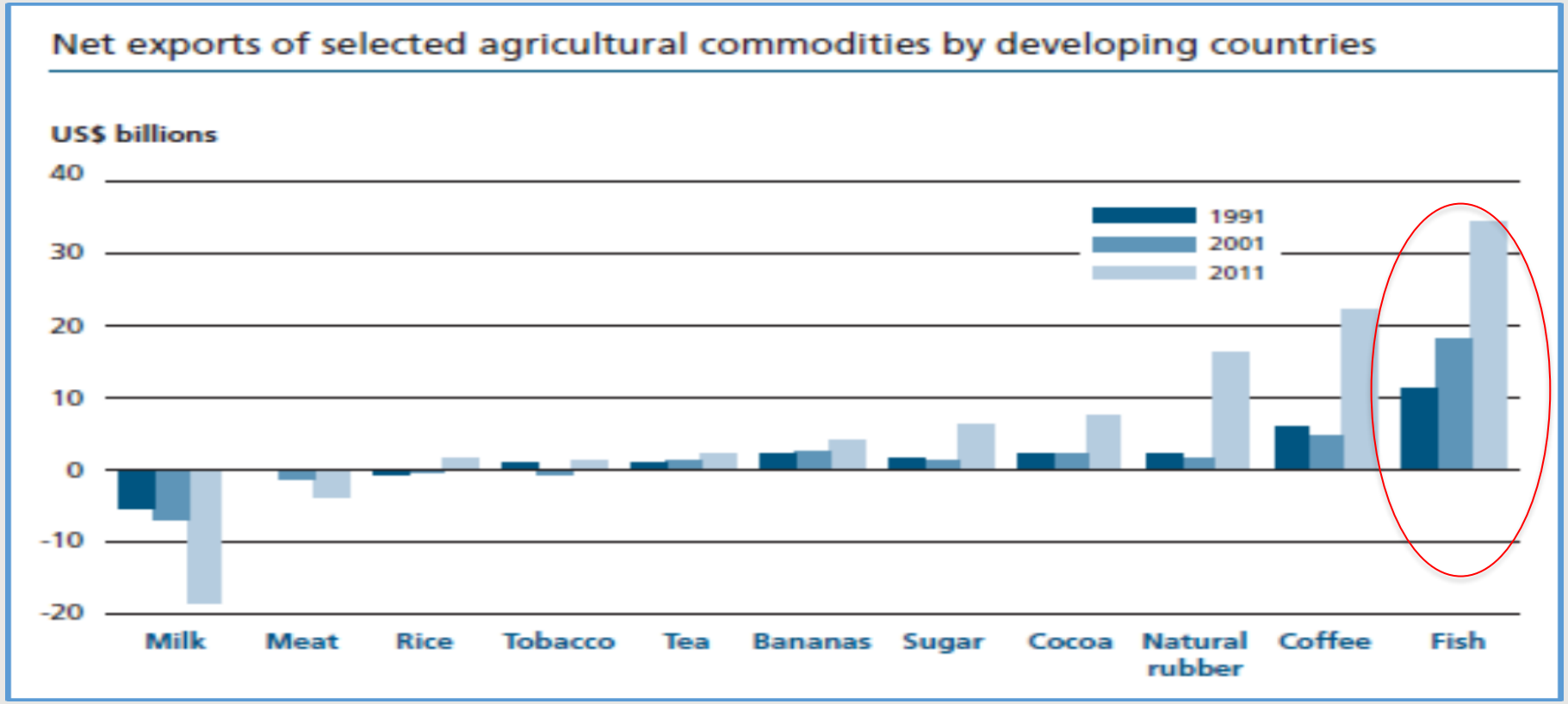
Photo: Glenn G. Page/USAID

HUMAN AND ENVIRONMENTAL HEALTH ARE INTERTWINED

- Growing recognition that “Food System” approaches must integrate nature-based foods and environmental services for nutrition, sustainability and resiliency
- Particularly important to understand and assess sources of nutrition, including from nature-based foods
- Fishing is one of the largest sources of nutritious food, and the largest extractive use of biodiversity

Source: FAO 2016.

