Is Aquaculture Sustainable?
AQUACULTURE (fish farming)

Production of aquatic animals and plants under controlled conditions for all or part of the life cycle.
What is Produced?

- Food - both finfish & shellfish
- Plants - food, ornamentals, remediation
- Baitfish & sportsfish
- Wildlife restoration
- Companion animals
- Biological controls
- Medical research
- Amphibians & reptiles
Demand based on new dietary guidelines: 2 (4 oz.) seafood meals per week

Demand = Per capita consumption x population

U.S. Harvest

U.S. Supply = Harvest - Exports
Sources of all seafood consumed in U.S.

- U.S. Farmed: 2.5%
- U.S. Wild-caught: 6.5%
- Imported Wild-caught: 45%
- Imported Farmed: 46%


Infographic by Patricia Andersson, Oregon Sea Grant.
Top 13 Aquaculture Producers Worldwide

Total aquaculture production in relation to land and water resources

Bangladesh: 1,308,515 (metric tonnes aquaculture)
Vietnam: 2,671,800
Thailand: 1,286,122
Myanmar: 850,697
Egypt: 919,585
Philippines: 744,695
Norway: 1,008,010
Chile: 701,062
Japan: 718,284
India: 4,648,851
Indonesia: 2,304,828
China: 36,734,215
USA: 495,499

Sources of all seafood consumed in U.S.

U.S. Farmed: 2.5%
U.S. Wild-caught: 6.5%
Imported Wild-caught: 45%
Imported Farmed: 46%


2010, UN Food and Agriculture Organization
Aquaculture Production by Region 2010 (%)

- **China**: 61.4%
- **Asia (excluding China)**: 27.7%
- **Americas**: 4.3%
- **Europe**: 4.2%
- **Africa**: 2.2%
- **Oceania**: 0.3%

FAO, 2012
U.S. aquaculture is sustainable
Sustainability

1. Wise use of natural resources
2. Maintain environmental integrity
3. Security
4. Social
5. Economic
U.S. Regulations

- Water quality
- Wetlands protection
- Wastewater treatment
- Water supply
- Non-native species
- Fish health programs
- Food safety
- Human Rights
Sustainability – Effluents
Sustainability – Feed Ingredients
Environmental Impact & Feed Use
Grain fed per pound meat protein produced

61 pounds

38 pounds

13 pounds
**Pocket Seafood Selector**

**Fish choices that are good for you and the ocean**

- **Best Choices**
  - Abalone (farmed)
  - Barramundi (U.S.)
  - Catfish (U.S.)
  - Caviar/sturgeon (farmed)
  - Char, Arctic (farmed)
  - Clams (farmed)
  - Clams, softshell
  - Cod, Pacific (bottom longline)
  - Crab, Dungeness
  - Crab, stone
  - Crawfish (U.S.)
  - Halibut, Pacific
  - Lobster, spiny (Australia, Baja, U.S.)
  - Mackerel, Atlantic
  - Mahimahi (U.S. pole/troll)
  - Mullet (U.S.)
  - Oysters (farmed)
  - Pollock, Alaska
  - Sablefish/black cod (Alaska, Canada)
  - Salmon (Alaska wild)
  - Salmon, canned pink/sockeye
  - Sardines (U.S.)

- **Avoid**
  - Scallops, bay (farmed)
  - Shrimp, pink (Oregon)
  - Shrimp (U.S. farmed)
  - Spot prawn (Canada)
  - Squid, longfin (U.S.)
  - Striped bass (farmed)
  - Tilapia (U.S.)
  - Trout, rainbow (farmed)
  - Tuna, albacore (Canada, U.S.)
  - Tuna, skipjack (pole/troll)
  - Tuna, yellowfin (U.S. pole/troll)
  - Wreckfish

