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### **Learning to govern at many scales: lessons from Maine's fisheries**

Fisheries are one of Maine's icons. People tend to think of fisheries, especially the lobster fishery, as quaint, traditional, the very symbol of the independent fisherman facing off against a difficult and unruly nature. This is a comfortable romantic vision of the fishery. But there is another side to our fisheries; they're very complicated and fascinating and most of all they are a marvelous case study of the difficulties we have adapting human activities to the environment.

Let me explain these difficulties as best I can with a little story from the fishery for sea urchins. Not too long ago this was the second most important fishery in the state. It is no longer.

The history of the urchin fishery is short and sour. In the mid-eighties, after the depletion of the west coast urchin fishery, Japanese buyers began purchasing Maine urchins. (The exclusive market for urchins is for sushi.) At the time urchins were extraordinarily abundant along the coast. My colleague Bob Steneck refers to sea urchin barrens – there were large areas of the bottom where all you could see when diving was sea urchins.

Prices were high, urchins were easily harvested and we had a minor gold rush. Itinerant divers from all over the country showed up and had one hell of a party for several years. By the mid-nineties the fishery had peaked; today there is only a remnant fishery Downeast. This episode was a classic case of over-fishing played out in a very short period of time.

The memory that stands out most in my mind is a series of intense conversations with a couple of fishermen and one of the buyers for the Japanese, George Parr. These guys saw the end coming long before there was any official concern. They were all looking for some way to forestall that end. And they were all frustrated. It was the same story we've played out in most of our other fisheries; some people see the problem, most people don't or don't want to, or do and don't give a damn.

The problem isn't easy. Fisheries are always highly variable and sorting out natural variability from human impacts is very difficult. It is also extremely difficult to negotiate a reasonable set of fishing restraints, especially if you can't agree on the probable cause. We've lost the urchin fishery for all practical purposes. Time and time again we play out this tragedy of the commons. We do it in a different way in each fishery; it is rarely the case that we generate a sustainable social and biological regime.

My plan for the talk tonight is to look quickly at the history of three of our other fisheries – groundfish, lobster and herring – with an eye towards the common threads that contribute to this usually dismal result.

After these brief histories I want to turn to the major theme of the talk: Have we learned anything about sustaining our fisheries and ocean ecosystems? Is there anything we can do to avoid a continuing tragedy of the commons?

## Groundfish

Let me start with the groundfishery. The fish in the groundfishery are cod, haddock, flounders, monkfish and a variety of others. Most of these fish are found near or on the floor, or the 'ground,' of the ocean. Today there are basically two kinds of boats that work in the groundfishery: Draggers, or trawlers, that tow a large funnel shaped net along the bottom of the ocean and gillnetters, generally smaller boats, that place stationary nets also at the bottom of the water column.

The groundfishery has a very long history in the Maine – about 400 years. Richmond Island, Monhegan, Damariscove, Pemaquid – all these places were used as fishing stations just before or after the settlement at Plymouth. The history since then has many fascinating chapters, but what I'd like to emphasize tonight is the fairly recent history, what might be called the modern fishery. There are a number of important waypoints in this history.

The modern groundfishery in Maine begins in the 1920s and 30s with the introduction of the dragger fleet. We really had two separate fleets. One was the small boat in-shore fleet operating out of over a dozen harbors along the coast.

The other was the redfish fleet based in Rockland and Portland. The vertically integrated redfish fleet and its processing and marketing arms were the height of modernity at the time they were introduced in the early thirties. Redfish are a deep-water species that yields a fairly homogenous catch – few unwanted species. Redfish are well suited for freezing and were one of the first food products to take advantage of Birdseye's new freezing technology. Processing took place ashore and the frozen product was shipped largely to the mid-west where it first competed with and then replaced the supply of lake perch. Redfish are known in the mid-west as ocean perch. The redfish boats worked mostly in what are now Canadian waters. The fleet went out of existence in 1984 for reasons I'll make clear later.

The small dragger fleet worked the near shore waters of the coast. Near shore dragging came a little late to Maine mostly because it is very difficult to fish the rough bottom of the Maine coast without tearing up your nets. In the 30s and 40s, in fact, all the way up

to the 70s, dragging was restricted to a few well-known areas of relatively smooth bottom – good tows.

