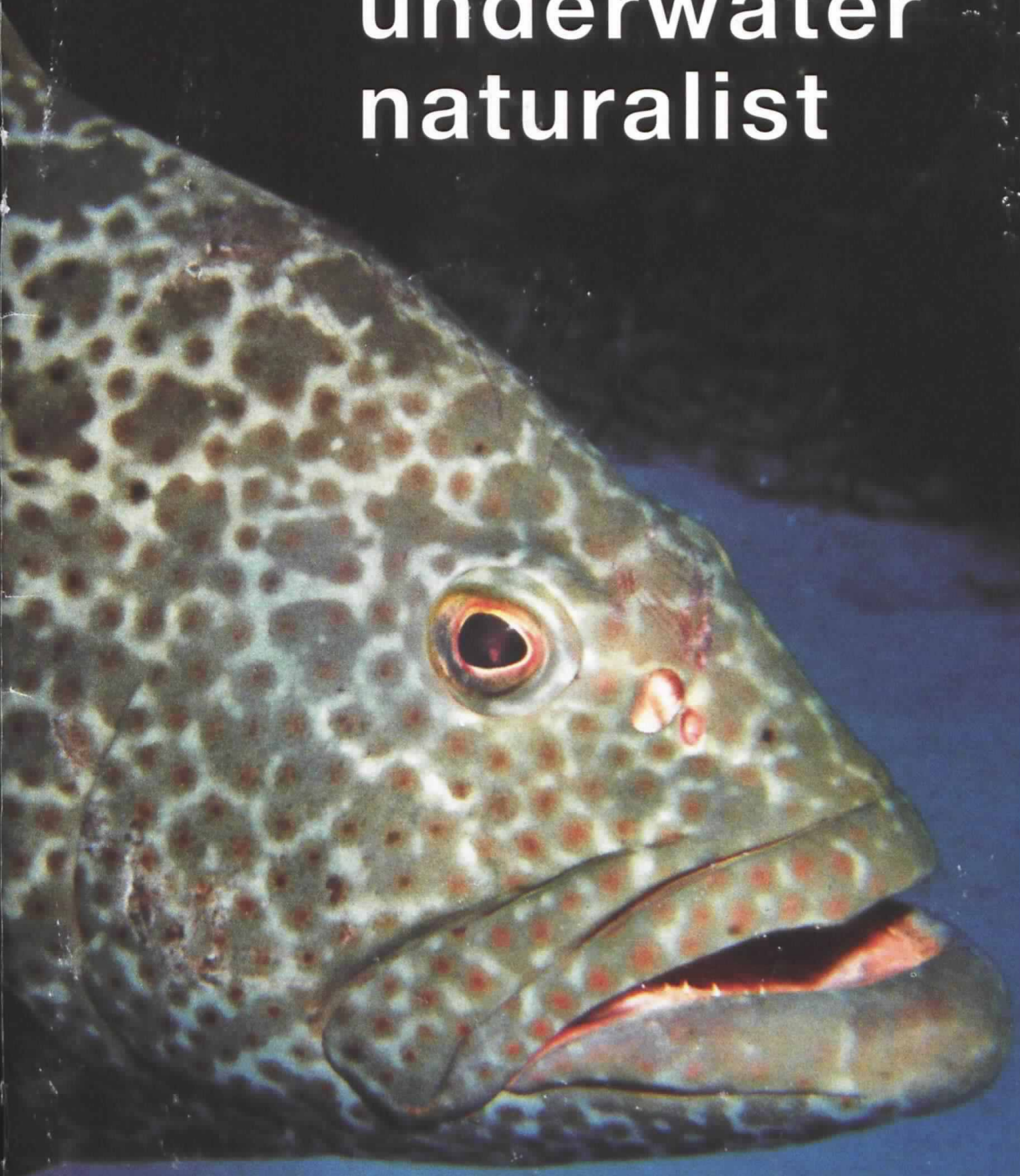


underwater naturalist



Vol. 27, No. 1

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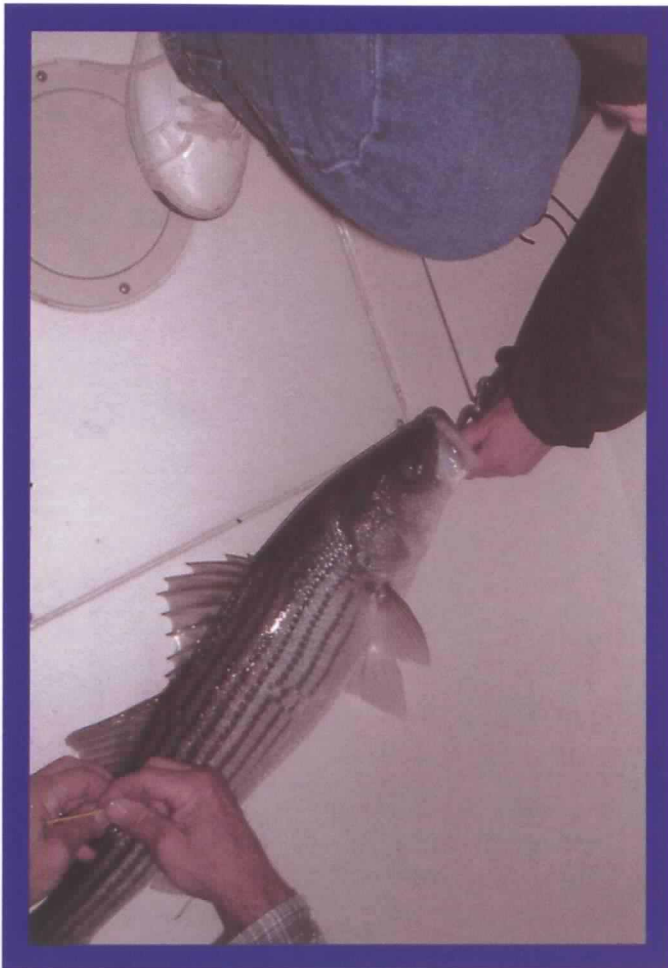
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Taggers in action. See pages 14 and 15-20.

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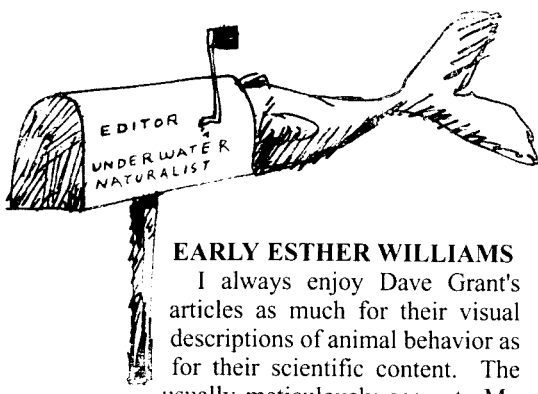
Cover Photo: Provided by Dave Grant. An unidentified fish of tropic seas. Grouper? Hind? Please tell us. For more groupers, see page 40.

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EARLY ESTHER WILLIAMS

I always enjoy Dave Grant's articles as much for their visual descriptions of animal behavior as for their scientific content. The usually meticulously accurate Mr. Grant, erred, however, in an analogy of the frogs and Esther Williams movies of the 1930s ("Disappearing Wetlands," Volume 26, Number 4). Williams didn't make her movie debut until 1942 in Andy Hardy's Double Life," directed by George B. Seitz. I'm not sure she would have liked her synchronized swimming compared to that of a frog. Perhaps Mr. Grant should check his references before waxing poetic.

Darlene Cummings
Berkeley, CA

GULLS VS. ANTS

I was glad to learn from Joseph Dutton's article ("Gulls in Action," Volume 26, Number 4) about gulls hawking insects. I have noticed this a few times in the fall here on Cape Cod and thought the gulls were either nuts, getting ready to fly south, or had found a new landfill. Now I know and will look forward to the same event this year. I can also impress friends with my new and accurate explanation.

Ron Smythe
Chatham, MA

SAVING TERRAPINS

Jim Merritt's "Diamond Turtle Rescue," reminds me of an episode from long ago. A friend of mine drove a Freihoffer Bread truck as a summer job in Cape May County, making deliveries to the shore towns along the barrier beach. Many times he stopped to pick terrapins off the road and hustle them on their wetland ways. This happened so often that he would often be late with his deliveries. His kind acts were rewarded -- he was fired.

Bill Wilkinson
Philadelphia, PA

COCKLES

The story about the Central American fishery for cockles was fascinating. That's an awful lot of work for the gatherers who get only six cents apiece. Cockles in deep mud -- another example of how rich and productive the coastal zone is and how difficult it is to wrest a living from it.

Celeste Bonin
Galveston, TX

A NOTE TO READERS: You can reach the authors of articles in Underwater Naturalist by email if you would like to learn more about their subjects. Their email addresses are listed with their biographies.

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A Salmon-Centric View of the 21st Century in the Western United States

By ROBERT T. LACKEY

While this article addresses an environmental issue from the salmon's point of view, its principles are universal. For your region you can substitute another marine animal – striped bass, oyster, flounder, shrimp, snook, blue crab – and the author's thesis holds.

Introduction

Members of the fisheries community have examined the current status of salmon, the causes of past declines, and the relative importance of various causal factors. In short, the how and the why of how we got to where we are today. Now it is time to move to the future.

What is the most likely future of salmon through this century? What factors must change if the long-term downward trajectory is to be reversed?

For sure, most of us secretly have a forecast about the long-term future of wild salmon, but we keep it to ourselves or perhaps share it with a few, close, discrete colleagues. Most of us are not willing to speculate publicly about wild salmon over the longer term. After all, how can anyone credibly speculate about what life will be like a century out? For



Lackey is a fisheries biologist with the U.S. Environmental Protection Agency in Corvallis, Oregon. He also is courtesy professor of fisheries science and adjunct professor of political science at Oregon State University. This article is adapted from a presentation at the World Summit on Salmon, Vancouver, British Columbia, Canada, June 10-13, 2003. The views presented are those of the author and do not necessarily represent those of any organization. lackey.robert@epa.gov

wild salmon, however, it is cast the long-term. Looking at patterns over a century or more does tend to dampen the confusion caused by year-to-year and decade-to-decade variations in ecological and social factors that often mask fundamental, underlying trends. It often takes 50 years or more to see the effect of human actions on salmon runs so the long term is much more realistic. In a sense, it is arguably easier to predict the status of salmon in 2100 than it is in 2010.

Whatever the intellectual or practical value, the big risk is that the forecaster will be highlighted a century from now in one of those Believe It or Not! cartoons about how naive people were in the old days. You know the kind of forecasts, like the one by the leading urban planner of 1900. He predicted that disposing of mountains of horse manure will be the great engineering challenge facing cities in the 20th century. It is easy to make fun of such a forecast now, but at the time it was based on a reasonable extrapolation of current knowledge.

To cut my risk, I am going to mostly limit my policy focus to the future of wild salmon in California, Oregon, Washington, and Idaho. I will slip occasionally into including southern British Columbia because many of the same forces that will drive the future status of wild salmon below the 49th parallel also

apply in southern British Columbia. You may well argue with my take on the rest of this century, but I do not want to be delusionally wishful, nor despondently fatalistic about it. So forget optimism; forget pessimism; here is my stab at realism.

Let me start with a simple statement of fact, one that, even in an audience of contrarian scientists, will likely engender little argument:

In spite of abundant uncertainty about the relative importance of the various factors that drove the decline of wild salmon in California, Oregon, Washington, and Idaho, we fundamentally recognize, we fundamentally know, the direct causes of the long-term decline.

The causes have been, and often still are:

- Intense commercial, recreational, and subsistence fishing and, especially these days, mixed stock fishing;
- Freshwater and estuarine habitat alteration due to urbanizing, farming, logging, and ranching;
- Dams built and operated for electricity generation, flood control, irrigation, and other purposes;
- Water withdrawals for agricultural, municipal, or commercial requirements;
- Stream and river channel alteration, diking, and riparian corridor modifications;
- Hatchery production to supplement diminished runs or produce salmon for the retail market;
- Predation by marine mammals, birds, and other fish species, often exacerbated by unintentionally concentrating salmon or their predators;
- Competition, especially competition with exotic fish species, many of which are better adapted to the highly altered aquatic environments we now have in these four states;
- Diseases and parasites;
- Reduction in the annual replenishment of nutrients from decomposing, spawned-out salmon; and
- Just to be safe, possibly others.

To no one's surprise, it is a long list. Moreover, it covers most of the entire human enterprise. In addition, we know that ocean and climatic conditions have a big influence on salmon abundance even if we do not understand exactly how they work.

But we know even more, even if many of us do not like to acknowledge it, we know much more about the decline of wild salmon. We know about the trajectory. Let me offer a second statement of fact:

As we move into a new century in California, Oregon, Washington, and Idaho, in spite of ups and downs, good years and bad years, favorable and unfavorable ocean conditions, even newspaper headlines proclaiming record runs, wild salmon have been on a 150-year downward trend and wild runs are now at very low levels.

Yes, newspapers regularly trumpet the fact that runs of both wild and hatchery fish in the Pacific Northwest are generally higher than the past several decades, not surprising because of shifting ocean and climatic conditions, but for assessments of the future, we need to focus on long-term trends and not get distracted by short-term variations in background conditions.

In these four states, wild salmon are well on their way to attaining a status enjoyed by some of their notable brethren—wolves, condors, grizzlies, bison—wild animals that are unlikely to disappear entirely, but struggle to hang on as remnants of once flourishing species in small portions of their original range.

OK. In a nutshell, these are my two scientific facts:

(1) We pretty much know the direct causes of the decline; and

(2) Wild salmon runs have been in a century and a half decline and are now at very low levels.

But how can it be that the direct causes of the decline are reasonably well known, have been studied in great detail, and the public appears to be supportive of altering the long-term downward trend, yet the

recovery prognosis is poor in these four states?

The answer is a simple policy statement of fact:

Effecting any change in the long-term downward trend for wild salmon is futile in the absence of shifts in the core drivers.

