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the 2016 Public Policy Forum

Science and Solutions for a Resilient Ocean

Resilient Fisheries
Managing Resilience into Fisheries: Fact or Fiction?

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Overview

• Resiliency to perturbation is programmed into the life histories of fishes

• Fisheries management policy can amplify or dampen resiliency to environmental variability

• Recent trends document progress in the developed world and especially in the USA - MSA

• USA fish consumption heavily dependent on imports from countries with a poor track record of sustainability

• Regulatory and market factors can be successful
Context: Fisheries Resilience is Important

- World Annual Seafood production (wild & aquaculture): 158 million tons in 2012 (91.3 million tons wild marine) - static; 66.6 million tons aquaculture, - increasing
- 20% of the world’s human population have fisheries as their major source of protein
- Total USA Fish Catch [domestic = Landings in 2014: 9.5 billion pounds (4.3 million metric tons)], 1st Sale Value $5.4 b
- Total USA Recreational Fish Catch (2014): 392 million fish
- Total Imported Seafood (2014): $20 billion; Edible $17.8 billion - Average per capita consumption (USA) 14.6 pounds
- Total USA Fisheries Sales $185 billion; 2 million American jobs are fisheries-dependent
Global fish production is quite flat..... growth in world fish production is from aquaculture
Fish stocks: fewer underutilized, more fully exploited, overfishing and rebuilding peaking.
Defining Fishery Sustainability in the USA

**Overfishing:** The RATE of harvest (percent of the stock removed by fishing) exceeds the pre-defined maximum rate (generally about 20% per year is sustainable)

**Overfished:** The current SIZE of the population is less than ½ of the population size required to generate maximum sustainable yields

If the rate of outflow exceeds the rate of inflow, the use rate is not sustainable

If the glass ½ full or less the water supply is overused
The diagram illustrates the relationship between Biomass (B) and Fishing Effort (F) in relation to Maximum Sustainable Yield (MSY). The diagram is divided into four quadrants:

1. **Overfishing and Overfished**: When F (Fishing Effort) is greater than 1/2 MSY and B (Biomass) is less than 1/2 MSY, the system is overfishing and the population is overfished.
2. **Not Overfishing and Not Overfished**: When F is less than or equal to 1/2 MSY and B is greater than or equal to 1/2 MSY, the system is not overfishing and the population is not overfished.

The axes are labeled as follows:
- **Biomass / B-MSY** on the x-axis.
- **F / F-MSY** on the y-axis.

The diagram highlights the conditions under which overfishing and overfished populations occur.
World-Wide Stock Status

From Worm, Hilborn et al. 2009 SCIENCE
Meeting sustainability targets does not ensure resiliency.
Red Snapper CPUE

Pounds per Trip (all trips)

$ per Pound

CPUE

price per pound

ITQ Implemented in 2006

Year

State of Global Fisheries

Major US Importing Countries
- China  22%
- Thailand  14%
- Canada  13%
- Chile   6%
- Indonesia 5%
- Ecuador  4%
- Vietnam  4%
- Others  32%

Failing 40%

Not honouring the code, Nature, Vol 457, Pitcher et al
Illegal, Unregulated, and Unreported Fishing (IUU)

• As much as $23 billion per year in losses to IUU fishing
• Often occurs when the vessels from a nation fish outside the requirements of an RFMO (e.g., international drift net ban)
• Under MSRA, the USA is required to send a list of countries it suspects of engaging in IUU fishing to Congress

• 2009 list: China, France, Italy, Libya, Panama, Tunisia
• 2011 list: Columbia, Ecuador, Italy, Panama, Portugal, Venezuela
• 2013 list: Colombia, Ecuador, Ghana, Italy, Mexico, Panama, S. Korea, Spain, Tanzania, and Venezuela
Summary

• Achieving sustainability metrics is a necessary but insufficient approach to improving resiliency in fish stocks and fisheries in the face of natural and market-based variations.

• MSA (especially the 1996 and 2007 reauthorizations) have been successful in meeting many of their goals – but significant unfinished business.

• Must be resolute in monitoring stocks – overfishing status can change quickly.

• Because of the dependency of the USA, Europe, Japan and China on fishery imports from the developing world, all have significant unmet international obligations – assistance and standards.
Backup Slides
Measuring Progress in Sustainability (USA wild; perfect score = 1000)

Points:
- No overfishing = 1
- Not overfished = 1
- Status of overfishing known = ½
- Status of overfished known = ½
- At least 80% of target level = 1
America’s Oceans

- United States Exclusive Economic Zone (U.S. EEZ)

How Big Is the U.S. EEZ?