The difficulty of knowing safe places to tow restricted the early draggers to a small portion of the bottom. This was good for conservation in some ways and a disaster in others. It helped because it maintained a large part of the Gulf as an unintended sanctuary. It became problematic because of the way cod behave and the way draggers work. When cod spawn they do two things that make them great targets for draggers – they form dense aggregations and they move generally to smooth mud bottoms. This makes them very easy to catch even for boats with no electronics or sounding gear.

Ted Ames, a good friend and fisherman who lives in Stonington, has done an extensive and extraordinarily interesting set of interviews with many of the now retired fishermen who worked on these early draggers. From these interviews it appears the dragger fleet probably extinguished well over a dozen local spawning groups of cod and haddock along the coast. After 60 to 70 years these spawning groups have either not returned or if they have, are present only in very diminished numbers. Whether these stocks are present today or not, it is fairly clear that these early dragger activities strongly impacted the abundance of cod and haddock and also the basic structure of our coastal ecosystems.

Way point 2: In the mid-sixties huge year classes of cod and haddock showed up on Georges Bank and in the GOM. Shortly after, the Soviets, the Germans, even the Bulgarians - almost everyone imaginable - showed up on our doorsteps with a very large fleet of very large factory trawlers. Within five or six years the fisheries of New England had been decimated. Not only the groundfish, but also the herring. The ecosystem was badly distorted. In the following decades, the 70s and 80s, we saw huge blooms of sand lance and eventually the growth of very large populations of dogfish and skates – at one point the dogfish and skates were estimated to account for nearly three quarters of the fish biomass on Georges Bank and the GOM. Another significant perturbation of the ecosystem

Waypoint three: By the early 70s it became very clear to the U.S. and to almost all other coastal nations that we could not maintain our ocean resources without some sort of control over fishing. In 1976 and 1977 the world reached a tipping point and almost all the major coastal nations of the world rushed to extend their jurisdiction to 200 miles.

When the US extended its jurisdiction, Congress made a strong commitment to manage our living ocean resources so that they were sustainable.

At the time there was a very strong sense that it would be possible to manage our fisheries in a way that would sustain the stocks and simultaneously provide much greater economic value from the resource, what was called 'optimum yield.' A number of tax and other incentives were put in place to encourage the development of a modern fleet. These incentives along with the expectation of restored stocks worked well and quickly – too quickly and too well in retrospect. In a parallel development, the first step of the New England Fisheries Council – created to manage the new federal fisheries under extended jurisdiction was to impose quotas designed to rebuild the stocks that were still recovering from foreign fishing.

By 1981 it became clear that the quota approach completely lacked credibility in the industry and was unenforceable. The Council shifted gears and embarked on the 'interim plan' which was intended to give everyone time to rethink our approach to managing the fishery. Two problems were beginning to become apparent; the difficulty of controlling fishing effort and the need to consider the ecosystem effects of fishing. At approximately the same time there began to be a growing sense that the US fleet was more than adequate for the available resources.

Waypoint four occurred in 1984 when the World Court established the US/Canadian maritime boundary. The boundary delimitation gave the best fishing grounds to Canada, the Northeast Peak. The Hague Line, as it is called, crossed Georges Bank, passing to the south and west of areas where the New England fleet had traditionally worked. Canada quickly excluded US vessels from its territory. The US fleet, including what was left of the redfish fleet, was forced to retreat into a much more restricted area and as a result there was a large increase in the effort expended on US stocks. Populations that appeared

to have been holding steady and perhaps even increasing were quickly reversed direction. The downward trend has continued with occasional blips of abundance almost to the present.

Two years after the delimitation of the US/Canadian maritime boundary, the Portland Fish Exchange opened. That was waypoint five. For North America this was a radical new way to sell fish. Fish at the Exchange are displayed and sold in small lots through a competitive auction. It was the first time the fishing industry had had an open and transparent market. The Exchange drew boats from as far away as Delaware and became a model for similar (mostly unsuccessful) efforts in New York, Gloucester, San Francisco, New Bedford and Vancouver. Portland quickly moved from the third to the most important groundfish port in New England. Unfortunately groundfish stocks continued to decline and closures and other rules imposed by the New England Council have increasingly come to favor fishing out of Massachusetts.

