Subcommittee 5:
Food Sustainability and Safety

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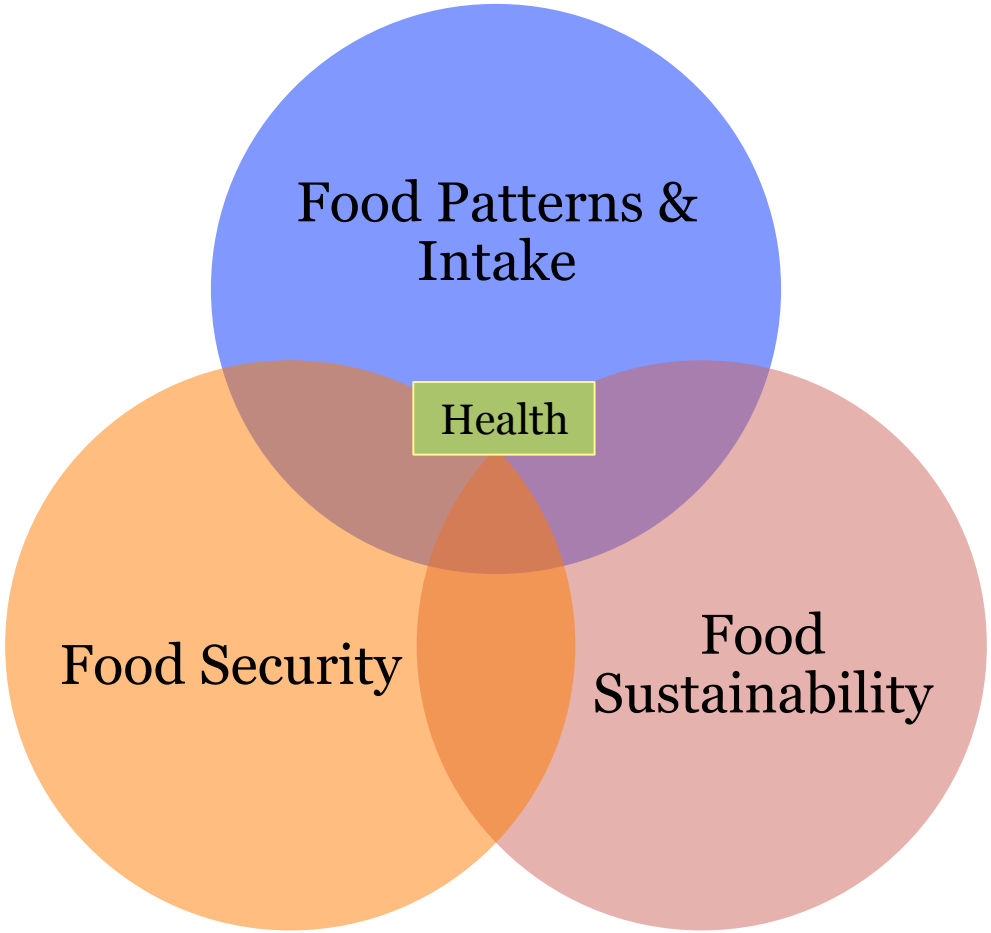
Scope

- To address food and nutrition issues that will inform public health action and policies to promote the health of the population through food safety and long-term food security.

Key Topic Areas

- Food Safety
  - Normal caffeine consumption and pregnancy outcomes
  - 2010 DGAC food safety individual behavior
- Food Sustainability
  - Dietary patterns - Update
  - Fish

SC 5 Framework



Invited Experts and Consultants

Invited Experts

Individuals invited by the SC, usually on a one-time basis, to provide their expertise to inform the SC's work. Invited experts do not participate in decisions at the SC level.

Consultant SC Members

Individuals sought by the SC to participate in SC discussions and decisions on an ongoing basis but who are not members of the full DGAC. Like DGAC members, consultants complete training and have been reviewed and cleared through a formal process within the Federal government.

Consultant SC 5 Members

- **Michael Hamm**, C.S. Mott Professor of Sustainable Agriculture, Departments of Community Sustainability and Food Science and Human Nutrition, College of Agriculture and Natural Resources, Michigan State University

- **Timothy Griffin**, Director for the Agriculture and Environment Program and Associate Professor at the Friedman School of Nutrition Science and Policy at Tufts University

Questions Addressed Today

Food Safety: Normal Caffeine and Pregnancy

What is the relationship between normal caffeine consumption and pregnancy outcomes?