It is the core policy drivers, the root causes, that have determined the status of wild salmon and will continue to determine the status of wild salmon through this century. Habitat alteration, dams, water withdrawals, fishing, hatcheries, and many more, are simply the way in which the core policy drivers are expressed.

What are these elusive drivers of the future status of wild salmon in California, Oregon, Washington, and Idaho-these agents of decline that also must be the agents of any recovery? I will make my case that there are six core policy drivers. I will briefly discuss two that society really can't do much about, then continue with the other four which fall, at least potentially, within the public policy arena.

The first two are changes in climate and changes in ocean conditions, two core drivers over which society has minimal control. In a policy sense, these are largely givens, essential for assessing the relative importance of the direct causes of the decline, but pretty much beyond our control. To be sure, to the extent that human actions are affecting changes in ocean and climate patterns, we could conceivably do something about that, at least over the long-term. Reducing greenhouse gas emissions may have some effect on wild salmon by the end of this century, but climatic and ocean cycles are predominantly independent of human influences as the 500-year reconstructions

of salmon, sardine, and anchovy abundance clearly demonstrate.

The other four core drivers are ones society does control and could change. I will briefly elaborate on each of these other core policy drivers and defend why I think each must be at the crux of any serious effort to restore wild salmon in California, Oregon, Washington, and Idaho.

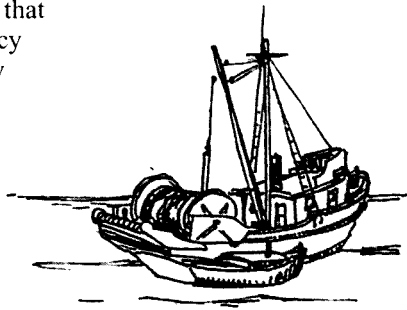
Core Driver #1: Rules of Commerce

The first core driver is an overarching one and, like everything else in salmon science and policy, difficult to rigorously quantify as to its influence on wild salmon. It is:

The rules of commerce, especially trends in international commerce and trade and reflected in increased market globalization, tend to work against increasing the numbers of wild salmon.

The drive for economic efficiency and low cost production is a widely professed approach to trade, both within nations and between nations. My purpose is not to argue for, or against, such a philosophy of commerce, but rather to note its impact on wild salmon.

My assumption is that economic efficiency, and the corollary of "free trade," will continue to be a dominant government policy through this century. One upshot of such an approach to commerce is that non-economic values, such as preserving remnant wild salmon runs, tend not to be weighted very heavily in decision-making. We obtain our computers from where they can be manufactured most cheaply. We move our automobile assembly plants to where they can produce cars most inexpensively. We tend to produce electricity in the most cost-effective



tive way. We obtain most of our wheat where it can be grown most productively and consistently. We obtain wood products where they can be grown and harvested most efficiently and sold at the lowest price, the current North American dispute over softwood trade notwithstanding. Even closer to home, we buy our salmon from Chile, Scotland, Norway, and British Columbia. Most consumers are not willing to pay a premium for wild fish, nor are they willing to limit their salmon consumption to only a few months of the year.

The benefits of public policies that favor economic efficiency are well recognized, but there also are consequences that, in my view, are not very favorable to wild salmon. How much more are people willing to pay for bread, for electricity, or for automobiles produced in ways that will help restore wild salmon? Do not hide behind the pabulum that bread, electricity, and automobiles can be produced just as cheaply in a salmon-friendly manner.

As with all policy choices, there are winners and there are losers and we should make that point clear to the public. We also can speculate, but as I observe consumer behavior today and guess about the future, I do not see much willingness on most people's part to pay much more for salmon-friendly products.

Core Driver #2: Increasing Scarcity of Key Natural Resources

The second core policy driver is reflected in many of the past, current, and likely future proximal causes of the decline of wild salmon. It is:

The demand for critical natural resources, especially for high quality water, will continue to be great (and increase) through this century.

Many rivers in California, Oregon, Washington, and Idaho suffer from severe water shortages, especially shortages of high quality water. Our seemingly insatiable demand for fresh water shows little sign of letting up nor do I expect it to do

so anytime soon. I am not arguing that allocating water for salmon is more, or less, important than allocating it for alternative uses, but, as competition for scarce water continues and gets much more intense, how will advocates for wild salmon fare relative to advocates for competing priorities:

- Water for drinking,
- Water for irrigation,
- Water for manufacturing,
- Water for generating electricity, or
- Water for any of a thousand other needs?

The on-going water war in the Klamath Basin, along the California/Oregon border, gives us an indication of the future: farmers defying law enforcement agents; illegally opening locked valves and releasing water to irrigate their fields; streams choked with dying salmon caused by low water flows and poor water quality; lawyers from various competing interest groups dueling in court over who will get how much water. At the end of the day, every faction in the battle being dissatisfied with the result and feeling their interest did not get a fair share of the water-and plotting ways to be more politically effective in next year's battle. It is not just water that is becoming increasingly scarce. We demand land-somewhere to build a second home, a place to build the next Disneyland, a mountain watershed to accommodate the next Whistler.

Life for an individual, as well as for society, is a series of trade-offs, of choices, of selections between appealing alternatives. As key natural resources become more scarce through this century, the individual and collective choices that permit long-term salmon abundance will become increasingly unacceptable to more and more people, at least that is the way I read society's collective current and likely future behavior.

Core Driver #3: Regional Human Population Levels

The third core driver that will determine

the status of wild salmon through this century is:

The number of humans in the region will continue to increase and their aggregate demands to support chosen life styles will constrain the abundance of wild salmon.

The most probable scenario for the human population trajectory through this century in this region, the most nearly certain scenario, is upward, substantially upward. As core drivers go, population growth is right up there at the top, but it is not popular to raise this issue these days. It has become a taboo subject in most circles. Environmental advocacy groups avoid it like the plague even though it dwarfs most of the human behaviors they are trying to modify. Wild salmon advocacy groups rarely even mention it, much less take policy positions.

Advocacy groups avoid raising it for some very good reasons. As one of my colleagues told me:

"Bob, you are absolutely right, most people already know it, and that's exactly why you should let it rest. Back off. You'll leave the proponents of wild salmon restoration depressed. Worse, you'll have the rest of the audience wondering why you are pontificating on the intuitively obvious. And you run the risk of being attacked as a racist, nativist, xenophobe, cultural imperialist, or, at the least, an economic elitist."

Undoubtedly, it is very good advice. However, if society wishes to do anything meaningful about moving wild salmon off their current trajectory, then something must be done about the unrelenting growth in the number of humans in the Pacific Northwest. I am not trying to argue that we collectively ought to necessarily

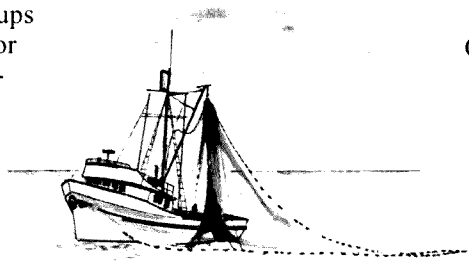
change any policy, but the simple and inescapable fact is that the human population level in this region that we can realistically anticipate through the rest of this century is a serious barrier, a showstopper, to achieving any significant long-term wild salmon recovery.

You may wish it otherwise, but that is the way it looks to me. Yes, the latest demographic forecasts show a flattening of the world population growth rate toward the end of this century and such may well be the case. For example, most countries in Western Europe have declining and aging human populations and the attendant economic and social consequences being the focus of policy debate. However, for the Pacific Northwest there is another story. It is largely one of immigration-continuing immigration to the Pacific Northwest from all directions.

Currently, Washington, Oregon, Idaho, and British Columbia are home to 15 million humans. Assuming a range of likely human reproductive rates, migration to the Pacific Northwest from elsewhere in Canada and the United States, and continuing immigration policy and patterns, by 2100 this region's

human population will not be its present 15 million, but rather will be somewhere between 50 and 100 million, a quadrupling or more, of the region's human population by the end of this century, less than 100 years from now.

Visualize 50 or 100 million people in this region, and their demands for housing, schools, tennis courts, football stadiums, expressways, planes, trains, automobiles, Starbucks, McDonalds, Wal-Marts, electricity, drinking water, pipelines, marinas, computers, DVDs, 12 screen movie theaters, ski resorts, golf courses,



weed-free lawns, big city hotels, and university conference centers.

Lets speculate about 2100 and the footprint of the human population for which we should plan.

Visualize Washington and southern British Columbia in 2100 with its metropolis of Seavan. You know Seavan, it mushroomed into a truly great city as smaller, discrete cities back in 2003 grew together. Seavan in 2100 stretches from Olympia in south Puget Sound northward through the once stand-alone cities of Tacoma and Seattle, and on to Vancouver, east to Hope, and west to cover the southern half of Vancouver Island. Rather than the 6 million people back in 2003, Seavan in 2100 rivals present-day Mexico City and Tokyo with its 24 million inhabitants.

Visualize Oregon and southern Washington in 2100 with Portgene, the other great metropolis in the Pacific Northwest. Portgene extends from its southern suburbs of what was once the stand-alone city of Eugene northward to Portland and across the Columbia River to Vancouver, Washington, and onward to sprawling suburbs to the east, west, and north. Remember back in 2003, of what was to eventually grow into Portgene, its population then was a mere 3 million. In 2100, it is a whopping 12 million.

You do not have to visualize California. We already have similar metropolises there today.

Regardless of whether my assessment turns out to be right or wrong, population issues are not easy ones to raise, much less discuss without resort to policy advocacy. There are understandable, strategic reasons why the big environmental groups, most groups in fact, stay clear of population issues these days. But the current and expected population level in this region is at the core of any credible analysis of potential recovery strategies, or at least those strategies that are offered as serious attempts to actually recover wild salmon.

Core Driver #4: Individual and Collective Preferences

Let me offer a fourth and final core policy driver-one that is very closely tied to the prior three:

Individual and collective preferences directly determine the future of wild salmon, and substantial and pervasive changes must take place in these preferences if the current long-term, downward trend in wild salmon abundance is to be reversed.

This core driver is perhaps the most obvious and arguably the most important. Among most folks like us, it is easy to assume that salmon are near the top of the public's priorities. Just look at the polling results. Everyone supports salmon and especially wild salmon! But, the fact is that salmon recovery is only one of many priorities that society professes to rank high. It is difficult for me to conceive of this, but that is the situation out there. Even my kids who I've had three decades to inculcate, regularly admonish me:

"Dad, get a life. Most people out here in the real world just do not care that much about restoring wild salmon. They have other things to worry about!"

Society's collective behavior, its actions, not public opinion polls, not thick recovery plans, people's individual and collective behavior, gives us the best indication. Let me offer a recent example for California, Oregon, Washington, and Idaho.

Remember what happened in this region in 1991. The first salmon "distinct population segment" was listed under terms of the U.S. Endangered Species Act. With this listing of salmon as a protected species, the policy debate shifted in these four states, it shifted away from restoring salmon runs in order to support fishing, to protecting wild salmon runs from extinction, two very different policy objectives. In 1991, protecting at-risk runs of wild salmon won out over providing fishing opportunities through supplemental stocking or other efforts to put fish on the hook,

or fish in the net. The residents of the western United States apparently made a choice. Did they?

Jump ahead 10 years to 2001. Just a decade after the first salmon listing, a severe drought, combined with ongoing electrical blackouts, provoked the Bonneville Power Administration to declare a power emergency, abandon previously agreed upon interagency salmon restoration commitments, and generate electricity flat out using water reserved to help salmon migrate. In one of the most striking recent barometers of competing societal priorities, air conditioners and electricity won out over both wild and hatchery-bred salmon, and with scant public opposition. No street protests. No legal challenges. No elected officials publicly pleading for salmon. No environmental group blanketing the Internet with calls to mobilize fax machines in defense of salmon. Near complete silence.

Over the past 150 years, we have made plenty of these kinds of choices, contradictory, opposing, apparently inconsistent, and these choices roughly reflect our collective and relative priority for wild salmon. These choices are tradeoffs, and we continue to make them, and these choices are a real measure of the relative importance of salmon to society.

I am not cheerleading for wild salmon, electricity, property rights, hatcheries, dredging shipping channels, or for having a McDonalds, Tim Horton's, and Starbucks on every corner. It is naive to consider salmon recovery as anything but one element, one often minor element, in a constellation of competing, often mutually exclusive wants, needs, and preferences.



Conclusion

You have now seen my take on the 21st century from a salmon-centric perspective, a perspective driven by assessing four core drivers that largely will determine the future of wild salmon in this region.

The core policy drivers are:

- (1) The economic rules of the game, especially the international and domestic drive for economic efficiency through market globalization;
- (2) The increasing scarcity and competition for key natural resources, especially for high quality water;
- (3) The rapidly increasing numbers of humans in the region and meeting their basic needs; and
- (4) Individual and collective life style choices and priorities.

For those of you who have a policy predilection to restore wild salmon, I am sure that it is not a cheerful message.

For those of you who rank restoring wild salmon as just one of many societal priorities, my forecast also may not be all that uplifting because we will probably continue to spend billions of dollars in a restoration effort that likely will be only marginally successful over the long-term.

I recognize that by making a few different assumptions about the future, my salmon forecast would be different, but in making the assumptions I did, I struggled to avoid succumbing to unfounded pessimism, or to baseless optimism.

Nor should we fall into the trap of equating the well being of wild salmon with overall environmental health from a human perspective. Good water quality is much easier to maintain than large runs of wild salmon. Just because runs of wild salmon in California, Oregon,

Washington, and Idaho almost assuredly will be reduced even more in 2100, it does not inevitably follow that we will have worse water quality.

I will end with a prediction and also offer a challenge to wild salmon advocates, but also an opportunity:

Any policy or plan targeted to restore wild salmon runs must at least implicitly respond to these four core drivers or that plan will fail. It will be added to an already long list of prior, noble, earnest and failed restoration attempts.

