



US Shrimp Aquaculture in a Global Perspective

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Global Shrimp Farming Industry

GLOBAL SHRIMP FARMING INDUSTRY

- Production currently in at least 50 countries worldwide (> 40 years).
- Pond area for 50 countries estimated at 2,135,110 ha (Boyd & McNevin 2018).
- Located mainly in Asia and Latin America.
- Global Aquaculture Alliance (GAA) production estimates for 2016 and 2017:

REGION	TM - 2016	% GLOBAL - 2016	TM - 2017	% GLOBAL - 2017
S.E. ASIA	1,483,935	36.6%	1,574,077	36.9%
CHINA	1,352,762	33.4%	1,350,622	31.6%
INDIA	438,579	10.8%	494,959	11.6%
AMERICA	701,200	17.3%	756,430	17.7%
MENA	53,796	1.3%	63,990	1.5%
OTHERS	25,419	0.6%	27,422	0.6%
TOTAL	4,055,690	100.0%	4,267,500	100.0%

+5%



MAIN PRODUCERS:

- China
- Thailand
- Vietnam
- Indonesia
- Malaysia
- Philippines
- India
- Bangladesh

PRODUCTION 2017:

- ~ 3.42 MMT
- 80.1 % of total
- *L. vannamei*
- *P. monodon*

Asia

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ADAPTED FROM BRIGGS

Pointer 14°54'24.09" N 116°22'15.88" E

Streaming ||||| 100%

Eye alt 4123.17 mi



America

MAIN PRODUCERS:

- Ecuador
- Mexico
- Brazil
- Venezuela
- Honduras
- Nicaragua
- Guatemala
- Belize
- Panama
- Peru

U.S. SHRIMP FARMING INDUSTRY

- Probably around 1500-1700 MT (3.3 – 3.7 million lbs.) annually.
- Outdoor farms in TX, AL, AZ?, FL? Others?
- Indoor production (mostly small-scale) in several states.

Production 2017:

- 756,430 MT
- 17.7% of total
- **100% *L. vannamei***

Rest of World

MAIN PRODUCERS:

- Saudi Arabia
- Madagascar
- Australia
- Iran
- New Caledonia
- Others

PRODUCTION 2017:

- ~ 85,000 MT
- 2% of total
- *L. vannamei, monodon, indicus, merguensis, stylirostris*

ADAPTED FROM BRIGGS

Image NASA
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Eye alt 4750.12 mi

0°35'30.99" S 98°58'24.81" E

GLOBAL SHRIMP FARMING INDUSTRY

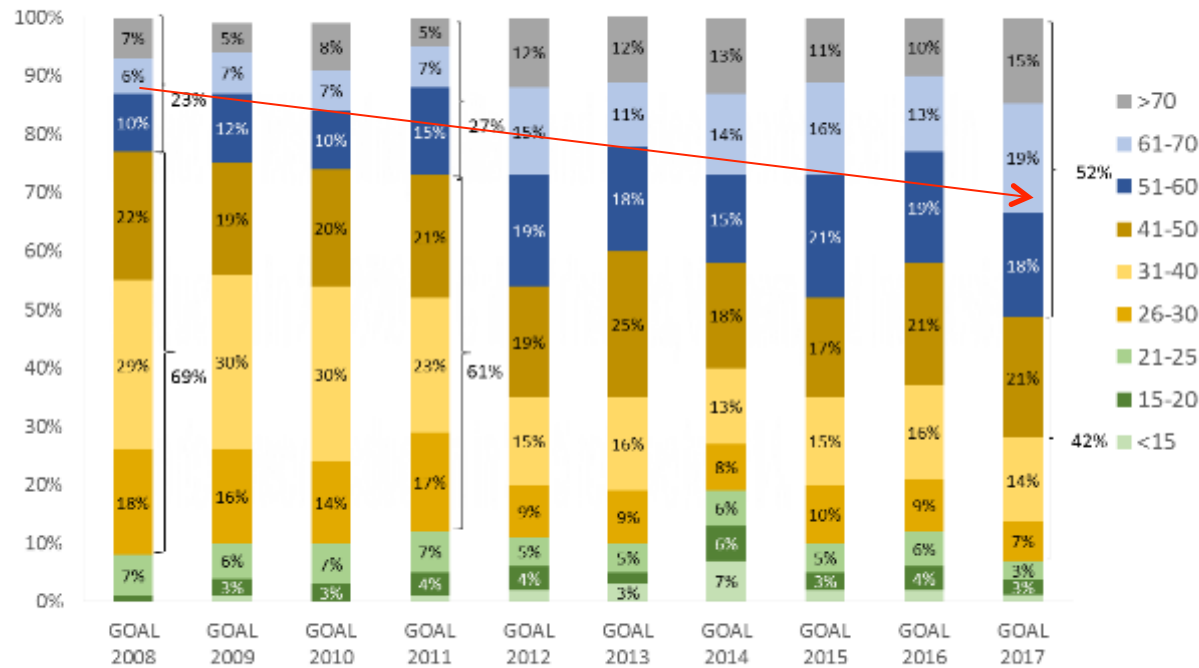
- Annual value of **US \$ 23.6 million** in 2014, second after the carps (FAO 2016, Tacon 2016).
- *L. vannamei* is the main aquatic species – in value - cultivated in the world, at **US \$ 18,460 million** in 2014 (FAO 2016, Tacon 2016) – **78%**.
- *L. vannamei* is the **commercially most important shrimp species** in the world, with practically all production from **aquaculture (> 76%, > 45%)**.
- Industry **based mostly on a single species**, and with relatively few genetically selected and improved lines.
- Much more **additional economic activity** focused on ancillary and value chain industries such as aquafeeds, various equipment, pharmaceuticals, chemicals, transport / marketing, R & D and others.
- At least **2.5 million direct jobs**, and many more indirectly.

GLOBAL SHRIMP FARMING INDUSTRY

- Production technology continues to be **mostly extensive to semi-intensive** - much potential to improve efficiency through innovation and standardization of procedures (**evolution from artisanal to industrial**).
- Industry history is one of **periodic disease outbreaks** and continuing health management problems that disrupt supply chains and markets, and is of **great concern to potential investors**.
- Relatively **few available proactive alternatives** apart from biosecurity and genetic selection measures – maybe “vaccines” sometime?
- **Much potential for genetic gains** to significantly improve production (growth rates, disease resistance, others) due to the relatively short life cycle of the animals.
- **Knowledge about nutritional needs is adequate**, but a lot of room for improvement.
- The industry **could expand significantly** (market, investment?).

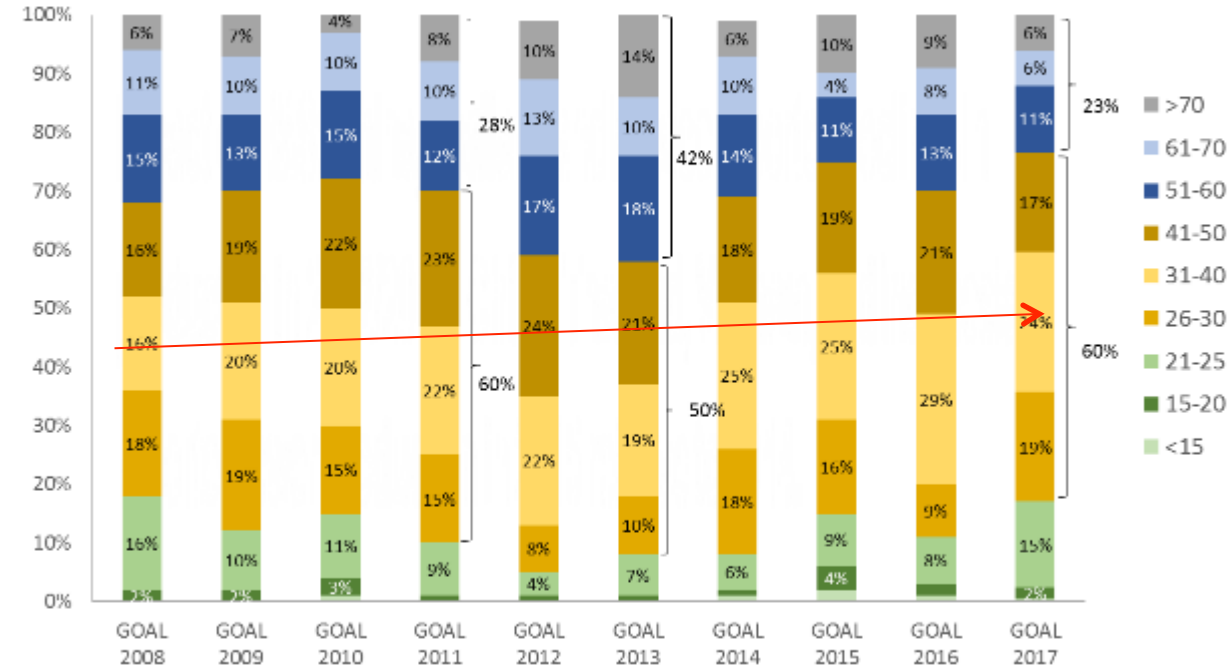
Size Categories: Asia vs. Americas (2008-2017)

Composition of Shrimp Aquaculture Production by Size Categories
Comparison of Survey Data for Asia



Disease problems in Asia led to the harvesting of smaller sizes since 2011.

