



**NOAA
FISHERIES**

WHY WE NEED FINFISH AQUACULTURE AND WHAT NOAA'S DOING ABOUT IT?

Michael Rust

NOAA Fisheries, Office of Aquaculture



What is NOAA doing about finfish?

- Grant funding:
 - Sea Grant, SK, SBIR, Commissions fund you
 - Support research at National Labs - Blackcod, Seriola
 - Tools for rules – Siting, genetics and whales
 - Workshops
 - International Agreements – access to technology from other countries
 - Outreach and Communication of Science
- But....We have to do what Congress tells us to do...



Congressional Direction from the FY20 Approps

- *NMFS is encouraged to give priority consideration to promising but less commercially developed technologies, such as those **targeting shellfish, seaweed, and other relative newcomers to the domestic aquaculture industry**. The Committee provides \$2,500,000 in the NMFS Aquaculture budget for this purpose.*
- *the Committee provides no less than \$5,000,000 to support ongoing research in **off-bottom Eastern oyster production in coastal areas**, particularly in areas where this method is being exploited for commercial production, including the Gulf of Mexico, and encourages NMFS to dedicate resources to support regional partnerships for genetics, disease, and economic modeling. NOAA is encouraged to use the increase above fiscal year 2019 levels to explore new research topics, including **engineering of ocean-based infrastructure, accumulation and metabolization rates of brevetoxins in commonly farmed shellfish, and integrated multitrophic aquaculture**.*
- *General NOAA Report Language Shellfish genetics.—The recommendation includes up to \$10,000,000 to **improve shellfish survival and growth rates and to classify and preserve the natural genetic variation of shellfish**. NOAA is encouraged to support regional partnerships to classify and preserve natural genetic variation in shellfish.*



Americans Mostly Eat 10 Items of Seafood

2017	
Shrimp	4.4
Salmon	2.41
Canned Tuna	2.1
Tilapia	1.08
Alaska Pollock	0.78
Pangasius	0.71
Cod	0.66
Crab	0.52
Catfish	0.53
Clams	0.31
Per Capita Consumption	16.00
Total Top 10	13.50884098
All Other Species Consumption	2.491159018
Top 10 as % of Total Consumption	84%

- 7 fish
- 2 crustacean
- 1 mollusk

What does that mean for human health?



Looking at the Last Two Years

Species	% farmed in 2016-17	Mean per capita consumption (Lbs)	Aquaculture's share (Lbs)	Contribution to total consumption	Aquaculture's portion contribution
Shrimp	90%	4.25	3.83	31.5%	28.4%
Salmon	61%	2.30	1.40	17.0%	10.4%
Tuna	0%	2.10	0.00	15.6%	0.0%
Tilapia	100%	1.13	1.13	8.4%	8.4%
Pollock	0%	0.87	0.00	6.5%	0.0%
Pangasius	100%	0.80	0.80	5.9%	5.9%
Cod	0%	0.66	0.00	4.9%	0.0%
Crab	0%	0.53	0.00	3.9%	0.0%
Catfish	95%	0.52	0.49	3.9%	3.7%
Clams	22%	0.33	0.07	2.4%	0.5%
Total Top 10	57%	13.48	7.72	100%	57%