FISH IS THE MOST WIDELY TRADED FOOD IN THE WORLD



- Export value of fish from developing countries is **greater than the value of rice, tea, bananas, sugar and cocoa <u>combined</u>**
- Wild fish support a **$260 - $500 billion** seafood industry

Source: FAO 2016

FISH IS MORE NUTRITIOUS THAN MANY COMMONLY CONSUMED FOODS

- **Fish is a better source of essential nutrients** such as calcium and vitamins A and D when compared to chicken, goat, beef and soybeans
- Compared with farmed catfish, **wild-caught catfish and sardines are higher in essential nutrients** such as calcium and vitamins A and D
- **Fish is a primary source of essential nutrients for pregnant mothers and children**, **omega-3 fatty acid** that is critical for early brain development.
- **3 billion people** depend upon fish for substantial part of their food security


Photo: FAO

Sources: USDA 2016, Swanson et al. 2012

GLOBAL FISH DECLINE, DUE TO INADEQUATE MANAGEMENT, CAN LEAD TO NUTRIENT DEFICIENCIES

COMMENT

POLICY Rubric for prioritizing action on the Sustainability Development Goals p.320 | PHYSICS A fond history of the Cavendish, a lab with few rivals p.323 | FILM Biomechanics adviser to *Finding Dory* in conversation p.325 | REPRODUCIBILITY A call to shun predatory journals p.326

MICHAEL D. KOCK

Women from a traditional sea-harvesting community fishing in Mozambique.

Fall in fish catch threatens human health

Christopher Golden and colleagues calculate that declining numbers of marine fish will spell more malnutrition in many developing nations.

How will the 10 billion people expected to be living on Earth by 2050 obtain sufficient and nutritious food? This is one of the greatest challenges humanity faces. Global food systems must supply enough calories and protein for a growing human population and provide important micronutrients such as iron, zinc, omega-3 fatty acids and vitamins.

Deficiencies of micronutrients — so called because the body needs them only in tiny amounts — can increase the risks of perinatal and maternal mortality, growth retardation, child mortality, cognitive deficits and reduced immune function[1]. The associated burdens of disease are large. Forty-five per cent of mortality in children under five is attributable to undernutrition; nutritional deficiencies are responsible for 50% of years lived with disability in children aged four and under[1].

Fish are crucial sources of micronutrients, often in highly bioavailable forms. And fish populations are declining. Most previous analyses have considered only how people will be affected by the loss of protein derived from fish. We calculate that this is the tip of the iceberg. Combining data on dietary nutrition, and fish catch, we predict that more than 10% of the global population could face micronutrient and fatty-acid deficiencies driven by fish declines over the coming decades, especially in the developing nations at the Equator (see 'Troubled Waters'. This new view underlines the need for nutrition-sensitive fisheries policies.

NUTRITIONAL RISK

Presently, 17% of the global population is zinc deficient, with some subpopulations being particularly at risk[2]. Nearly one-fifth of pregnant women worldwide have iron-deficiency anaemia and one-third are vitamin-A deficient[2]. We estimate that 845 million people (11% of the current global population) are poised to become deficient in one of these three micronutrients if current trajectories in fish-catch declines continue.

Considering nutrients found only in foods derived from animals, such as vitamin B_{12}, and DHA omega-3 fatty acids ▸

16 JUNE 2016 | VOL 534 | NATURE | 317

Source: Golden et al. 2016

- A recent analysis found that at least **10 percent of the global population** is at risk of fatty acid and micronutrient deficiencies due to a decline in wild fisheries productivity.
- Countries that are particularly vulnerable due to their high reliance on fish as a source of nutrition include **Mozambique, Ghana, Senegal, Nigeria, Cameroon, Ivory Coast, Bangladesh, Indonesia** and **the Philippines**.
- **Nutrition-sensitive policies and strategies** that improve fisheries management and balance fish exports with local use of fish are urgently needed.