Composition of Shrimp Aquaculture Production by Size Categories
Comparison of Survey Data for the Americas

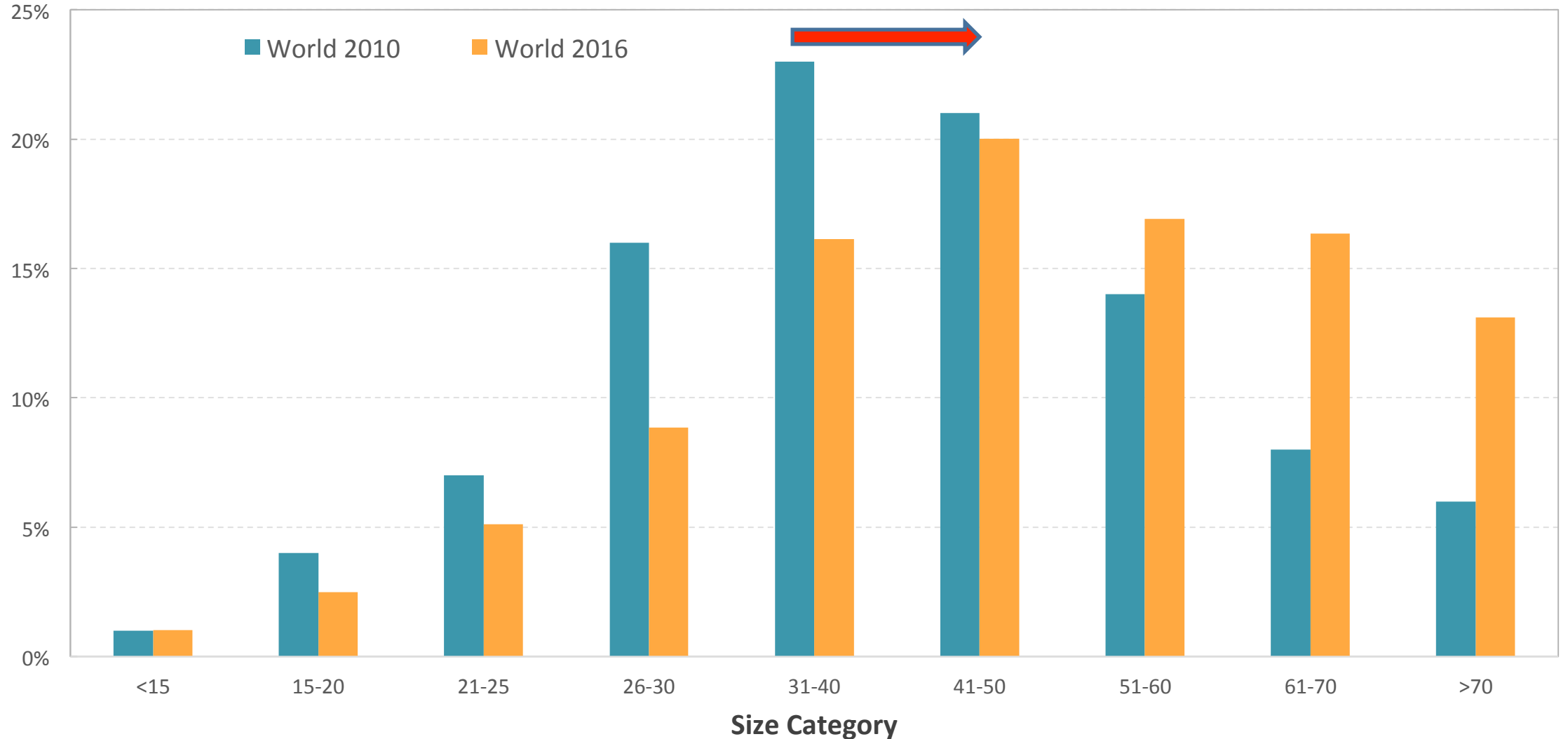


There was also a temporary trend towards smaller sizes in Latin America in 2011 and 2012.

Asia produced a larger % of smaller sizes (52 vs. 23%) in 2017.

Composition of Shrimp Aquaculture by Size Categories

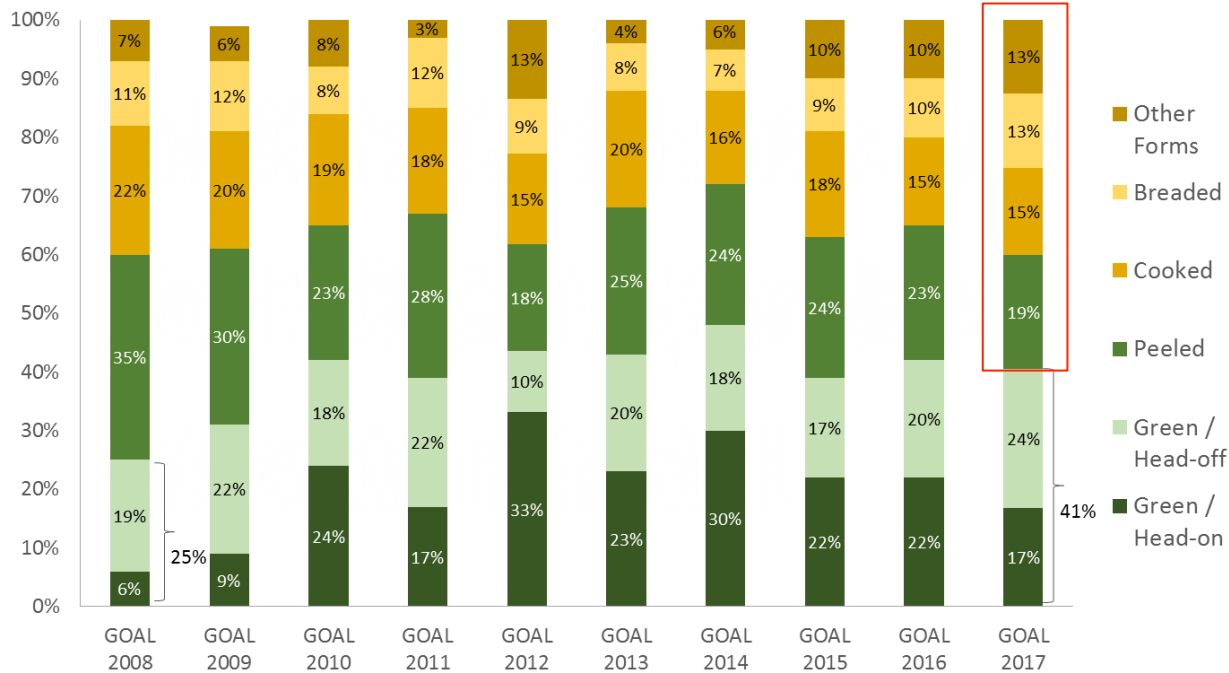
World 2010 vs. World 2016



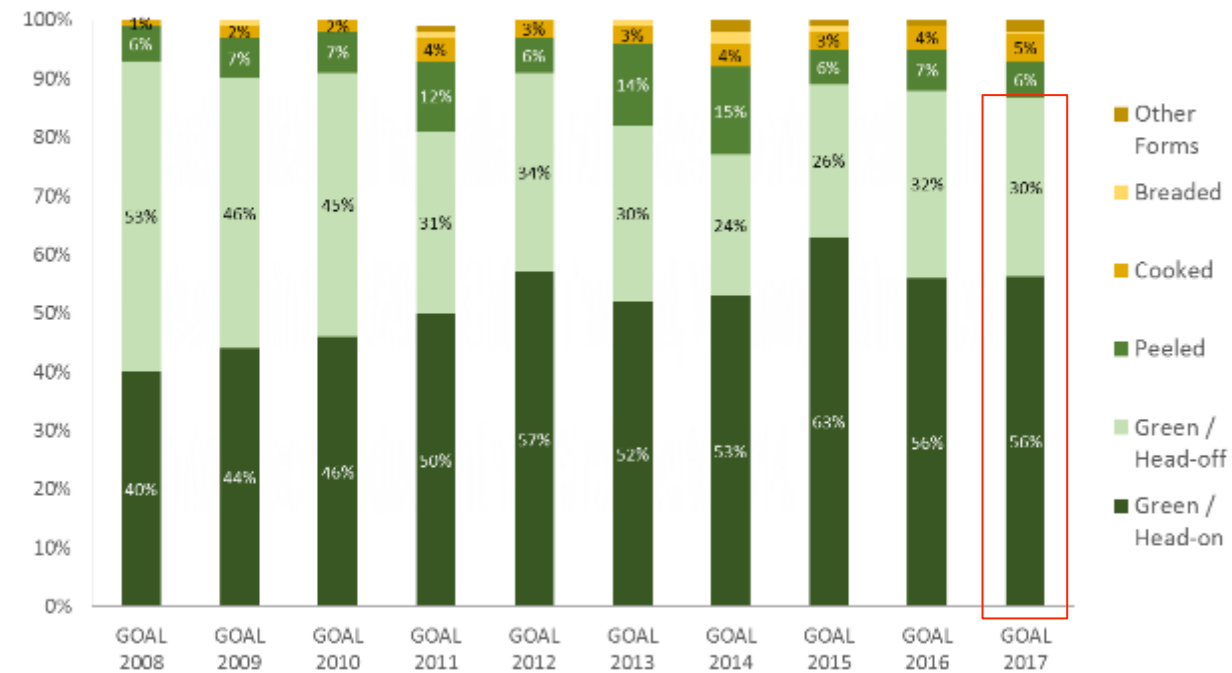
Sources: GOAL (2011, 2017).

Product Forms: Asia vs. America (2008-2017)

Composition of Shrimp Aquaculture Production by Product Form
Comparison of Survey Data for Asia



