Potential to Increase Global Tilapia Production

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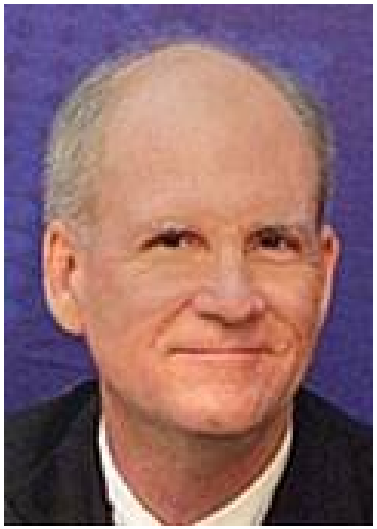

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Dr. Kevin Fitzsimmons is a professor and extension specialist of environmental science at the University of Arizona, where his research and extension work is focused on tilapia aquaculture.

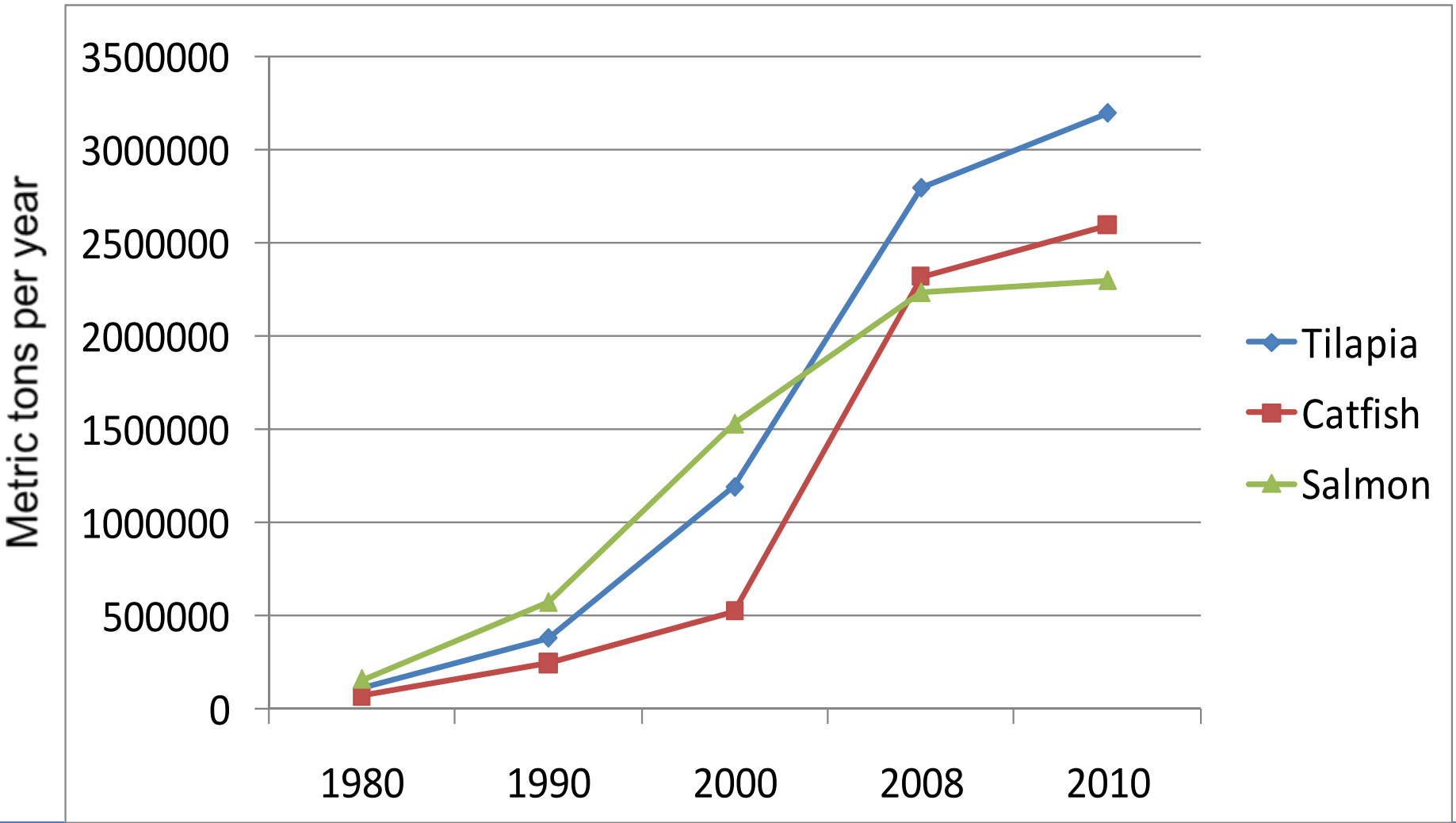
He is a past president of the U.S. Aquaculture Society and World Aquaculture Society.

Fitzsimmons holds an adjunct professorship at the Asian Institute of Technology in Thailand, and serves as a consultant to the China Department of Agriculture and other entities on tilapia production and processing.

Tilapia: the most important aquaculture fish of the 21st century

- Tilapias are second only to the carps as a farmed food fish.
- But tilapia have unique characteristics that will facilitate its continued growth to someday surpass carp production.
- Where and how will tilapia production increase?