CONTRIBUTIONS OF WILD FISHERIES ARE OFTEN OVERLOOKED: WHY?

- Under BRIDGE, we **surveyed USAID staff** from BFS, Global Health, Food for Peace, and Resilience Center for **their perspective** and to **identify knowledge gaps:**
  - Role of fisheries in food security and nutrition?
  - Fisheries contribution to poverty reduction, income and resilience?
  - Emerging risks from poor fisheries management?
  - Should future investments focus on wild fisheries or aquaculture?
  - What lessons from Feed the Future can be applied to fisheries management?
  - What are examples of successful fisheries projects and approaches?

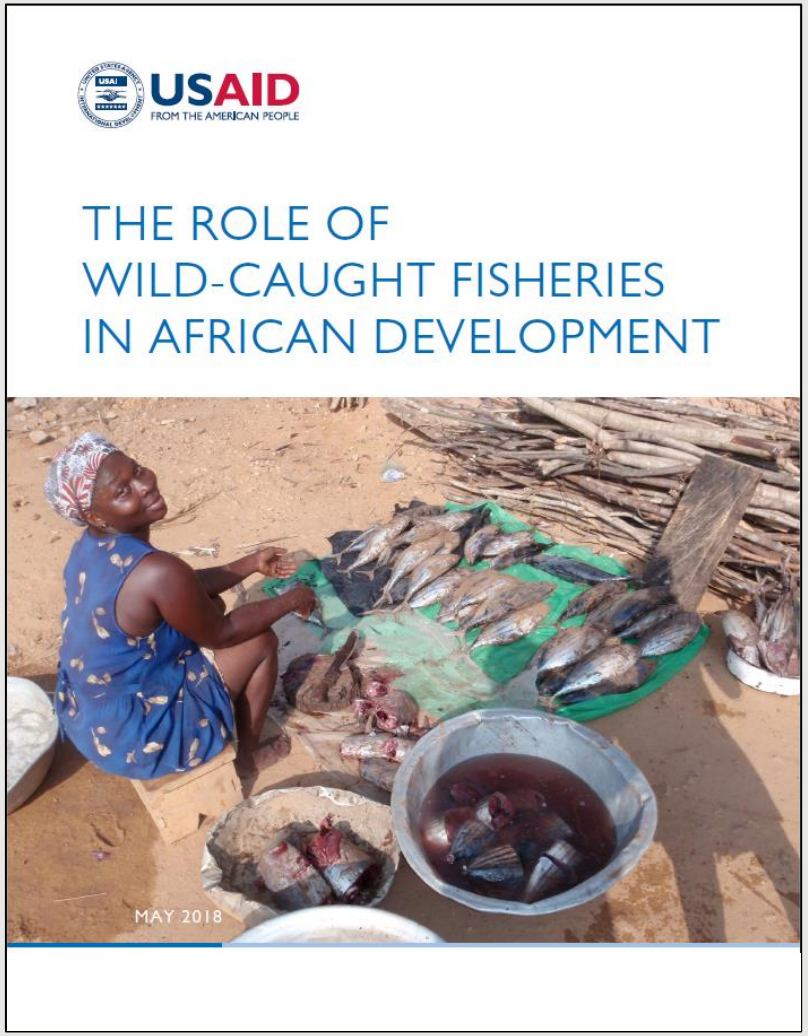
I don't think about fisheries at all – how important can they be?

I hear that fisheries are declining so we have to invest in aquaculture, right? What can be done?

Aquaculture is not the solution – I have seen too many abandoned fish ponds. We need fisheries.