The U.S. Exclusive Economic Zone, totaling 4,453,068 square miles, is nearly one and one-half times larger than the landmass of the lower 48 states.
Resilient Ecosystems and Communities Arise from Resilient Fisheries

Richard Merrick, Director of Scientific Programs

March 2016
Washington, DC
Why Worry About Resilience

Magnuson Stevens Act

Marine Mammal Protection Act

Endangered Species Act

National Environmental Policy Act

Resilient Ecosystems & Communities
Growing Challenges for Effective Management

- Droughts
- Warming Oceans
- Loss of Sea Ice
- Rising Seas
- Ocean Acidification
EBFM Guiding Principles

**Outcome**
6. Maintain Resilient Ecosystems

What is our advice?
5. Incorporate ecosystem considerations into management advice

What are our options?
4. Explore and address trade-offs within an ecosystem

What are our priorities?
3. Prioritize vulnerabilities and risks of ecosystems and their components

What is the foundational science we need?
2. Advance our understanding of ecosystem processes

What are our objectives?
1. Implement ecosystem-level planning
Why EBFM?

• Better Economics, $$$
• Fewer Misses, Better advice
• Triage & Prioritization
• Increased Stability
• Address Tradeoffs
Ongoing EBFM-related efforts

- NOAA SAB ESMWG EBFM Report
- Fishery Ecosystem Plan (FEP) Analysis
- Survey of EBFM in Fishery Management Plans
- Lenfest EBFM (FEP) Task Force
- FEP Development/Update in 5 of 8 Regional Fish. Management Councils
- Stock Assessment Improvement Plan Update
- National Climate Science Strategy
- Climate Regional Action Plans
- Integrated Ecosystem Assessment ESR updates, Info to Councils
- Science Center Program Review, Ecosystem Science
- Ecosystem Modeling Workshops
- *NOAA Fisheries Policy on EBFM
- *NOAA Fisheries Implementation Plan for EBFM a.k.a., ‘Roadmap’
Policy Statement

NOAA Fisheries strongly supports implementation of Ecosystem-Based Fisheries Management (EBFM) to better inform and enable better decisions regarding trade-offs among and between fisheries (commercial, recreational, and subsistence), aquaculture, protected species, biodiversity, and habitats. Recognizing the interconnectedness of these ecosystem components will help maintain resilient and productive ecosystems (including the human communities on which they depend), even as they respond to climate, habitat, ecological, and other environmental changes.
Goal: Increase the production, delivery and use of climate-related information. In fulfilling NOAA Fisheries mandates.

www.st.nmfs.noaa.gov/ecosystems/climate
Next Steps for Policy

• Draft Public Open for Comment last Sept-Dec
• Visited 7 of 8 Councils
• Comments from more than 30 organizations and individuals
• Finalize in Spring 2016
But Where Does Community Resilience Fit In?

Community Resilience

Fisheries Resilience

Ecosystem Resilience

NOAA Fisheries
Social Indicators of Coastal Community Vulnerability and Fishery Dependence

http://www.st.nmfs.noaa.gov/humandimensions/social-indicators/
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Towards a Policy on Community Resilience

• MSA National Standard 8: Conservation and management measures shall… (a) provide for the sustained participation of such communities, and (b) to the extent practicable, minimize adverse economic impacts on such communities.

• Co-Management and Cooperative Research programs and policies

• NOAA Community Resilience Grants Program as well as the Fishery Innovation Fund with NFWF
Summary

• EBFM is needed as a roadmap to Ecosystem resilience

• NOAA is committed to EBFM and we’re starting to codify what operational EBFM looks like

• Enhanced Community Resilience is a product of resilient Fisheries and Ecosystems
Thank you

www.st.nmfs.noaa.gov/ecosystems/climate
Policy Defines EBFM as:

a systematic approach to fisheries management in a geographically specified area that contributes to the resilience and sustainability of the ecosystem; recognizes the physical, biological, economic, and social interactions among the affected fishery-related components of the ecosystem, including humans; and seeks to optimize benefits among a diverse set of societal goals.
LOBSTERMAN TO SEA FARMER

A STORY THAT SPANS 6 DECADES
ON LONG ISLAND SOUND
AND
THE ROLE CLIMATE CHANGE HAS IMPACTED THIS STORY
My name is D.J. King. Began Lobster/fishing in 1969. Graduated from Clark University and majored in economics/geography. Have a 50 ton captains license. I am the owner of D.J. King Lobsters and captain of the 42’ lobster boat Kory Alexander. I have captained other clam boats, oyster boats and tug boats. In 2007 began farming oysters and recently started farming seaweed.
Pulling lobsters out of wooden pots
Lobstering in the 70’s

When pots were wood
and men were steel
Lobstering at its peak!