Major farmed fishes

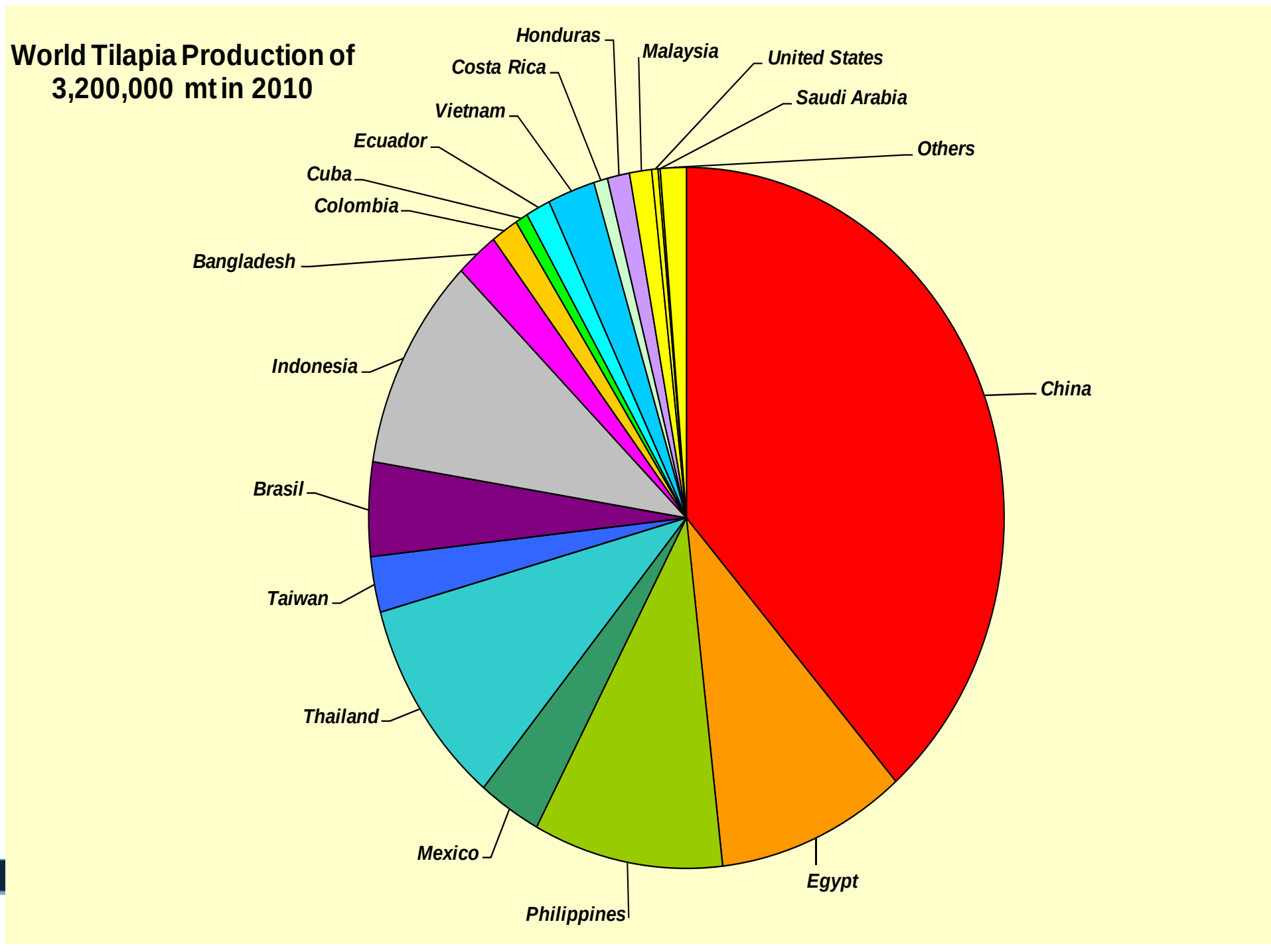


Comparison of major farmed fishes

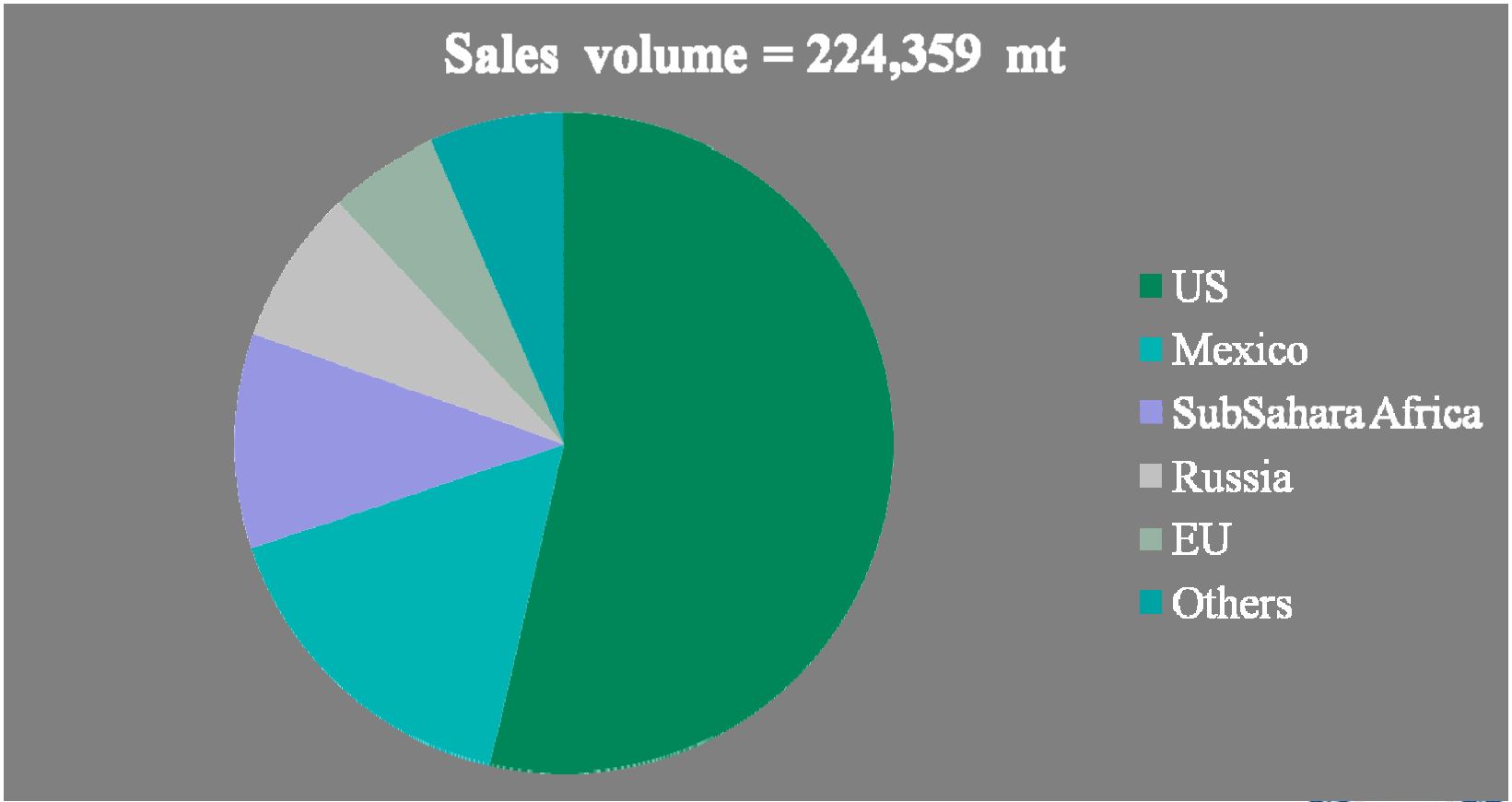
Species	Geography	Consumers	Fish meal	Systems	Freshwater or Marine
Salmon	Regional	Global	Moderate	Cages	Requires both
Carps	Global	Regional	Minimal	Ponds & cages	Freshwater only
Catfish	Global	Global	Minimal	Ponds & cages	Freshwater only
Sea bass, cobia, snappers	Global	Global	High	Cages, recirc systems	Marine only
Tunas	Regional	Global	High	Cages	Marine only
Tilapia	**Global**	**Global**	**Minimal**	**Ponds, cages, raceways, recirc systems**	**Either**