Waypoints six and seven occurred at the beginning and the end of the 90s. They were precipitated by legal challenges initiated by the conservation community. These suits demanded that the Council take steps to fulfill the often renewed Congressional commitment to sustainable fisheries. The conservation groups won both suits. At the moment the fishery is in the midst of the deep uncertainties surrounding Amendment 13 – Amendment 13 is the Council's attempt to respond to the mandate of the court to fulfill the Congressional commitment to sustainable fisheries. The proposals before the Council today are not very appetizing. In my opinion they are mostly patches and quick fixes that may keep the fishery afloat for a while but do not address the fundamental problems perceived way back in 1981 – finding meaningful ways to restrain fishing and figuring out the ecosystem impacts of our activity.

Currently stocks are at a very low level; there appears to be growth in some of the important groundfish stocks. But the picture is mixed. Many people see the light at the end of the tunnel. I am much more pessimistic.

## Lobster

Let me turn now to the lobster fishery – a fishery with a very different profile. Today landings in the lobster fishery are at historical highs. Eighty to ninety years ago the fishery was in abysmal shape. In the twenties and thirties of the last century landings were 2 – 5 million pounds. After WWII and into the mid-eighties landings increased to a fairly stable 20 million pounds per year. Today they are in the neighborhood of 60 million pounds. There are several waypoints that are important in this history.

In the late thirties and continuing through the 60s and 70s the industry made an important social transition. In the early part of the period the population of lobstermen appeared to have had a heavy sprinkling of outlaws. There was an active short lobster trade and other indications of a studied disregard for any conservation laws. By the end of that period things had changed. Somewhere along the line there was a collective decision that conservation was important. There was a new ethic of conservation; the laws were enforced. The fishery recovered and landings increased.

I'm not sure how this came about but it expressed itself in the resolve of ordinary fishermen, buyers and coops. They were willing to confront the guys selling the short lobsters; they were willing to collaborate with the marine patrol. This made it possible to effectively enforce the rules. That ethic continues, and is perhaps even stronger today.

You have all probably heard stories of how fishermen often engage in local enforcement initiatives. Sometimes it is with a quick knife, but mostly it is much more subtle and graduated. However it occurs, it is critical to the functioning of the fishery.

Nevertheless, there is a dangerous balance here between vigilantism and the community and individual interest in conservation. The State – really the marine patrol – plays an important role in this balance. The patrol has to know when to collaborate with these local initiatives and when to restrain their vigilante tendencies. What is remarkable about the lobster fishery – what sets it off from most other fisheries – is how well this balance tends to work.

The next important waypoint for lobster was the sudden increase in landings and apparently population, beginning in the late 1980s. From an average 20 million pounds

the fishery moved up to 60 million pounds. Even the strongest proponents of the current management system, such as myself, will not claim that this surge in landings was the result of management. Management may have avoided the destruction of the fishery before the '80s but it has not been the reason for the current abundance.

It is much more likely that this change is due to significant human induced shifts in the structure of the ecosystem – in this case fortuitous and surprising shifts. But the fact is we don't know enough about the structure and dynamics of the GOM ecosystem to do anything other than guess at the source of our current good fortune. The other side of this good fortune is the unknown consequences of losing many of our other inshore fisheries – groundfish, urchins, and herring. Our current good fortune was a surprise. The next surprise may not be so pleasant.

The final waypoint for lobster was the establishment of the system of lobster zones in 1997. This is a dramatic experiment in the democratic, local governance of a natural resource. There are seven zones along the coast; each has a council elected by the fishermen in the zone. The zone councils can propose changes in rules that affect things local. A change in the rules requires a two-thirds approval by the fishermen in the zone and ratification by the State Commissioner of Marine Resources.