SYNTHESIZED EVIDENCE IN REPORT

- **Gathered evidence** to fill identified knowledge gaps, supported by USAID BRIDGE activity and Smithsonian Institution
- **Compiled findings** into report
- Resources available on **USAID's AgriLinks** and **USAID's Biodiversity Conservation and Development Gateway**



TWO-PAGE INFOGRAPHIC

5 FACTS ABOUT WILD-CAUGHT FISHERIES & AFRICAN DEVELOPMENT

BUREAU FOR FOOD SECURITY | CENTER FOR RESILIENCE | BUREAU FOR GLOBAL HEALTH | DEMOCRACY, HUMAN RIGHTS AND GOVERNANCE OFFICE | OFFICE OF FOOD FOR PEACE | OFFICE OF FORESTRY & BIODIVERSITY (FAB)

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

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

1. **20%** — **Fisheries support up to 20% of jobs** in some countries.
2. **50%** — **Women make up 50%** of fish industry workers.

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

2. 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?

3. **$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?

4. **93%** — 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?

5. 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** of USAID's new fisheries report* to learn about **9 strategies and 4 examples of successful fisheries management.**

*For the full report, please visit USAID's Biodiversity Results and Integrated Development Gains Enhanced (BRIDGE) project webpage here: https://rmportal.net/biodiversityconservation-gateway/resources/projects/bridge

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.

TOP RIGHT PHOTO: GHANA – 2010: A fishmonger preparing fish for smoking. Photo by Glenn G. Page, SustainaMetrix for USAID

CONTRIBUTION TO FOOD SECURITY AND NUTRITION

- On average, fish accounts for **21%** of animal protein consumed in Africa; **over 50%** in several countries
- For **400 million** Africans, fish is an affordable and accessible source of protein
- **Fish catches** in West Africa are **2 to 7 times higher** than official reports
- Wild fish, especially small fish species that are eaten whole or as fish sauce, provide many important nutrients, including **calcium, iron, omega-3 fatty acid, phosphorous, sodium, zinc and vitamins A, B-12, D, E**

Gleaning by women can make important contributions to household nutrition, but is poorly studied.