Subsistence and Export Commodity

- Tilapia is unique in its role as a livestock animal grown by subsistence farmers in developing countries around the world…..
- And it is widely grown and exported to high value markets to be served in expensive restaurants and grocery stores
- Commodity or specialty crop - BOTH, like chicken


World Tilapia Production of
3,200,000 mt in 2010
Honduras
Malaysia
United States
Costa Rica
Saudi Arabia
Vietnam
Others
Ecuador
Cuba
Colombia
Bangladesh
Indonesia
China
Brasil
Taiwan
Thailand
Mexico
Egypt
Philippines

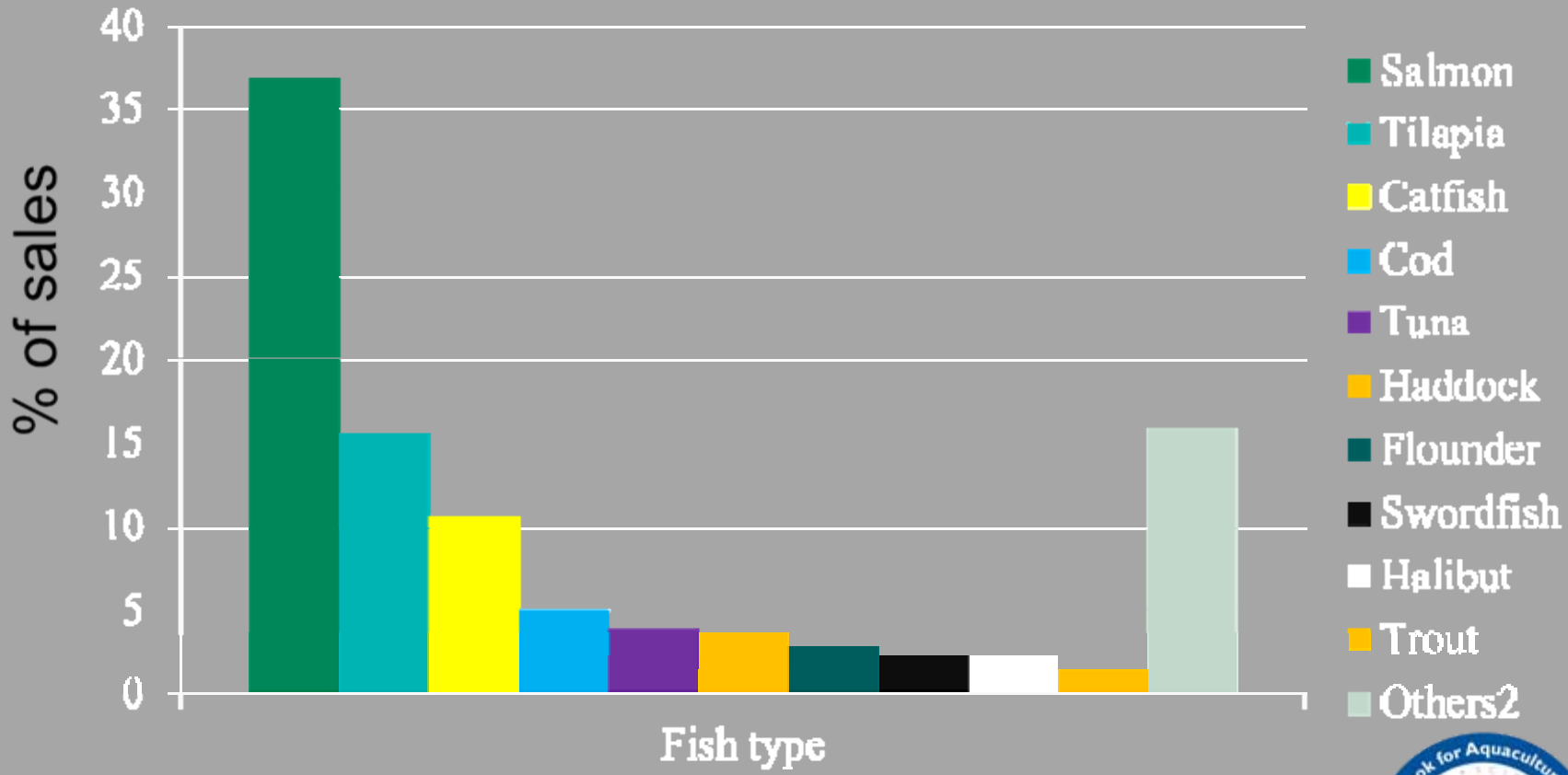
2008 Tilapia exports from China



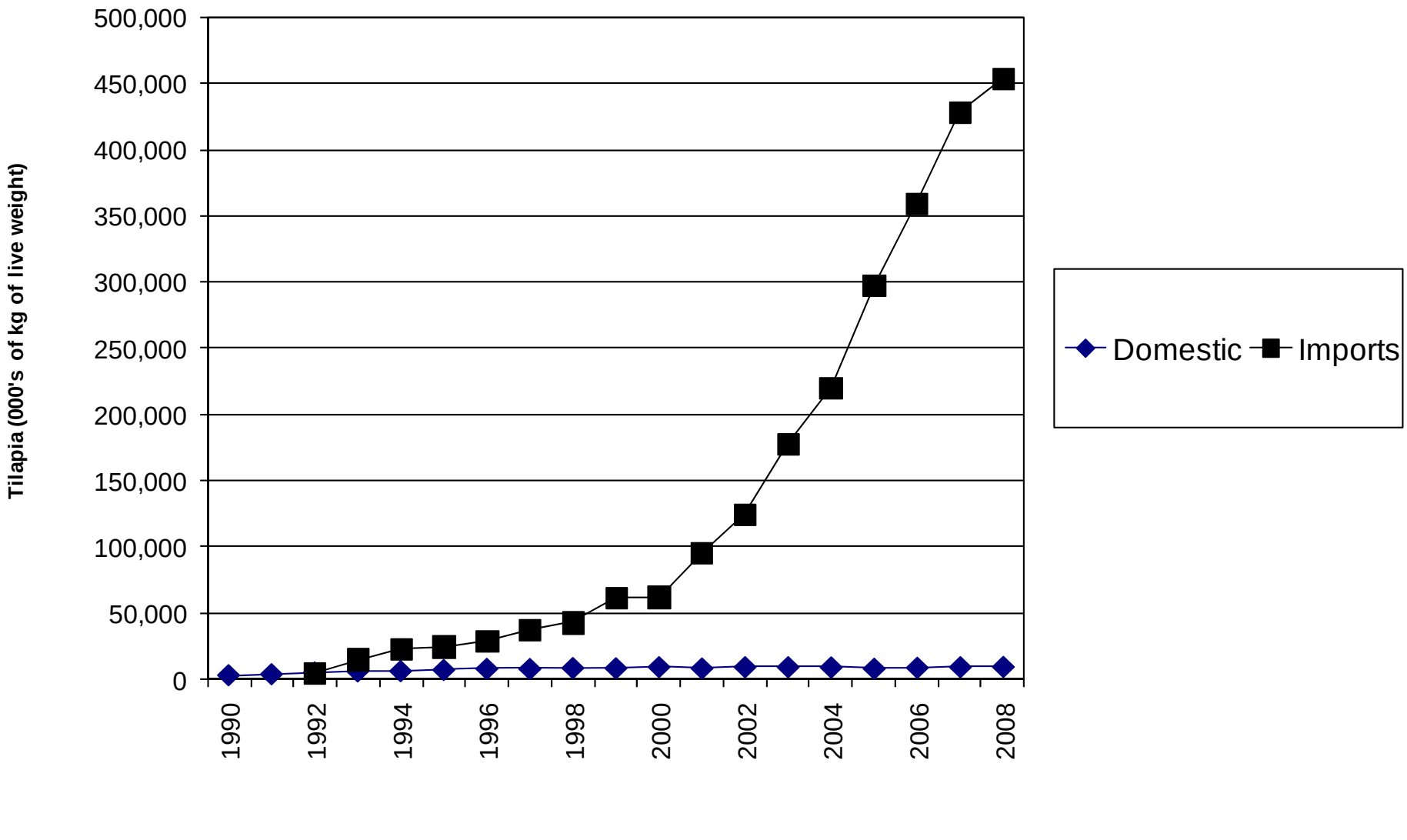
Top Ten Seafoods (U.S.)
per capita (lbs)

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Tuna 3.5	Shrimp 3.4	Shrimp 3.7	Shrimp 4.0	Shrimp 4.2	Shrimp 4.1	Shrimp 4.4	Shrimp 4.1	Shrimp 4.1	**Shrimp 4.1**
Shrimp 3.2	Tuna 2.9	Tuna 3.1	Tuna 3.4	Tuna 3.4	Tuna 3.1	Tuna 2.9	Tuna 2.7	Tuna 2.8	**Tuna 2.5**