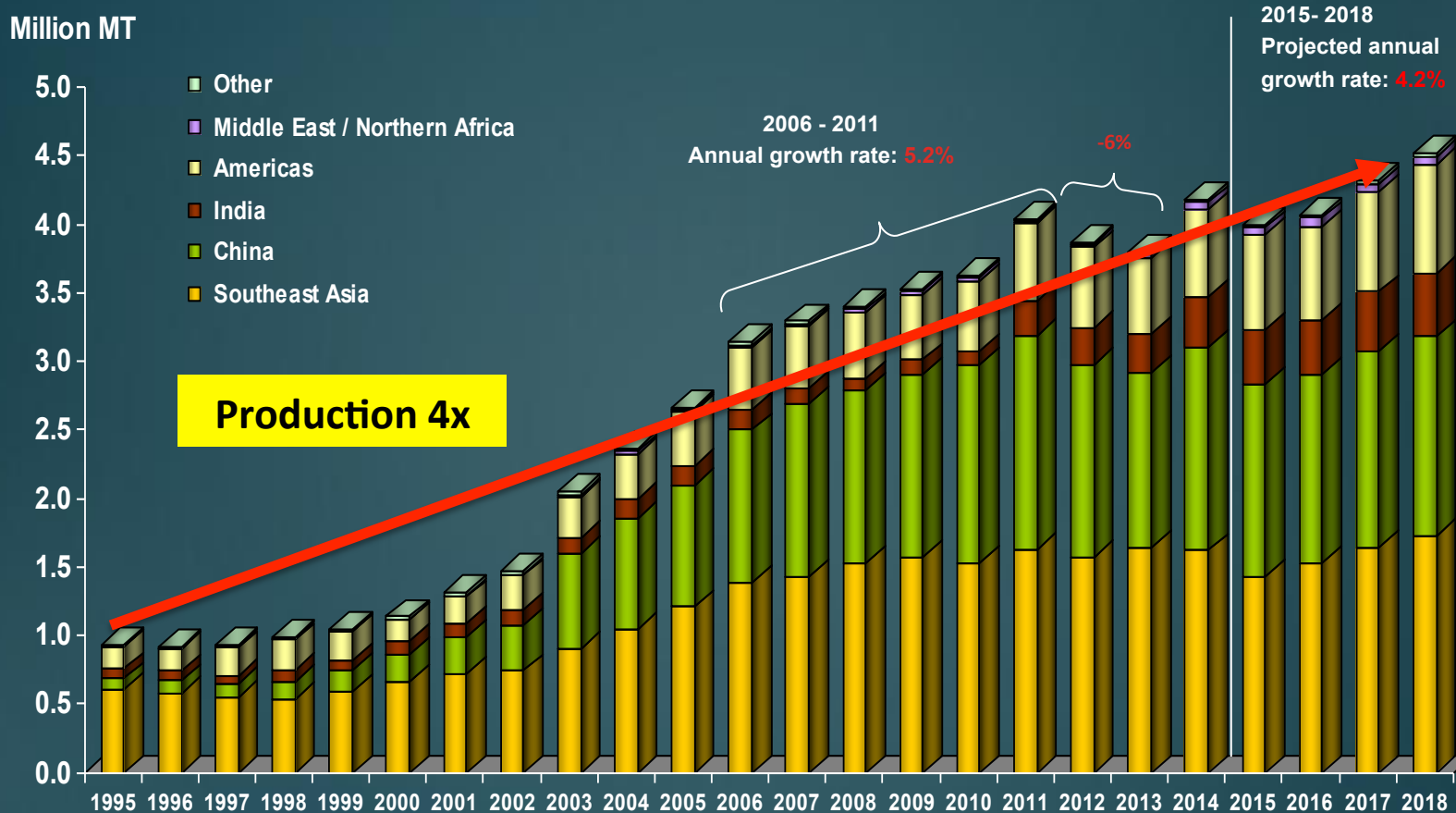
Composition of Shrimp Aquaculture Production by Product Form
Comparison of Survey Data for Latin America



The growing share of the green head-on form reflects an increased presence of Ecuadorian shrimp in European and Asian markets.

**Asia produces significant volumes of value-added shrimp products.
America produces mostly green shrimp.**

Shrimp Aquaculture Production by World Region: 1995 - 2018

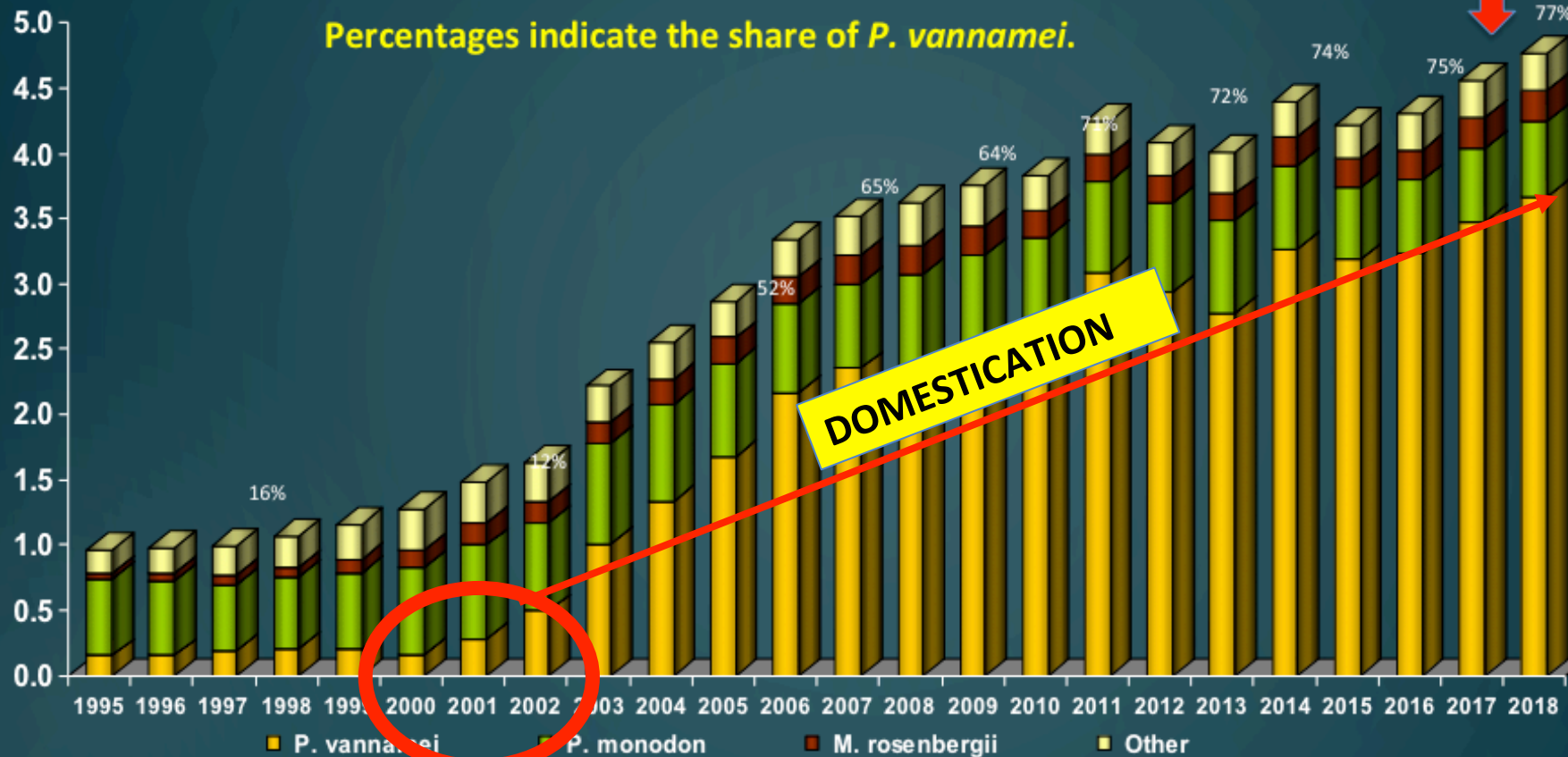


Sources: FAO (2016) for 1995-2011; FAO (2016) and GOAL (2014) for 2012-2014; GOAL (2016) for 2014-2018.

Southeast Asia includes Thailand, Vietnam, Indonesia, Bangladesh, Malaysia, Philippines, Myanmar and Taiwan.
M. rosenbergii is not included.

World Shrimp Aquaculture (including *M. rosenbergii*) by Species: 1995 - 2018

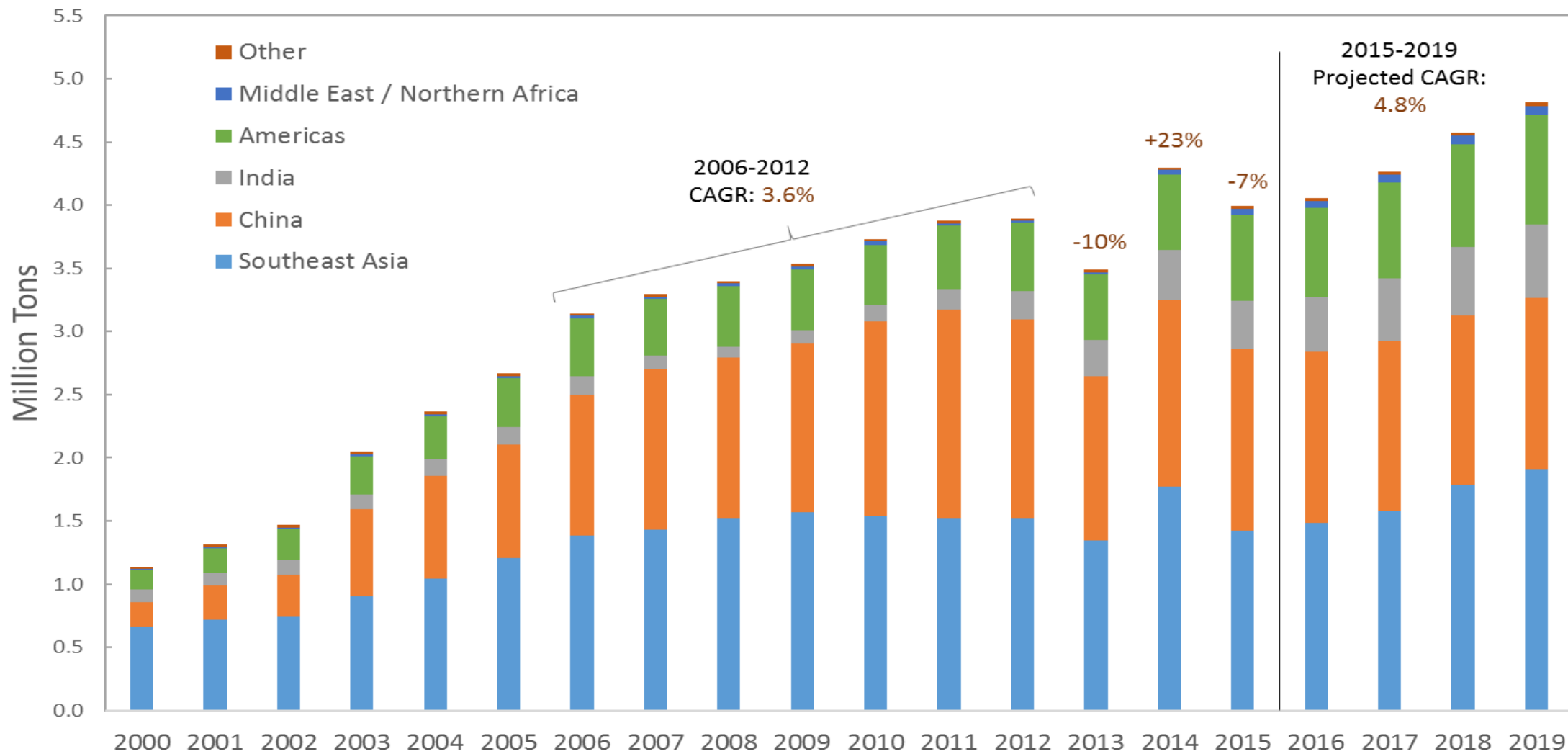
Million MT



GOAL

2016 Guangzhou China

Shrimp Aquaculture Production by World Region: 2000-2019 (FAO and GOAL Data)