Sources: Ayilu et al. 2016, World Bank 2012, Swanson et al. 2012

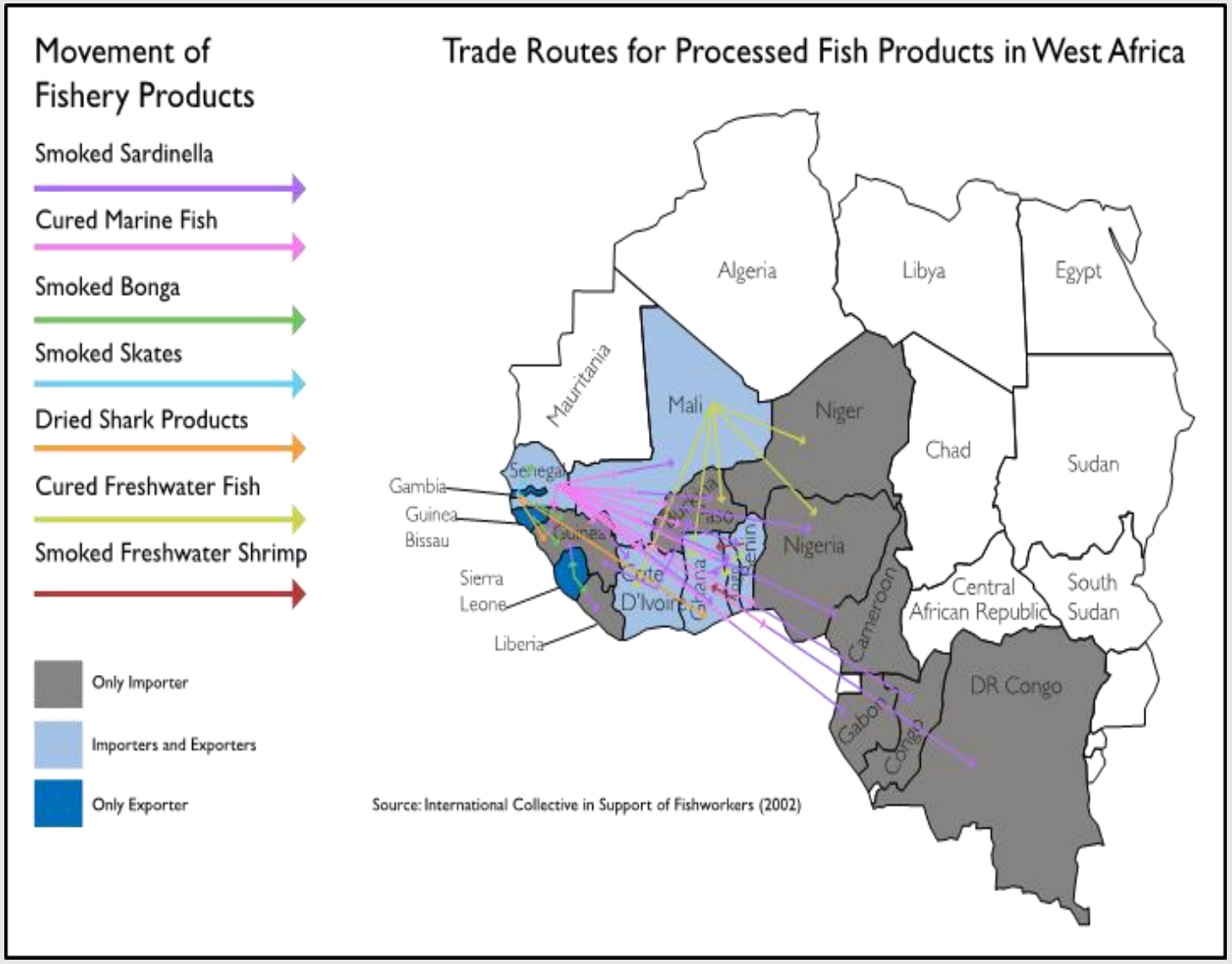
CONTRIBUTION TO LIVELIHOODS, POVERTY REDUCTION AND RESILIENCE

- In Africa, **93% of people** in the fish sector are employed in **wild fisheries, 7% in aquaculture**
- Women make up about **50%** of fish industry workers, with **90%** engaged in post-harvest activities
- Small-scale wild fisheries support **up to 25%** of the workforce in some coastal countries
- West African small-scale fisheries employ about **1.7 million** people
- In West Africa, the number of people relying on wild-caught fisheries has increased by about **2% each decade**, driven in part by decreasing crop productivity and climate change

Sources: Belhabit et al. 2014, Belhabib et al. 2015,

The World Bank estimates that poor management of wild-caught fisheries leads to $10 billion in lost economic benefits in Africa each year.

INTRA-REGIONAL FISH TRADE CONTRIBUTES TO INLAND FOOD SECURITY HUNDREDS OF MILES AWAY



- In many African countries, wild-caught fish collected from coastal waters are dried, processed and **transported inland for trade and consumption**.
- In West Africa, the **informal artisanal fish trade** is often undertaken by disadvantaged populations, particularly **women**, and **provides important social and economic benefits**
- **More research is needed** on **informal fish trade routes** and their contributions to local food security, household nutrition and livelihoods

Sources: ICSF 2002, WorldFIsh 2015, Ayilu et al. 2016

FRESHWATER FISHERIES AND TRADE ALSO IMPORTANT

- Freshwater fisheries are important sources of **local, low-cost and highly nutritious food**
- A recent global analysis found that many of the continent's freshwater fisheries are **fully exploited**.
- Fisheries in Lake Victoria, the largest lake in Africa, provide livelihoods for over **three million people** and generate **$500 million** in revenue annually