Look down the road to the end of this century, to 2100:

- Less than 10 decades away;
- Only a few dozen generations of salmon beyond today's runs;
- Just 2 or 3 Pacific Decadal

Oscillations from now;

- To a time when this region's human population will not be its present 15 million, but rather will be somewhere between 50 and 100 million;

Even given all this, there are still salmon recovery options that are likely to be ecologically viable and probably socially acceptable, but the range of options continues to narrow. For professional fisheries experts, for fisheries scientists, technocrats, analysts, and managers, for those of us who are involved with salmon issues in California, Oregon, Washington, and Idaho, it is a time for neither crippling pessimism, nor for delusional optimism; rather it is a time for uncompromising ecological realism and forthright policy analysis.

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Look for Earth Share of New Jersey in your employer's charitable payroll deduction program. If it's not there, check its website at www.earthsharenj.org or call us at 732-291-0055.

If you reside in another region, please go to the website to see how you can help get the Society listed.

The Anastasia Formation: Florida's Fortress Wall

By SILVIO CRESPO, JR.

What has kept Florida from washing into the sea? A question often asked, especially after the series of hurricanes that occurred in 2004.

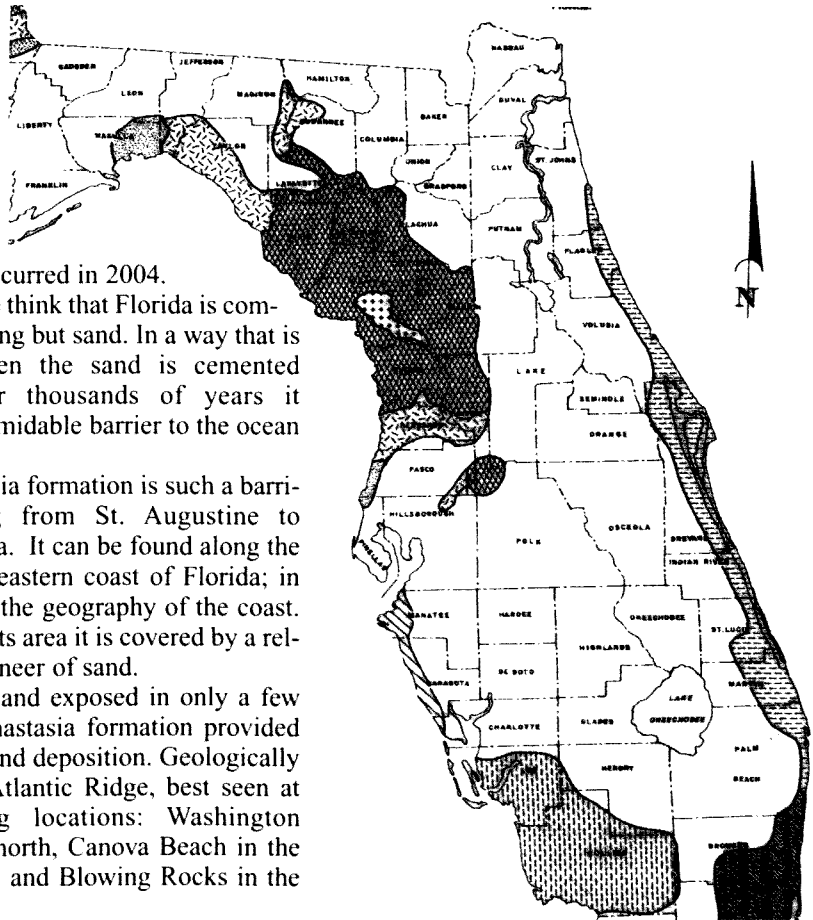
Most people think that Florida is composed of nothing but sand. In a way that is true, but when the sand is cemented together over thousands of years it becomes a formidable barrier to the ocean and weather.

The Anastasia formation is such a barrier, extending from St. Augustine to Jupiter, Florida. It can be found along the length of the eastern coast of Florida; in fact it defines the geography of the coast. Over most of its area it is covered by a relatively thin veneer of sand.

Underlying and exposed in only a few places, the Anastasia formation provided the base for sand deposition. Geologically it forms the Atlantic Ridge, best seen at the following locations: Washington Rocks in the north, Canova Beach in the central region, and Blowing Rocks in the south.

Locally it is known as Coquina Rock, so named for the small coquina clams that are cemented into it. The formation itself is relatively narrow, from 1 to 10 miles wide, east to west, with about one third of the formation starting at the tide line, and plunging down as part of Florida's conti-

Crespo taught earth science in New Jersey and retired to Florida's east coast. His most recent piece in this magazine dealt with fossil ghost crabs. He took the photos. crespol@msn.com



The Anastasia Formation is the gray strip down Florida's east coast.

ental shelf. In some places it is referred to as an onshore, near shore reef, hosting a wide variety of marine plants, animals, and fish.

Historically it has been the dreams of treasure hunters. At Sebastian it may be the reason for the lost treasure fleet of 1715 as it tore open the keels of the Spanish ships that were blown near shore during the 1715 hurricane. To date after storms treasure can be found within the



The formation at Canova Beach. The base is a host for sea plants, invertebrates, and juvenile fishes.

rocks of the Anastasia formation much to the delight of both casual and professional beachcombers.

In other places it was material for early stonemasons, and Spanish builders. The formation derives its name from the extensive quarries on Anastasia Island that provided the rock from which old St. Augustine is built. As early as 1570 the Spanish were using the rock in their buildings and fortifications. In fact the oldest, and largest European built structure in the United States is the Castillo de San Marco in St. Augustine. Today it is still a major tourist attraction in the oldest city in North America.

Coquina was used extensively as a building material until modern times, when it was replaced by Portland Cement. Because it is relatively soft, and coarse, the newer building materials are easier and better to work with. Today it is used as road base and for landscaping.

What does the rock look like? It has so many appearances, that at first one would think that looking at various samples of the rock they are not related. These specimens can be found on the beaches of Florida's Atlantic coast, from small nodules to large slabs, all produced by wave action. Upon close examination the rock is much the same. First one sees shells or pieces of shells, grains of quartz, all cemented together with calcite. Some pieces have whole shells, coquina the smallest, and cockles and ark shells the

largest. These are the most common whole shells. Other layers are made of just shell hash, so broken it is difficult to identify the original material.

At different places and looking at different layers, the mixture of ingredients varies, thus producing the apparent confusion in rock type. Best seen between Satellite and Canova beaches, where the formation is exposed at low tide, this is also a great place to collect, and examine Coquina Rock. It is by taking a close look at the rock that one can see why it is so



Slabs of the formation, fossilized shells above, shell hash below.

important to the marine environment. Within its cavities and crenulations live marine worms of various species, bryozoan colonies, and invertebrates of all kinds.

The thickness of the formation varies from place to place. The current thinking is that in places it may be as much as 100 feet; in others it can be measured in inches.

It is a true sedimentary formation. When looked at from the side one sees layer after layer of rock. Some as thin as half an inch, others as much as two feet thick.

One has only to visit an Eastern Florida beach day after day to see how the formation came to be. Shells and sand are deposited on the beaches as tides wax and wane. No two tides leave the sediments the same. If one took a picture of each low tide, and stacked then one upon the other it would illustrate the fossilized Anastasia Formation today.

The oldest members of the formation date back to the early to mid-Pleistocene when the world was in the oscillations of the Ice Age. As transgressing seas deposited sand and shells on the beaches, new layers of sediment raised the land.

Regressing seas exposed the sediments; freshwater dissolved calcite and cemented the sediments into distinct horizons. Today calcite crystals up to three-eighths of an inch can be found in shells and in the exoskeletons of invertebrates. This mineralogy shows how the cementing process has taken place within the various layers

of the Anastasia Formation.

Today the unconsolidated sands and sediments that make up Florida's east coast beaches are Holocene Age and are the subject to the wiles of wind and wave.

Tens of millions of dollars have been spent renourishing the beaches with sand over the past decade. One good nor'easter let alone three hurricanes, (Charley, Frances, and Jeanne) that directly impacted Florida's east coast in 2004 have removed vast quantities of sand, leaving coastal communities to deal with the loss.

The Anastasia Formation also takes a pounding, but it takes a tremendous amount of wave energy to destroy, and move pieces of rock. In so doing the beaches are protected. Beach sand is removed only to the top level of the remaining layer of the formation.

One can only imagine what Florida's geography would look like if it did not have this geologic feature as its eastern barrier to the sea. The question is what will happen in the future as sea levels rise?

Further reading:

Castillo de San Marco. Manucy, A. and Arana, L. , Handbook #149, U.S. Department of the Interior Washington, D.C.

The Conservation and Preservation of Coquina ; A Symposium on Historic Building Material in the Coastal Southeast., 12/2000, Published by: Bureau of Historic Preservation Tallahassee, FL 32399



Canova Beach, the formation at dead low water.



Tagging Report

By PAM CARLSEN, *ALS Tagging Director*

In the ranks of the Littoral Society's tagging program are many charterboat captains, who care for the resource, as well as earn their living from the sea.

Captain Monty Hawkins onboard "Morningstar" from Ocean City, MD, holds a Maryland Department of Natural Resources "Scientific Collection Permit" which allows 15 anglers to tag and release tautog (blackfish) during the closed season. On 12/15/04, after limiting out on bluefish, the charter went "togging." According to Capt. Monty, "A lady aboard hadn't ever been toggin', but was catching on fast...super fast! She caught a 31", 22 lb. 8 oz. tautog, an easy state record... but it was the closed season on a permit, so the only option was to take many pictures, tag it and turn it loose."

In Vol. 26.4, we reported another tagging of a very large tautog. This 28", 18 lb. 11 oz. fish was caught by Rich Shapiro, a

Brooklyn Yacht Club member and tagged and released by A.L.S. member, Stuart Fries. History repeats itself, when in November of 2004, B.Y.C. member Max Dell'Orso caught a 28", 15 lb. 11oz. tautog. Once again, Stuart Fries tagged and released the fish, 11/25/04 in Ambrose Channel. This was one tough tautog; its right eye and side of face were missing.

Capt. Bill Russo, onboard "Orient Star II," Seaford, NY, wrote: "Had our limit on 6/12/04, fishing for fluke at Gardiners Is., when I caught a beauty, 25", 7 lbs. The charter just stared, kind of in shock and then broke out in applause when we tagged and released it...kind of cool." In

May of 2004, Capt. Bill tagged 11 fluke from 15 1/2" to 23 1/2".

In April 2004, Capt. Monty fishing in sight of Assateague, VA, caught cod. This surprising catch produced one 26" fish with a Canadian tag from the Biostation at St. Andrews, New Brunswick. This fish had been tagged in the Bay of Fundy.

Cooperation between tagging agencies is very important. On 5/15/04, a jaw tag from a northern pike was returned to us by a fisherman who knew about our tagging program. I forwarded the tag and his letter to the NYDEC. We received a letter of thanks and information regarding the tag.

This fish was tagged to study the long term population decline of pike in the St. Lawrence River. The fish was tagged 4/13/02 in Goose Bay and was recaptured in the same bay two years later. "It was evident that Mr. Chaparro's fish did not move any appreciable distance in two years. A

recent genetic study found that there are actually discrete, unique populations of pike along the St. Lawrence. Should a recovery plan be instituted in the future, this information will become extremely valuable." So, if you find a tag you can't figure out, contact us and we'll do our best to solve the mystery. In the case of the pike, Chapparo learned about his fish and the value in returning a tag.

Capt. Al Anderson, onboard "Prowler", Snug Harbor, RI, has tagged and released fish with us since 1970. The article that follows concerns his winter tagging of stripers in the Thames River, CT.



Mate Steve Smyth, angler Pam Little, Capt. Monty Hawkins.

Tag Recapture of Thames River Over-Winter Stripers

by CAPT. AL ANDERSON

Several years ago I learned the Thames River in Norwich, CT, hosted tremendous numbers of over-wintering striped bass. This raised a slew of questions, to which I could find no answers. Recognizing a unique situation, I embarked on a project of tagging these fish in the hopes of learning more about their biology. Since then I've confirmed some of what we know, as well as creating questions only others will be able to answer.

Over a period of seven years, beginning in 1997, 111 trips were made to the Thames to catch, tag and release over-wintering striped bass from November through April. During this period 6,569 stripers, mostly juveniles, were tagged for the American Littoral Society (ALS). The bulk of the fish were caught in the river channel north of the Pequot Bridge to the basin area at Chelsea Landing below downtown Norwich.

Unseasonably warm weather in the Fall of 2001 allowed increased effort to nearly double the numbers marked that season. In 2002, charter trips to the river nearly tripled, undoubtedly due to increased awareness by the angling public. When asked if I've ever recaptured one of these 6,569 fish, the answer is no! This hasn't happened yet, but many have been recaptured in the Thames and elsewhere by other anglers.

Thames River

Three major Connecticut rivers carry freshwater into Long Island Sound. The *Captain Anderson runs a charter fishing boat out of Snug Harbor, RI. He concentrates on striped bass but also goes offshore for tuna, cod, and other prey. He took the photographs. ahatuna@aol.com*

largest, the Connecticut, with a drainage basin of 11,200 sq. miles, is followed by the Housatonic River (1,930 sq. miles), and the Thames (1,400 sq. miles). Both the Shetucket and Yantic Rivers feed the Thames River (formerly called the Pequot), which collectively drain 510 sq. miles. Only the Thames River reportedly hosts significant numbers of over-wintering striped bass, and there is no evidence of a striper spawning population there.

Over-Wintering

It appears that 30 or 40 thousand or more striped bass have congregated here each winter in recent times. In 1999 Bob Sampson, Jr. and I used an underwater video camera to survey an area in the basin at Chelsea Landing. In it was a school of fish 250 yds. long by 15 yds. wide by 10 yds. deep. Sampson calculated that approximately 30,000 fish made up this school, which he profiled in a story for a N.E. Edition of The FISHERMAN magazine.

Furthermore, my research uncovered a Boston newspaper article reporting that following a warm, wet Southeaster that broke up river ice, 20,000 stripers were haul-seined at Chelsea Landing over several days in February, 1729. Tremendous numbers of fish undoubtedly over-wintered here long before colonial times.