Sustainability: Dietary Patterns - Update

What is the relationship between population-level dietary patterns and long-term sustainability and related food security?

Sustainability: Seafood

1. What is the relationship between current farm- raised versus wild caught seafood and respective nutrient profiles?
2. What is the relationship between current farm-raised versus wild caught seafood and contaminants?
3. What is the worldwide capacity to produce farm-raised versus wild-caught seafood that is nutritious and safe for Americans?

2010 Update: Food safety and individual behavior

Normal Caffeine and Pregnancy

Food Safety: Normal Caffeine

What is the relationship between usual coffee/caffeine consumption and health?

Overview of Systematic Reviews

Normal Caffeine and Pregnancy Outcomes Evidence Review

Overview of Systematic Reviews/Meta-Analyses (SR/MA)

Total Mortality
•2 SR/MA

Cardiovascular Diseases
•15 SR/MA

Type 2 Diabetes
•5 SR/MA

Cancer
•22 SR/MA

Cognition and Parkinson's Disease
•6 SR/MA

Pregnancy Outcomes
•2 SR/MA

Normal Caffeine and Pregnancy Outcomes Evidence Review

- 2 SR/MAs assessed observational studies on the association of caffeine intake with adverse pregnancy outcomes
  - Greenwood 2014 (AMSTAR 10/11)
  - Maslova 2010 (AMSTAR 10/11)
- Pregnancy outcomes included miscarriage, preterm birth, stillbirth, small for gestational age (SGA), and low birth-weight
- Pregnant women were from a variety of countries in North America, Europe, and South America
- Caffeine intake (dietary sources, primarily from beverages) categories ranged from non-consumers to those consuming >1,000mg/day

Normal Caffeine and Pregnancy Outcomes Evidence Review

- Greenwood (2014*)* included 60 publications from 53 separate cohort (26) and case-control (27) studies on miscarriage, preterm birth, stillbirth, SGA, and low birth-weight

- Maslova (2010) included 22 studies (15 cohort, 7 case-control) on preterm birth

Normal Caffeine and Pregnancy Outcomes Evidence Review

Greenwood (2014*)*

- Magnitude of associations was relatively small within range of caffeine intakes of the majority of women in study populations; associations were more pronounced at higher ranges (>300 mg/day)

- Increment of 100 mg caffeine associated with:
  - 14% increased risk of miscarriage
  - 19% increased risk of stillbirth
  - 10% increased risk of SGA
  - 7% increased risk of low birth weight
  - No increased risk of preterm delivery

- Substantial heterogeneity in the meta-analyses for all outcomes

- Results from cohort and case-control studies were combined (although assessed separately in sub-group analysis)

Normal Caffeine and Pregnancy Outcomes Evidence Review

Maslova (2010)

- No association between caffeine intake during pregnancy and risk of preterm birth in either case-control or cohort studies
- Results from sub-analysis of only coffee intake were similar to results from the main caffeine analysis
- No overall heterogeneity by region, publication decade, exposure and outcome assessment, caffeine sources, or adjustment for confounding

Normal Caffeine
Key Findings: Pregnancy Outcomes

- No association between caffeine intake during pregnancy and risk of preterm birth was observed in either cohort or case-control studies

- Consumption of caffeine from various sources was associated with a small increased risk of miscarriage, stillbirth, low birth weight and small for gestational age births within the typical range of consumption (up to 300 mg per day)

- Inadequate control for confounders such as maternal age, smoking, and alcohol was a limitation in some primary studies

Normal Caffeine and Pregnancy Outcomes: *Draft* Conclusion Statements

- Moderate evidence from observational studies indicates that caffeine intake is not associated with risk of preterm delivery.

  Grade Moderate

- Higher caffeine intake is associated with a small increased risk of miscarriage, stillbirth, low birth weight, and small for gestational age births.

- These data should be interpreted cautiously due to potential recall bias in case-control studies and confounding by smoking and pregnancy signal symptoms.