Pollock 16	Salmon 2.0	Salmon 2.0	Salmon 2.2	Salmon 2.2	Salmon 2.4	Salmon 2.0	Salmon 2.4	Salmon 1.8	**Salmon 2.0**
Salmon 15	Pollock 12	Pollock 11	Pollock 17	Pollock 17	Pollock 15	Pollock 16	Pollock 17	Pollock 1.34	**Pollock 1.45**
Catfish 11	Catfish 11	Catfish 11	Catfish 11	Catfish 11	Catfish 10	Tilapia 1.0	Tilapia 1.14	**Tilapia 1.19**	**Tilapia 1.21**
Cod 0.8	Cod 0.6	Cod 0.7	Cod 0.6	Tilapia 0.7	Tilapia 0.8	Catfish 0.97	Catfish 0.90	Catfish 0.92	**Catfish 0.85**
Clams 0.5	Clams 0.5	Crabs 0.6	Crabs 0.6	Cod 0.6	Crabs 0.6	Crabs 0.7	Crabs 0.68	Crabs 0.61	**Crabs 0.59**
Crabs 0.4	Crabs 0.4	Clams 0.5	Tilapia 0.5	Crabs 0.6	Cod 0.6	Cod 0.5	Cod 0.47	Cod 0.44	**Cod 0.42**
Flatfish 0.4	Flatfish 0.4	Tilapia 0.4	Clams 0.5	Clams 0.5	Clams 0.4	Clams 0.4	Clams 0.45	Flatfish 0.43	**Clams 0.41**
Scallops 0.3	Tilapia 0.4	Flatfish 0.3	Scallops 0.3	Scallops 0.3	Scallops 0.3	Scallops 0.3	Flatfish 0.32	Clams 0.42	**Pangasius 0.35**
Tilapia 0.3									