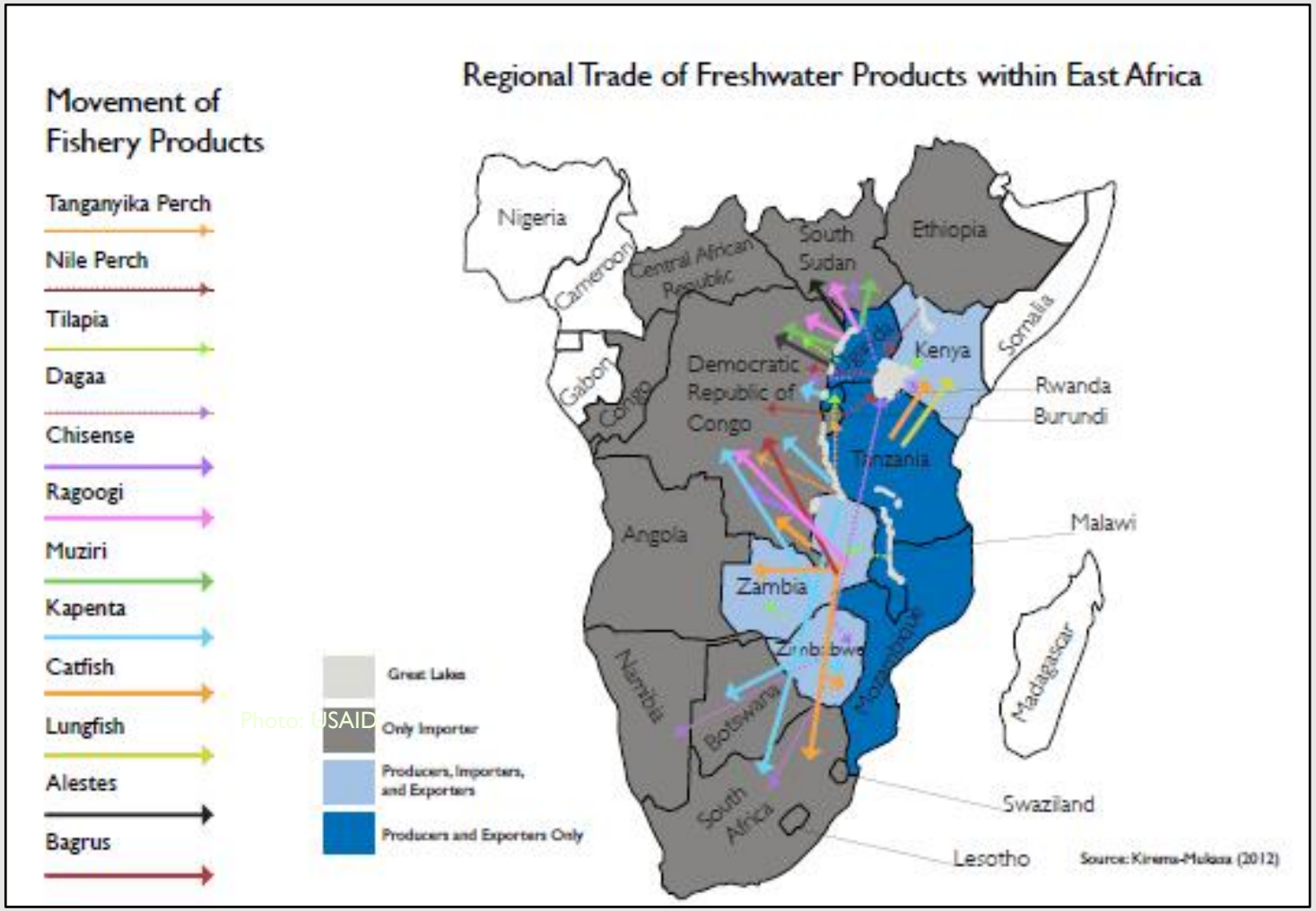
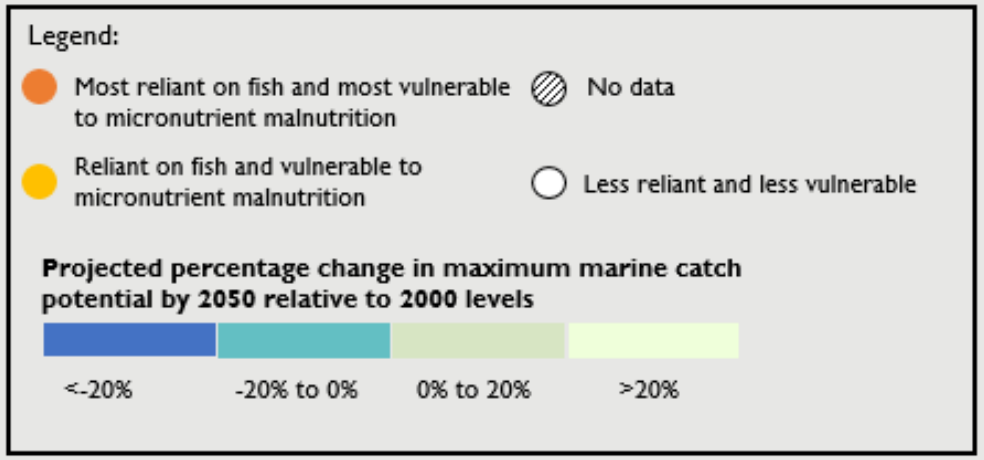