  Grade Limited

Normal Caffeine and Pregnancy Outcomes: *Draft* Implications

- Overall, the evidence provides support for current recommendations to limit caffeine intake during pregnancy as a precaution.

- Based on existing evidence, pregnant women, or women planning to become pregnant, should be cautious and adhere to current recommendations of the American Congress of Obstetricians and Gynecologists regarding caffeine consumption, and consume no more than 200 mg caffeine per day.

Normal Caffeine and Pregnancy Outcomes: *Draft* Research Recommendations

- Given the evidence of the effects of caffeine consumption on adverse pregnancy outcomes, future studies need to establish safe levels of caffeine/coffee consumption during pregnancy.

Food Safety: Normal Caffeine and Pregnancy Outcomes

What is the relationship between usual and high-dose coffee/caffeine consumption and health?

Discussion

Dietary Patterns and Sustainability

Food Sustainability: Dietary Patterns

What is the relationship between population-level dietary patterns and long-term food sustainability and related food security?

NEL Systematic Review

Food Sustainability: Dietary Patterns

Definition: Sustainable diets are a pattern of eating that promotes health and well-being, and provides food security for current and future populations while sustaining human and natural resources.

Dietary Patterns and Sustainability *Draft* Conclusion Statements

Consistent evidence indicates that, in general, a dietary pattern that is higher in plant-based foods and lower in animal-based foods is more health promoting and is associated with lesser environmental impact (GHG emissions, energy, land and water use) than the current average American diet.

Grade: Moderate

Dietary Patterns and Sustainability *Draft* Conclusion Statements

- The evidence consists primarily of life cycle assessment modeling studies or land-use studies from the US and other highly developed countries. The models predict that following diets similar to those suggested in the *Dietary Guidelines for Americans* and respective guidelines of other countries is more environmentally sustainable than the average American diet or the average diet from other developed countries.

- A more environmentally sustainable diet can be achieved without excluding any food groups.

Grade: Moderate

Dietary Patterns and Sustainability *Draft* Implications

- Evidence supports that a more environmentally sustainable dietary pattern promotes better health. The evidence supports the U.S. population moving towards the *Dietary Guidelines for Americans*, which can be achieved by a variety of dietary patterns that generally increase consumption of vegetables, fruits, whole grains, nuts and seeds, while decreasing some animal-based foods.

- Sustainability considerations provide an additional rationale for following U.S. Dietary Guidelines. Using sustainability messaging in communication strategies should be encouraged.

Dietary Patterns and Sustainability *Draft* Implications

- The application of environmental and sustainability factors to dietary guidelines can be accomplished because of the compatibility and degree of overlap between favorable health and environmental outcomes.

- It is also clear that, within individual food categories or types, much has been done by the private and public sectors to improve environmental practices around production, processing, and distribution.

- It will be important that both a greater shift towards healthful dietary patterns and improving the environmental profile within the needed food categories are achieved to maximize our environmental sustainability now and to ensure greater progress in that direction over time.

Dietary Patterns and Sustainability *Draft* Implications

- Promoting healthier diets that are also more environmentally sustainable will conserve resources for present and future generations, assuring that the U.S. population has access to a diet that is healthy as well as sustainable and secure, now and in the future.

- Careful consideration will need to be made to ensure that sustainable diets are affordable for all Americans.

Dietary Patterns and Sustainability

What is the relationship between population-level dietary patterns and long-term food sustainability and related food security?

Discussion

Seafood Sustainability

Seafood Sustainability Questions

1. What is the relationship between current farm- raised versus wild caught seafood and respective nutrient profiles?

2. What is the relationship between current farm-raised versus wild caught seafood and contaminants?

3. What is the worldwide capacity to produce farm-raised versus wild-caught seafood that is nutritious and safe for Americans?

Farm vs. Wild Seafood: Nutrient Profile

What is the relationship between current farm-raised versus wild caught seafood and respective nutrient profiles?