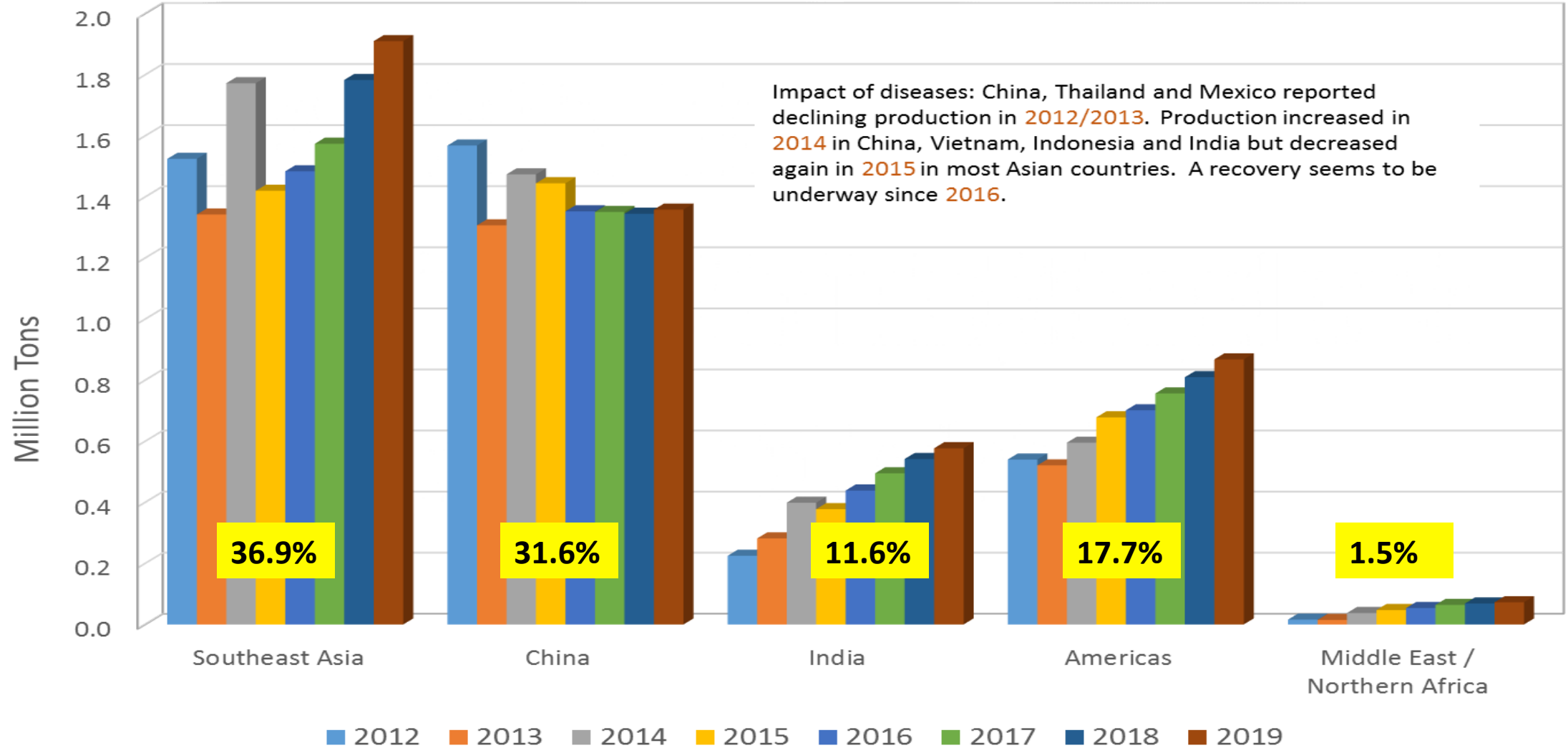


Sources: FAO (2017) for 2000-2009; GOAL (2011-2016) for 2010-2015; GOAL (2017) for 2016-2019.

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Shrimp Aquaculture by Major Producing Regions: 2012 – 2019

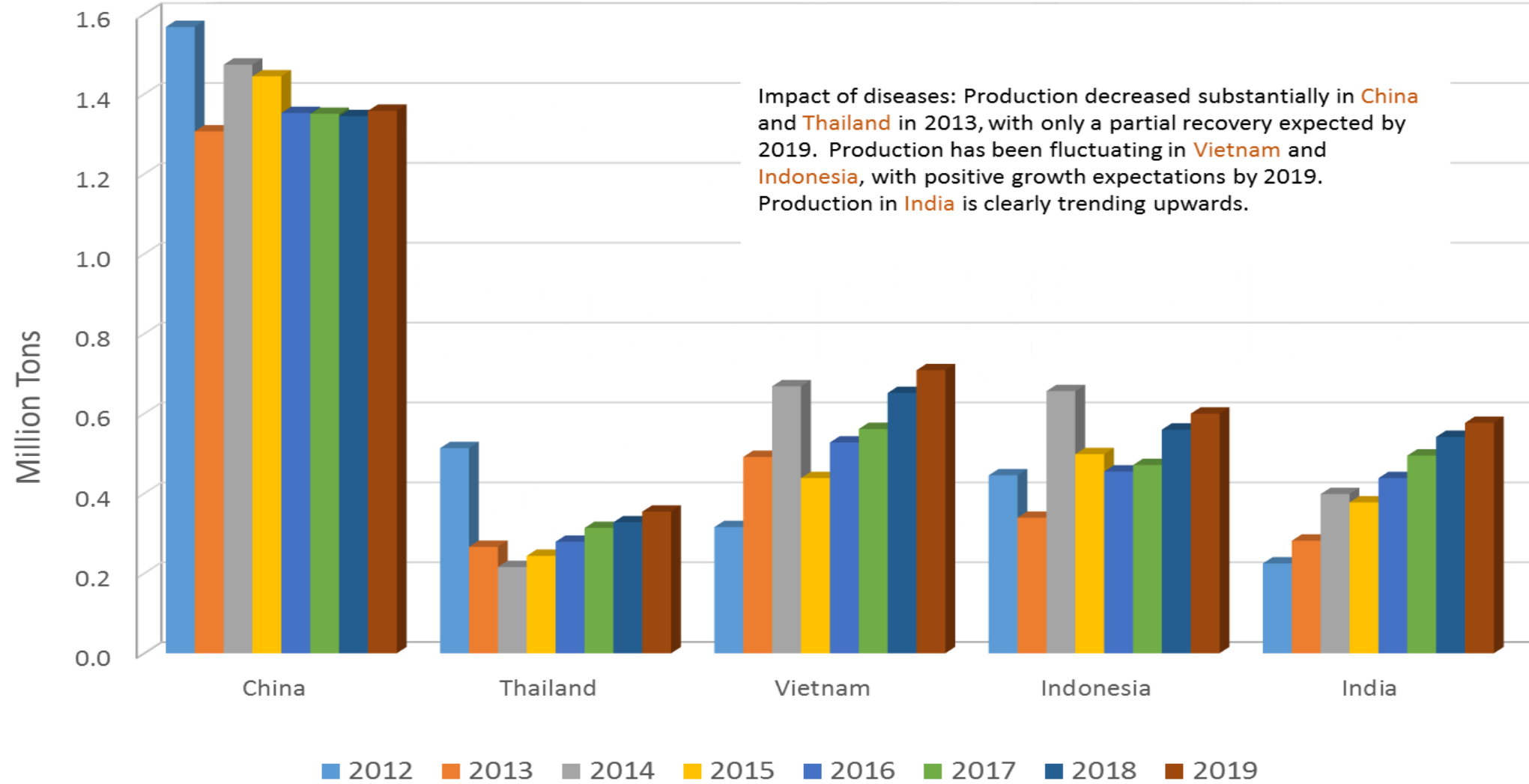


Sources: GOAL (2013-2016) for 2012-2015; GOAL (2017) for 2016-2019.

Southeast Asia includes Thailand, Vietnam, Indonesia, Bangladesh, Malaysia, Philippines, Myanmar and Taiwan.

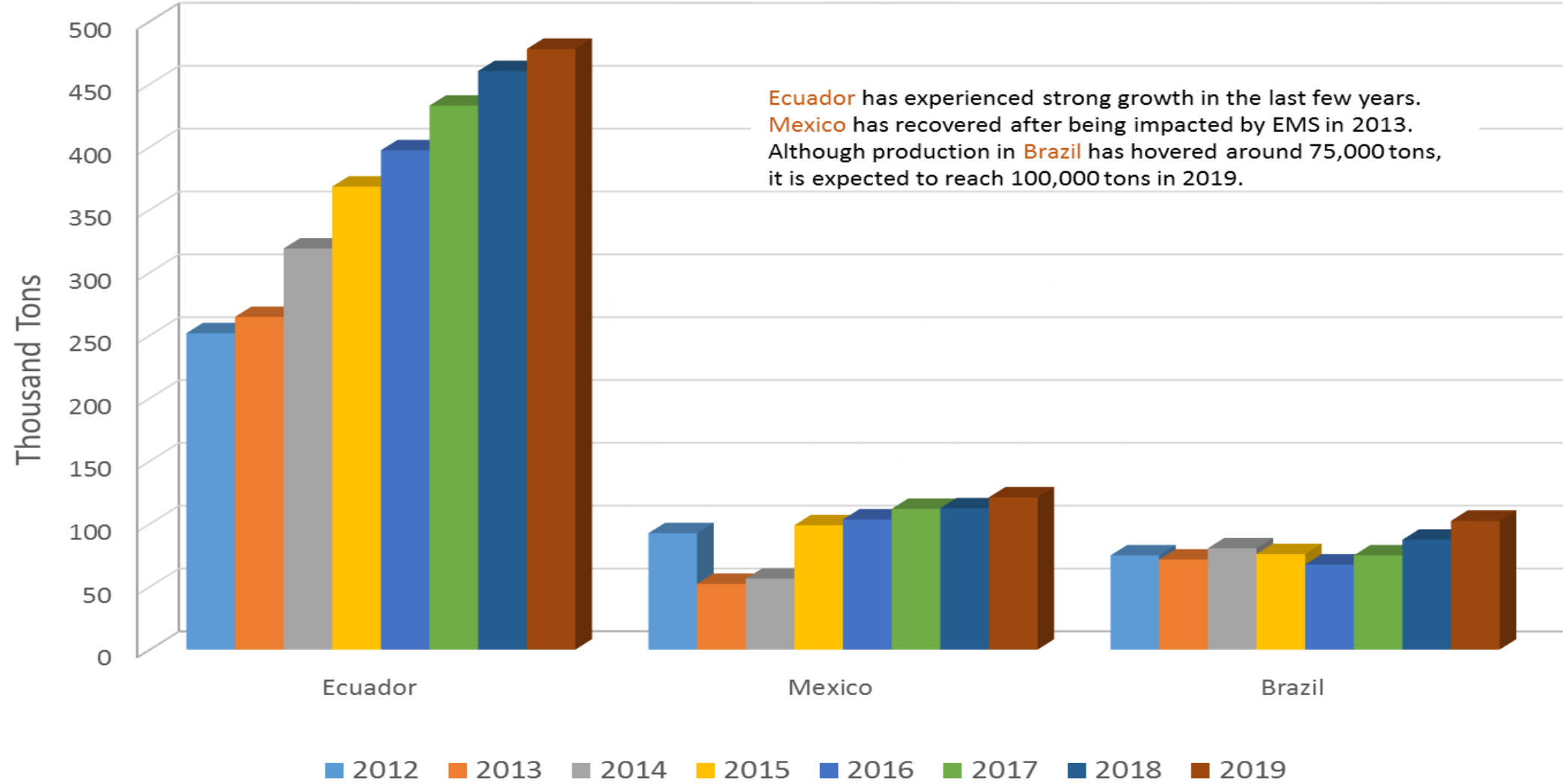
M. rosenbergii is not included.