Data are means from 2016 and 2017



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1/3 Shrimp, 1/6 Each Salmon and Tuna, 1/12 Tilapia					
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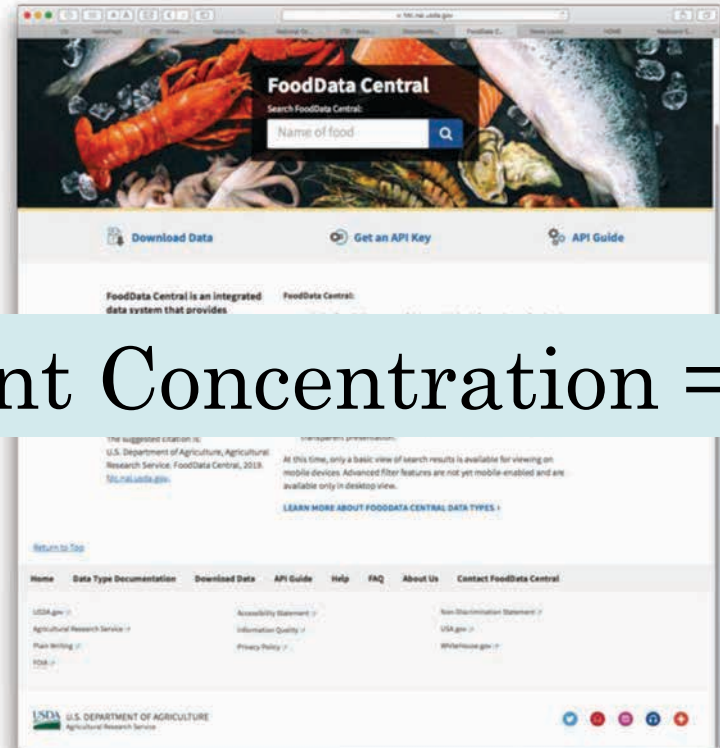
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57% of consumption from aquaculture by weight



What About LC Omega-3 Fatty Acids?

2017	
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Consumption X Nutrient Concentration =

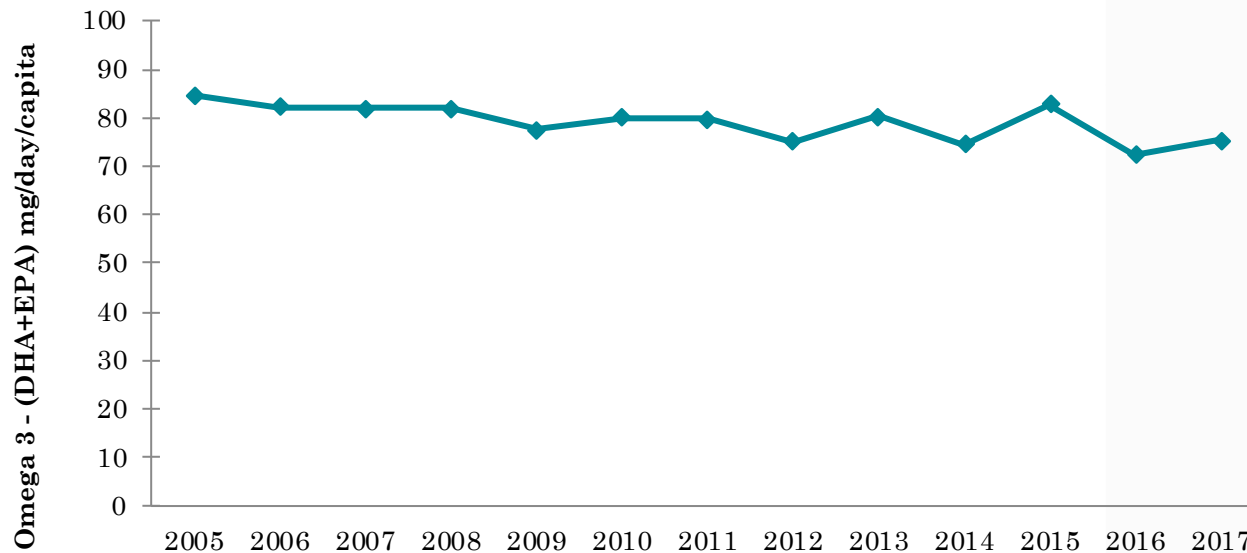
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Per capita dose of LC Omega 3 fatty acids



Top 10 Have Been Providing 80-90 mg/d/person...

Average Americans' Daily Omega Dose



...the recommendation is 250 mg/d/person.



Where Do LCN3s Come From?