Nutrient Database

Farm vs. Wild Seafood: Nutrient Profile Description of the Evidence

- USDA National Nutrient Database for Standard Reference, Release 27 (2014)
- Fatty Acid Profiles of Commercially Available Finfish Fillets in the United States (Cladis et al, 2014)

Farm vs. Wild Seafood: Nutrient Profile Description of the Evidence

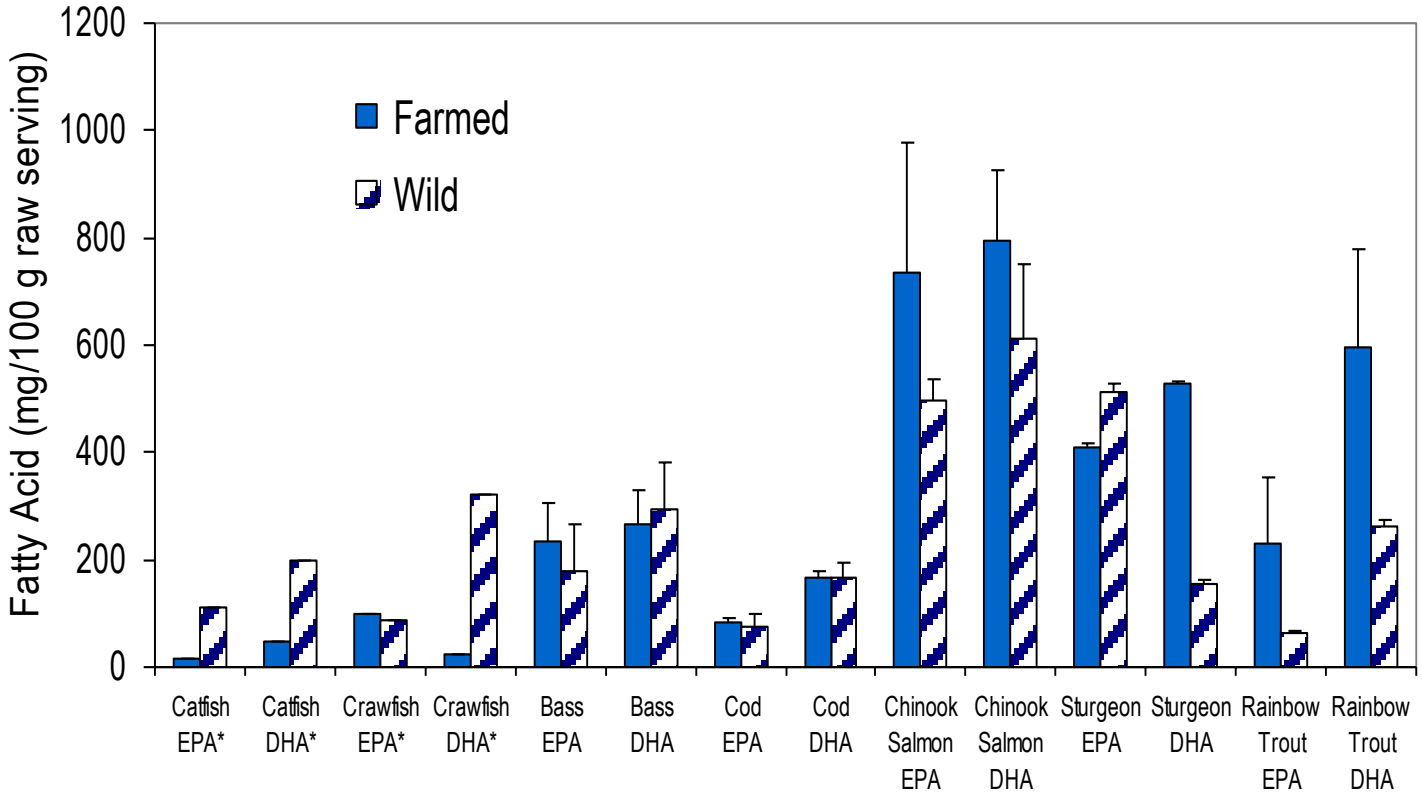


Figure 1. Comparison of EPA and DHA in Seafood from USDA-ARS National Nutrient Database, Release 27 (*) and from updated 2014 survey (Cladis *et al*., 2014)