Several features may facilitate over-wintering here, including water depths approaching 48 ft., significant daily tidal flushing (2.7' rise), proximity (14 miles) to the deeper waters of Long Island Sound, flow of freshwater from the Shetucket and Yantic Rivers, and high late-season forage abundance (vertebrate and invertebrate) due to connection with several large tidal coves and creeks.



Ned Kittredge in his just-launched skill in downtown Norwich, CT, on a cold January morning. Next stop: striped bass.

Catch, Tag & Release

Fishing occurred by means of rod and reel from several outboard powered boats trailered to various river launching ramps. Tackle was either conventional, spin or fly rod. Single hook lures such as bucktail and plastic tail jigs, small tubes and flies were used to minimize tissue damage or injury, as initial attempts ('97) using multi-hook plugs were found to be highly unsatisfactory.

The bulk of the fish were caught along river channel edges with conventional tackle trolling mini-umbrella frames sporting several single hook lures on relatively short lines, which resulted in short fight times. Fish boated were placed on a tagging board and eyes quickly covered with a wet towel to minimize any stress due to thrashing. "Lock-on" loop tags were placed in the back between the anterior and posterior dorsal fins.

Time out of water for unhooking, tagging, measuring, and releasing was kept to a minimum. Weights were not taken, but estimated from a published striped bass length to weight chart.

Seasonal surface water temperatures ranged from the low 50's F to low 30's F. Upper river areas demonstrated a constant seaward flow of fresh water over a deeper wedge of tidal salt water, in which most fish were located. Trip catch, tag and

release averaged 59 stripers; however ideal conditions allowed for as many as 150 fish to be marked in a single trip.

Juvenile fish, less than age 3 (<11" TL) were occasionally caught, but were judged to be too small for tagging. If fish size was greater than 24" TL, a landing net was used. Fish less than 23" TL were simply lifted aboard by grasping the line.

Recapture Rates

Most ALS tagged stripers are recaptured within three years of tagging. Thus, near maximum possible returns have now occurred for fish marked in '97-'00. For these four years, 2,298 tags have yielded 133 returns, for a 5.8% recapture rate (Table 1), somewhat higher than the mean of 4.5% for ALS taggers.

By the end of 2003, 252 (3.8%) of the 6,621 ALS tagged bass had been reported recaptured. The potential to recapture any of these tagged fish is, of course, an ongoing situation. For example, a fish tagged in '01 may be recaptured in 2004, adding to the total number. Checking Table 1, there were slightly more recaps for fish tagged in '02, due to much larger numbers marked that year. Conversely, those T/R in 2003 have been out the least amount of time, hence less chance for recapture despite marking significant numbers. If our recapture rate of the first

three years of approx. 6% holds, we can expect many more returns for 2001, 2002, and 2003 tagged fish.

Recaptured fish in '97 averaged 16" (Total Length) at tagging, and ranged from 13" to 22". In '98, recaptured fish averaged 18" TL at tagging, and ranged from 13" to 29", and in '99 averaged 20" TL at tagging, ranging from 13" to 30". In 2,000, recaptured fish averaged 21" TL at tagging, ranging from 13" to 30". In 2001 fish averaged 17" TL at tagging, and ranged from 14" to 27". In 2002 fish averaged 17" TL at tagging, and ranged in size from 12" to 44". In 2003 fish averaged 19" TL at release and ranged in size from 12" to 38". (Table 2.) The progressive increase in size of fish marked in '97-'99 may have been due to several factors: return of a year class for several years, modification of fishing techniques, and chance recapture reporting of larger fish.

Unfortunately, failure to provide valuable recapture information by some fishermen prevents valid reporting on length and weight increases during at-liberty times.

Would it surprise you to learn 48 of the 98 recaptures (49%) for the years '97-'99 came from the Thames River itself? Of these, 11 were at liberty for over a year, suggesting some fish return several years in a row. At the present time, 85 fish (34%) of all Thames strippers tagged through 2003 have been recaptured therein, the majority between November and April.

Of the remaining 167 fish, 141 came from 21 other New England rivers (See Appendix), along with one each from the Hudson and East River, NY. Studies published in 1987 by Fabrizio estimated that Hudson River origin bass make up 90% of the Long Island Sound fishery.

Not all recaptures report the body of water involved. If an inland municipality was named, it was assumed the recapture occurred in a river flowing through it, i.e., Derby, CT, is on the Housatonic River. For that reason, several rivers named were

assumed to be the site of recapture though not actually mentioned in recapture reports.

Catch & Release Mortality

A striped bass hooking mortality study published by Diodoti and Richards (MA DMF) in 1996 concluded that angler experience, which was significantly correlated to handling time, was a major factor affecting survival of released fish. They reported that experienced anglers helped reduce fight times, substantially lowering the mortality of catch and release.

Our results reflect a minimal fight time due to small fish size and the use of short lines, single hook lures, followed by brief handling time, all complemented by seasonally low water temperatures that enhance survival rates. No doubt intense seasonal fishing pressure along the river significantly contributed to the elevated recapture rate as well.

Habitat Preference

Does it surprise you to learn the bulk of the recaptures came from New England rivers? Juvenile fish prefer these habitats, as estuarine environments offer tremendous feeding opportunities. However, as fish age and mature, habitat preferences change, which undoubtedly contributes to diminishing tag recaptures. Increased swimming strength creates improved foraging ability enabling them to make use of deeper and stronger current waters of bays and sounds. This habitat change reduces the chance of recapture by shore-based fishermen, who far outnumber those in boats.

Therefore, it seems reasonable to assume this may be the primary reason why most ALS tagged fish, which are school size (juveniles), are recaptured within 3 years of their tagging. Maturation leads to increased swimming ability which changes habitat preferences. Consequently, they become less susceptible to recapture by shore based anglers.

Time at Liberty

Time at liberty for '97 to '99 tagged fish ranged from as little as 4 days to 906 days. For fish tagged in '97, the average time at liberty was 327 days. However, the average time at liberty was only 217 days for fish tagged in '98, and 214 days for '99 fish. Several '97 tagged fish with near 3 year at-liberty periods contributed to this disparity. A total of 28 trips occurred during '97-'99, 12 during a winter-spring period and 16 during an autumn-winter period.

Although it appears a disproportion exists between the recapture percentage for '98 tagged fish as compared to '97 and '99, given the small sample number involved, 5 additional recaptures (<1%) for '98 would have increased the percentage to 6.5% for that year.

Hudson River Stocks

Various publications have reported that, based on tagging information, Hudson River-origin fish migrate annually in an easterly direction. Assuming the bulk of Thames over-winter fish have a Hudson origin, tag-recaptures from ME, NH MA, RI, and CT continue to confirm this behavior.

Recaptures have come from 22 other New England River systems including the Merrimack River, MA, and adjacent estuarine environs, which ranks as the primary recapture zone. I'm reminded this estu-

arine environment play a tremendously important role in the maturation of these stocks.

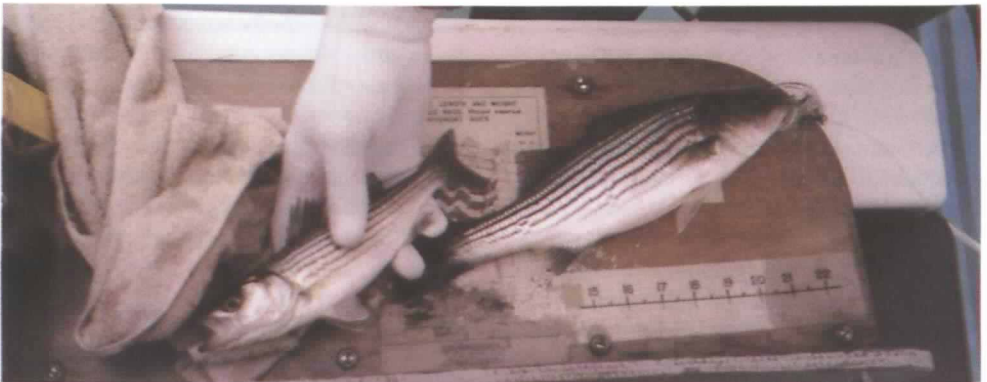
Also, to a lesser degree, other southern New England rivers, along with coastal ponds, are presently being utilized by over-wintering populations, possibly the result of competition in the Hudson (resources in the Hudson may no longer be able to support any more fish).

Stock Origin

Our recapture of tagged fish would help answer the question of whether Chesapeake or Delaware origin stocks utilize the Thames for over-wintering. During '97-'03, friends, clients, or myself recaptured a total of 22 tagged stripers from the Thames marked elsewhere. These fish bore either U.S. Fish & Wildlife Service (USFWS), American Littoral Society (ALS), or Hudson River Foundation (HRF) tags.

Two of the 6 USFWS stripers were marked south of the New York Bight area, one from Delaware Bay, the other from Newport News, VA. This suggests that few fish with a mid-Atlantic origin join those from the Hudson to winter-over in the Thames. In support of that premise, we have yet to recapture any other Thames stripers tagged in the Chesapeake or Delaware areas.

The other 4 juvenile stripers were tagged for the USFWS by either the New



Juvenile striper from the Thames River (in hand), too small for a Littoral Society tag.

York Department of Environmental Conservation (NYDEC) or the Connecticut Department of Environmental Protection (CTDEP) in either New York or Connecticut waters.

All ALS recaptured fish were initially tagged north and east of New Jersey, suggesting a Hudson-origin for these fish.

Schooling Fidelity

Our HRF tagged fish recaptures occurred in '00, '01 and '03, all initially tagged one or more years prior in the lower Hudson or New York Harbor. In December of 2001, three of the 7 HRF tagged stripers were recaptured on three consecutive trips to the Thames. All recaps occurred in same area, and all were initially marked within weeks of one another off lower Manhattan. Assuming these fish came from the same massive school in the Hudson, their recapture supports the establishment of schooling fidelity at a young age. At the present time HRF tag-recaptured fish outnumber those of other tagging agencies, further evidence suggesting most Thames overwintering fish have a Hudson origin. Few juvenile Hudson-origin fish are believed to migrate south to mid-Atlantic areas, with little evidence, if any, for their overwintering in that region of the seaboard.

Hudson River Foundation

The Hudson River Foundation began a Tag Recovery Program in 1984, and since that time more than 250,000 striped bass have been tagged. Tagging occurs chiefly between November and April, targeting age-1 to age-3 fish in the lower Hudson off Manhattan. Fish are caught with use of trawl nets by professional biologists, and internal anchor (belly) tags are attached prior to release. In the winter of '01, approximately 14,000 stripers were tagged. Annual recaptures from all tagging years range from about 700 to 1400, with recapture sites occurring from the Bay of Fundy to Cape Hatteras.

Juvenile fish make treks that boggle the

mind. In fact, school-size stripers may travel greater distances than adult fish. I was introduced to the marvels of striper movements decades ago ('68) when a small striper I tagged in the Annapolis Basin, Nova Scotia, was recaptured the following spring in the Choptank River, a tributary of Chesapeake Bay. I believe this was the first record of an internationally traveled tag-recaptured striped bass for the ALS.

Brokenstripedness

Contrary to angler opinion, the origin of a fish cannot be recognized by a visibly pronounced broken stripe pattern called "brokenstripedness". Although this morphological aberration occurs in both wild and hatchery reared fish, brokenstripedness is significantly more pronounced in hatchery reared fish. Millions of hatchery reared fish released into both the Hudson and Chesapeake tributaries demonstrate a high percentage of this morphological deformity. Studies suggest it is not genetically based, but relates to a hatchery environment.

Recapture data indicate that stripers are able to find their way back to favored areas two or more years running. For example, I've tagged bass at Block Island's North Rip and recaptured them in the same area a year or two later not once, but on seven different occasions. All 12 of my personal striper recaptures occurred in areas in which they were initially tagged weeks, months, or years prior.

After wintering in the Thames, the onset of sexual maturity may drive a striped bass to return to its birthplace in the Hudson to spawn. Both juvenile and adult bass winter-over in the Hudson; however some young fish may return to the Thames in the fall to spend another winter.

Stock Contingent

At the present time, evidence suggests the bulk of these O-W fish are Hudson River stock origin, and are a probable long term contingent. How does a one year old

striper know to search out the Thames for over-wintering? My guess is those fish are programmed to do so (it's in the DNA). This probably came about eons ago due to intense competition in the Hudson resulting from high stock abundance. Could it be those fish that wintered in the Thames ages ago, which provided a sanctuary due to its deep water, close proximity to L.I. Sound, a diurnal tidal saltwater wedge, and high forage abundance were so successful they passed the "instinct" on to future generations? My guess is yes.

Thames river over-wintering striped bass are doing what countless generations have done before them. No doubt the rich forage abundance of New England rivers centuries ago, coupled with a species biomass greater than could be supported in the Hudson, led to the development of this behavior. The Thames has long suited this behavior, serving now as a window back into history. I feel privileged every winter-time I visit it.

These fish are creatures of habit. They

are programmed that way because it has contributed to success of the species. However, we can't help but wonder about their future. In the meantime, there will be days spent tagging when air and water temperatures will have me questioning my sanity. The more we learn about striper behavior, the more questions arise, confirming much remains to be learned.