The idea behind the zones is both simple and complex. There are many aspects of the fishery, both biological and social, that are very different as you travel from Kittery to Eastport. Some are local in nature; some have a much broader scope. When the fishery was managed as a single state-wide fishery we could not take those local differences into account. For 25 or more years the legislature (and the Federal system) tried to deal with trap limits and limits on the number of fishermen. These are very difficult matters of culture and equity. For 25 years the legislature and the Feds failed to resolve these problems. What was acceptable in Casco Bay was an outrage in Jonesport, and vice versa. Interestingly, within a year of their start-up all seven zones had put in place trap limits but these were trap limits that they felt fit their local circumstances. Within three or four years the seven councils went to the legislature to ask for the right to control entry into the fishery. And, when given that ability, five of the seven promptly did just that.

The lesson is important: By learning to manage at multiple scales – local, state, regional and national – we can partition our conservation problem into more manageable components. We can fit ourselves into the environment in a way that is better for us and for the environment. Too often our fisheries and environmental policies have been top down, undemocratic and without a clue about local circumstances –either biological or social.

The next important way point for the lobster fishery has not yet happened. The big question facing everyone in the fishery is ‘how long will the current levels of extremely high abundance last?’ Southern New England has seen an epidemic of shell disease and landings have dropped by 30%. We haven’t seen significant instances of shell disease in Maine, but we know we’re working in a destabilized ecosystem; and it is probably true that the only reasonable expectation that we can draw from that is that we are going to be surprised. But how and when is not at all clear.

The practical problem is this: There are a lot of guys with large mortgages on new houses and boats and they can’t afford to stop fishing hard. Many of them have never seen a bad year and are not prepared in either their head or their pocketbook, if one should appear. The real test of the lobster zones will be their ability to react in an appropriate way if the next ecological surprise is not so nice. Or to put it a little differently, we will have to relearn the difficult lesson of the last century?

### **Herring**

The last fishery I want to quickly survey is herring. The herring fishery in Maine began in the mid-eighteen hundreds. For nearly 150 years the fishery supplied canneries and a large trade in salted and smoked fish. The trade in salted and smoked herring supplied the tavern trade and virtually disappeared with the advent prohibition. The canning part of the industry is still intact but much diminished. After WWII we had close to 50 canneries, today less than a handful.

Until the 1970s the industry caught mostly juvenile fish with weirs and stop seines – passive gear that cannot chase down the fish. (Weirs are shallow water traps made of stakes and nets that are used to herd the fish. Stop seines are nets used to close off a narrow cove.) In the 1970s a shift to purse seiners and mid-water trawlers began. These are boats and gear that search out schools of herring in open water and set encircling nets (in the case of purse seiners) or tow large funnel shaped nets (in the case of mid-water trawlers). The fishery now catches both juvenile and adult fish and has gained a new, major market, lobster bait, which replaced redfish frames after the loss of the redfish fishery. Today there are only a handful of weirs and stop seine operations remaining – almost all along the Cutler and Perry shores Downeast.

Also beginning in the 1970s we saw a significant shift in the spatial structure of herring populations. For a long time it has been known that herring have a complicated population structure. There are spawning groups on Georges Bank, along the Scotian shore and in the Bay of Fundy. Until the 1970 or 80s we had had, apparently, a host of localized spawning sites in the bays along the coast and maybe off shore from mid-coast to Downeast. We have gradually lost the bay spawning populations and have only a small residual left Downeast. Spawning apparently occurs on some of the off-shore ridges.

In spite of these depleted conditions inshore, landings and the estimated biomass of fish have remained in the same range as we have seen historically and on that basis alone one would judge the fishery to be in good shape. In fact, the National Marine Fisheries Service, which does a combined assessment of the Georges Bank and GOM stocks, is very explicit in their judgment that this is not an over-fished fishery. Nevertheless, there is a fairly strong presumption that says we have many stocks of herring, not one. Consequently, the loss of our inshore stocks in the last twenty or so years, is a disquieting reminder of what has happened to almost all our fisheries – significant changes in population structure and abundance either in response to major shifts in the ecosystem or to the effects of fishing.

## Problems of scale

Now let me turn to my main theme. What have we learned about sustainable fisheries in the last 25 years? Is there anything we can do to forestall the tragedy?

I want to emphasize a single, admittedly large, thread running through all these histories – problems of scale, as they affect

- scientific uncertainty and
- building the public (industry) resolve to take conservation action.