Farm vs. Wild Seafood: Nutrient Profile Key findings

- Farm-raised fish are comparable to wild-caught fish in EPA and DHA profiles, with the exception of low trophic level species
  - Wild species EPA and DHA per 100 g raw serving ranges are 64-511 mg and 156-610 mg, respectively
  - Farmed species EPA and DHA ranges are 14-737 mg and 23-796 mg, respectively
- Farm-raised fish contain more total fat than wild-caught fish
- Recommended amounts of seafood that provide EPA and DHA can be obtained by consuming farm-raised seafood, as EPA and DHA levels are as high or higher compared to wild-caught of the same species

Farm vs. Wild Seafood: Nutrient Profile *Draft* Conclusions

The DGAC concurs with the recent survey of commonly consumed fish species in the U.S., such as bass, cod, salmon and trout, that farmed fish supplies, on average, as much EPA and DHA as similar species captured from the wild. Recommended amounts of EPA and DHA can be obtained by consuming farm-raised fish, especially salmon and trout. Farmed low trophic species catfish and crawfish have less than half the EPA and DHA per serving than wild. Farmed-raised fish also contain more total fat than wild-caught fish.

Grade: Strong

Farm vs. Wild Seafood: Nutrient Profile *Draft* Implications

- The U.S. population should be encouraged to eat a variety of seafood that can be wild caught or farmed, as they are nutrient dense foods that are uniquely rich sources of healthy fats.

- It should be noted that low trophic farm-raised fish such as catfish and crayfish have lower EPA and DHA levels than wild-caught. Nutrient profiles in popular low trophic level farmed species should be improved through feeding and processing systems that produce and preserve nutrients similar to those delivered by wild capture in the same species

- Overall, farm-raised fish have higher total fat levels than wild-caught fish

Farm vs. Wild Seafood: Nutrient Profile *Draft* Research Recommendations

- Research should be undertaken to maintain nutrient profiles of high trophic level farmed seafood and improve nutrient profiles of low trophic farmed seafood concurrently with research to improve production efficacy

Farm vs. Wild Seafood: Contaminants

What is the relationship between current fishery practices (farm-raised versus wild caught seafood) and contaminants in seafood?

Expert Report

Farm vs. Wild Seafood: Contaminants Description of the Evidence

Report of the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption

Food and Agriculture Organization of the United Nations; Geneva, World Health Organization

2011

Farm vs. Wild Seafood: Contaminants Key findings

- Levels of mercury and dioxins are in the same range for farmed and wild fish
- At the same level of mercury content (lowest and 2nd lowest levels), farmed fish have the same or higher levels of EPA+DHA as wild-caught
- At the same level of dioxin content (2nd lowest level) farmed fish have the same or higher levels of EPA+DHA as wild-caught
- There are CHD mortality benefits from eating fish and CHD risks from not eating fish, except for fish in the highest dioxin and lowest EPA+DHA categories

Farm vs. Wild Seafood: Contaminants Key findings

Classification of the content of EPA+DHA by mercury (Hg) levels in 96 seafood species

		EPA + DHA			
		x ≤ 3 mg/g	3 < x ≤ 8 mg/g	8 < x ≤ 15 mg/g	x > 15 mg/g
Mercury	x ≤ 0.1 µg/g	**Fish:** butterfish; catfish; cod, Atlantic; cod, Pacific; croaker, Atlantic; haddock; pike; plaice, European; pollock; saithe; sole; tilapia **Shellfish:** clams; cockle; crawfish; cuttlefish; oysters; periwinkle; scallops; scampi; sea urchin; whelk	**Fish:** flatfish; John Dory; perch, ocean and mullet; sweetfish; wolf fish; **Shellfish:** mussels; squid	**Fish:** redfish; salmon, Atlantic (wild); salmon, Pacific (wild); smelt **Shellfish:** crab, spider; swimcrab	**Fish:** anchovy; herring; mackerel; rainbow trout; salmon, Atlantic (farmed); sardines; sprat **Fish liver**: cod, Atlantic (liver); saithe (liver) **Shellfish:** crab (brown meat)
	0.1 < x ≤ 0.5 µg/g	**Fish:** anglerfish; catshark; dab; grenadier; grouper; gurnard; hake; ling; lingcod and scorpionfish; Nile perch; pout; skate/ray; snapper, porgy and sheepshead; tuna, yellowfin; tusk; whiting **Shellfish:** lobster; lobster, American	**Fish:** bass, freshwater; carp; perch, freshwater; scorpion fish; tuna; tuna, albacore **Shellfish:** crab; lobster, Norway; lobsters, spiny	**Fish:** bass, saltwater; bluefish; goatfish; halibut, Atlantic (farmed); halibut, Greenland; mackerel, horse; mackerel, Spanish; seabass; seabream; tilefish, Atlantic; tuna, skipjack	**Fish:** eel; mackerel, Pacific; sablefish
	0.5 < x ≤ 1 µg/g	**Fish:** marlin; orange roughy; tuna, bigeye	**Fish:** mackerel, king; shark	**Fish:** alfonsino	**Fish:** tuna, Pacific bluefin
	x > 1 µg/g		**Fish:** swordfish		