Photo: USAID

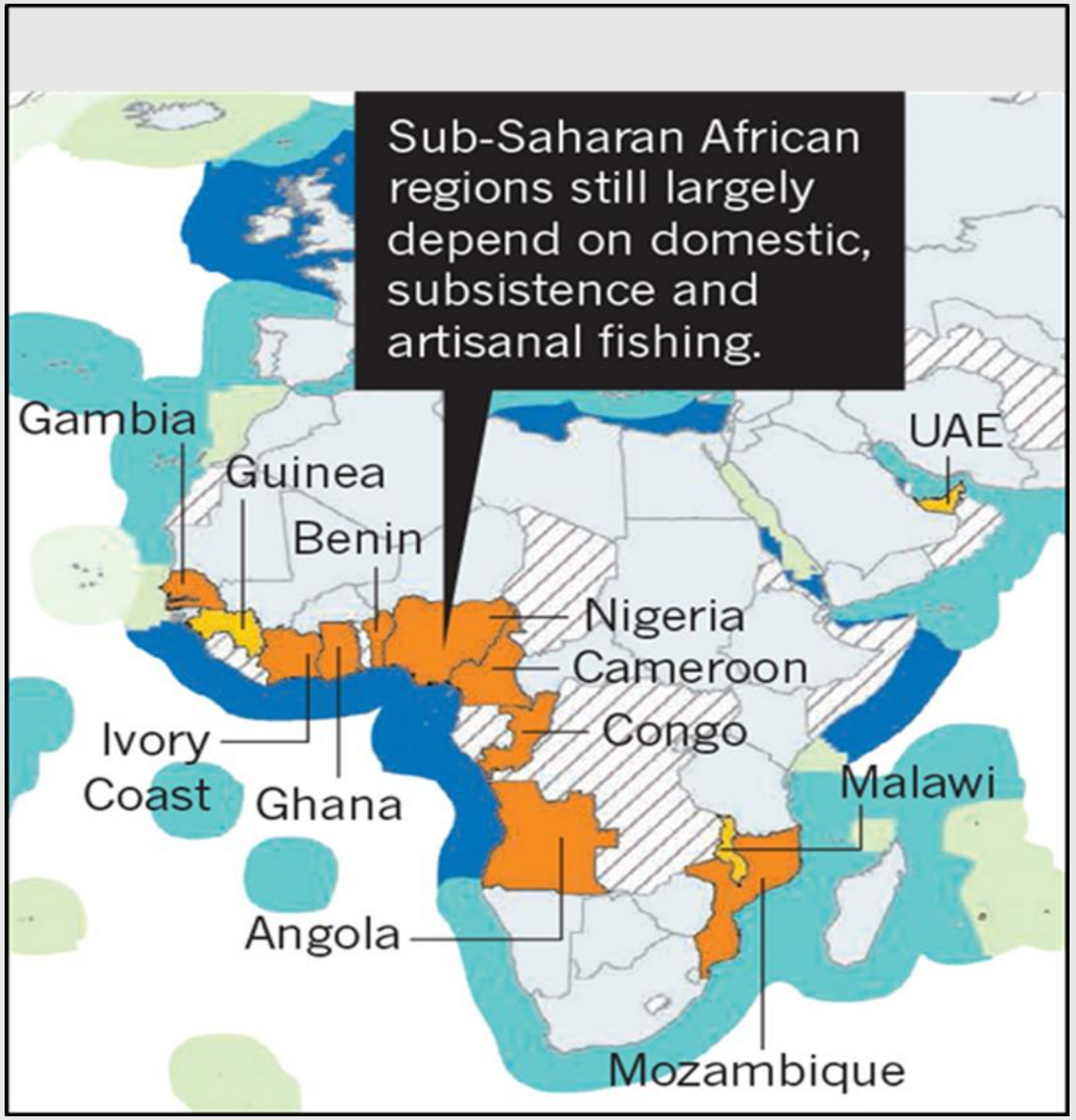
Sources: McIntyre et al. 2016, World Bank 2016