Rivers of Recapture

NEW YORK

East River, Hudson River

CONNECTICUT

Connecticut, Housatonic, Mystic, Niantic, Thames

RHODE ISLAND

Barrington, Pawcatuck, Pettaquamscutt, Providence,

MASSACHUSETTS

Annisquam, Bass, North, Seekonk, Westport, Weweantic

NEW HAMPSHIRE

Merrimack, Piscataqua

MAINE

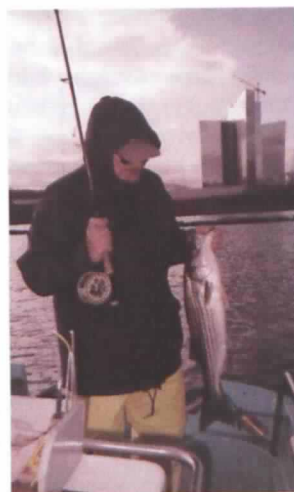
Saco, Mousam, Scarborough, Kennebeck, Penobscot

TL of Recaptured Fish at Tagging

| YEAR | AVER. LGTH | RANGE IN TL |
|------|------------|-------------|
| 1997 | 16" | 13" - 22" |
| 1998 | 18" | 13" - 29" |
| 1999 | 20" | 13" - 30" |
| 2000 | 21" | 13" - 30" |
| 2001 | 17" | 14" - 27" |
| 2002 | 17" | 12" - 44" |
| 2003 | 19" | 12" - 38" |

TAGGING ACTIVITY

| Year | Fish T&R | Number of Trip TRIPS | Catch AVER. | Number RECAPTURED | % |
|---------------|--------------|----------------------|-------------|-------------------|--------|
| 1997 | 377 | 9 | 42 | 26 | 6.9% |
| 1998 | 560 | 11 | 51 | 33 | 5.9% |
| 1999 | 582 | 8 | 73 | 43 | 7.2% |
| 2000 | 779 | 12 | 65 | 31 | 4.0% |
| 2001 | 1,340 | 22 | 61 | 45 | 3.0% |
| 2002 | 1,855 | 31 | 60 | 56 | 3.0% |
| 2003 | 1,076 | 18 | 66 | 18 | < 2.0% |
| Total: | 6,569 | 111 | 59 | 252 | |



Bill Kruger with a soon-to-be-tagged striper. In the background is the Mohegan Sun Casino on the Thames.

Dead Stuff in the Water

by STEVE SAUTNER

The image still haunts me. Midnight on a lonely stretch of beach along the bayside of Sandy Hook... My fishing partner and I wading the mouth of the Shrewsbury River, casting for striped bass. An autumn nor'easter howled like a wild animal, spitting rain down our slickers. Storm tides had pushed a slick of debris tight against the beach. We waded among floating mats of decaying phragmites, peppered with bits of Styrofoam and empty beer cans. Then we saw something bobbing in the tide. At first it looked like a log, or maybe the top of an old piling, but as waves and current swept it closer, it began to transform into something pale and fleshy. Finally, when it was practically at our feet, I switched on my headlamp. Two beady eyes stared back lifelessly. A low-slung mouth hung open, circled by thick ghastly lips. The severed head of an Atlantic sturgeon rolled at the water's edge. Whether it came from a commercial fisherman's net or straight from a shark's mouth didn't matter -- it gave us the creeps, that big dead thing. We backed out of the water. Time to go, we both agreed, time to go.

Things die. Bunker get chopped in half by bluefish; stripers chase rainfish onto dry sand, where gulls pick them off by the thousands. Shoals of spawned-out sock-eye salmon succumb in Alaskan rivers, with sleek Dolly Varden and arctic char scarfing down pieces of their decaying flesh. On trout streams, great mayfly hatches are thinly veiled showcases of death and carnage. Trout slash at hatching insects; dragonflies, swallows and bats gobble up those that make it off the stream. Finally the mayfly itself expires after it mates and lays its eggs, only to be

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sucked down by yet another trout once it lands on the water. Some anglers call these spectacles noble and poetic. Others hoot and cheer them on - between casts of course - like Romans watching slaves getting thrown to the lions.

But similar to the sturgeon's head making its unwanted appearance, sometimes stumbling upon the Grim Reaper's handiwork in nature lacks that certain poetic flair. Once while bushwhacking my way to a good shad fishing spot on the lower Delaware River, I almost ran headlong into a rotting deer carcass dangling from a tree - the by-product of the previous winter's floods. Every time I made a cast, I would glance back only to see those empty eyes, which now seemed to be staring at me. Near this same spot a year later, I flushed a flock of turkey vultures feasting on a bloated piglet that must have drowned before washing downriver from a farm. "Noble" was not a word that came to mind; repulsive and smelly, on the other hand, seemed to fit nicely.

A few summers ago I wet-waded a stretch of a suburban river fly-fishing for big carp. It started raining, and the river began to swell with runoff from the acres of parking lots and side streets that flush directly into its mildly polluted waters. As I watched the water turn the color of chocolate milk, something soft and hairy brushed my calf. With an uneasy feeling, I looked down, just in time to see a dead muskrat using my legs as a temporary log-jam. When I got home, I scrubbed from the waist down with the intensity of a heart surgeon.

Yet, compared to what happened to a friend of mine while trout fishing in upstate New York, I got off easy. He hiked to a small remote stream, and instead of packing a heavy water bottle, decided to bring one of those high-tech osmosis filters in case he got thirsty. He had just fin-

ished a long, cold, satisfying drink from the stream, before wading upriver to fish the next plunge pool. There he came face to face with the remains of an immense bloated deer slowly spinning round-and-round in a back eddy. I'm not sure what

happened next, but I don't think it involved trout fishing. Mr. Reaper may not always be the sensitive poet, but apparently he does like a good practical joke now and then.

ANNOUNCING A NEW GUIDE TO EFFECTIVE COASTAL CONSERVATION...

What's happening to:

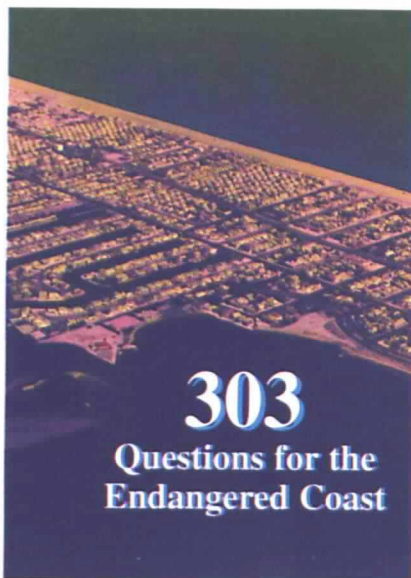
1. Coastal habitat?
2. Coastal open space?
3. Coastal fish?
4. Coastal birds?

We are losing all four. But the tide will turn if the right questions are asked of the right people at the right time.

The American Littoral Society's just-published "*303 Questions for the Endangered Coast*" is a guide for the coastal activist, elected official, planning board member, developer, engineer, regulators in general, and anyone interested in what makes coastal lands and waters valuable...and threatened.

Wetlands filling? Bad water quality? Limited beach access? Sprawling coastal overdevelopment? If these are your issues, "303 Questions..." will help you find the answers.

For a free copy write to American Littoral Society, Highlands, NJ 07732 or email pat@littoralsociety.org. Ask about bulk purchases.



Sturgeon Poaching and Black Market Caviar: A Case Study

by ANDREW COHEN



A white sturgeon from the Rogue River (Photo by Dan Erickson/Wildlife Conservation Society).

This is a story about a United States Federal prosecution of members of a poaching ring that sold caviar derived from illegally taken Columbia River white sturgeon, *Acipenser transmontanus*. Experts estimated that over 2000 adult sturgeon were killed in the process of illegally harvesting the more than 3000 pounds of caviar involved in the case. Case studies of illegal activities related to exploitation of natural resources are rare. These crimes are difficult to discover and prosecute, for secrecy is essential, and by the time the facts are publicly available, irreparable environmental damage may

have already been done. Sturgeons and paddle fishes have long life spans but take many years to reach reproductive maturity; they reproduce infrequently and rely upon large, often urban rivers for their spawning migrations.

These basic biological characteristics render these fishes especially susceptible to illegal exploitation, particularly when stocks have already been damaged by over fishing, dam construction or pollution (as has the Columbia River population of white sturgeon). Given the often-exorbitant prices for sturgeon and paddlefish caviar, and the relative ease of capturing these fishes during their spawning migrations, persons may be tempted to circumvent state and federal regulations designed to protect acipenseriforms. Additionally, those involved in the distribution and sale of caviar can be motivated to fraudulently

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mislabeled the product; for instance, in this case, white sturgeon caviar was marked as beluga caviar and sold at approximately five times the normal price of white sturgeon caviar. Despite the clear evidence of an environmental crime, the scale of the abuse, and the convictions, sentencing was light, a discouraging sign for those who hope to limit such destructive crimes in the future.

Between 1985 and 1990 poachers in the Pacific Northwest shipped more than 3000 lbs (>1352 kg) of high quality caviar made from the roe of white sturgeon, *Acipenser transmontanus*, to a caviar company in New Jersey. The poachers sent containers of caviar via the Federal Express shipping company, using a fictitious business name, and a variety of nonexistent return addresses. The president/owner of the caviar company paid the poachers, whom he had never met in person, by mailing packages of cash to various post office boxes in Washington. The owner of the company, a well-known fifth generation caviar merchant, had been profiled in both *Playboy* and *People* magazines, and was often quoted as an industry expert.

How was this poaching ring finally cracked? The story began with a bank robbery in the rural southern Washington State town of Dollars Corner, not far from the Columbia River, near Portland, Oregon.

During November 1990, a poacher and his confederate were producing high quality caviar in a cheap motel room in Vancouver, Washington. Much of the caviar came from sturgeon caught by the poachers, and some of it was made from roe illegally purchased from sport fishermen on the banks of the Columbia River. The poachers had paid the month's rent, approximately \$900, in cash, and then told the motel manager that they did not want any maid service. The manager thought that the request for privacy was unusual, and became suspicious.

About the time the poachers were

checking into the motel, a bank robbery occurred in nearby Dollars Corner, Washington. The bank robbers escaped with a package of cash that contained an exploding dye pack. The pack detonated, spewing red ink and staining both the cash and the thieves.

The day after the robbery another local bank received a cash deposit from the motel where the poachers had rented the room. This deposit included red dye stained money. The bank teller recognized the stains on the bills as stains from the dye pack and notified the FBI. The FBI went to the motel and asked the manager where she had obtained the cash. There were only two rooms paid for in cash, one of which belonged to the poachers. The manager then told the FBI about her suspicions. The FBI immediately began to conduct surveillance of the poacher's activities, suspecting that they were the bank robbers.

For the next few days the FBI agents hid in a nearby motel room and watched the suspected robbers through the window blinds. They looked like a pair of fishing buddies, with their ragged clothes and small boat trailed behind an old red pickup truck. At one point, the agents observed one of the poachers deposit a bag of trash in the motel dumpster. An agent casually took a look at the garbage, and found an empty salt box. Although the agent did not know it at the time, he had discovered an important piece of evidence; salt, of course, is a major ingredient in caviar.

The next day the fishermen left the motel room with two large boxes. They loaded the boxes into the back of the red pickup truck and drove to a Federal Express office in Portland, Oregon. The agents followed the truck as it crossed the state line, and watched the driver mail the boxes at the Federal Express office. The poachers then left, and the FBI agents soon lost the truck in traffic. The agents returned to the Federal Express office and spoke to a clerk who showed them the air

bills and the boxes. Both boxes were addressed to a caviar company in New Jersey. The Federal Express clerk told the agents that the man who shipped the boxes looked like a fisherman, and smelled like fish. The FBI agents thought that the case was looking less like a bank robbery with every new bit of information. Without a search warrant, they could not look inside the boxes, so after recording the information from the shipping labels, the boxes were loaded on a plane bound for New Jersey.

In the meantime, the motel manager was concerned about the poachers' unusual request for no room service and the FBI's interest in both the cash and the men. She took it upon herself to enter the room with a passkey. She had read that drug dealers sometime manufactured meth-amphetamines in motels, and suspected that perhaps that was occurring in her motel. To her surprise, she found no drug-manufacturing paraphernalia, but lots of fishing gear, an outboard engine, and buckets of brine. She later testified in court that the whole place smelled like fish.

The FBI agents soon realized that the suspects were not involved in the bank robbery. Nevertheless, their actions were strange for a couple of buddies who were on a fishing holiday. They contacted the Washington Department of Fisheries and the National Marine Fisheries Service, two agencies that specializes in resource related crimes. Thus began a two-year investigation of an organized poaching ring that spread from the Columbia River to New Jersey.

Evidence began to trickle in as a federal grand jury in Seattle issued more than 30 subpoenas for records from telephone companies, banks, the caviar company accountants, auditors and others. No stone was left unturned; after obtaining one of the poachers' one-gallon sized shipping containers, the agents contacted the plastic company that manufactured the jars to obtain a list of everyone who had ever pur-

chased that type of container in quantity. The caviar merchant provided a few documents after they were demanded by subpoena; however, he denied any contact with the poachers before 1990. Agents later learned that the records of over 50 earlier shipments had been destroyed. Fortunately, copies of the early records had been secreted away by a company employee and were discovered during the execution of a federal search warrant. When all of the evidence was compiled, the agents determined that at least 67 shipments had taken place. The poachers had been paid estimated \$247,176 tax-free dollars for 3200 pounds of American sturgeon caviar. The poaching ring had been active for over five years.

Seized records and court testimony indicated that when the caviar company repacked the illegally harvested product for resale, much of it was labeled as beluga or osetra caviar. Although the poachers' caviar was of high quality it was still merely American sturgeon caviar, which sells for about \$89 wholesale and about \$130 per pound retail. Imported beluga caviar can sell for as much as \$600 per pound. During trial in federal court, the president of the caviar company testified that he sold the American caviar as imported caviar to customers such as the Rainbow Room, the Waldorf Astoria and Pan American Airlines. He stated, in substance, that he would not sell the mislabeled caviar to those customers whom he thought would recognize the subtle differences in American, beluga and osetra caviar; however he thought that the mislabeled caviar was acceptable for some restaurants and other commercial or institutional customers. If all of the poachers' caviar was resold as beluga, then it was worth almost \$ 2 million

The caviar company's records indicated that the poachers were paid up to \$100 a pound for the illicit caviar. The poachers did not pay income tax on their profits from the unlawful sales. It is impossible to distinguish a male from a female sturgeon

in the field, without first killing the fish. Therefore, it must be assumed that the poachers probably killed as many adult male sturgeons as female in their search for the valuable eggs. Of course, only a fraction of adult female sturgeon will be ripe at any particular time, and those fish would also have to be killed and eviscerated to determine if they contained roe. Caviar experts estimated that during the process of transforming sturgeon roe into caviar, about forty percent of the original weight of the eggs is lost. The Washington Department of Fisheries estimated that to obtain 3220 pounds of finished caviar, approximately 2000 male, female, ripe, and unripe sturgeon were killed in a five-year period. Those figure represent a significant part of the sturgeon population in the lower Columbia River, where the poachers were operating.