Report of the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption. Food and Agriculture Organization of the United Nations; Geneva, World Health Organization, 2011

Farm vs. Wild Seafood: Contaminants Key findings

Classification of the content of EPA+DHA by dioxin levels in 76 seafood species

		EPA + DHA			
		x ≤ 3 mg/g	3 < x ≤ 8 mg/g	8 < x ≤ 15 mg/g	x > 15 mg/g
Dioxins	*x* ≤ 0.5 pg TEQ/g	**Fish:** anglerfish; catshark; cod, Atlantic; grenadier; haddock; hake; ling; marlin; orange roughy; pollock; pout; saithe; skate/ray; sole; tilapia; tuna, bigeye; tuna, yellowfin; tusk; whiting **Shellfish:** cockle; clams; crawfish; cuttlefish; periwinkle; scallops; scampi; sea urchin	**Fish:** flatfish; John Dory; perch, ocean and mullet; shark; sweetfish; tuna, albacore	**Fish:** redfish; salmon, Pacific (wild); tuna, skipjack	
	0.5 < *x* ≤ 4 pg TEQ/g	**Fish:** catfish; dab; gurnard; plaice, European **Shellfish:** lobster; oysters; scallops; whelk	**Fish:** scorpion fish; swordfish; tuna **Shellfish:** mussels; squid	**Fish:** alfonsino; goatfish; halibut, Atlantic (farmed); halibut, Greenland; mackerel, horse; salmon, Atlantic (wild); seabass; seabream	**Fish:** anchovy; herring; mackerel; mackerel, Pacific; rainbow trout (farmed); salmon, Atlantic (farmed); tuna, Pacific bluefin **Shellfish:** crab (brown meat)
	4 < *x* ≤ 8 pg TEQ/g			**Shellfish:** crab, spider	**Fish:** sardines; sprat
	x > 8 pg TEQ/g			**Fish:** bluefish	**Fish:** eel **Fish liver:** cod, Atlantic (liver); saithe (liver)

Report of the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption. Food and Agriculture Organization of the United Nations; Geneva, World Health Organization, 2011

Farm vs. Wild Seafood: Contaminants Key findings

Table 3. Estimated changes in mortality per million people from consuming fish with different dioxin and EPA + DHA contents at two100 g servings per week

Two servings per week			EPA + DHA			
			x ≤ 3 mg/g	3 < x ≤ 8 mg/g	8 < x ≤ 15 mg/g	x > 15 mg/g
		Median	2	5.5	11.5	20
Dioxins	*x* ≤ 1.0 pg/g	0.2	+100 −9100	+100 −25 000	+100 −39 800	+100 −39 800
	1.0 < *x* ≤ 4.0 pg/g	2.5	+1200 −9100	+1200 −25 000	+1200 −39 800	+1200 −39 800
	4.0 < *x* ≤ 8.0 pg/g	6.0	+2900 −9100	+2900 −25 000	+2900 −39 800	+2900 −39 800
	x > 8.0 pg/g	20.0	+9500 −9100	+9500 −25 000	+9500 −39 800	+9500 −39 800

Report of the Joint FAO/WHO Expert Consultation on the Risks and Benefits of Fish Consumption. Food and Agriculture Organization of the United Nations; Geneva, World Health Organization, 2011

Farm vs. Wild Seafood: Contaminants *Draft* Conclusions

- The DGAC concurs with the FAO/WHO Expert Consultancy that neither mercury nor organic pollutants obviate the benefits of seafood consumption for reduction of chronic disease risk, specifically cardiovascular disease, considered by the Consultancy, for the vast majority of commercial wild and farmed species.

