Integrating a Fisheries Ecosystem Perspective into the RI Food Strategy

Part II. Markets and Food Webs

Fishing in balance: why and how we should leverage our markets to support a better match between the variety of species in our local ocean and the fish our fishermen are landing

By Eating with the Ecosystem

Rhode Island is home to a bounty of wild-caught seafood that provides a healthy food source for its citizens and supports many commercial fisheries and related businesses. Seafood has always been an important part of Rhode Island food culture and our economy. Traditionally, fisheries have been driven by market demand: fishermen preferentially target the fish that consumers are willing to pay the most for, while practically leaving other less popular species alone.

This market-driven selective harvesting has caused unintended consequences within our ecosystem structure. Selective harvesting can toy with marine food webs, leading to ecosystem turmoil and unpredictable fisheries. That's why Eating with the Ecosystem is advocating for flipping this arrangement around. Instead of markets determining ecosystem structure, we think that ecosystem structure should drive our markets.

A parallel consensus is emerging in the policy arena. Traditionally, our fisheries have been managed through a single-species regulatory approach that doesn't take into account the interconnectedness of the species in the sea. But increasingly, scientists and fishery managers are calling for a new approach to managing fisheries, called ecosystem-based fishery management (EBFM).

EBFM is an all-inclusive way to manage fisheries that realizes that species do not exist in isolation from each other or their environment and therefore considers ecosystem factors such as species interactions, environmental changes, and habitat quality. As fisheries management moves toward EBFM, it is important that our markets also follow suit. By harvesting the widest variety of species possible from our ecosystems and harvesting them in proportion to their natural production, we can minimize our human impacts on overexploited populations and our ecosystems while maintaining the natural balance of our marine food webs.

The perils of overly selective harvesting

Overly selective harvesting can have impacts on the structure and function of marine ecosystems. For example, harvesting more of certain species and less of others can cause ecosystems to skew in favor of those species that are less desired by the market - or to undergo unexpected transformations altogether.

Trophic, or food web, relationships are the ties that bind an ecosystem together and give it its overall structure: phytoplankton convert the sun's energy to plant biomass; zooplankton convert the energy embodied in phytoplankton into their own energy; a wide array of shellfish and forage fish compete to prey upon zooplankton, and an equally array of invertebrate and fish predators in turn compete prey on them – not to mention the mammals and seabirds that are also part of the ecosystem (but not part of the food system). When target and non-target species are removed from the ecosystem in volumes that are out of proportion to their relative abundances in the ecosystem, it means that their role as predator and prey are either accentuated or downplayed. In other words, the flow of energy through the system changes. To put it simply, four mechanisms can occur:

- Selective removal of a target species can create conditions for its prey to thrive
- Selective removal of a target species can create conditions for its competitors to thrive
- Selective rejection of a non-target species can give it an edge over its competitors
- Selective rejection of a non-target species can cause it to overtake its predators

Selective removal and/or rejection can happen either as a result of market incentives or as a result of management regulations (or both).

An emergent property of highly selective fisheries systems is that they are given to more rapid change and shifts of state. For example, highly selective fishing of codfish and flounder on Georges Bank in the 1970s and 1980s triggered a "regime shift" to an ecosystem now dominated by dogfish and skates.[1] In other parts of the world, where fish are harvested less selectively, research suggests that ecosystems tend to retain greater stability in the face of fishing pressure.[2]

The promise of dynamic balance

[1] Fogarty, MJ and SA Murawski. 1998. Large-scale disturbance and the structure of marine ecosystems: fisheries impacts on Georges Bank. *Ecological Applications* 8(1): S6-S22.
[2] Hall, SJ. 1999. *The Effects of Fishing on Marine Ecosystems and Communities.* Oxford: Blackwell Science.

Because of the negative effects of highly selective fishing, some scientists are calling for a shift to "balanced harvest".[3] These scientists compare this concept to the modern progressive taxation system, in which citizen is taxed in proportion to his/her income and worth. Likewise, in balanced harvest fisheries, each fish species or stock[4] is harvested in proportion to its productivity. More productive species/stocks sustain higher fishing mortality rates than less productive ones, and food web processes like predation and competition remain unaltered.

It is important to note that this balance must not be static. Inherently dynamic in nature, ecosystems are now more variable than ever before due to climate change. Keying our harvest patterns to our ecosystems by striving for balance can be a climate-adaptive approach to sustainability, as long as we remember to constantly revisit and redefine what the harvesting side of the balance equation looks like. Moreover, enabling our marine ecosystems to evolve to new temperature states without sacrificing their integrity or the ecosystem services they provide to humans (such as seafood), means minimizing the additional stressors that we place on them. By broadening our harvest patterns and correcting asymmetries between the relative output of local marine species and their relative uptake by our markets, we can help make our ecosystems and fisheries more resilient and adaptable.