EMERGING RISK OF MICRONUTRIENT MALNUTRITION FROM FISHERIES DECLINE

- At least **10 percent** of global populations could face fatty acid and **micronutrient deficiencies** due to **poor fisheries management**
- **West African countries are among the highest at risk** for malnutrition due to declining fisheries and high reliance on fish as a source of nutrition.



Source: Golden et al. 2016



PROVEN PRACTICES TO ENHANCE PRODUCTION AND RESILIENCE OF WILD-CAUGHT FISHERIES: WORK WITH NATURE AND FISHERS

- Promote **participatory co-management**
- **Secure tenure and access** to fishing grounds for small-scale fishers
- Strengthen **fisher associations** and **social cohesion**
- Use **fish reserves/sanctuaries, closed seasons** and **appropriate gear** to enhance natural productivity and resilience
- **Reduce or eliminate subsidies** that distort the market and drive overfishing
- Use **extension services** to scale-up capacity


Photo: USAID

USAID'S ECOSYSTEMS IMPROVED FOR SUSTAINABLE FISHERIES PROJECT (2012-2017) IN THE PHILIPPINES

- Worked with fishing communities and the Philippines Department of Agriculture to **improve fisheries management** in **1.8 million hectares** of municipal waters
- Reduced destructive fishing gear
- Established networks of fish reserves
- Enhanced productivity and resilience:
  - **24% increase** in fish biomass within select fisheries
  - **12% increase** in employment or better employment in focal areas


Photo: Jason Houston/USAID

Source: USAID 2017

WILD-CAUGHT FISHERIES ARE TOO BIG TO IGNORE: PROGRAMMING IMPLICATIONS?

- Recognize the value of integrating nature-based foods and ecosystem services into "food systems" and development programs
- Assess and monitor the contribution of nature-based foods and environmental health:
  - Demographic Health Surveys; Country assessments; Famine Early Warning Network (FEWSNET)
- Promote increased investments in equitable and resilient fisheries management
- Promote adoption of nutrition-sensitive fishing policies to ensure local access to fish
- Measure food production at the watershed-scale and include coastal, river and lake aquatic productivity

THANK YOU!


Photo: Christian Smith/USAID


Photo: FAO

USAID's AgriLinks & USAID's Biodiversity Conservation and Development Gateway

RESOURCES AVAILABLE on USAID's AgriLinks and USAID's Biodiversity Conservation and Development Gateway

- *The Role of Wild-Caught Fisheries in African Development*
- *Facts About Wild-Caught Fisheries and Africa Development (Infographic)*
- *Fishing for Food Security: The Importance of Wild Fisheries for Food Security and Nutrition*
- *The Importance of Wild Fisheries for Local Food Security* – Country profiles for Eight Feed the Future Countries
- *Integrating Food Security and Wild-Caught Fisheries Management in USAID Programming*
- *Sustainable Fisheries and Responsible Aquaculture: A Guide for USAID Staff and Partners*