Let me summarize the problem of scale. Both people and fish adapt to their local circumstances; when we ignore these fundamental ecological and social facts we erect unnecessary scientific and social/political obstacles to the sustainability of our resources. The point is not that we should do everything at a local level; the point is that we need to operate at several scales, not simply at a large scale as we tend to do now.

Unfortunately when we think about ocean conservation at a large, a broad, scale almost exclusively. We do not pay much attention to finer scale biological and social phenomenon. When we think of cod, it is the cod in the GOM not the cod that spawn off the Sheepscot or in Machias Bay. The same is true of herring. In the lobster fishery we got hung up for years trying to manage with one-size-fits-all rules for the entire coast – Kittery to Cutler. In the urchin fishery we also completely ignored local aspects of the population and the fishermen.

This preoccupation with large scale events creates a conceptual black box about both the biological and social aspects of the fishery. We're not really sure why lobster are doing so well; we don't know why the cod have not come back to the old spawning areas along the coast, we don't know if we have impaired the population structure of herring, and even though we know there have been substantial shifts in the structure of the ecosystem we don't know the ecological mechanisms behind those shifts or ways that they might be repaired. The list could go on for a long time.

On the social side we are essentially oblivious to the finer scale organizational and incentive problems that immobilize the management process. Basically the problem is that when there is a heterogeneous biological and social environment one-size-fits-all rules create horrendous allocational and scientific problems.

The politics around these rules are nasty and inconclusive. All the political and private incentives are to do as little as possible. To do more would seriously disadvantage someone in the system without giving others appreciable advantage. The forced compromises that do emerge tend to favor, of course, the areas where the votes are – and that's not Maine.

I want to emphasize that I do not see evil intent in all this. It is a difficult problem and most of the people involved would like to find a reasonable solution. Solutions just have not been forthcoming.

Scale is a major reason for these problems, in case I haven't made my point clear. By emphasizing only the large scale we confound our science, we slow down our learning and we make our political process almost intractable.

To address these problems we have to decentralize our management institutions. We have to divide our problem up into manageable local and manageable regional pieces.

The ironic part of all this is that this country of all the countries in the world has been the first to apply these principals to almost everything we do. The federalist system of governance is multi-scale management. The US Senate does not decide when to plow the streets here in Portland. Neither does Augusta. Over the years we've learned how to fashion an uneasy but workable balance between local and larger scales. Our industrial empires pioneered the decentralized management of economic activity. The chairman of GM does not oversee the installation of alternators in each car. And Dick pointed out to me tonight that even our religious institutions are highly decentralized.

We simply have not learned these obvious lessons and applied them to fisheries. So the single point of the talk is this: we have to start decentralizing, running experiments like the lobster zones, finding ways to adapt our human activities to the ecology of the ocean. Technical solutions are important but social solutions are paramount.

*Professor James Wilson of the School of Marine Sciences at the University of Maine was educated at the University of Wisconsin and has been a respected and influential presence on the Maine fisheries scene for three decades. In 1975, with Robin Alden of Stonington, he initiated the annual Maine Fishermen's Forum, which each March brings the entire Maine fishing community together to learn from one another, to have fun, and to make some trouble for the politicians. A decade later, in 1986, his research in market economics led to the creation of the Portland Fish Exchange, which permanently changed the marketing of the Gulf of Maine's products and saved the Maine fishing community from marginalization. More recently, he helped initiate the current lobster zones within Maine, about which you will hear more later; as well as a comparable, larger-scale system for all of New England. For the past decade, and most importantly for Maine's future, he has conducted extensive research in fisheries management and the governance of complex, adaptive systems – for both the U.S. and the Swedish National Academies of Science, the University of Michigan, and others.*

*Professor Wilson's important research has focused on the question, "How do we build a social environment in which marine resources, especially fisheries, may be sustained?" And he has found that the answer is anything but simple; rather, it is likely to come only through an integration of the social and natural sciences, as well as a thorough understanding of the human environment – that is, of the real people involved in fishing. The strong implication of this work is that the problem of sustainability does not lie in a technical solution; rather, if an answer is to be found, it lies in governance – in how we govern our own behavior with regard to the resource.*