A balanced seafood market

Fishermen cannot harvest in balance with our ecosystems unless our regulatory and marketing systems support these practices. This is where Rhode Island food policy and consumers can play a role. By eating and promoting a local seafood diet that consists of the full suite of species available to us and that matches ecosystem production, and promoting policies that facilitate this, we can help protect our local seafood for generations to come.

Benefits Include:

- **Adapting to environmental changes over time.** With our changing climate and warming oceans, the species composition of our marine ecosystems is changing. However, by changing our diets as the ecosystem changes, we can minimize the amount of additional stress we put on our ecosystem. Additionally, we can help fishermen and businesses adapt to these changes as well. They can catch and make a profit from the species available to them

[3] Zhou, S, ADM Smith, AE Punt, AJ Richardson, M Gibbs, EA Fulton, S Pascoe, C Bulman, P Bayliss, K Sainsbury. 2010. Ecosystem-based fisheries management requires a change to the selective fishing philosophy. *Proceedings of the National Academy of Sciences* 107(21): 9485-9489.

[4] A fish stock is a semi-discreet population unit of a species, defined by its genetic, geographic, and reproductive coherence.

and not have to worry about providing consumers with a species that no longer exists or exists in small numbers in their local waters.

- **Enabling fishermen to catch more fish while still minimizing the impact on less prevalent species.** By providing a market for species that traditionally have not been in high demand, we can allow fishermen to profit from a wider variety of species but also have less of an impact on species that have been heavily fished or have declining populations due to environmental changes.

- **Reducing our carbon footprint**. By eating locally landed species, our food will travel shorter distances before reaching out plate and uses less greenhouse gases in the process. Fishermen also might not have to travel as far or spend as much time trying to catch species of traditionally high demand if they can catch and sell species readily available to them. This reduces their fuel consumption and costs.

- **Less bycatch.** By eating and therefore adding value to species that were traditionally thrown back because of their perceived low value, we can reduce waste in our fisheries.

- **Supports local fishermen and businesses.** In today's selective seafood market, fishermen face a daily struggle of trying to catch exactly what the market desires. When less profitable fish are in higher supply or when more profitable fish are in lower supply, the profitability of local fishing operations – and their contribution to our local economy – suffer as a result. Balancing local market demand to our ecosystem supply reduces this tension and boosts profits for our local fishing economy.

- **Consumers will have more access to local seafood.** By increasing market demand for a wide variety of locally caught species, more markets will be motivated to sell these species. If more markets are selling local species, more consumers will have access to them.

What Rhode Island is doing now

Rhode Island currently has efforts from various organizations around the state to promote local underutilized fish. These efforts are a great starting point for a balanced approach to harvest, even if they are focused on single-species marketing. Some of these efforts are:

The Commercial Fisheries Research Foundation's new markets for scup project[5]. The project goal is to facilitate the market development of scup (*Stenotomus chrysops*), a locally underutilized species in New England. This project will compile baseline marketing information to determine new domestic and foreign market opportunities and evaluate marketing approaches.

[5] http://www.cfrfoundation.org/scup-marketing/

RI Seafood Marketing Collaborative- The RISMC's Research Subcommittee identified a need to increase the use of "underutilized" species was identified in 2012. This interest carries on an earlier commitment by the erstwhile Rhode Island Seafood Council, which helped pave the way for marketing local species like squid. The RISMC identified various avenues to market underutilized species, such as tastings in markets, restaurant events, cookbooks, and investigation of the potential of local "ethnic" markets. [6] Various groups are following up on these ideas in their own work and using the RISMC as a space to share information and foster collaboration.

Eating with the Ecosystem's School of Fish workshops, community dinners, and restaurant series- These workshops and dinners introduce consumers to underutilized species they may not be familiar with. Chefs demonstrate how to cook with these prevalent local species and scientists and fishermen discuss the importance of eating a diverse and ecosystem-aligned seafood diet. Eating with the Ecosystem's School of Fish workshops at Hope & Main target a particular barrier to a more balanced seafood market: most people's lack of familiarity with cooking with whole fish, which is typically the only form in which many underappreciated fish are available.

NAMA Seafood Throwdowns (in partnership with Healthcare without Harm, End O Main Lobster, Eating with the Ecosystem, African Alliance, etc.)- These outdoor events, typically taking place at farmers markets, are friendly competitions between chefs charged with preparing the best dish using a local whole seafood species and seasonal farmers market ingredients to introduce consumers to underutilized seafood and increase the demand for these species.