After a two and a half week trial, a federal jury found the owner of the caviar company guilty of conspiracy to violate the Lacey Act. That statute prohibits the interstate transportation, purchase, sale or possession of fisheries products, like caviar, if the product was taken in violation of any state law. He was also found guilty of four misdemeanor counts of the Lacey Act itself, and one felony count of obstruction of justice. The obstruction charge stemmed from the destruction of documents that were under grand jury subpoena, and the lying to the grand jury to hide his involvement. He was sentenced to 18 months in federal prison, \$4175 in fines and penalties, three years probation, plus the costs of his imprisonment and probation.

The caviar company itself was charged as a separate defendant, and was also found guilty of criminal conspiracy and four misdemeanor counts of the Lacey Act. Fines and penalties (\$20,625) were assessed, along with three years' probation, although \$10,000 of the fine was suspended by the judge.

One of the poachers pleaded guilty to a conspiracy, four felony Lacey Act counts

and one felony income tax count. His plea-bargain arrangement included testimony against the other defendants at trial, in return for a lesser sentence. He was sentenced to eight months in federal prison and \$2675 in fines and penalties.

The resale of the American caviar mislabeled as imported beluga and osetra caviar was not charged in the indictment. Nevertheless, when the caviar company president took the witness stand, he testified that the mislabeling took place.

When a consumer pays several hundred dollars a pound for a product, there is a presumption that he or she is buying credibility. After all, "you get what you pay for." At the same time, most consumers cannot afford to eat top of the line caviar often enough to truly develop an educated palate, and rely on the caviar tin's label and the brand name to ensure quality. Had it not been an unrelated bank robbery, this cycle of wholesale commercial poaching and product mislabeling might still be going on.

The jury returned the guilty verdicts on 22 October 1993, exactly eight years to the day after the first known shipment between the poachers and the caviar company.

Convicted were: Hansen Caviar Co., Inc.; Arnold Hansen-Sturm, the president of Hansen Caviar Co., Inc.; and Stephen Gale Darnell, the lead poacher (the second poacher served as a witness for the prosecution). This case was documented by the commercial news media at the time of the indictments, trial and convictions, but this and other poaching cases are little known to the scientific community. In part, we think that this may stem from general unfamiliarity with (or unwillingness to recognize) the catastrophic biological impact that can be made by small numbers of environmental criminals. If we are to have any impact in reducing environmental crime, better awareness and swifter condemnation by biologists seem essential.



Finding Buried Lady Crabs

By J. C. A. BURCHSTED and FRED BURCHSTED

Many years ago we heard the great animal behaviorist Niko Tinbergen talk about how crabs hide by burying themselves in the sand and how the seaside crows find them. We visited our own favorite beach, Phillips Beach in Swampscott, Massachusetts, (the north end called Preston Beach in Marblehead) to find buried crabs.

We have watched a population of lady crabs, *Ovalipes ocellatus*, here. The field guides and most distributional studies give the range as Georgia to the southern shore of Cape Cod and out onto Georges Bank with an isolated population in the southern Gulf of St. Lawrence. This northern population, along with those of many molluscs, echinoderms and algae, is apparently a relict from the Hypsithermal era (9500-3000 years before present) when temperatures were up to 2.5 C. higher (at the Climatic Optimum, 7500 b.p.) than today, and these creatures had continuous ranges from the U.S. mid-Atlantic coast to the Gulf of St. Lawrence. Most populations in the Gulf of Maine and on the Nova Scotia coast have since gone extinct. (See E. L. Bousfield and M. L. H. Thomas' Postglacial changes in distribution of littoral marine invertebrates in the Canadian Atlantic region -- (Proceedings

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of the Nova Scotia Institute of Science, volume 27, supplement 3, (1975), pp. 47-60 for more information). There are scattered Gulf of Maine populations, either Hypsithermal relicts or recent range extensions, which are largely unnoticed in the literature. Stephen Berrick in his Crabs of Cape Cod (Cape Cod Museum of Natural History, Brewster, MA, 1986) says that he commonly finds lady crabs on Cape Cod Bay sand flats. Our population



Lady Crab

is apparently unique in the Gulf of Maine in occurring on an ocean beach.

We found our buried crabs. On flat parts of the beach just above low tide line, they are betrayed by slight bumps in the sand, best seen when the sun is low on an early morning or late afternoon low tide. The lady crabs are buried completely, unlike blue crabs which bury horizontally just under the surface with their antennae sticking out. The lady crabs are slanted under the sand with the front nearest the surface only about 6 mm. and the rear about 14 mm. beneath the surface.

Many crabs can briefly reverse their

normal respiratory current for cleaning purposes and take water into their branchial chambers near the mouth and expel it through openings at the bases of the legs. But lady crabs are capable of prolonged reversal of their respiratory currents. This keeps them from getting clogged when buried with their posteriors deep in the sand. When buried in shallow water you can see the two spots where the sand is roiled by the excurrent water. The relatively deep burial allowed by their reversed respiratory flow gives them a distinct advantage over blue crabs in avoiding predation by larger crabs (D. E. Barshaw and K. W. Able's Deep burial as

a refuge for lady crabs *Ovalipes ocellatus*: comparisons with blue crabs *Callinectes sapidus*. Marine Ecology Progress Series, v. 66 (1990), pp.75-79).

When we release them in shallow water, they bury themselves by digging with their last pereopods (walking legs) which are flattened for swimming as in blue crabs. It has been speculated that the flattened pereopod tips evolved originally for digging rather than swimming. Meanwhile they slam their bodies against the sand, stirring it up so that it settles back down on top of them.

We hope someday to see the fish crows find them.

GUIDELINES FOR SUBMISSION

UNDERWATER NATURALIST is the Society's journal. We encourage members to submit articles, pictures, observations, comments, compliments or criticisms. Please follow these guidelines.

SUBJECT MATTER: Feature articles run 1,500-3,500 words (4-10 double-spaced, typed pages); please refer to back issues for guidance. For **Field Notes and Coast Issues**, submit no more than three pages of direct observations of interesting natural history found while walking, diving, or fishing in a coastal area. Topics can be of current interest, such as red tide in the Carolinas, whale deaths in New England, or mangrove preservation in the south; you can also submit a number of short observations or notes regarding a particular area. **Letters to the Editor** expressing thoughts on the magazine and its contents or general food for thought are especially appreciated.

ART WORK: For illustrations, please include clear color slides or color prints with good contrast; drawings, maps and charts will also be considered. For Cover Photos, we need clear, sharp 35mm color slides or color

prints, either horizontal or vertical, of littoral subjects above or below the water. Horizontals can wrap around from front to back. Action is not necessary. (Note: Unless otherwise requested, we keep all accepted art work until it is published).

HOW TO SUBMIT: Double-spaced manuscripts, please. Include a disk with your manuscript. Use common, not Latin, species names. We do not carry footnotes; incorporate sources in your article. We edit for clarity using Strunk and White's Elements of Style as our guide and favor clear wording over specialized terminology. Send your work with a stamped, self-addressed envelope; we will acknowledge its receipt.

We do not pay for articles or illustrations, but we do send five authors' copies when published. Thank you for your interest. We look forward to receiving your submission.

Shark Coprolites of Central New Jersey

by GLENN HARBOUR and DONALD DORFMAN

A coprolite is fossilized feces from any animal with a backbone. Along with footprints and bite scars, it is considered a trace fossil.

Coprolites are found in north central New Jersey in two creeks (Big Brook, in Marlboro, and Ramanessen, in Holmdel) where the streams cut into the fossil beds of the upper cretaceous period (middle Maastrichtian), which is approximately 75-70 million years old.

Shark River (Neptune, NJ) coprolite specimens are from a more recent geological time period. They are found in the green sands of the Asbury Park Member (Kirkwood Formation), which is early Miocene period in age, or approximately, 26 million years old.

The North American continent was divided in half by a large body of water called the Cretaceous Interior Seaway 75 million years ago. Modern New Jersey was the northeastern terminus for this interior ocean. Parts of New Jersey were up to 300 feet underwater, whereas other sections were shallow enough to be considered estuarine type environments. The coast of this waterway was west of its present day location

The water in most locals was salty, and thus the species found are of the marine type. Marine reptiles and sharks were the most common predators present in this ecosystem, and their ancient remains are often found mixed into the cretaceous gravels of Central Jersey streams. Sharks' teeth (which are constantly replaced) are most often encountered. Shark coprolites

(which are the usual mineralized feces to be found, along with rarer crocodile coprolites) are much harder to find.

Although conditions for any excrement to fossilize are rare, sharks are helped by their unique anatomy and the fact that they swallowed large amounts of undigested bone and hard parts, which compacted the offal.

Cretaceous coprolites are of the pellet shaped type with one pellet appearing to be stacked on top of the next (Fig. 1). This is due to the species of shark, predominantly Lamniforms, whose intestinal tracts were shaped in such a manner as to produce a pellet shaped feces. This differs from Miocene sharks, mostly



Shark coprolite, pellet type, Cretaceous period, from Big Brook, NJ.

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Carchariforms, which have spiral shaped lower intestines. These produce scrolled coprolites (Fig 2). Five to seven stacked



Scrolled coprolites, Miocene epoch, from Shark River, NJ.

pellets is a common number to encounter in Cretaceous forms and an equal number of rolls are commonly found in the spiral types of the Miocene.

The best cretaceous shark coprolite samples are found in the Navesink marl. (The Navesink and Mt. Laurel are the best vertebrate fossil producing formations in central New Jersey.) The detail and preservation from marl (ancient compressed sea life) specimens are good to excellent. Coprolites exposed to minerals in the stream or ones that are reworked (re-deposited after fossilization) are a variety of colors. Those excavated from the marl are normally light to dark gray.

In the geologic past, the Shark river area was also a coastal environment and many ancient shark remains are found here. Shark coprolites are abundant in some of the fossil producing zones. Most of the mineralized feces are ill formed but may have been produced that way or flattened before being fossilized, since erosion would not be present in samples extracted from the sand matrices. Some examples from Shark River, however, are excellent scroll specimens.

Both Cretaceous and Miocene type



Coprolite broken to show luster.

shark coprolite specimens often display bone and, less often, small rocks. Pieces of bone, stones and other undigested organic materials in coprolites are called inclusions. Additionally, all coprolites possess luster when broken open (Fig. 3), due to the reflective quality of the mineralized organic matter mixed into the feces. Luster usually highlights the pellets or spirals and is a method for identifying materials collected in the field, which are thought to be coprolites.

The Arrival of Arbacia

BY Dave Grant

"Sometimes you see queer things...spiny sea urchins, for instance...in a slow motion parade. In the magic of the night the wooden soldiers have come to life, though it is a stiff, hardly perceptible life." (Marston Bates, The Forest and the Sea)

Sea urchins are an ancient and diverse group of invertebrates that, with the noteworthy exception of Sandy Hook Bay, have filled many niches in the world's oceans. There are about 800 species worldwide; interestingly, more than appear in their long fossil record. In many years of beachcombing in New Jersey, I can remember finding fragments of them only a few times, usually after inlets were dredged. That is until the winter of 2001. To my surprise, kids and colleagues began presenting me with sizable pieces of urchin tests collected on the ocean beaches. Some even had spines attached.

I assured the curious that living ones were not found locally and undoubtedly these were carried north from Shark River Inlet (the nearest place I've seen a few live specimens) by littoral drift. I speculated that dredging of the river; the beach renourishment projects and the covering of groins to our south were contributing to the increased abundance of these dried specimens at Sandy Hook. Also, because of the counter-clockwise circulation pattern in the bay, Sandy Hook is at the receiving end of runoff and anything unpleasant that washes out from the Hudson and Raritan rivers.

All appear to be the purple urchin, which is common around the rocky shores of Woods Hole on the warm side of Cape

Cod, but not in our area. Although it ranges from the Cape to the Caribbean, Kenneth Gosner describes its distribution as: "peculiar...uncommon in the southern part of the Virginian province" with "but one Chesapeake record. Nevertheless it occurs locally in the West Indies and Florida."

As more specimens were brought in, I was forced to modify my theory that the burying of the sand-stopping groins and the latest "solution" to the coastal erosion problems here -- notching of the landward sections of others to facilitate beach drift, were also facilitating the northward drift of this latest beach find. Coal spilled from a barge grounded in the 1960's in Spring Lake (south of Shark River) took less than a year to tumble north in the surf, 18-miles to Sandy Hook - so it's a reasonable hypothesis, right?

Almost daily, puzzled beachcombers began bringing fragments in and they were becoming impossible to ignore, but I stuck to my guns, making a mental note to look for live ones during summer snorkeling trips to the few remaining unburied groins south of Sandy Hook.

Well, to no one's surprise around here, I had been wrong all along. On April 27, (2001) we were trawling in 50-feet of water off the tip of Sandy Hook, an area of sandy bottom and strong currents --- not what I would consider prime urchin real estate. Remarkably, we brought up live urchins - dozens of them; ranging in width from one-to-two inches. I was forced to get serious about the situation and started surveying the real experts -- local fishermen and divers.

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In August, the captain of a commercial dive boat, who had earlier volunteered to collect some small rock specimens from an offshore work site for identification of their origins, left me a message to: "come down to the dock to pick up your rocks." Of course when I got there, to his amusement, I needed help dragging a boulder to my car. He'd retrieved it from a navigation hazard the fishermen call Ambrose Ridge, which was being removed by a dredge ("They're wrecking ALL of our fishing spots!").

Eureka! Among the patches of fouling growth of young mussels and bryozoans, I found a tiny urchin.