Species	% farmed in 2016-17	Mean annual Contribution in EPA + DHA	Aquaculture's share	Contribution over all	Aquaculture portion contribution
Shrimp	90%	6.07	5.47	22.6%	20.3%
Salmon	61%	12.76	7.79	47.4%	28.9%
Tuna	0%	2.72	0.00	10.1%	0.0%
Tilapia	100%	0.47	0.47	1.7%	1.7%
Pollock	0%	1.85	0.00	6.9%	0.0%
Pangasius	100%	0.64	0.64	2.4%	2.4%
Cod	0%	0.43	0.00	1.6%	0.0%
Crab	0%	1.15	0.00	4.3%	0.0%
Catfish	95%	0.42	0.40	1.6%	1.5%
Clams	22%	0.42	0.09	1.6%	0.3%
Total Top 10	55%	26.93	14.85	100%	55%
Data are means from 2016 and 2017					



Where Do LCN3s Come From?

- Salmon at half the consumption of shrimp provides more than twice our LCN3sand at about the same consumption as tuna provides almost 5x as much
- Tilapia at half the consumption of Tuna provides about 1/5 the amount of LCN3s

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Aquaculture provides more than half of our LCN3 dose



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You Are What You Eat!

—with fats anyway...



ScienceDaily
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YOU, WHO LIVES TO PUSH THE LIMITS.
HEALTH FOR ALL. CARE FOR YOU.
PROVIL Health & Serv

Science News
Popular Fish, Tilapia, Contains Potentially Dangerous Fatty Acid Combination

Date: July 10, 2008
Source: Wake Forest University Baptist Medical Center

Summary: Farm-raised tilapia, one of the most highly consumed fish in America, has very low levels of beneficial omega-3 fatty acids and, perhaps worse, very high levels of omega-6 fatty acids, according to new research. The researchers say the combination could be a potentially dangerous food source for some patients with heart disease, arthritis, asthma and other allergic and auto-immune diseases that are particularly vulnerable to an "exaggerated inflammatory response."

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Omega-3 oils in farmed salmon 'halve in five years'

By Pallab Ghosh
Science correspondent, BBC News

6 October 2016

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The bad news is that fish oil is expensive relative to plant oils

Functional Foods

- Functional foods are foods that have a potentially positive effect on health beyond basic nutrition.
 - The term may also apply to traits purposely bred or added via feed or processing into existing foods.
-
- Fish such as Salmon, Tilapia, and Pangasius are obvious choices for increasing delivery of LCN3s
 - But so are other non-seafood choices...
 - It is possible to increase LCN3 dose without increased seafood consumption