In neighboring MA, the Cape Cod Fisheries Alliance dogfish project- The Cape Cod Fisheries Alliance is trying to rebrand dogfish as the new and more sustainable alternative to the area's namesake, cod. By calling dogfish "cape shark" and partnering with local chefs they have been trying to expand the market demand for cape shark.

These efforts to promote underutilized species are a great start towards sustaining our New England seafood. However, an ecosystem approach to marketing is all of this and more. Think "Underutilized Fish 2.0." These efforts promote eating more of one or two specific species that are currently abundant, however we are proposing that we bring value to all of our local species by viewing them through an ecosystem-marketing lens and adapting our preferences to match our ecosystems production in real time. By taking care of our ecosystems that produce our food and providing an adaptable market for all of our local seafood, we will help strengthen our economies and create balanced, resilient ecosystems.

Building the science behind an ecosystem approach to marketing

[6] Rhode Island Seafood Marketing Collaborative. Report to the General Assembly, April 2012.

Eating with the Ecosystem is currently working in partnership with researchers Dr. Jeremy Collie and Dr. Hirotsugu Uchida at the University of Rhode Island to gain a better understanding of the matches and mismatches that exist between our New England marine ecosystems and our seafood markets that our fisheries supply. The project is called *The Other "EBFM": Designing Ecosystem-Based Fisheries Marketing Strategies to Complement Ecosystem-Based Fisheries Management.*

Phase I (January-April 2017): Ecological and bio-economic analyses will enable us to compare the relative proportion of each species' ecosystem production ("ecosystem share") with its proportion of landings ("market share"). Key informant interviews with people up and down the seafood supply chain will help us understand why mismatches exist, and what actions are needed to resolve them.

Phase II (May-October 2017): A citizen science project will engage 50+ New England consumers in an attempt to match their seafood diets to ecosystem production (i.e., eat at truly representative array of local species) for six months. A mobile website will record and share participants' experiences, providing key clues about how our region can achieve a closer symmetry between ecosystems and markets.

Phase III (November 2017-August 2018): Outreach and dissemination. Our findings will support creation of an ecosystem-market symmetry toolkit that seafood businesses throughout New England can employ. Through networking, conferences, reports, and public education, we will help make the notion of ecosystem-market symmetry a foundational principle for seafood marketing and food advocacy throughout the region, and a model for other regions. We will also publish a cookbook.

Recommendations

- **Reduce regulatory barriers that prevent landing a representative variety of species found in our local waters.** An example of this would be with the black sea bass fishery. Black sea bass is currently a plentiful species in Rhode Island waters. The fishery is managed collaboratively by the Atlantic States Marine Fisheries Commission and black sea bass quotas are allocated to each member state. Typically, allocations are based on historic catches, giving the southern states a larger quota and Rhode Island a fairly small quota. However, due to warmer water temperatures Rhode Island fishermen have been seeing more and more black sea bass every year but despite this, quota allocations have not changed to reflect the new distribution of fish. Anecdotal evidence suggests that highly abundant black sea bass in our local waters are preying heavily on local lobsters, highlighting a perfect example of the ecosystem effects of imbalanced fishing. However, balanced fishing is not possible until regulations catch up and allow Rhode Island fishermen to harvest more black sea bass.

- **Facilitate shorter supply chains and increase communication between fishermen and consumers.** By reducing the distance and the number of hands our seafood has to pass through before reaching consumers, we can increase communication between fishermen and the people buying their fish. Fishermen are often the first people to notice changes in species abundances or composition because they are out on the water everyday. By increasing communication between our fishermen and our consumers, our markets can quickly adapt to ecosystem changes as they happen. Shorter supply chains are also more nimble than long, global supply chains. Utilization of hand labor rather than mechanization means that processing houses can get a wider variety of species ready for market. In sum, local, short supply chains are key to supporting balanced harvest at the local level.

- **Provide incentives for middlemen (dealers, retailers, and restaurants) to begin purchasing and selling a more representative variety of seafood.** Right now, middlemen do not have the incentive to sell a representative variety of seafood because they don't believe consumers will buy it. And consumers who would like to help advance the goal of balanced harvest are unable to, because they are restricted to buying what's available on the market. Promotional programs that provide incentives to middlemen to start selling a representative variety of local seafood and educational programs that push consumers to buy it will be key to attaining greater symmetry between our ecosystems and our markets.

- **Support multi-species marketing**. Underutilized fish promotion programs like those listed above are an important first step to broadening our harvesting patterns. But moving forward, efforts such as these should be framed in the context of whole-ecosystem balance and flexibility. If not, there is a danger of entrenching popularity for a particular species – causing economic suffering when that species is no longer as abundant as it may be now. Rather than promoting particular species, the emphasis should be on promoting the notion of dynamic balance between our ecosystems and markets, and equipping businesses and customers to utilize a wide variety of different species.