Percentage of US finfish grocery sales

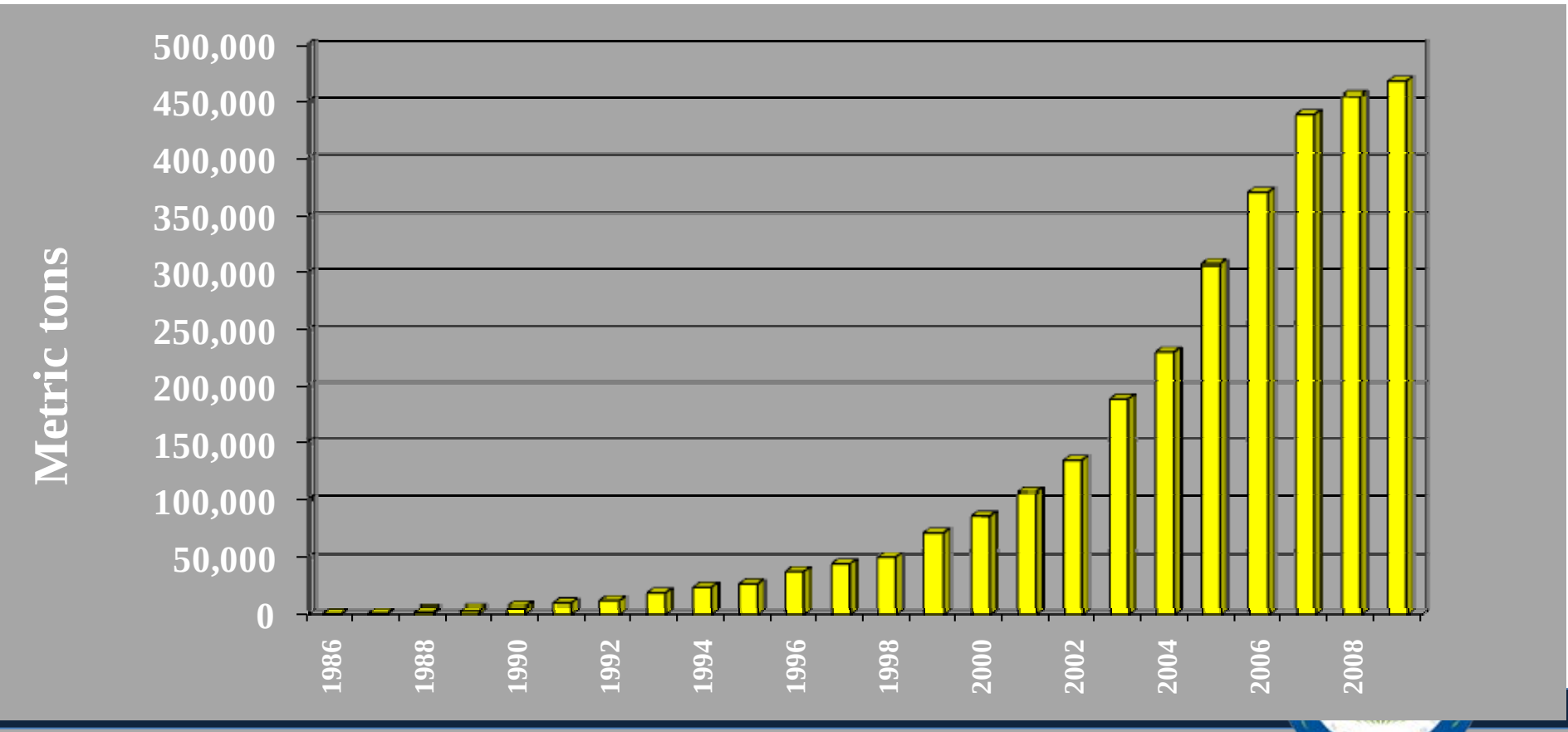


US Consumption of tilapia from domestic and imported sources

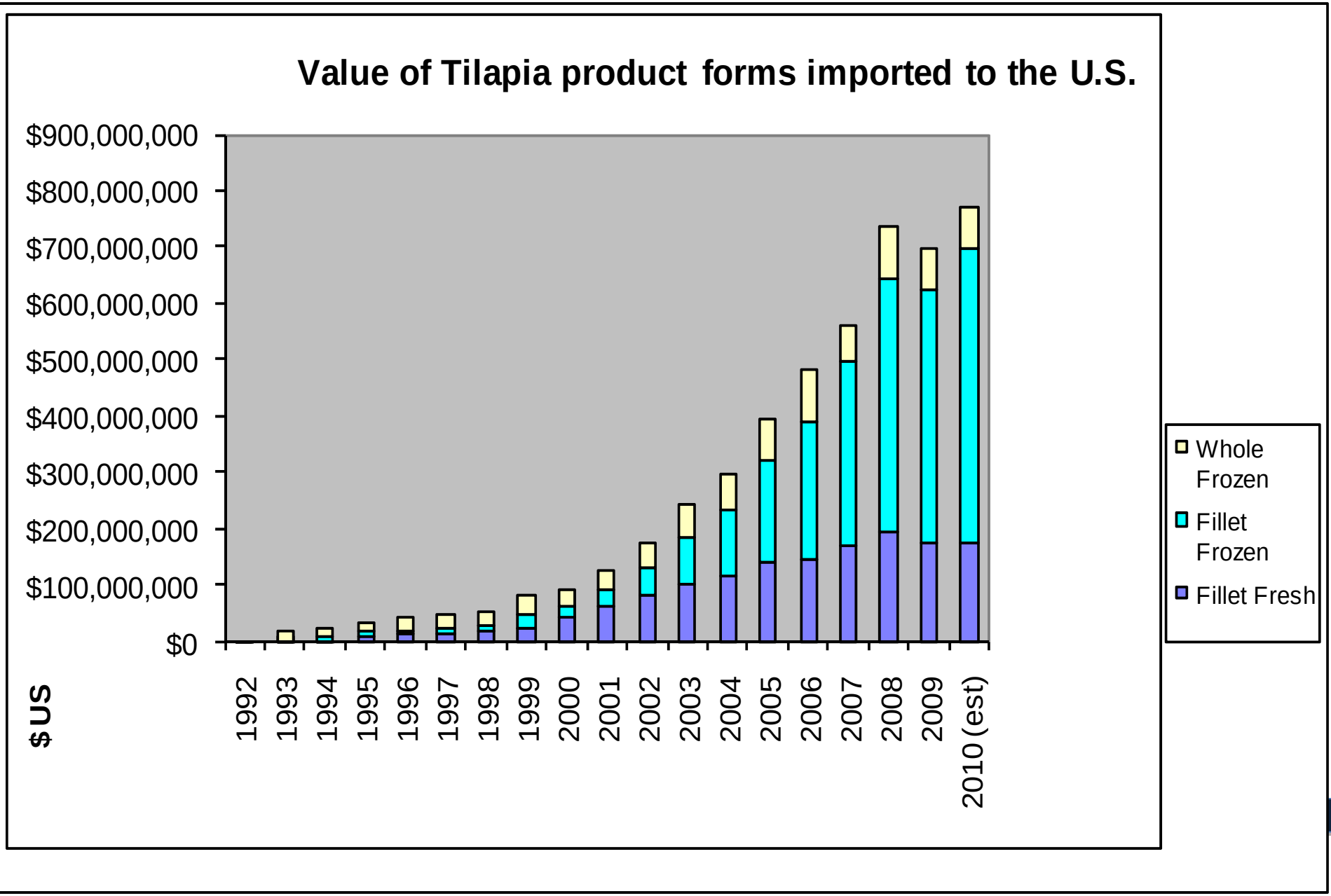


US Tilapia consumption (imports and domestic)

306,410 mt of live weight (equivalent) – 2005
368,295 mt of live weight (equivalent) – 2006
437,000 mt of live weight (equivalent) - 2007
453,264 mt of live weight (equivalent) – 2008
465,953,089 mt of live weight (equivalent – 2009)



$482,742,515 (2006), $559,788,809 (2007), $734,450,306 (2008) $696,085,981 (2009) **$ 760,000,000 (2010)**



US Sales of tilapia

- Imports in 2010 will be **$760,000,000**
- US production of 20,000,000 lbs at farm
- 2010 US tilapia farm-gate sales will be over

  $60,000,000

- 2010 US Tilapia Sales estimate –

$760,000,000 + $60,000,000 =

$820,000,000

Tilapia

- Model for how aquaculture industry should develop
- Global demand, variety of production systems and geographic regions, some vertically integrated
- Environmentally sustainable – “Green Aquaculture” (no fish meal required in the diet, no antibiotics, many farms use effluents for crops)
- Vaccines available for Strep infections.