In 1998 lobstering was at its peak. In a small 10 mile square area around Branford there were 24 full time lobstermen fishing 27,000 pots. Today there are 3 part time lobstermen. In this rare, never seen in public picture, our days catch was 17 totes of lobsters over 1500 pounds.
Dead lobsters

In 1998 there was a huge lobster die off. Heavy rainfall from Hurricane Floyd washed deadly chemicals (malathion & permethrin) into the sound. It was an abnormally warm year for water temperatures in LIS and along with the spraying of chemicals to kill the mosquitoes to prevent the spread of west Nile virus. The lobsters died and were coming up dead in the pots. The warmer water is a trend which continued until 2013. This was the beginning of the end for the lobster in Long Island Sound.
Hauling empty wire lobster pots

After the die off the lobster pots were coming up empty. Lobsters and lobstermen have become an endangered species.
With no lobster to catch, lobstermen looked for other ways to make a living on the water. Some began conching. Conch or winkles as there known locally are a warmer water species. They are able to tolerate the warmer waters and without lobsters were able to flourish.
The Almighty Conch

The Conch or winkle has saved the local fishing industry. Very little is known about this animal it has been very tolerant to temperature and salinity changes. In my own tests they was able to live out of the water for up to one month and lived in stagnant water for 6 months where all other creatures died. The conch is a ferocious predator that has carved a nitch for it self with the disappearance of the lobster which has always been the area’s reigning KING. The sales and demand of the conch is no longer tied to local economy which at one time was solely used for scungelli salad. The conch has become a delicacy in China. The high foreign demand has allowed the price to skyrocket.
Diversification or bust

Notice wire lobster pots, wooden and wire conch pots, and gill net.
Welcome to the new age
New upweller ready to launch
Began growing oysters
Select farm raised oysters
A multi-use lobster pot. With no lobsters to catch, the pots became worthless. Other uses had to be found for the 3000 pots. Notice the red weed (gracilaria vermiculophyla) that has recently become a big problem. The weed is invasive flourishes in warm water and was brought over from Asia by tanker or clinging to far east oysters.
Scallop bag on top of lobster pot

Scallops in bags on the top of a lobster pot. Notice pvc pipe in middle of bag to keep it open and allow room for scallops to move around.
Converted lobster trap to scallop cage

Trying to think of other ways to use lobster pots other than catching lobsters. Lined the lobster trap with small mesh plastic material to hold oysters and scallops.
Scallops and oysters in bags stacked 3 tiers high. Restricted water flow due to fouling can be a problem. Lower densities of animals per bag create faster growth but take up a lot of room. Scallops are very tolerant to warm water and have found them to die in the colder water.
Two year old scallop that was lucky to have survived the winter. I have had difficulty wintering scallops over in 10’ to 15’. This year I tried cages in deeper water 25’ to 35’. Scallops are much more difficult to grow than oysters.
Coldest Water Temp Ever

Last year LIS recorded the coldest water temperatures ever recorded and for the longest duration. The water temp remained at 29 degrees F for 12 days under 30 degrees F for 45 days. Ice was a big issue for fisherman.
Ice around oyster cages

Oysters temperature and ice. In general small (one inch) oysters survived temperatures of 7 degrees out of the water for an amazing 4 hours while inside bags or cages. As the temperature drops the bags/cages develop a thin layer of ice that becomes thicker until the cage becomes encased in ice and eventually a solid block of ice. This insulates the oysters from the sever cold. Oysters survived in solid blocks of ice in the bags for 40 days. Even bigger oyster stuck to pilings that were out of the water for over 6 hours at 7 to 12 degrees were still alive! Oysters are very tolerant to the wild weather fluctuations that we are experiencing today.
Wild oysters
Wild oyster after hurricane

Storms can cause destruction to both farm raised oyster cages as well wild beds. The storms have been less frequent but more violent. Energy gets built up in the water and is released like a coiled spring. The oysters have been slitted over after the hurricane.
Deploying kelp seed on long lines
Kelp Hanging off Long Lines
Another seaweed gracilaria

Notice the good color and no marine growth. This seaweed flourishes in the warm summer month.
Old gracilaria long line

Gracilaria long line after 3 month attached to long line. When the water becomes too warm there is unhealthy growth and marine fouling.
With the warmer waters menhaden and sharks began showing up in the nets. This summer an 8 foot tiger shark with 4 inch teeth startled an even seasoned deck hand. Also large gator blue fish, sea trout and cod fish. Following this migration of fish was the largest seal population ever seen in LIS. Seals are so smart that they never get stuck in the nets.
The future is uncertain

Due to the climate change the lobster may never flourish again in Long Island Sound therefore it is necessary to pursue other viable options. Sea Farming, conching, fin fishing will be our ticket to future success.
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SCIENCE AND SOLUTIONS FOR A RESILIENT OCEAN

Dr. Fern Gibbons
Senate Commerce Committee
Resilient Fisheries