Shrimp Aquaculture in Asia: 2012 – 2019



Sources: GOAL (2013-2016) for 2012-2015; GOAL (2017) for 2016-2019.
M. rosenbergii is not included.

Shrimp Aquaculture in Latin America: 2012 – 2019



Sources: GOAL (2013-2016) for 2012-2015; GOAL (2017) for 2016-2019.
M. rosenbergii is not included.

Global Industry Challenges

- Diseases
- Feed ingredients
- Environmental impacts
- Markets
- Investment

ESTIMATED ECONOMIC LOSSES DUE TO (VIRAL) AND OTHER DISEASES

DISEASE	SINCE	PRODUCTION LOSSES (US\$ MILLION)
IHHNV - Americas	1981	500-1000
YHV - Asia	1991	500
TSV - Americas	1991/92	2000
TSV - Asia	1999	1200
WSSV - Asia	1992/93	> 6000
WSSV - Americas	1999	> 2000
IMNV - Brazil, Indonesia	2002	1200
EMS / AHPND	2009	> 10,000 ?
EHP	2010 (2003?)	???

China

Research—New Iridescent Virus

From Abstract: A newly discovered iridescent virus that caused severe disease and high mortality in farmed *Litopenaeus vannamei* in Zhejiang, China, has been verified and temporarily labeled “Shrimp Hemocyte Iridescent Virus” (SHIV).

Histopathological examination revealed basophilic inclusions and pyknosis in hematopoietic tissue and hemocytes in gills, hepatopancreas, periopods and the tail muscle. Using viral metagenomics sequencing, researchers obtained partial sequences, annotated as potential iridoviridae. Phylogenetic analyses using amino acid sequences of major capsid protein (MCP) and ATPase revealed that it is a new iridescent virus, but it does not belong to the five known genera of Iridoviridae.

Transmission electron microscopy showed that the virus exhibited a typical icosahedral structure with a mean diameter of 158.6 ± 12.5 nm. Challenge tests of *L. vannamei* via intermuscular injection, per os and reverse gavage all exhibited 100% cumulative mortality rates. The *in situ* hybridization showed that hemopoietic tissue, gills and hepatopancreatic sinus were positively reacting tissues.

Additionally, a specific nested PCR assay was developed. PCR results revealed that *L. vannamei*, *Fenneropenaeus chinensis* and *Macrobrachium rosenbergii* were SHIV-positive, indicating a new threat to the shrimp farming industry in China.

Observation and Detection of Diseased Shrimp: The samples of *L. vannamei* collected from the pond with massive die-offs exhibited obvious clinical signs, including empty stomach and guts, pale hepatopancreas and soft shells. The shrimp samples were tested and demonstrated to be free of whitespot syndrome virus (WSSV), yellowhead virus (YHV), Taura syndrome virus (TSV), infectious hypodermal and hematopoietic necrosis virus (IHHNV) and *Vibrio parahaemolyticus*.

Discussion: In partially infected shrimp, the clinical symptoms of SHIV infection include slight loss of color, empty stomach and guts, soft shells and slightly reddish bodies in one-third of individuals. These symptoms are not similar to those caused by the infection with putative iridovirus in penaeid shrimp.

Conclusions: Through isolation, reinfection and histopathological characterization, researchers say that SHIV is a new virus in the Iridoviridae family and a pathogen of *L. vannamei*. Additionally, they developed an ISH assay and a nested PCR method for the specific detection of SHIV.

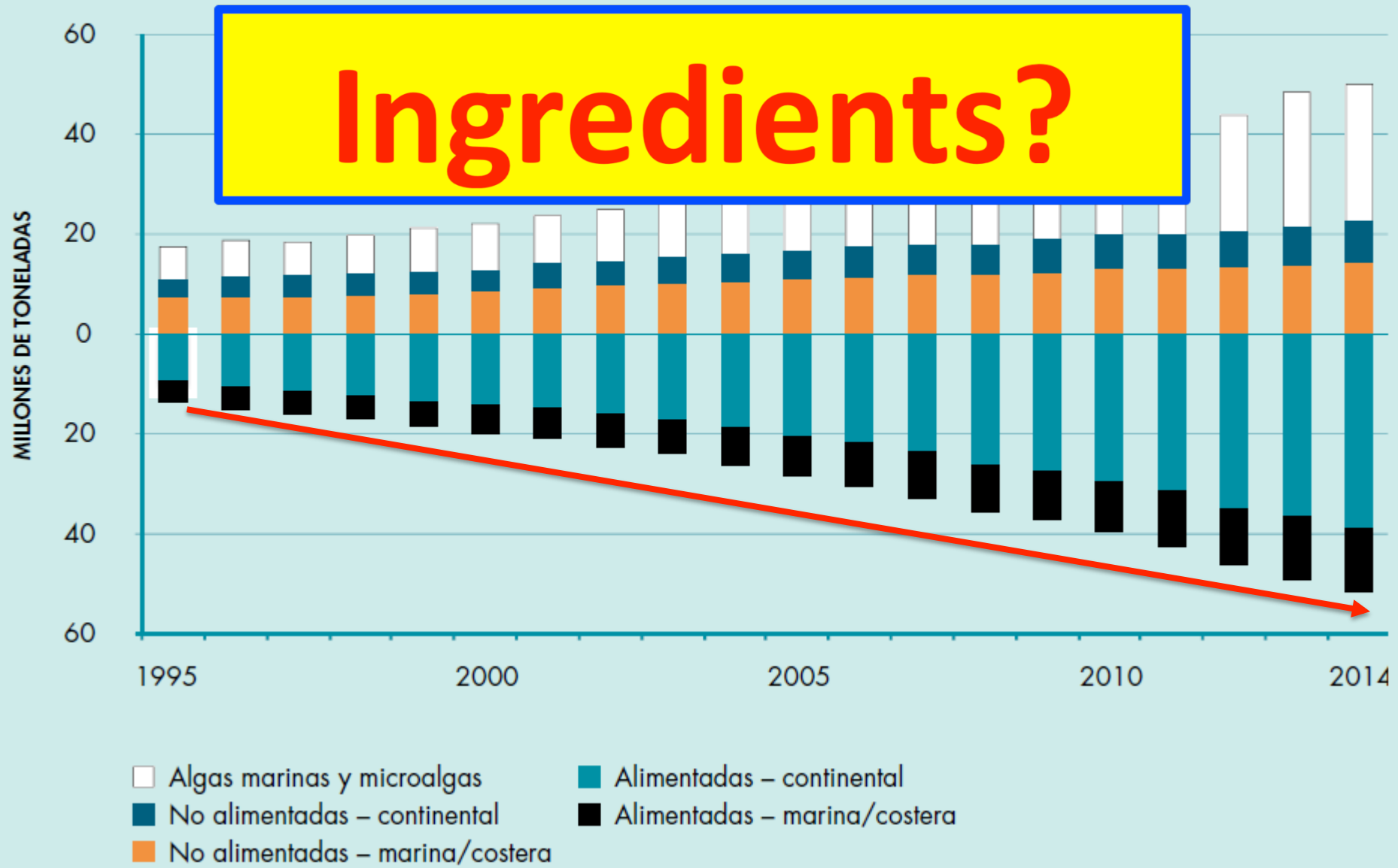
Sources: 1. [The Shrimp List](#) (a mailing list for shrimp farmers). Subject: [Acuacultura-SLA] SHIV Vannamei. From: [Juan Aguirre \(jxaquirre58@yahoo.com\)](mailto:jxaquirre58@yahoo.com). September 26, 2017. 2. [PubMed](#). [Characterization of a New Member of Iridoviridae, Shrimp Hemocyte Iridescent Virus \(SHIV\), Found in White Leg Shrimp \(Litopenaeus Vannamei\)](#). A Free PMC Article ([Full Text Free](#)). Liang Qiu, Meng-Meng Chen, Xiao-Yuan Wan, Chen Li, Qing-Li Zhang, Ruo-Yu Wang, Dong-Yuan Cheng, Xuan Dong, Bing Yang, Xiu-Hua Wang, Jian-Hai Xiang and Jie Huang (Corresponding Author, nc.ca.irfsy@ejignauh, Qingdao Key Laboratory of Mariculture Epidemiology and Biosecurity, Key Laboratory of Maricultural Organism Disease Control, Ministry of Agriculture, Function Laboratory for Marine Fisheries Science and Food Production Processes, Qingdao National Laboratory for Marine Science and Technology, Yellow Sea Fisheries Research Institute, Chinese Academy of Fishery Sciences, Qingdao, 266071, China). *Sci Rep.* (11834. doi: 10.1038/s41598-017-10738-8, PMID: 28928367). September 19, 2017.

Shrimp Hemocyte Iridescent Virus” (SHIV).



Feeds

PRODUCCIÓN ACUÍCOLA MUNDIAL DE ESPECIES ALIMENTADAS Y NO ALIMENTADAS (1995-2014)



Globally, the shrimp farming industry continues to grow...