So here we have another Maritime mystery ...where have they been hiding all this time? There is little firm, mussel-covered hard bottom here (the urchin's preferred habitat). All I'm aware of are a few small uncharted wrecks (Known only to about a zillion serious bass fishermen crowding the narrow Sandy Hook channel -- most of them anchored over their secret spots;



Close up of urchin mouth parts.

many within casting distance of each other, and all of them forcing New York harbor pilots earn their keep.)

I also contacted Dr. Andy Draxler of the National Marine Fisheries Service who organizes a divers' survey, and with others who collect in the bay; and I doubt we all have over-looked these conspicuous creatures in the past. Is the purple urchin a new resident of the bay, or re-colonizing old haunts? It's difficult to tell, but the

urchin is certainly a welcome addition to our faunal assemblage at Sandy Hook.

When you begin to take a closer look at any sea creature, it is always remarkable what we know about them, but also, what needs to be learned. The purple urchin is known to scientists as *Arbacia punctulata*. The Latin dictionary informs me that *Arbacia* is from "cap" and *Arbaces* - the ancient king of Media. *Punctulate*, the diminutive of *puncture* refers to points and small spots (in this case associated with the urchin's spines). With little artistic license, the urchin, with its symmetrical array of erect spines that has attracted the attention of Mediterranean artists designing coins and emblems for centuries, looks like a king's crown. (Or I should say, the crown looks like an urchin!)

The urchins have also attracted my attention and appreciation over the years. When I kept saltwater aquaria, I used to dive at Shark River to collect these old friends because they are good indicators of water quality in the tanks. (Although some species exhibit a tolerance to low-level sewage pollution in the water, they cannot tolerate low oxygen levels.) If the urchins did not find the aquarium conditions suitable, their inch-long spines would droop quite noticeably. Perhaps this is a clue to their recent appearance in the area.

Years ago, when NOAA biologists at Sandy Hook were intensively studying sludge dumpsites off New Jersey, I recall one of them (Jack Pearce) speculating that the absence of live sand dollars some distance from the sites might be a clue that the biological effects of the sludge were not as localized as presumed. No doubt there are many factors to consider regarding the recent appearance of the sand dollar's cousin, but might changing water conditions be one of them?

Mark Twain reminds us that, when we look back on our lives, we won't regret the things we've done; we'll regret the things we haven't done. I regret not taking better notes every time I dipped a net in Sandy

Hook Bay over the years. Our resident echinoderm, the starfish, is definitely cyclical in its abundance here. So is its prey: mussels. I have never seen them as abundant as in the early 1980's when we would often bring in a trawl net full of them, and two years later, be hard-pressed to find even one.

Perhaps the urchins are riding an even longer wave than their starfish relatives and the populations fluctuate in a pattern we have yet to recognize. Of course, after all these years; it is also possible I've just been looking in the wrong place! Recent research on West Coast urchins indicates

specimens immediately would respond and release gametes for laboratory observations. The fertilized eggs are easy to keep and observe in their early developmental stage, and since the urchin is so common in those cool waters, it is a cheap source of laboratory material.

The green urchin is a favorite of mine for a few other reasons: ALS diver George Edwards claims it has the longest name of any common local invertebrate -- *Strongylocentrotus droehbachiensis* -- and I'll believe him and won't bother searching for a longer one until the day I can pronounce it three-times-fast. Their spines



Aquarium shot of Arabacia.

that some species may live well over a century; and if the data is correct, some individuals there were alive in 1805 when Lewis and Clark arrived in Oregon!

Generations of embryology students have cut their teeth on urchin eggs. In Maine, we used to anesthetize their northern relative, the green urchin, because

are a major constituent of the few beaches, like Sand Beach at Acadia National Park, to be found north of Portland, Maine. Also, over the years they have supported a number of fishermen who dive for them, and this is always a good thing.

Native Americans harvested urchins for thousands of years, but there was little

commercial exploitation until the 1970's. Before that they were considered a pest in California kelp beds and killed by the thousands. Between 1971 and 1981 the annual catch there climbed from a few hundred pounds to 25 million pounds, and peaked at 52 million pounds in 1988 when urchins became one of California's most valuable "fisheries." Urchins also have been harvested commercially by divers in Maine, Massachusetts and New Hampshire. (And of course for my aquarium in New Jersey.)

They are collected for the roe (Uni) and exported to the orient where they are cherished for their taste and reputation as (What else?) an aphrodisiac. To stimulate his artistic mind, it is said that Salvador Dali would eat urchins a la Catalane, in a chocolate sauce, before going to sleep. Both species are edible and once, in Maine, following the instructions of writer Paul G. Howes to "knock off the top of the shell" of a few, we scooped out the eggs and ate them raw. (Much to the consternation of our cook.)

I didn't find the snack especially tasty, nor did I feel particularly creative or frisky, but they are fascinating creatures nonetheless. Donald Zinn informs us that "before the time of Pliny" urchins were

used as an antidote for certain poisonous plants. Pliny also reported that in the Levant, fossil spines were licked to break up gall stones. In England, "Shepherd's Crowns" (Dome-shaped Cretaceous fossil urchins, reminiscent of a bishop's crown) guarded against lightning; and witches coveted the stones because the five-point design characteristic of most Echinoderms, represented a Pentagram.

Today, urchins continue to furnish us with food and decorations (including an ornamental cover for my bathroom night-light) and of course, captivate biologists and beachcombers.

For the curious:

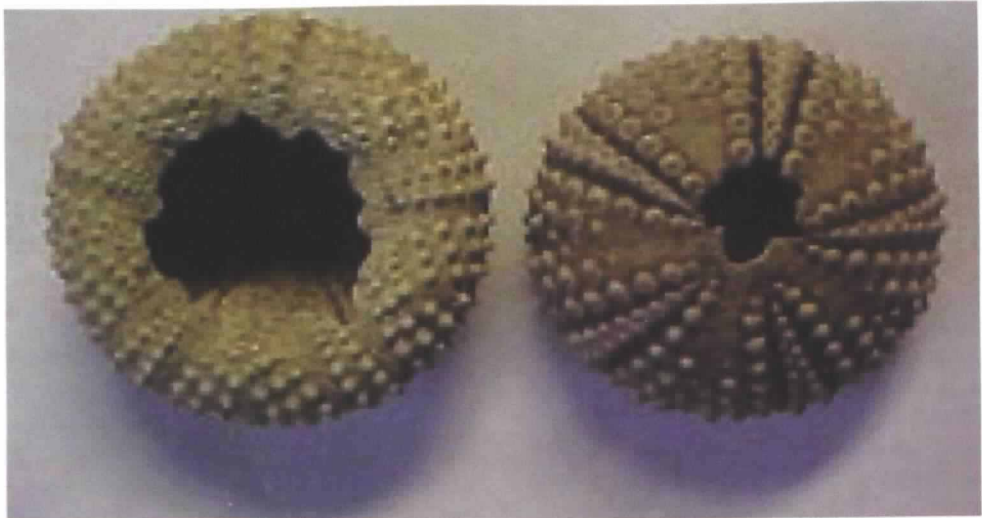
Collins, Henry H. Complete Field Guide to North American Wildlife

Gosner, Kenneth (Guide to the Identification of Marine and Estuarine Invertebrates

Grant, U.S., IV, and L.G. Hertlein (1938) The west American Cenozoic Echinoidea

Hill, Paul J. and Mavis. The Edible Sea Howes, Paul Griswold. Handbook for the Curious (1936)

Zinn, Donald J. Handbook for Beach Strollers



The test (shell) of an urchin without the spines.

MISSING THE BOAT

The United States Commission on Ocean Policy (USCOP), and its non-profit cousin the Pew Commission on the Oceans, represented an opportunity to comprehensively review the health and management of the nation's coastal and ocean resources for the first time in 30 years. Each had undertaken several years of research, public outreach across the nation and scientific and policy analysis across an enormously broad range of issues. The efforts grew from growing concern about a crisis in the health of the ocean and its resources, and recognition that status quo approaches to management were inadequate.

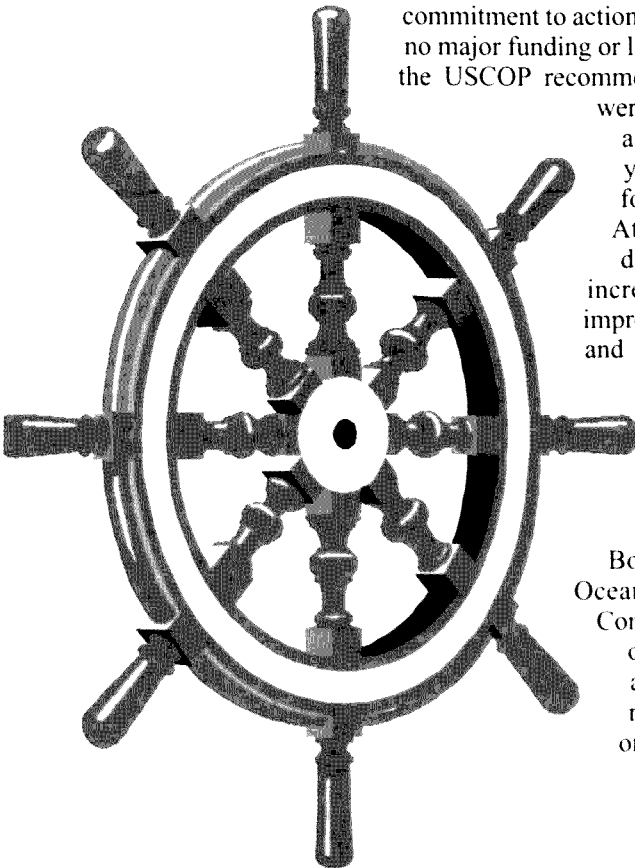
Last winter, the USCOP released its findings and recommendations - more than 200 specific items that if implemented were intended to provide "a balanced approach to protecting the marine environment while sustaining the vital role oceans and coast play in our lives and the national economy."

The recommendations were submitted to the Bush Administration for response and action. They got little of either. Beyond the obligatory press releases, the Bush Administration fundamentally referred the work of the Commissions off to a committee - never a sign of commitment to action in Washington DC. There were no major funding or legislative proposals to carry out the USCOP recommendations; in fact, while there

were minor budgetary increases for a small number of programs this year, overall proposed funding for the National Oceanic and Atmospheric Administration is down. Programs targeted for increases focus primarily on improving monitoring, observation and assessment abilities. Down are marine mammal and sea turtle protection programs, and support for the National Marine Fisheries Service.

Both the US Commission on Ocean Policy and the Pew Commission characterized the state of the oceans and its resources as a crisis. This is hardly the response necessary, appropriate or of which the nation is capable.

Tim Dillingham



THE CRIMSON BROADBILL

by Thomas Armbruster

Xlibris, 436 Walnut St., Philadelphia, PA 19106. Phone 888-795-4274
208 p. \$18.69 (paper).

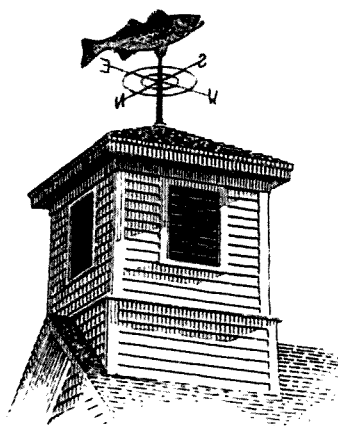
Swordfish grow to 600 pounds; a pound of swordfish is worth \$4 to the boat that catches it, and around \$10 a pound at the fish market. No wonder they are pursued. This is one young man's account of a summer on a commercial swordfish boat "Defiance," fishing the northwest Atlantic from homeport, Barnegat Light, NJ. The fishing took place 13 years ago, but Armbruster kept a detailed log and, probably more importantly, went into the game with his eyes and mind wide open to observe, record, and remember. His enthusiasm for the ocean and what lives there is undimmed.

A fishing trip is about three weeks. The method is longlining, a miles-long string of hooks set in the afternoon near the surface of the sea, left to fish all night, and pulled at first light.

While the preferred target is a swordfish of at least 100 pounds, the haulback often delivers empty hooks, tangled line, small swords (called rats), sharks -- all but makos thrown back -- tuna, and, occasionally an entangled pothead or pilot whale. Armbruster gives vivid detail of the whole works -- the boat and crew, the gear, the hazards of fishing through 20-hour shifts, the brutality (swordfish dead or alive are gaffed through the eye and bled immediately to prevent damage to the saleable meat), and the excitement of a successful haul and a fish hold slowly filling.

Periodically, throughout the narrative, the author steps aside to describe the weather, the birds, the life histories of marine animals, and the rules that regulate

fisheries, and to express his mixed emotions as he manhandles fish, bleeds and guts them, and helps ice them down. There's a lot here to digest. Armbruster himself changed careers from biology major and part-time commercial fisherman to medical school and family practice. So now he heals people at the same time he is haunted by memories of wondrous, cruel days at sea.



ON THE RUN

by David DiBenedetto

HarperCollins, New York
238 p. \$24.95 (cloth).

Two (sane?) men don wet suits and swim fins, tuck surf rods under their arms and sandwich bags of eels in their pockets, and launch themselves through a rough surf to float several hundred yards off the beach to fish for striped bass. It's at Montauk at the tip of Long Island on a chilly October night. They call it "skishing," a cross between skiing and fishing. It's a sport invented by Paul Melnyk, described by a local fishing guide as "on the extreme end of extreme." So it's

Melnyk and the author out there against the angry Atlantic. Things happen.

With anecdotes like this, DiBenedetto combines a truckload of fish facts with his obvious enthusiasm for striped bass and the millions of fishermen who chase them in all sorts of places and weathers. He meets, talks to, and fishes with a variety of slightly bent to outright dangerous coastal people. It's a wonderful book about fishing.

The author had a plan. He would start catching fish at Higgins Beach at the mouth of the Kennebec River in Maine in September and then follow the autumn run south for three months, finishing on the Outer Banks of North Carolina. Along the way, he would hook up with fishing fanatics, fishing guides, and other miscellaneous misfits -- the guy with a tattoo of a striper on his shoulder that took three and a half hours to put there, a Red Sox fan who has perfected a technique for catching bass at sewer outfalls in Boston Harbor, a photographer whose idea of a workday is free diving to the ocean floor off Rhode Island and getting maybe a minute of film in two hours worth of 90-second dives, and Melnyk, the inventor of skishing.