Where will additional stocks of tilapia come from to maintain increased supplies?

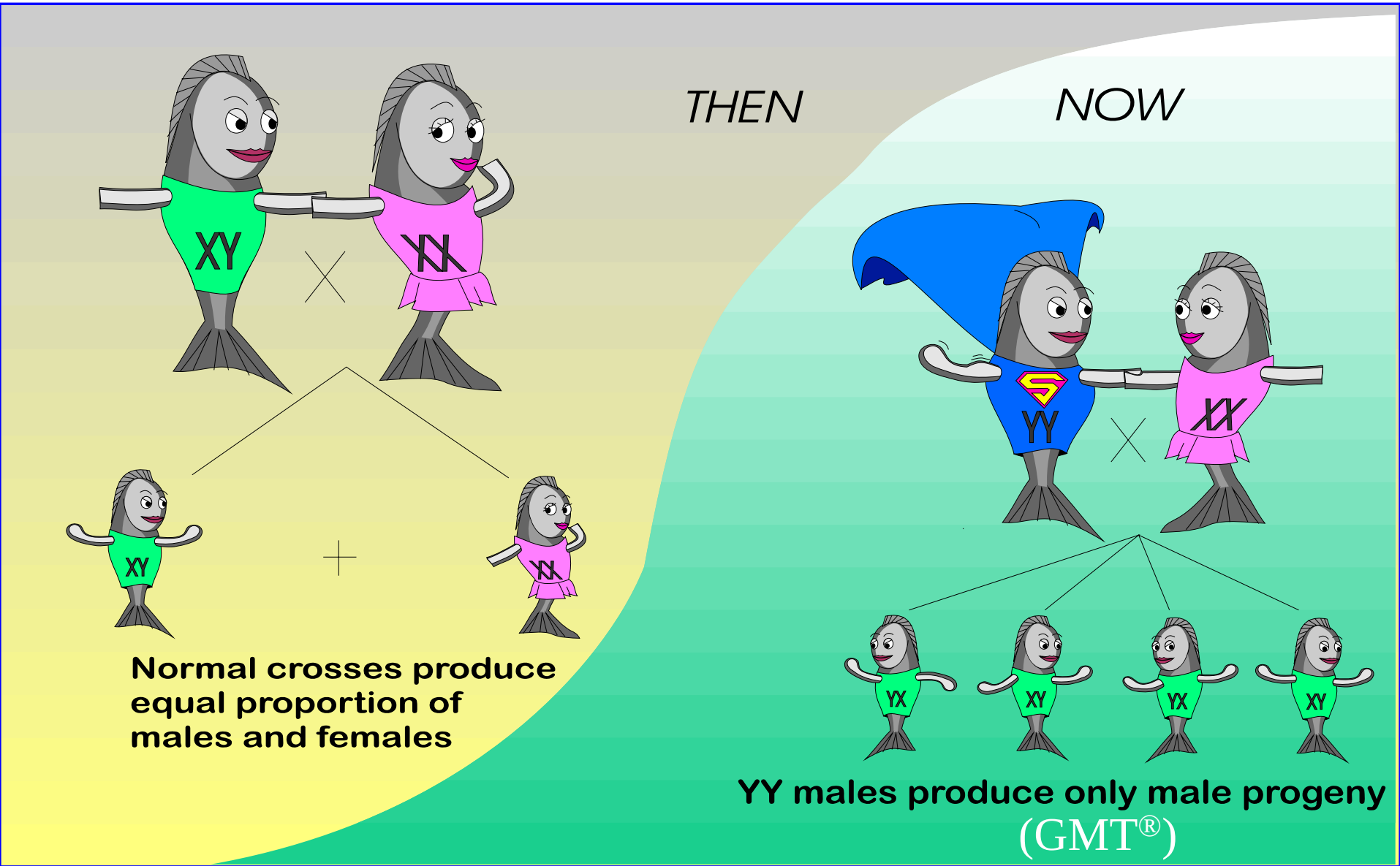
- Faster growing fish with better fillet yield from selective breeding programs.
- More fish from existing farms – more intensive
- Integrated farming with effluents going to field crops
- Polyculture with shrimp and other fish
- Additional new farms in major producing countries

Selective breeding and genetic improvements

- Excellent breeding programs
  - G.I.F.T. - Malaysia
  - Genomar - Brazil and Norway
  - Chitralada – Thailand
  - TabTim – Thailand (CP Group)
  - GIFT Excell - Philippines

- YY Supermale - Philippines and Swansea, Egypt and Indonesia

The YY male technology



Continued growth globally

Taal Lake, Philippines, 2007

Taal Lake, Philippines, 2009

More cages, better breeds, better feeds and checking water quality

Regions of rapid production growth

- Vietnam – conversion of catfish cages to tilapia in Mekong, and culture in all regions
- Indonesia – cage culture, polycultures, rice culture
- Malaysia – government support and private sector investment
- Brazil – lots of available water, labor, land, feed
- Thailand – better reporting, shrimp polyculture
- Egypt – continued intensification
- Sub-Saharan Africa - commercialization

Integrated Farming Systems

Tilapia farm effluents to irrigate and fertilize field crops: Grapes, wheat, olives, barley, sorghum, cotton, melons, peppers