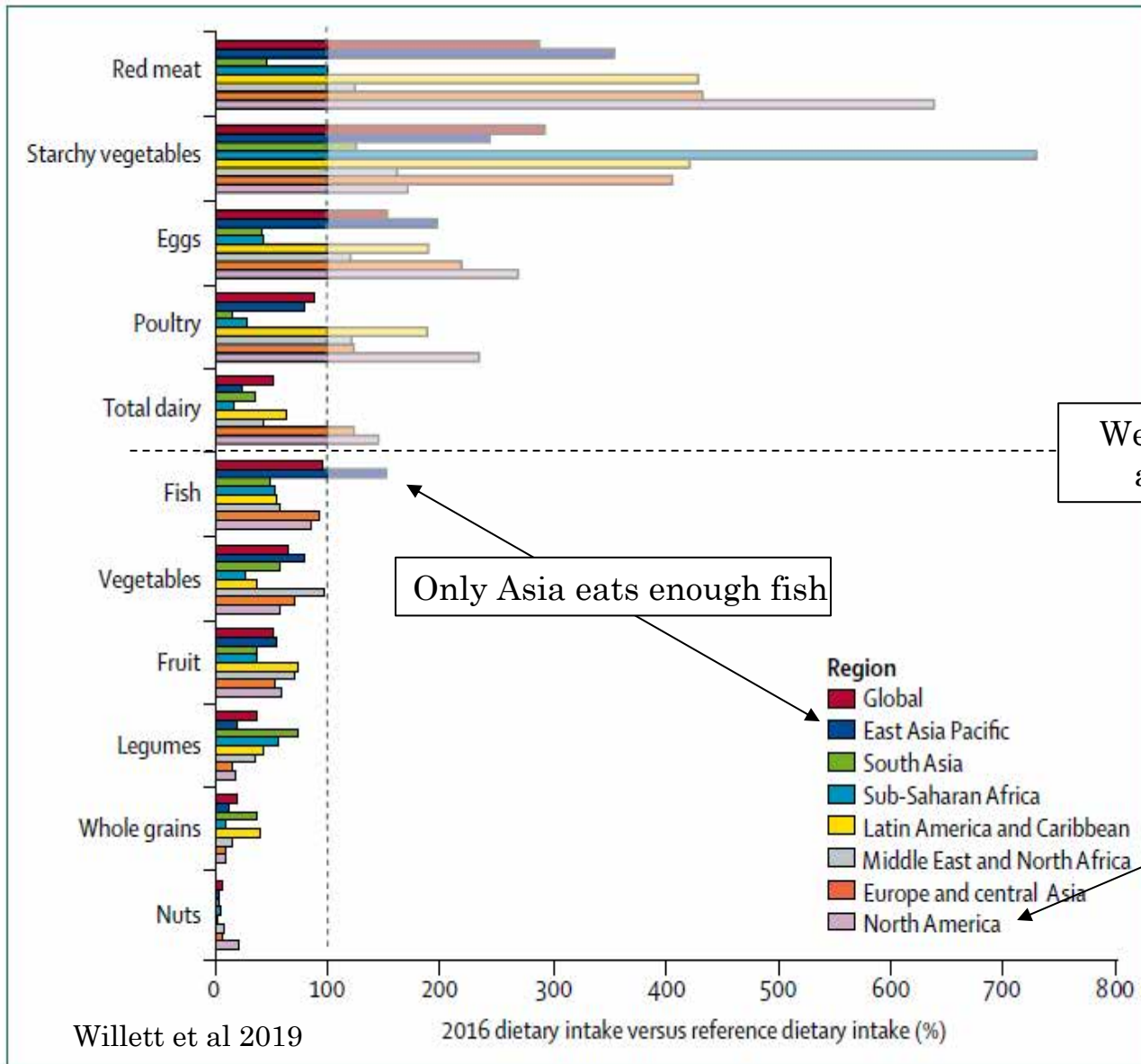


Conclusions

- Per capita US consumption of Omega 3 fatty acids via seafood is well below optimum for human health benefits.
- 2x a week might not be enough depending on what you eat.
- Aquaculture is closing in on providing 60% of US seafood but will have to expand to provide enough super seafood to meet nutritional needs.
- High levels of Omega 3 fatty acids in farmed seafood have the largest effect on current dose and the highest potential increase even without increased consumption.
- There are new sources of omega-3 oils for aquaculture diets and they will likely spawn seafood and non-seafood functional foods.



What Do We Eat, Anyway?