The U.S. Seafood and Shrimp Industry

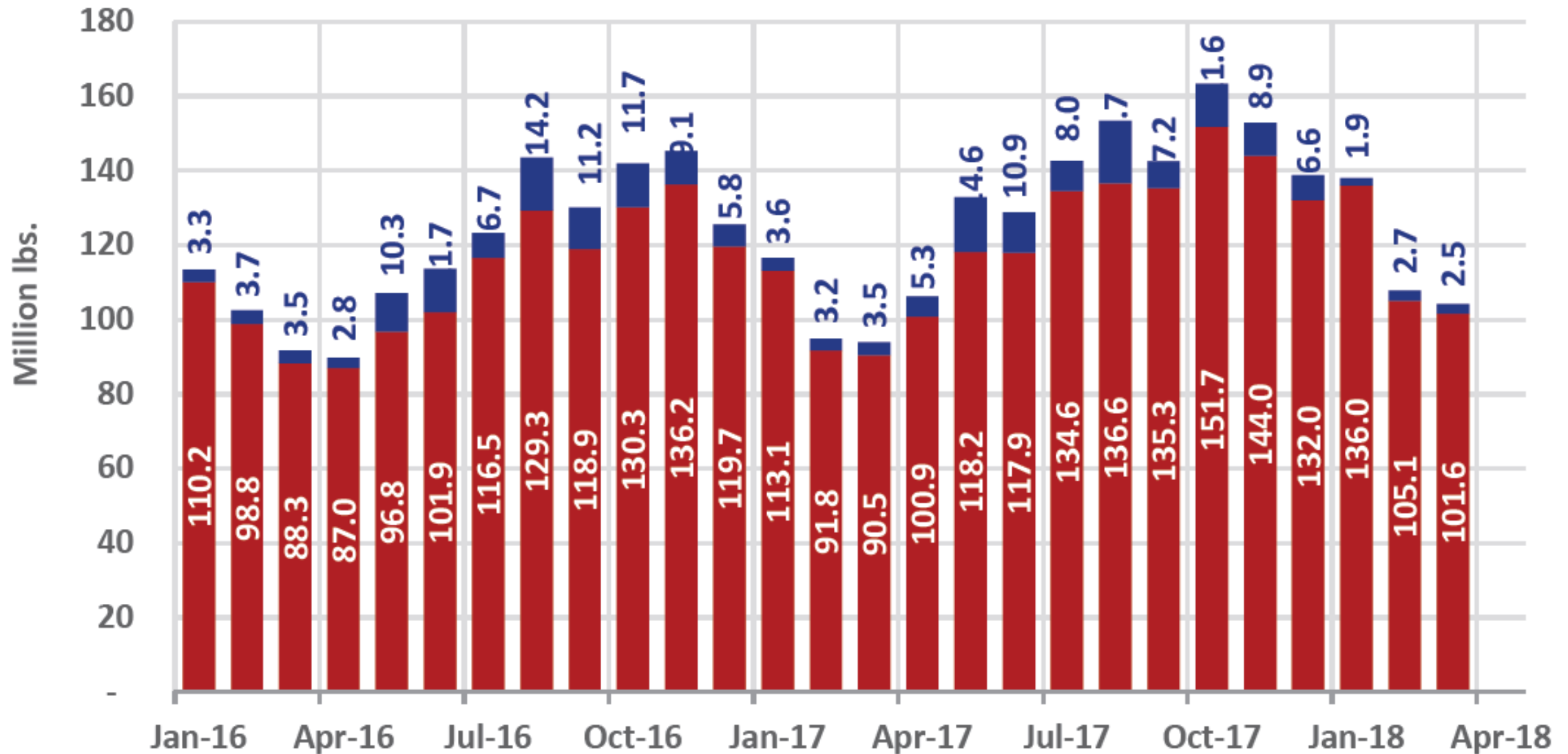
US PER CAPITA SEAFOOD CONSUMPTION & COMPOSITION

SPECIES / PRODUCT	CONSUMPTION (LBS) 1987	SPECIES / PRODUCT	CONSUMPTION (LBS) 2016	DIFF. (LBS)	CHANGE % 1987 TO 2016	% OF TOTAL 2016
Tuna	3.51	Shrimp	4.10	1.81	79.0%	27.5%
Shrimp	2.29	Salmon	2.18	1.74	395.5%	14.6%
Cod	1.68	Canned Tuna	2.10	-1.41	-40.2%	14.1%
Alaska Pollock	0.88	Tilapia	1.18	---	---	7.9%
Flatfish	0.73	Alaska Pollock	0.96	0.08	9.1%	6.4%
Clams	0.66	Pangasius	0.89	---	---	6.0%
Catfish	0.60	Cod	0.66	-1.02	-60.7%	4.4%
Salmon	0.44	Crabs	0.54	0.21	63.6%	3.6%
Crabs	0.33	Catfish	0.51	-0.09	-15.0%	3.4%
Scallops	0.33	Clams	0.34	-0.32	-48.5%	2.3%
Other	4.76	Other	1.44	-3.32	-808.0%	9.7%
Total For All Species	16.21	Total For All Species	14.90	-1.31	-8.1%	100.0%

- **Two top-10 species** in 1987 are not on 2016 list.
- In 1987, only one of top 10 species was aquacultured (3.7% of total).
- In 2016, 4 of 5 top species were mostly/exclusively aquacultured (56% of total consumption; ~60% adding catfish).
- In 1987, top 10 species consumed were 71 percent of total (11.45 of 16.21 lbs).
- In 2016, top 10 species consumed were 90% of total (13.46 of 14.90 lbs).
- **We eat as much shrimp as salmon and canned tuna combined!**

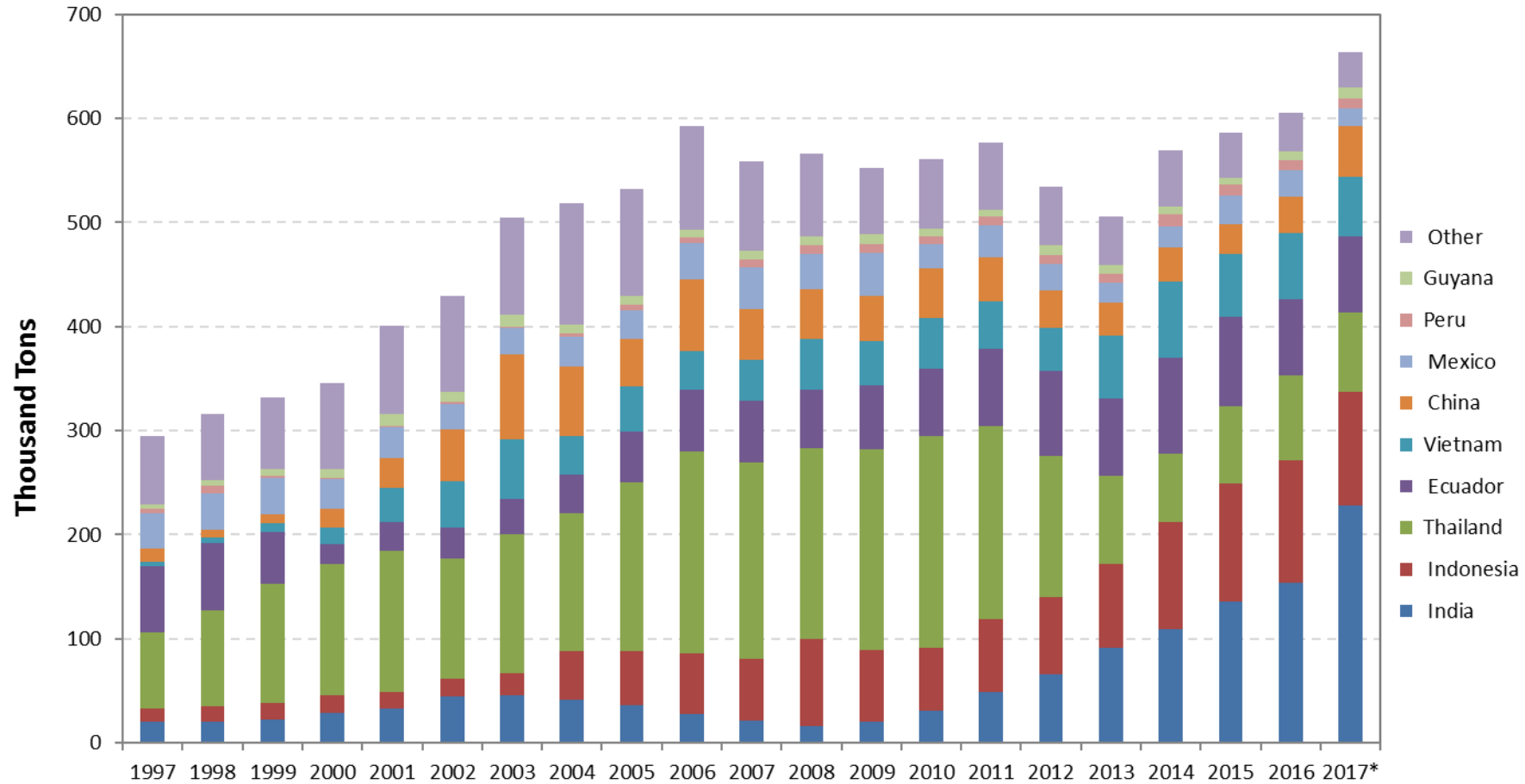
U.S. Shrimp Supply before exports

■ Domestic ■ Import



U.S. Shrimp Imports

Down 12% between 2011-13, Up 31% between 2013-17



Imports from Thailand declined sharply (by 68%) between 2010 and 2014, slightly recovering since then (from 65 to 75 thousand tons). India and Indonesia have become the top exporters to the U.S. market, accounting for 50% of imports in 2017. India's exports have increased at a CAGR of 35% between 2008 and 2017.