Safford, AZ

Marana, AZ

Desert Springs
Tilapia,
Hyder AZ
Olives, wheat, alfalfa

Tilapia and citrus in Hainan, China

Polyculture

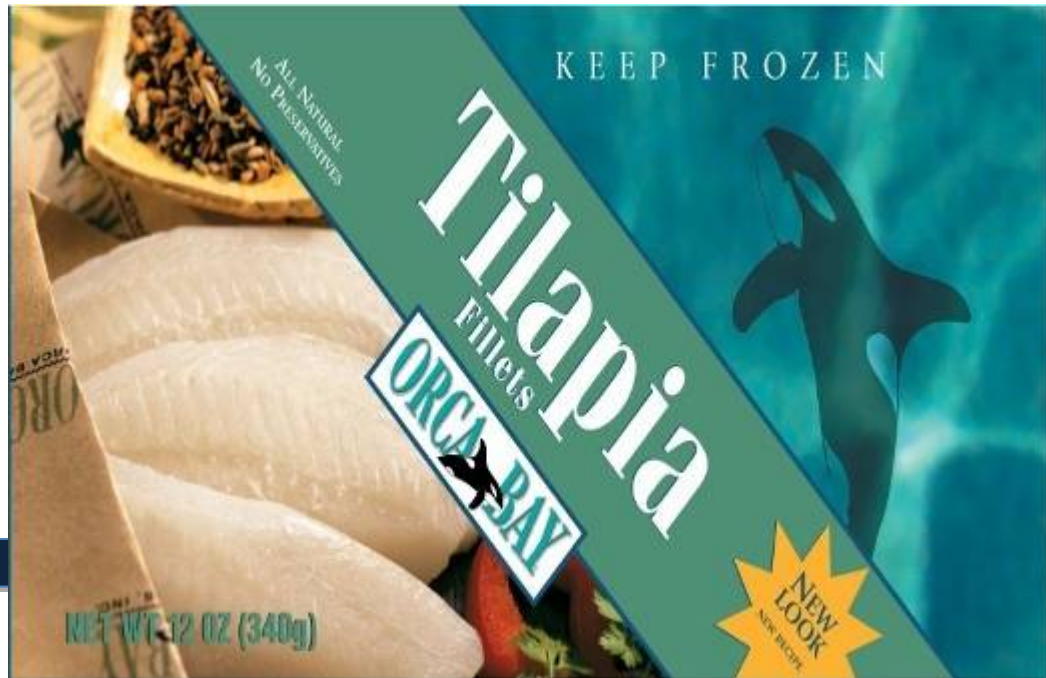
Gracilaria

Shrimp

Tilapia

Improvements in packaging

IQF Fillets
in re-sealable
packages




Ocean
Tilapia
Fillets
Tropische zoetwatervis
Poisson d'eau douce tropical
Tropical freshwater fish
Tropischer Süßwasserfisch
Tropisk ferskvannsfisk
Tropisk sötvattensfisk


ANOVA
Gourmet
Tilapia
2


Tilapia
Tilapia
7.9


Tilapiafilet
gram (min. 4 stuks)


TiLoveYa
Boneless & Frozen
Fresh Tilapia Fillets
Lemon-Dill
Serving Suggestion Enlarged to show texture


TiLoveYa
FARM RAISED
All Tilapia are not created equal.
Natural TiLoveYa for lovers of healthy food


TiLoveYa
Boneless &
Fresh Frozen Fillets
SKIN ON
GREAT FOR BARBECUE
KEEP FROZEN
Tilapia
Available Packages
HQ Sustainable Maritime Industries, Inc.


TiLoveYa
GUTTED & SCALED
Frozen Tilapia
All Tilapia are not created equal,
Zero Toxin TiLoveYa,
for lovers of healthy food
HQ Sustainable Maritime Industries, Inc.


TiLoveYa
Boneless &
Fresh Frozen Fillets
Tilapia
All Tilapia are not created equal,
Zero Toxin TiLoveYa,
for lovers of healthy food
Available Packages
HQ Sustainable Maritime Industries, Inc.


Ready to cook gourmet seafood
Sea Cuisine™
Natural Cut Crusted Fillets
TORTILLA CRUSTED TILAPIA
with Chipotle & Lime
NET WT. 2 LB (907g)
KEEP FROZEN
SERVING SUGGESTION


TRUSTED SINCE 1849
GORTON'S
NEW!
Premium Fillets
Tilapia
CRUNCHY BREADED FISH FILLETS
GORTON'S FIVE STAR TILAPIA
KEEP FROZEN
NET WT 17.2 OZ. (488 g)


Oven Poppers
From Our Kitchens To Your Home
Tilapia
Stuffed with Sun Dried Tomato, Shrimp & Lobster
Carbs 8g Protein 19g
2
5 oz. servings of hand-selected stuffed fish fillets
Premium Choice
NET WT. 10 OZ. (284g) • KEEP FROZEN • LESS THAN 200 CALORIES PER SERVING


High Liner
SEAFOOD SELECTS
PRIMAVERA TILAPIA
Tilapia and spring vegetables in a garlic butter sauce
ALL NATURAL INGREDIENTS
NET WT 32 oz (2 lbs) 907 g

New product forms

Smoked tilapia

Sashimi grade tilapia

Global Outlook for Aquaculture Leadership
KUALA LUMPUR 2010

Tilapia and food service

- On almost all cruise ships
- Starting to appear on airlines
- Increasingly with schools, hospitals and prisons
- Several prisons have their own tilapia farms