- Composition can vary rapidly based on production practices for farmed seafood. Any assessment considers evidence within a specific time frame.

Grade Moderate

Farm vs. Wild Seafood: Contaminants *Draft* Implications

- Based on health outcomes, either farmed or wild-caught seafood are appropriate choices

- Pregnant and breastfeeding women should not eat certain types of fish: tilefish, shark, swordfish, and king mackerel because of their high methyl mercury contents

Farm vs. Wild Seafood: Contaminants *Draft* Research Recommendations

- Research should be undertaken to ensure contaminant levels in all seafood remain at levels similar to or lower than at present

- Monitoring of contaminant levels should be maintained for the capture fisheries to ensure that levels caused by pollution do not rise appreciably

Capacity to Produce Nutritious and Safe Seafood

What is the worldwide capacity to produce farm-raised versus wild-caught seafood that is nutritious and safe for Americans?

Expert Report

Capacity to Produce Seafood Description of the Evidence

The State of World Fisheries and Aquaculture. FAO Fisheries and Aquaculture

Department Food and Agriculture Organization of the United Nations

2012

Capacity to Produce Seafood Description of the Evidence

- The most recent United National (UN) Food and Agriculture Organization (FAO) report on The State of World Fisheries and Agriculture was issued in 2012 and formed the basis of the DGAC's opinions on this topic
- The FAO report addressed a wide variety of issues impacting capture fisheries and aquaculture, including the economics, infrastructure, labor and government policies
- The DGAC focused on matters that directly address the world production as it impacts the supply of seafood for Americans, as a first attempt by a DGAC to consider the implications of dietary guidelines for production of a related group of foods

Capacity to Produce Seafood
Key findings

- Seafood production is expanding worldwide at a rate that can continue to support American's needs, which are now met primarily by importation