Source: USDC/NMFS (2017)

* Estimate

U.S. IMPORTS OF MAIN AQUATIC PRODUCTS IN 2017, AND BALANCE OF TRADE

YEAR	BALANCE
2011	-\$11,090,034,797
2012	-\$11,072,399,817
2013	-\$12,233,035,913
2014	-\$14,327,877,349
2015	-\$13,063,669,721
2016	-\$13,883,673,274
2017	-\$15,680,087,945

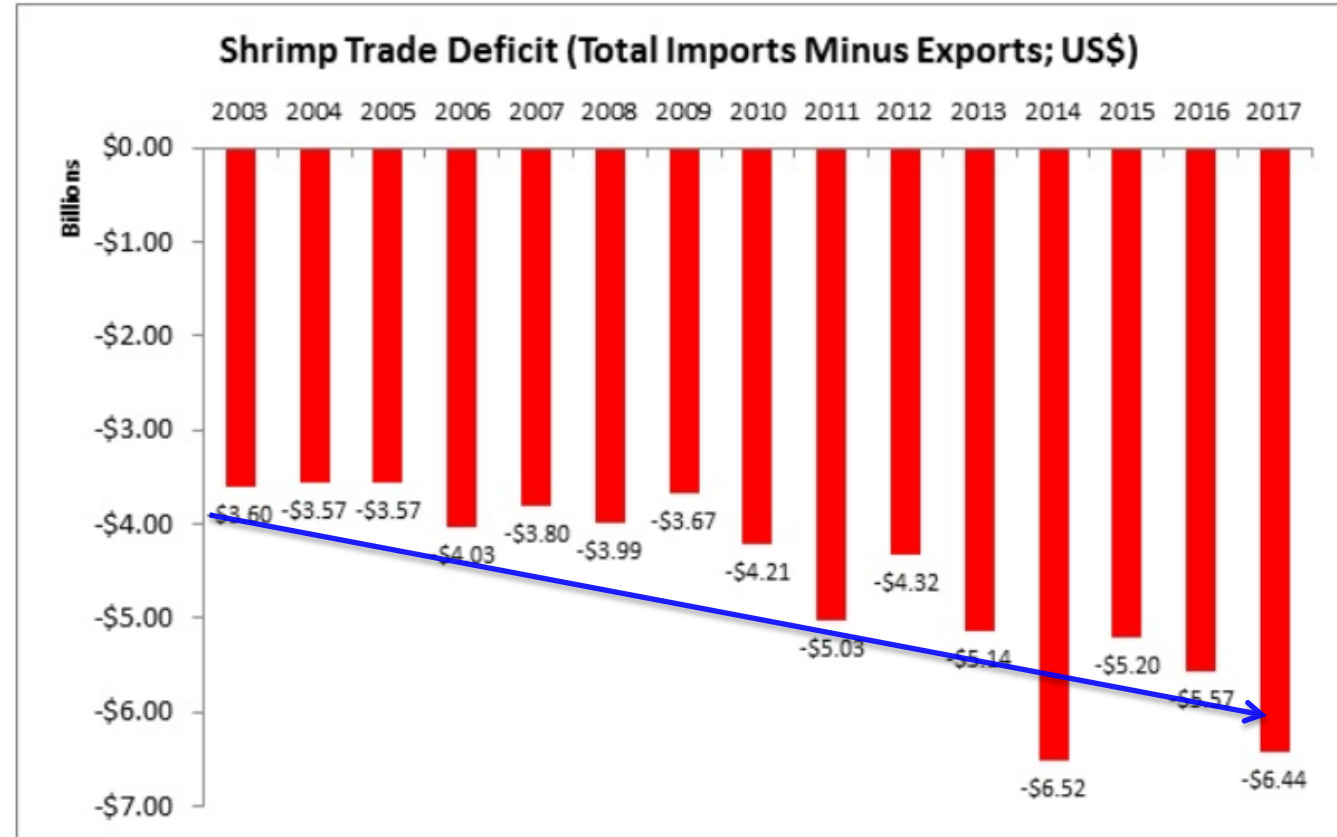
PRODUCT	IMPORTS	EXPORTS	RE-EXPORTS	BALANCE OF TRADE
SHRIMP WARM-WATER SHELL-ON FROZEN 51/60	\$131,829,220	\$891,215	\$379,390	(\$130,558,615)
SHRIMP WARM-WATER SHELL-ON FROZEN 26/30	\$324,704,203	\$1,308,109	\$360,093	(\$323,036,001)
SHRIMP WARM-WATER SHELL-ON FROZEN < 15	\$344,005,050	\$5,992,652	\$3,375,506	(\$334,636,892)
SHRIMP WARM-WATER SHELL-ON FROZEN 15/20	\$352,115,033	\$1,770,436	\$2,284,256	(\$348,060,341)
SHRIMP WARM-WATER SHELL-ON FROZEN 31/40	\$361,005,800	\$352,098	\$438,985	(\$360,214,717)
SHRIMP WARM-WATER SHELL-ON FROZEN > 70	\$37,394,447	\$34,695	\$238,680	(\$37,121,072)
SHRIMP COLD-WATER SHELL-ON FROZEN < 15	\$7,708,538	\$2,872,661	\$521,266	(\$4,314,611)
SHRIMP WARM-WATER SHELL-ON FROZEN 21/25	\$467,981,902	\$648,368	\$2,080,182	(\$465,253,352)
SHRIMP COLD-WATER SHELL-ON FROZEN 51/60	\$505,083	\$18,641	\$0	(\$486,442)
SHRIMP WARM-WATER SHELL-ON FRESH	\$4,937,030	\$0	\$0	(\$4,937,030)
SHRIMP WARM-WATER PEELED FRESH	\$5,253,370	\$0	\$0	(\$5,253,370)
SHRIMP WARM-WATER SHELL-ON FROZEN 61/70	\$56,098,487	\$174,654	\$0	(\$55,923,833)
SHRIMP COLD-WATER SHELL-ON FROZEN 15/20	\$2,164,411	\$752,678	\$742,307	(\$669,426)
SHRIMP WARM-WATER FRESH	\$0	\$12,933,140	\$14,088	\$12,947,228
TILAPIA (OREOCHROMIS SPP.) FILLET FROZEN	\$452,342,238	\$1,108,346	\$3,435,083	(\$447,798,809)
TILAPIA (OREOCHROMIS SPP.) FILLET FRESH	\$152,989,169	\$4,757,589	\$14,949,625	(\$133,281,955)
TILAPIA (OREOCHROMIS SPP.) FROZEN	\$47,242,911	\$1,209,654	\$962,795	(\$45,070,462)
CATFISH (PANGASIUUS) FILLET FROZEN	\$341,471,801	\$0	\$0	(\$341,471,801)
CATFISH (PANGASIUUS) FILLET FRESH	\$110,915	\$0	\$0	(\$110,915)
CATFISH (ICTALURUS) FILLET FROZEN	\$35,940,830	\$0	\$0	(\$35,940,830)
CATFISH (SILURUS,CLARIAS) FILLET FRESH	\$1,969,814	\$0	\$0	(\$1,969,814)
SALMON ATLANTIC FILLET FROZEN	\$620,984,523	\$0	\$0	(\$620,984,523)
SALMON ATLANTIC FRESH FARMED	\$948,531,153	\$35,134,920	\$920,042	(\$912,476,191)
SALMON ATLANTIC FILLET FRESH FARMED	\$1,538,009,797	\$0	\$0	(\$1,538,009,797)
COBIA, ALL FORMS, TOTAL			\$3,389	(\$10,237,678)
GROUPERS (all sp.), TOTAL			\$0	(\$52,522,108)
FLATFISHES (all sp.), TOTAL			\$4,332	(\$56,778,534)
SNAPPERS (all sp.), TOTAL			\$0	(\$124,708,347)
TUNA (all sp.), TOTAL			\$1,475	(\$1,513,424,037)
SHRIMP, ALL FORMS, TOTAL			\$9,334	(\$6,423,239,246)
TILAPIA, ALL FORMS, TOTAL			\$7,571	(\$652,723,805)
CATFISHES (incl. Pangasius), ALL FORMS, TOTAL			\$8,555	(\$381,419,700)
SALMON, ALL FORMS, TOTAL	\$3,144,068,676	\$42,528,391	\$8,980,784	(\$3,092,559,501)
ALL SEAFOOD, TOTALS	\$21,945,979,556	\$5,922,470,081	\$343,421,530	(\$15,680,087,945)

**SHRIMP IMPORTS ARE
41% OF U.S. SEAFOOD
TRADE DEFICIT**

<https://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/applications/annual-trade-balance-for-product>

U.S. SHRIMP TRADE 2017

Product Name	Imports	Exports	Re-exports	Balance of Trade
SHRIMP COLD-WATER SHELL-ON FROZEN 41/50	\$1,661,721	\$658,216	\$0	-\$1,003,505
SHRIMP FROZEN OTHER PREPARATIONS	\$1,013,183,659	\$517,462	\$179,960	-\$1,012,486,237
SHRIMP WARM-WATER SHELL-ON FROZEN 51/60	\$131,829,220	\$891,215	\$379,390	-\$130,558,615
SHRIMP COLD-WATER SHELL-ON FRESH	\$1,322,161	\$0	\$0	-\$1,322,161
SHRIMP COLD-WATER SHELL-ON FROZEN 61/70	\$54,335	\$41,019	\$0	-\$13,316
SHRIMP PRODUCTS PREPARED DINNERS NOT IN ATC	\$5,525,936	\$5,421,290	\$87,744	-\$16,902
SHRIMP COLD-WATER SHELL-ON FROZEN 21/25	\$2,348,570	\$435,842	\$110,448	-\$1,802,280
SHRIMP COLD-WATER PEELED FRESH	\$1,842,170	\$0	\$0	-\$1,842,170
SHRIMP WARM-WATER SHELL-ON FROZEN 41/50	\$191,707,857	\$198,274	\$51,191	-\$191,458,392
SHRIMP COLD-WATER SHELL-ON FROZEN 26/30	\$2,931,935	\$585,247	\$201,982	-\$2,144,706
SHRIMP COLD-WATER SHELL-ON FROZEN 31/40	\$2,644,764	\$67,594	\$19,448	-\$2,557,722
SHRIMP CANNED	\$27,197,429	\$710,850	\$69,597	-\$26,416,982
SHRIMP WARM-WATER PEELED FROZEN	\$2,770,532,418	\$12,577,073	\$8,384,824	-\$2,749,570,521
SHRIMP PEELED DRIED/SALTED/BRINE	\$2,967,340	\$0	\$0	-\$2,967,340
SHRIMP WARM-WATER SHELL-ON FROZEN 26/30	\$324,704,203	\$1,308,109	\$360,093	-\$323,036,001
SHRIMP WARM-WATER SHELL-ON FROZEN < 15	\$344,005,050	\$5,992,652	\$3,375,506	-\$334,636,892
SHRIMP BREADED FROZEN	\$339,520,471	\$0	\$0	-\$339,520,471
SHRIMP WARM-WATER SHELL-ON FROZEN 15/20	\$352,115,033	\$1,770,436	\$2,284,256	-\$348,060,341
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SHRIMP COLD-WATER SHELL-ON FROZEN 15/20	\$2,164,411	\$752,678	\$742,307	-\$669,426
SHRIMP FROZEN IN ATC	\$69,689,054	\$0	\$0	-\$69,689,054
SHRIMP PRODUCTS PREPARED DINNERS IN ATC	\$1,346,147	\$250,330	\$284,441	-\$811,376
SHRIMP SHELL-ON DRIED/SALTED/BRINE	\$972,012	\$0	\$0	-\$972,012
SHRIMP DRIED/SALTED/BRINE	\$0	\$1,024,162	\$110,795	\$1,134,957
SHRIMP WARM-WATER FRESH	\$0	\$12,933,140	\$14,088	\$12,947,228
SHRIMP COLD-WATER SHELL-ON FROZEN > 70	\$718,903	\$876,819	\$0	\$157,916
SHRIMP COLD-WATER FRESH	\$0	\$24,393,696	\$88,950	\$24,482,646
SHRIMP COLD-WATER PEELED FROZEN	\$6,653,401	\$8,458,071	\$985,279	\$2,789,949
SHRIMP OTHER PREPARATIONS	\$5,705,299	\$5,298,912	\$1,137,402	\$731,015
SHRIMP FROZEN	\$0	\$6,825,372	\$2,752,520	\$9,577,892
Totals	\$6,544,228,156	\$96,089,576	\$24,899,334	-\$6,423,239,246