Courtesy: Eric Roderick

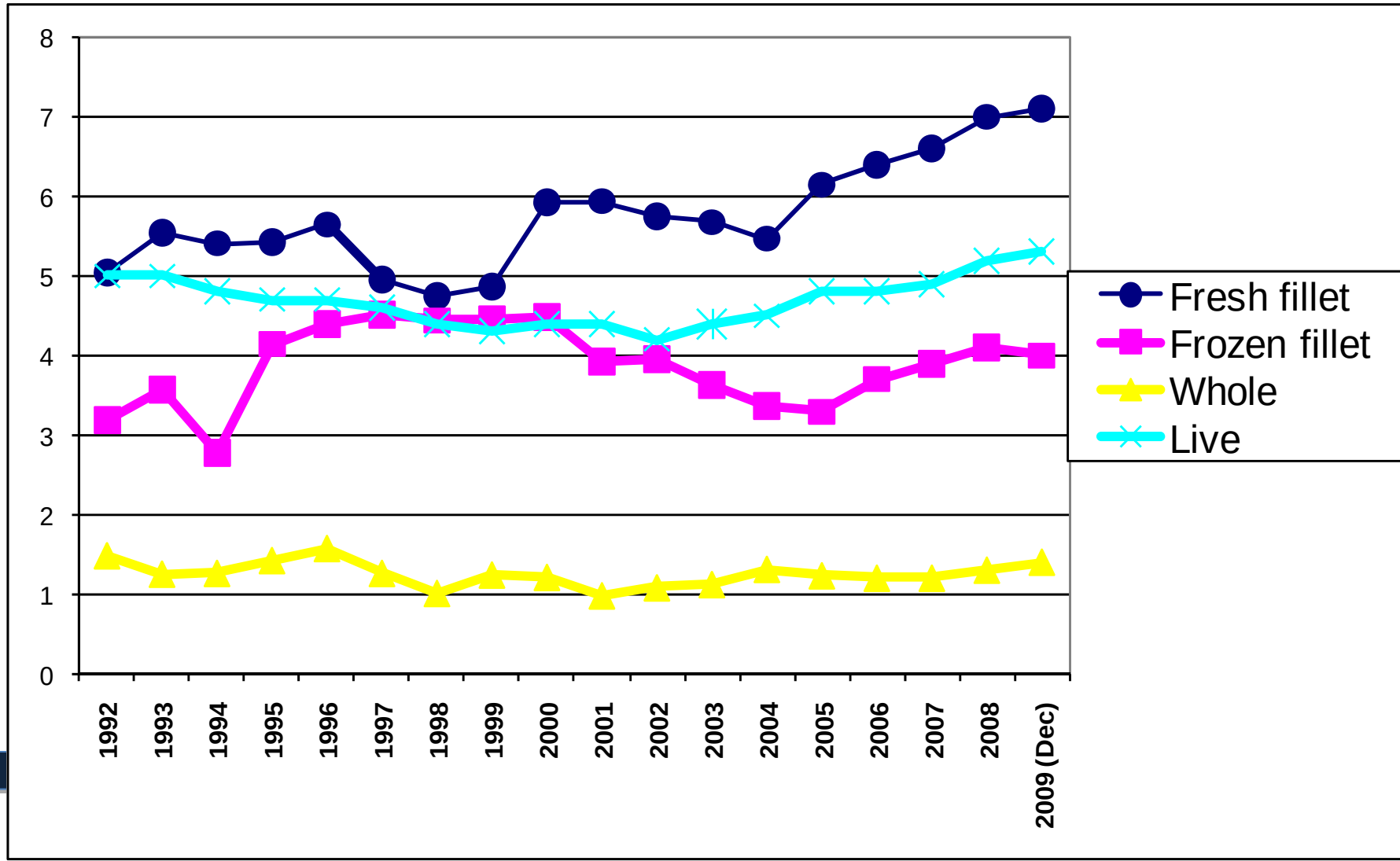
Tilapia in Long John Silver's

McDonald's and other fastfoods could double tilapia global demand

Byproducts - Tilapia Leather

Global Tilapia Market Trends

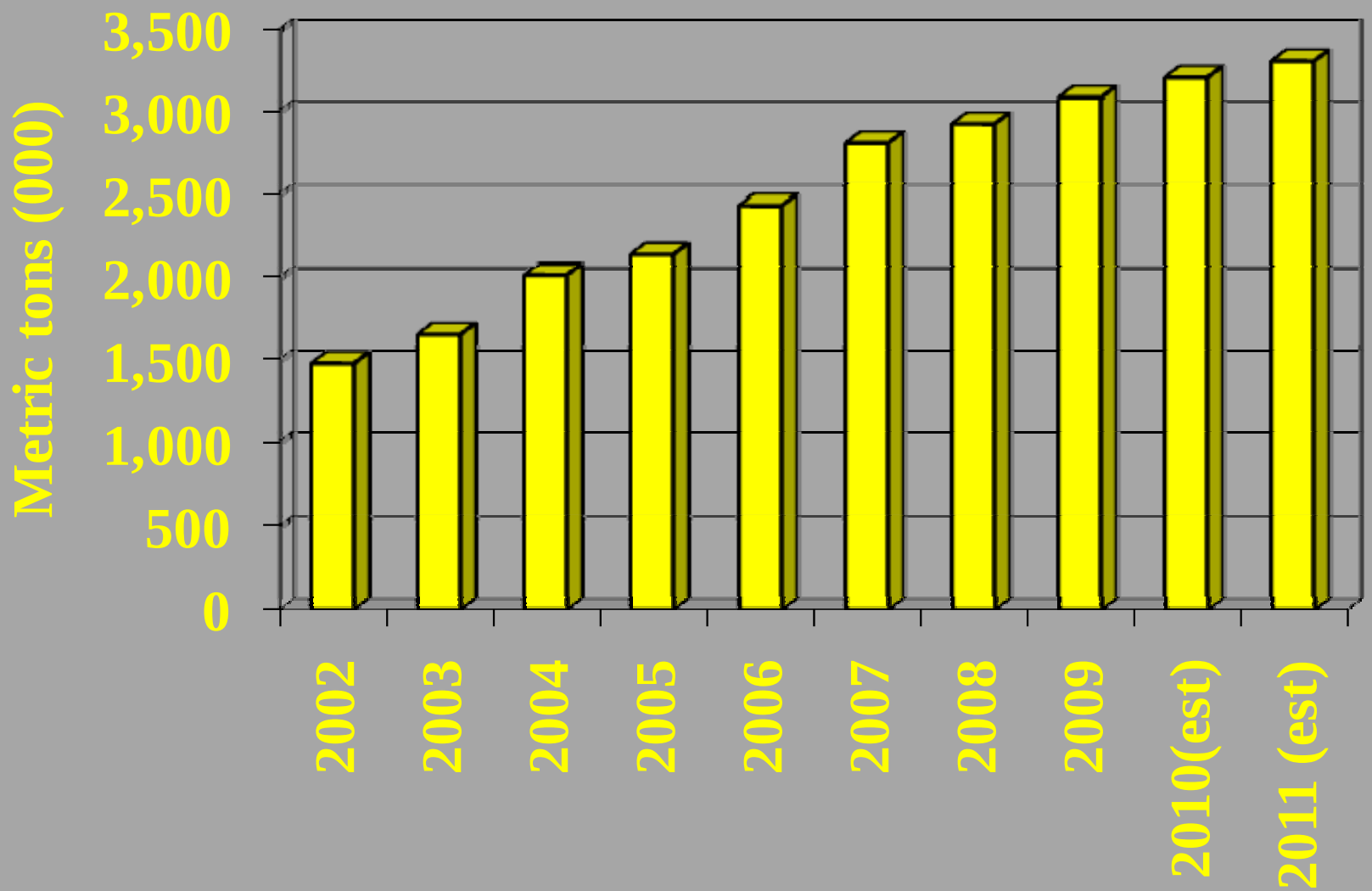
Prices have been constant, only fresh fillets have increased significantly, will not see increases beyond inflation



Global Aquaculture Tilapia Sales

- For year 2000 =US $ 1,744,045000
  (FAO FishStat 2007)
- 2005 sales = $ 2,457,312,000
  (FAO FishStat 2007)
- 2010 sales >$ 5,000,000,000

Future global tilapia aquaculture



Conclusions

- Global tilapia production exceeded 3,078,000 metric tons in 2009 and will be 3,200,000 in 2010.
- Constantly improving farming, processing and packaging for food safety, quality assurance, traceability and environmental safeguards (with little increase in price).
- Other aquaculture species will follow the tilapia model.