Capacity to Produce Seafood
Key findings

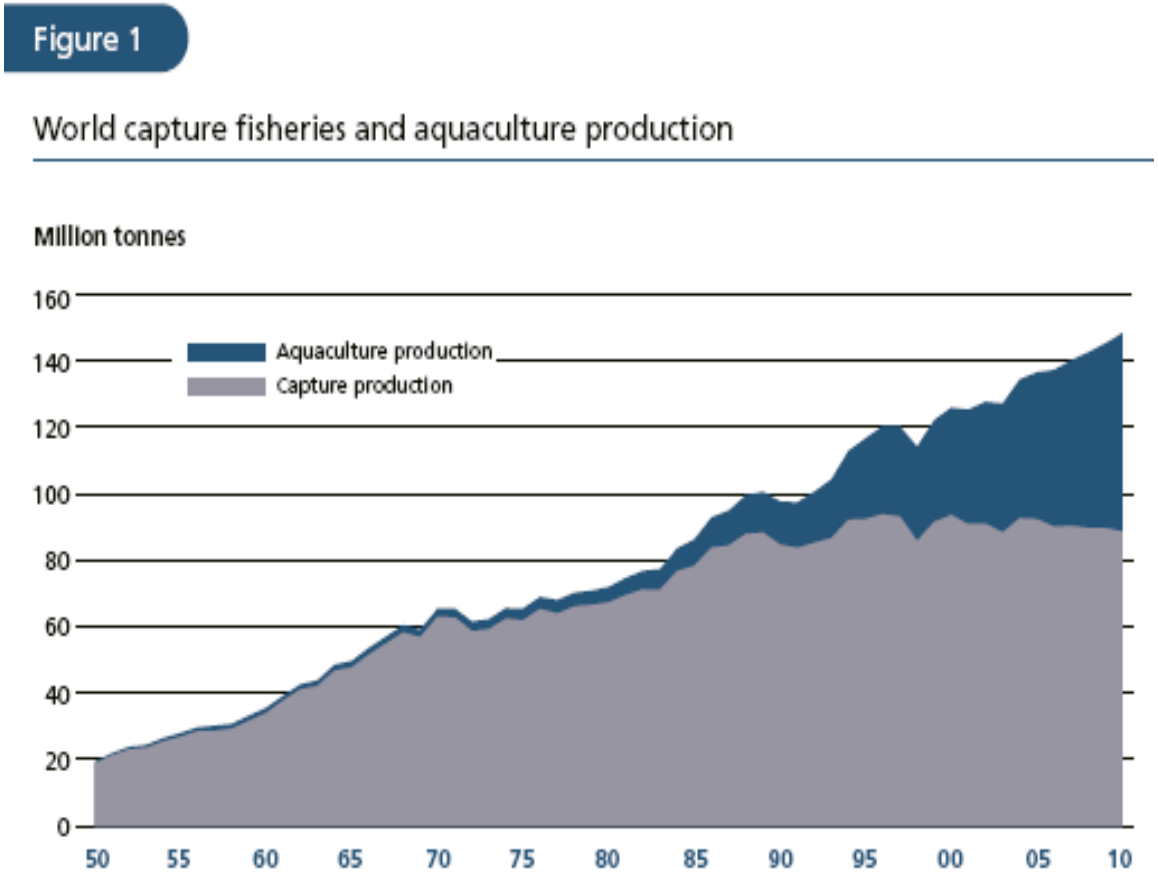


Figure 1. Capture fishery production hit plateau ~1990 while aquaculture is rapidly rising.

United National (UN) Food and Agriculture Organization (FAO) report, 2012

Capacity to Produce Seafood *Draft* Conclusions

- The DGAC concurs with the FAO that capture fisheries increasingly managed in a sustainable way are an important and stable source of important nutrients. On average capture fisheries are fully exploited and their continuing productivity relies on careful management to avoid over exploitation and long term collapse.

Grade Strong

Capacity to Produce Seafood *Draft* Conclusions

- Expanded seafood production relies on continuation of the rapid increase in aquaculture output worldwide, projected at 33% increase by 2021 and adding 15% to the total supply of seafood. Distributed evenly to the world's population, this capacity could in principle meet DGA recommendations for at least 8 oz. seafood per week.
- There are concerns that the expanded capacity may not be for fish species with the most desirable nutrient profile. Under the current production, Americans rely on significant amounts of imported seafood to meet DGA recommendations.

Grade: Moderate

Capacity to Produce Seafood *Draft* Implications

- Both wild and farmed seafood are major food sources available to support DGAC recommendations to regularly consume a variety of seafood
- Responsible stewardship over environmental impact is needed as farmed seafood production expands
- Availability of these important foods is critical for future generations of Americans to meet their needs for a healthy diet
- Strong policy, research, and stewardship support is needed to increasingly improve the environmental sustainability of farmed seafood systems
- From the standpoint of the dietary guidelines this expanded production needs to be largely in omega-3 rich species

Seafood Sustainability

1. Farm vs. wild seafood: nutrient profile
2. Farm vs. wild seafood: contaminants
3. Capacity to produce safe and nutritious seafood

Discussion

Consumer Behavior and Food Safety Update

Consumer Behavior and Food Safety Update

- Food safety and prevention of food borne illness is an important public health issue
- 2010 DGAC food conducted a NEL review on consumer behavior and prevention of food safety problems.
- The 2015 DGAC reviewed the 2010 report and updated the content with federal sources.

Consumer Behavior and Food Safety Update: Federal Sources

- Centers for Disease Control and Prevention
  - Hand washing: Clean Hands Save Lives

- Food and Drug Administration:
  - Food Facts, Raw Produce: Selecting it and serving it safely, 2012
  - Food Safety for Moms-to-Be: Safe Eats - Meat, Poultry & Seafood

- USDA/Food Safety and Inspection Service
  - Kitchen Companion: Your Safe Food Handbook

Core Food Safety Principles emphasized

CLEAN and SEPARATE

- Techniques for hand sanitation, washing fresh produce, and preventing cross-contamination.

COOK and CHILL

- Temperature control during food preparation and storage.

Food Safety—Recommendation Tables

- Procedures for hand sanitation
- Techniques for washing produce
- Techniques for preventing cross-contamination
- Safe minimum internal temperatures
- Recommended techniques for food thermometers

Consumer Behavior and Food Safety

Discussion

SC 5: What's Next?

1. Complete chapter background and conceptual model
2. Identify research gaps
3. Finalize writing of chapter

Subcommittee 5:
Food Sustainability and Food Safety

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