We eat too much above this line and too little below the line

Only Asia eats enough fish

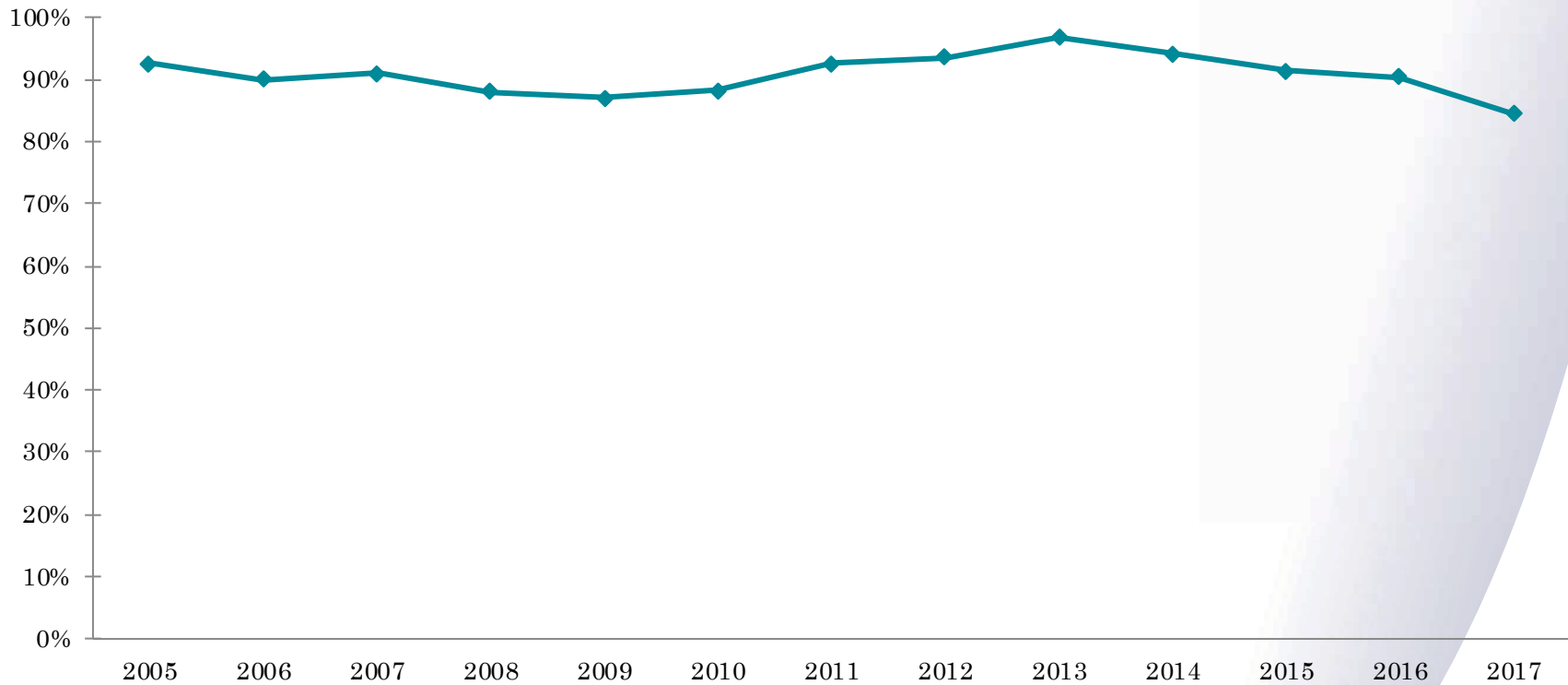
The pink one is us



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Top 10 Account for 90% of U.S. Consumption