The Opportunity

THE U.S. OPPORTUNITY

- Global production of farmed shrimp seriously impacted in the last 30 years by several **major diseases**, with likely cumulative losses of over USD 25 billion.
- Current, predominant, global "open pond" shrimp production model is **vulnerable** to pathogens and relatively **inefficient** due to lack of controls and seasonality.
- This causes **unpredictability and uncertainty** in shrimp production, costs and market prices – what investors do not like.
- But it **creates the opportunity** for indoor shrimp production, with better risk management ability and more dependable/stable/predictable production.
- **The opportunity to grow shrimp:**
 - Year-round in locations close to major consumption centers.
 - Under relatively controlled conditions and maximum biosecurity.
 - Several niche and commodity markets, including fresh and live.
 - And the most advanced technological base and the best aquafeed technology.



THE U.S. MARKET

- Established market that consumes > 1300 million lbs. per year at only ~ 4.1 lbs per person.
- U.S. market for shrimp can be expanded: best known, most popular seafood item.
- No need (or cost) for storage at country of origin, maritime transport, crossing of international lines, additional storage and documentation, tariffs, etc.
- Possibility of fresh, live, organic and other niches.
- Possibility for export to other high-paying markets (e.g. China, S.E. Asia, E.U.).
- Local markets: Florida has over 20 million people who are permanent residents, and a floating (visiting) population of > 110 million per year. Most /all consume shrimp.
- Different expansion paths, including growout production centers adjacent to major population centers in the US and Canada.
- Products without various illegal antibiotics and processing commonly added to increase shrimp weight.
- “Product of the U.S.”

Worldwide, the indoor aquaculture industry continues to grow...

Why not shrimp?

U.S. Indoor Shrimp Farming: Challenges and Perspectives

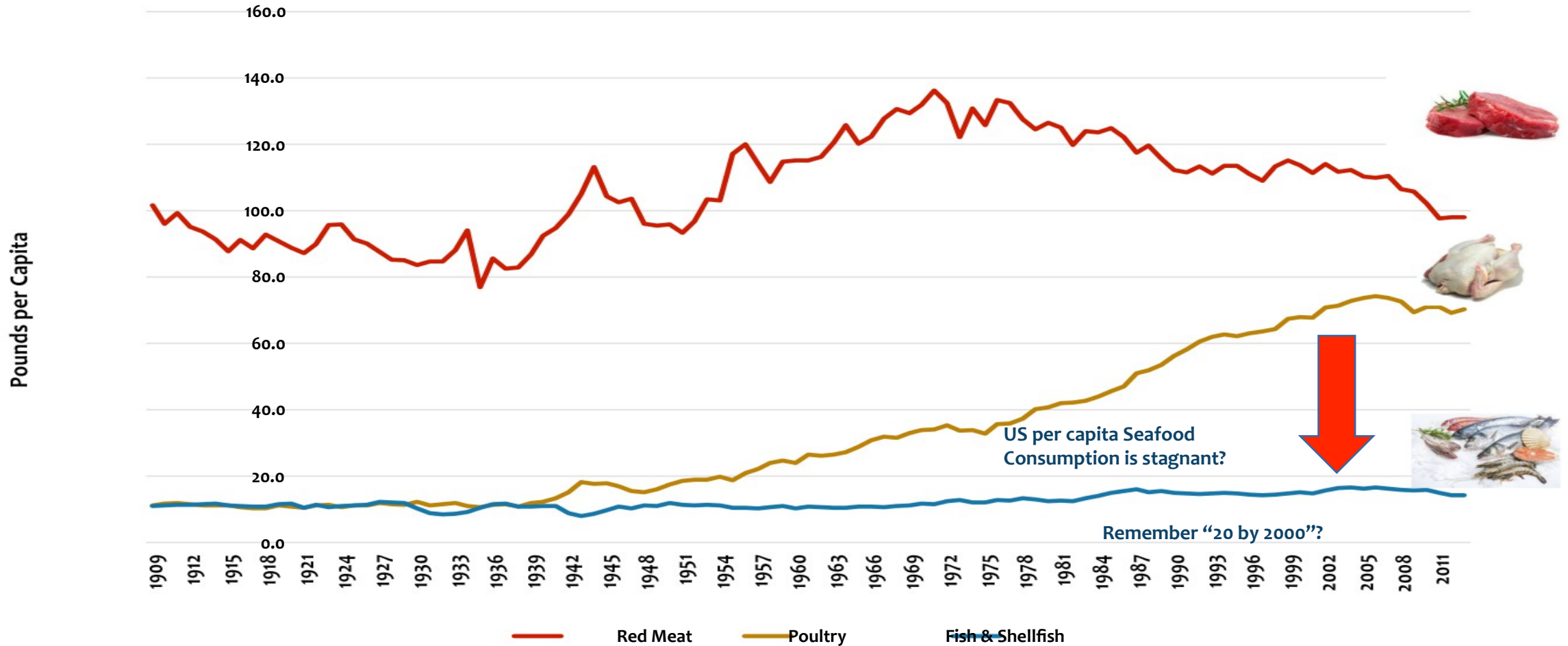
CHALLENGES

- Proper due diligence, planning and system design / construction.
- Sufficient financing / proper project scale.
- Consistent and reliable supply of quality seedstock.
- Proper operation management / training / technical support:
 - Acclimation
 - Monitoring (water quality, environment, animal health).
 - Biosecurity
 - Feeding
 - Etc.
- Markets – which?
 - Small producers (< 1000 lbs./month) – Niche Markets
 - Medium producers (1000-20,000 lbs./month) – Niche / Commodity Markets
 - Large producers (>20,000 lbs. month) – Commodity Markets
 - Compete With Global Commodity Industry
- Proper marketing plan – know how/who to sell first.

PERSPECTIVES

- Learn from past industry mistakes, in U.S. and elsewhere (post-mortem needed).
- Have realistic expectations.
- There will be a (significant) learning curve for most.
- Expertise is available – use it.
- Knowledge is available – learn.
- Seedstock:
 - More hatcheries.
 - Fast-growing, resistant lines are available elsewhere – get them.
- Feeds: continuously-improving – manage properly and use manufacturers' expertise.
- Established market but how to grow demand?
 - Know your market – have a good marketing plan – get help.
 - Branding.
 - U.S. consumers acceptance of whole shrimp.
 - Fast-food markets.
 - We have a good story – tell it right!
- Embrace technology, innovation and communication:
 - Automation / robotics.
 - Cloud-based management tools.
 - Continuous learning and industry awareness – be informed.

Per Capita Red Meat, Poultry, and Fish and Shellfish Consumption



Facts about shrimp and cholesterol

Despite an unfair reputation, most people can eat shrimp as part of a well-balanced diet



A landmark study conducted by the Harvard School of Public Health and Rockefeller University in New York two decades ago showed that a low-fat diet that included steamed shrimp did not raise blood cholesterol levels, and that it "may even lower blood cholesterol." Photo by Darryl Jory.

PERSPECTIVES

- A serving of a dozen large shrimp contains 130 mg of cholesterol.
- This should not be a health concern, because shrimp is a low-fat food with a rich content of highly unsaturated fatty acids, which lead to the formation of high density lipids, commonly known as "good cholesterol."
- Consuming shrimp may actually lower blood cholesterol levels.
- Scientists have concluded that a healthy diet can include shrimp, boiled or broiled (as with most foods, it is better to avoid deep-frying, and to limit the amount of oil, butter, tartar sauce, etc.).
- Per Dr. Rosemary Stanton, the Japanese are the world's greatest consumers of shrimp, and they also have the highest life expectancy, so there may be a connection.
- "At the very least, it is fair enough to say that the cholesterol in shrimp and other seafood is unlikely to damage the arteries provided the seafood is not battered or crumbed and cooked in saturated fat."

BENEFITS OF EATING SHRIMP

- Information developed by nutritionist Dr. Rosemary Stanton Ph.D., APD -- a most well-known "celebrity" nutritionist in Australia -- for the Australian Prawn Farmers Association (www.apfa.com.au), report that shrimp are an excellent source of protein, low in saturated fats, a great way to get iron, zinc and Vitamin E, as well as a good source of omega-3 fatty acids.
- These valuable fats lower triglyceride levels and have many other benefits for heart health.
- Shrimp have less fat and therefore contain a lower level of omega-3 than some other seafood (like Atlantic salmon), but the omega-3 content in prawns (average of 120 mg/100g) is well above the minimum 60mg/100g required for an official label of "good source of omega 3 fatty acids".

CONCLUSIONS

- We have increased global production > 4x in just over two decades.
- Global population growth - need for more aquaculture production.
- Diseases are part of the industry.
- Many new support technologies to help become more efficient.
- Industry can grow in many regions (including U.S.), but it needs investment and due diligence.
- Global markets and consumption can grow:
 - Development of internal markets.
 - New export markets (Asia, Africa and the Middle East).
 - New packaging and transport technologies.
 - New value-added products (convenience).
 - Better promotion (tell our story better).
 - Understand (try to...) and earn the trust of the new generations.
- The U.S. can develop a significant, indoor shrimp farming industry – the pie is big enough.
- The way forward: innovative and continuous change!



US Shrimp Aquaculture in a Global Perspective

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