**Environmental Defense Fund**

Finding the ways that work

**Cover Image:** "Endangered Ocean" ©2008 www.marianocher.com
<table>
<thead>
<tr>
<th>BEST CHOICES</th>
<th>GOOD ALTERNATIVES</th>
<th>AVOID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arctic Char (farmed)</td>
<td>Caviar, Sturgeon (US farmed)</td>
<td>Caviar, Sturgeon* (imported wild)</td>
</tr>
<tr>
<td>Barramundi (US farmed)</td>
<td>Clams (wild)</td>
<td>Chilean Seabass/Toothfish*</td>
</tr>
<tr>
<td>Catfish (US farmed)</td>
<td>Cod: Pacific (US trawled)</td>
<td>Cobia (imported farmed)</td>
</tr>
<tr>
<td>Clams (farmed)</td>
<td>Crab: Blue*, King (US), Snow</td>
<td>Cod: Atlantic, imported Pacific</td>
</tr>
<tr>
<td>Cobia (US farmed)</td>
<td>Flounders, Soles (Pacific)</td>
<td>Flounders, Halibut, Soles (Atlantic)</td>
</tr>
<tr>
<td>Cod: Pacific (Alaska longline)*</td>
<td>Herring: Atlantic</td>
<td>Groupers*</td>
</tr>
<tr>
<td>Crab: Dungeness, Stone</td>
<td>Lobster: American/Maine</td>
<td>Lobster: Spiny (Caribbean)</td>
</tr>
<tr>
<td>Lobster: Spiny (US)</td>
<td>Oysters (wild)</td>
<td>Marlin: Blue*, Striped*</td>
</tr>
<tr>
<td>Mussels (farmed)</td>
<td>Pollock (Alaska wild)*</td>
<td>Monkfish</td>
</tr>
<tr>
<td>Oysters (farmed)</td>
<td>Salmon (Washington wild)*</td>
<td>Orange Roughy*</td>
</tr>
<tr>
<td>Sablefish/Black Cod</td>
<td>Sablefish/Black Cod</td>
<td>Salmon (farmed, including Atlantic)*</td>
</tr>
<tr>
<td>(Alaska* or British Columbia)</td>
<td>(California, Oregon or Washington)</td>
<td>Sharks*, Skates</td>
</tr>
<tr>
<td>Salmon (Alaska wild)*</td>
<td>Scallop: Sea (wild)</td>
<td>Shrimp (imported)</td>
</tr>
<tr>
<td>Scallops: Bay (farmed)</td>
<td>Shrimp (US, Canada)</td>
<td>Snapper: Red</td>
</tr>
<tr>
<td>Shrimp, Pink (Oregon)*</td>
<td>Squid</td>
<td>Swordfish (imported)*</td>
</tr>
<tr>
<td>Striped Bass (farmed or wild**)</td>
<td>Swai, Basa (farmed)</td>
<td>Tilapia (Asia farmed)</td>
</tr>
<tr>
<td>Tilapia (US farmed)</td>
<td>Swordfish (US)*</td>
<td>Tuna: Albacore, Bigeye, Yellowfin</td>
</tr>
<tr>
<td>Trout: Rainbow (farmed)</td>
<td>Tilapia (Central America, farmed)</td>
<td>(longline)*</td>
</tr>
<tr>
<td>Tuna: Albacore (troll/pole, US* or British Columbia)</td>
<td>Tuna: Bigeye, Yellowfin (troll/pole)</td>
<td>Tuna: Bluefin*, Tongol, Canned (except Albacore and Skipjack)</td>
</tr>
<tr>
<td>Tuna: Skipjack (troll/pole)</td>
<td>Tuna: Canned Skipjack and Albacore*</td>
<td>Yellowtail (imported farmed)</td>
</tr>
</tbody>
</table>
“We must plant the sea and herd its animals using the sea as farmers instead of hunters. That is what civilization is all about - farming replacing hunting.”
What About Nutrition and Product safety?
About half of all Americans have one or more preventable, diet-related chronic diseases, including cardio-vascular disease, diabetes, overweight and obesity.

Americans consume only 44% of the seafood that they should be consuming.