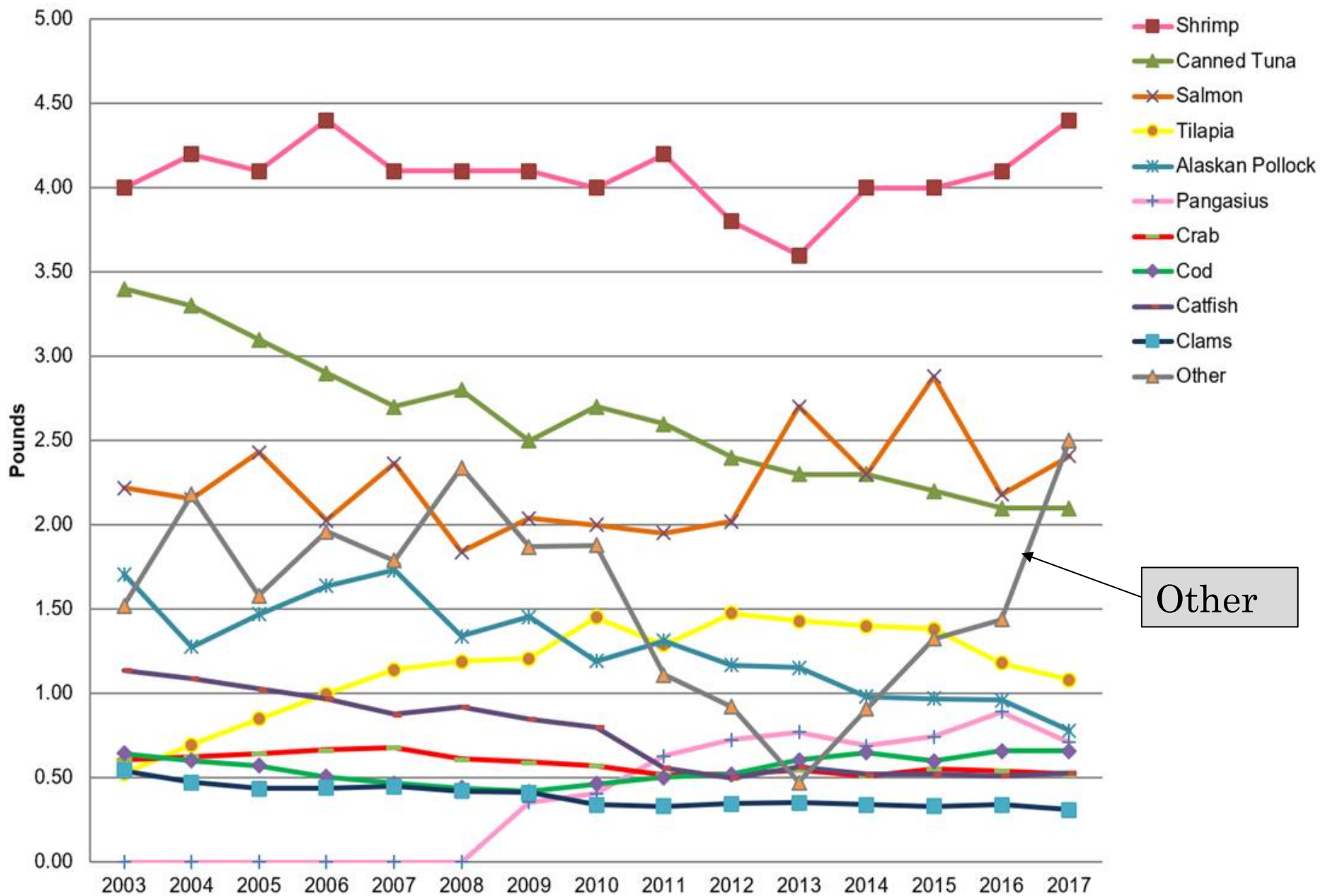
Average Americans Seafood Consumption Covered by the Top Ten



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Top 10 Consumed Seafoods in US

Source: AboutSeafood.com



You Are What You Eat!

—with fats anyway...

07.10.19

In this Nebraska town, superpowered algae is the latest cash crop

A new plant will make algae designed to feed farmed salmon, so we can stop overfishing the small fish we feed them now.



Cargill gets green-light for omega-3 producing canola

By Aerin Einstein-Curtis

09-Aug-2019 - Last updated on 09-Aug-2019 at 07:29 GMT



© GettyImages/Baloncici

RELATED TAGS: Canola. Aquaculture. Omega-3 fatty acid. Cargill

Cargill has received approval to grow biotech, omega-3 producing canola, in the US providing the next step in ongoing work to commercialize an alternative ingredient for use in aquaculture feeds.

The good news is we have a lot of LCN3 oils coming on line.



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