The review of the evidence demonstrated, in the species evaluated, that farm-raised seafood has as much or more EPA and DHA per serving as wild caught.
Seafood Consumption & Pregnancy
Benefits of Fish Consumption During Pregnancy and Breastfeeding

• Neurodevelopmental
  o Visual
  o Cognitive
  o Motor

• Improved nutritional content of breast milk

• Documented Benefits

• Increased gestational length
• Management of perinatal depression
• Lower body fat in infancy and childhood
• Improved immune response

• Emerging Benefits
Pregnant women, nursing mothers, women who may become pregnant, and small children should avoid certain fish—

King mackerel, Tilefish, Swordfish, Shark

limit their consumption of **albacore tuna** to 6 ounces per week
Low mercury fish and shellfish include:

- Shrimp
- Channel Catfish
- Tilapia
- Trout
- Salmon

Source: FDA
Typical American Diet Intake

Usual intake as a percent of goal or limit

Eat more of these:
- Whole grains: 15%
- Vegetables: 59%
- Fruits: 42%
- Dairy: 52%
- Seafood: 44%
- Oils: 61%
- Fiber: 40%
- Potassium: 56%
- Vitamin D: 28%
- Calcium: 75%

Eat less of these:
- Calories from SoFAS*: 280%
- Refined grains: 200%
- Sodium: 149%
- Saturated fat: 110%

Percent of goal or limit

© 2009 by the University of Idaho.
U.S. Farm-Raised Seafood and Health

- Alzheimer’s Association
- American Diabetes Association
- American Dietetic Association
- American Heart Association
- American Optometric Association
- Arthritis Foundation
- Food and Agricultural Organization
- National Healthy Mothers, Healthy Babies Coalition
- National Heart, Lung and Blood Institutes
- US Department of Agriculture
- US Food & Drug Administration
In addition to Omega-3s...

- High quality protein
- Low calorie
- Low in saturated fats
- Easily digestible
- Low in sodium
- High in vitamins A, D, thiamine, niacin, $B_6$, $B_{12}$
- High in valuable minerals (selenium, iron, magnesium, and zinc)
Antibiotics and Hormones

- No growth or production hormones
- No growth promotion with antibiotics
- No pesticides
- Very few drugs
Feeds

Regulated by:

- FDA
- State Departments of Agriculture
- American Association of Feed Control Officials
Astaxanthin

Wild

Farmed

Super Anti-Oxidant
ASTAXANTHIN
4mg
Safety - GMOs

- Sterile
- Produce growth hormone all year long
The Really Exciting News...

Scientific Report of the 2015 Dietary Guidelines Advisory Committee

Advisory Report to the Secretary of Health and Human Services and the Secretary of Agriculture
“Expanded supply of seafood nationally and internationally will depend upon the increase of farm-raised seafood worldwide”
“Seafood varieties commonly consumed in the United States that are higher in EPA and DHA and lower in methyl mercury include salmon, anchovies, herring, shad, sardines, Pacific oysters, trout, and Atlantic and Pacific mackerel (not king mackerel, which is high in methyl mercury).

“Individuals who regularly consume more than the recommended amounts of seafood that are in the Healthy U.S.-Style Pattern should choose a mix of seafood that emphasizes choices relatively low in methyl mercury.”
“Consistent with overall sustainability goals, farm-raised finfish (e.g., salmon and trout) is more sustainable than terrestrial animal production (e.g., beef and pork) in terms of GHG emissions and land/water use.”
“The review of the evidence demonstrated, in the species evaluated, that farm-raised seafood has as much or more EPA and DHA per serving as wild caught.

It should be noted that low-trophic seafood, such as catfish and crawfish, regardless of whether wild caught or farm-raised seafood, have less EPA and DHA per serving than high-trophic seafood, such as salmon and trout.”
Attributes of U.S. Farm-Raised Seafood

- Environmentally-sound production methods
- Product safety
- Consistency in price
- Consistency in supply
- Local production
- Product quality
Questions???
Health and Nutrition

Learn more about U.S. farm-raised seafood and your health, safe handling of seafood, and browse some great recipes for both finfish and shellfish on the health and nutrition pages.

Health and Nutrition

- U.S. Aquaculture and Health
- Food Safety
  - Purchasing
  - Handling
- Recipes
  - Finfish
  - Shellfish
- Site Home