DiBenedetto fishes alone, with guides, and with just plain locals. He fishes from boats and in the surf, as he hits most of the hotspots on his way south: Maine, the mouth of the Piscataqua River in New Hampshire, Boston Harbor, Cape Cod, the Rhode Island shore, Montauk, New York Harbor, Long Island, the northern New Jersey shore, Indian River Inlet, Delaware, the Virginia Capes, the lower Chesapeake, and finally Oregon Inlet and the North Carolina surf. He missed Block Island and the Cape May Rips at the mouth of Delaware Bay, but a fisherman can't go everywhere when he is trying to keep up with a 1000-mile migration.

Some generalities can be drawn from this book: striped bass fishing is best when the fisherman and the weather are miserable; striped bass will stop feeding

for no discernible reason; the goal of every striped bass fisherman is to catch a bass whose weight is divisible by 10, starting at 20; and it is a fish whose size and beauty draw anglers to the saltwater edge.

This is not just another book about striped bass fishing. There is a design to it, and the author manages to skip most of the cliches -- he doesn't struggle for synonyms for striped bass (linesiders, etc.) or for fishermen (jetty jockeys, suds tacklers, etc.). He does capture the allure of this superior fish and the motivations of those who in pursuit. Recommended.

OYSTER WARS AND THE PUBLIC TRUST

By Bonnie J. McCay

University of Arizona Press, Tucson
203 p. \$42.00 (cloth)

First off, in a fit of disclosure, readers should know that the author is an emeritus trustee of the American Littoral Society. Having said that, we have no qualms recommending her scholarly and engaging discourse on the tangled question of who owns what along the coast below mean high tide. She focuses her attention on oysters on the shallow water bottoms of New Jersey, mostly Raritan and Delaware Bays, with side trips to the Mullica River (oysters) and into New York Harbor to write about the shad fishery, but her work applies broadly to the coast.

The question before her and for those who live near the shore or visit there is: Are tidal waters, the shores they lap, and the resources they hold common property open to all, or private property owned by a few? Or, more narrowly, how are we to wrestle with the fact that the land below high tide is held in trust for use by all the people, but some of it is or can be cultivated to produce oysters? And, if private interests do the cultivating, do they own the end product -- marketable oysters.

Having opened Pandora's Box, McCay uses her knowledge of fish and fishermen, ecology, anthropology, and law to weave a

detailed tapestry as the courts and the fishermen try to come up with a fair formula that protects public rights while encouraging shellfish production. And, it gets tricky: Can fishermen who lease bay bottom for shellfish grow-out also fish "wild" bottom, or should that population be reserved for the rest of us? How do we prevent poaching? If leased beds are closed because of pollution, can fishermen sue for damages? And who pays?

McCay's answers to these and many more questions result in a detailed, entertaining history of serious property rights, sometimes seemingly trite squabbles that lead to important law, and, yes, oyster wars both in the courts and out on the water. There are 60 legal citations here, some earthshaking and others colorful: *Lusardi v. Curtis Point Property Owners Ass'n* 1981.J. 217, dealt with loud, late evening parties on a beach. The question was, "What right did people have to have fun on a beachfront lot? The Supreme Court decided they did have such a right..."

There is plenty here for the lawyer, the fisherman, and the fisheries buff as McCay addresses an important issue: How do we protect legitimate uses of the coast's natural resources without stepping on each other's toes, especially when those resources suffer from the impact of more and more toes.

THE EMPTY OCEAN

By Richard Ellis

Island Press, Washington, DC
305p. \$26.00 (cloth)

Most of Ellis's books (and he seems to write at least one a year) are fun to read; they are full of good science, they are witty, and have given us layer upon layer of fact and enjoyment. He has written and illustrated books about, whales, sharks, the lost island of Atlantis, giant squid, and sea creatures that glow in the dark. In pursuit of his craft he has traveled to such places as Spitsbergen, the Aleutians, the

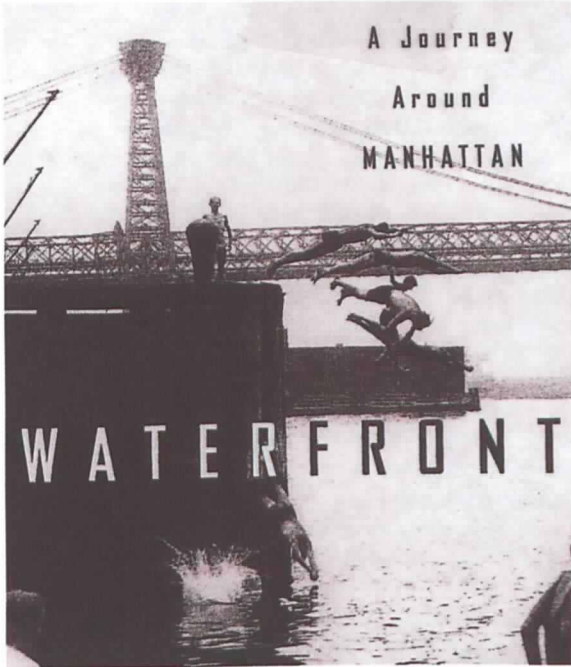
North Pole, the Falklands and North Georgia, Baja California, the Azores, Japan, Scotland, and the Galapagos. Maybe he hasn't been to Guam.

The message of this book - that we are doing bad things to the ocean - built up in him as he covered his other subjects. Now the time is right for him to address the possibility that we have damaged the ocean's ecosystem and mistreated its inhabitants to the point where recovery is uncertain.

He does this with detailed accounts of marine organisms under stress. Things that live in the sea are living without borders and thus available to those who pursue them. The pressure to catch fish to make money and feed people is unrelenting, and Ellis details some examples: menhaden, tuna, swordfish, sharks, cod, and Atlantic salmon. As fishermen scour the sea they often go from species to species, finding new targets to replace depleted ones.

Consider the Patagonian toothfish, a large, slow growing (and, thus, slow reproducing) fish sold in fancy restaurants as Chilean sea bass (How often have you heard a gourmand order up a Patagonian toothfish platter?). The first toothfish specimen was found in 1888 in 6000 feet of water off southern Chile but tossed overboard before biologists could learn more about it. In the 1960s, Soviet whalers reported 100-pound specimens in the stomachs of sperm whales, and soon fishermen began going after them in the South Atlantic and Indian oceans, landing as much as 90,000 tons a year. Now the fishery is in a downslide as managers try to staunch the bleeding.

Ellis traces the same story for fishes and marine mammals, turtles, and birds. It's all valuable, but the best parts are Ellis's concise summaries of the life histories of ocean species - their adaptations and their interactions. This is a sad and enlightening book.



**WATERFRONT: A JOURNEY
AROUND MANHATTAN**

By Phillip Lopate

Crown, New York
412p. \$25.95 (cloth)

Most of Ellis's books (and he seems to

**WALKING MANHATTAN'S RIM,
THE GREAT SAUNTER**

By Cy A Adler

Green Eagle Press, Box 20329, NY, NY
10025
165p. \$13.95 (paper)

Here are two very different books, both urging the reader to understand that Manhattan is an island and that its edge welcomes exploration. They have explored and got it down on paper. Adler's book is a step-by-step guide to the 42-mile hike around the island with civics lessons thrown in at no extra charge. Lopate's is more a cultural history of the edge, partly by hiking the whole stretch in pieces, some by reading, and some by talking to strangers along the way.

The two authors crossed tracks at least figuratively: Adler founded an

organization called Shorewalkers to encourage Manhattan edge hiking, and Lopate joined one of its spring walks especially to cover a complicated section where the East and Harlem rivers meet. Lopate describes Adler as "challenging, namely one who has some good ideas (like the hikes) along with the more debatable ones (like the proposal to dam the Harlem River to turn it into a lake.)"

Both books are well worth reading and using. Lopate's is more serious (though by no means heavy handed) literature; there is lots of history, and he spends much time covering each section of his meander, back physically a few blocks and back in time to the Dutch. Lopate starts his journey at the Battery, "The bulbous V-point of the magnetic tip of Manhattan" - the Staten Island ferry terminal, which he remember as the "skuzzy-looking terminal that was here recently," now replaced by an "attractive, if very modest corrugated steel box..." From there he goes on u the west side (Part One), and 400 and some pages later he has covered the east side.

Along the way, he discourses about walking itself and about people and where they live and what they do. He runs into those marvelous denizens of the city who preach, sell, yell, and beg. And he jumps sideways to write about the Battle of Westway, shipworms, the writings of Joseph Mitchell, merchants, Robert Moses, and the Projects. It's all wonderful. New York is a walking city, and Lopate helps you see it in a different light.

Adler is more nuts and bolts. Start here, go this way, turn left at this, and right at that. His is a guidebook, peppered with some biting asides. He is often angry, but his message is kind and helpful: Come walk with us," he is saying. "In walking Manhattan's edge, we protect it."

EASY QUESTIONS: TOUGH ANSWERS

We are constantly amazed by the challenging saltwater questions that readers submit by phone, mail, and email. Arcane or brilliantly succinct, we are willing to take them on, one at a time.

Q: Should the United States drill for oil and gas in the Alaskan National Wildlife Refuge?

A: First, we should correct a misconception. It appears from your letter that you don't realize Alaska is part of the United States. It might not act like it but it is. The answer to your question is: absolutely. How else can we free ourselves from OPEC's grasp, keep on driving SUVs, and teach caribou how to jump?

Q: Can you tell me what kind of shell this is. I found just this one in 240 feet of water (it was a mixed gas, decompression dive) on the Albatosa Shelf 200 miles southeast of the Falkland Islands during a full gale last August. We managed to bring it up whole. The seashell people around here have never seen one before and believe it could be valuable..

A: Sorry, the shell came to us in a million pieces. Please go get another one.

Q: Do all ducks go "quack."

A: No. Only mallards and black ducks go quack, and for some reason they usually go quack three times, quickly: "Quack, quack, quack." All other ducks go south.

Q: Has a scientist ever tried to find out if fishes can think.

A. We found two academicians who have worked on the question. Charlton Dimension (PhD, UC Berkeley) published a paper on the subject several years ago titled "I Taught Fish to Read!". It was carried in Reader's Digest without peer review. Dr. Dimension was the first full professor at Yale University to be stripped of his tenure. A second expert, Prof Brigitta Nesselrode at the University of Miami, says she has been carrying on complicated conversations with a 40-pound Nassau grouper on a coral reef off Big Pine Key, FL, for more than a year (Personal communication). That sounds like thinking to us.

Q: My beachfront house fell into the ocean during a recent coastal storm. Can you tell me where it is, or where to look for it.

A: Sorry about your house. That's a real shame. Now, on to your question. If your house was made of wood, look down current. It probably floated with the littoral drift (why do you think we call this the American LITTORAL Society?). Wooden houses can float as far as 5-10 miles in sea water if the doors are closed. You might want to call in the Coast Guard for some search and rescue, but they are likely to sink the house with small arms fire if they judge it to be a navigation hazard. If your house was made of brick or stone, check just offshore. It will look sort of like a jetty and provide good fishing this fall; however, you will need a Corps of Engineers permit to leave it there. (By the way, is your empty lot for sale? Give me a call.)

Q: Why are shorebirds called shorebirds?

A: Because they sure are birds, and they ain't mammals (7.4 on the laffometer!). On a more serious note, these birds are most often seen along shorelines; hence the accurate name. In point of fact, they were once called shoreline birds; their name was changed in 1951 after a knockdown, drag-out fight within the American Ornithological Union. Here's an added fact, not that you asked for it: shorebirds and, for some reason, chimney swifts, are often found slathered with suntan lotion and wearing sunglasses

Q: Our six graid scool clas wants a know all about howe we can all be a coastle communist just like yu. (I am 11 years old).

A: I believe the word you are struggling for is "columnist." Have you thought of another profession? How about advertising? In the meantime, I suggest you cut down your iPod time and try looking at a dictionary. It's a big book with lots of words in it. And, please show this to your guidance counselor.

Q: Who likes pearls?

A: Girls.

Q: If you sail around the world from east to west, do you get younger?

A: Actually, it's just the opposite. Mavis Lonigan and her daughter Evelyn, who was three when they started, sailed around the world from Key West back to Key West in 35 months. When they landed, Evelyn was a teenager, and mother and daughter were not talking to each other.

Coming Next Issue: What makes clams clam up? And do they ever clam down?

D. W. Bennett

AMERICAN LITTORIAL SOCIETY 2005 FIELD TRIP SCHEDULE

A brief listing of trips through the rest of the year.

July 8-17

NEWFOUNDLAND COAST

Rugged coastlines and small towns, whales, icebergs, puffins, and a ferry trip to Labrador. This area is flush with wildlife, especially sea birds. And there are the rocky shores to investigate.

August 18-21

CAPE ANN WHALE WATCH

Traditional long weekend for a whale watch, canoeing, a sunset cruise, and visit to the Parker River National Wildlife Refuge. The trip is centered in the famous fishing port of Gloucester, home of Gortons and classic architecture.

September 26-27

44th ANNUAL MEETING, NJ

A weekend in and around the Hackensack Meadows – hikes, boats, kayaks, canoes, seining, and speakers. An oasis of open space – wetlands, landfills coming back to life, and winding creeks. Members will receive formal announcement and details by mail later.

September 25-October 4

YELLOWSTONE NATIONAL PARK

Visit to the country's major park as fall arrives, plus some time in Montana and Wyoming. This is more than just a standard trip; an experienced naturalist will smoke out special sightings.

November 11-15

FLORIDA MANATEES/KENNEDY SPACE CENTER

Spend time snorkeling with manatees in Citrus County, and then visit the NASA center, its rockets, its wildlife. This is the best month of the year to visit the Sunshine State.

November 3-6

ASSATEAGUE FALL WEEKEND

Explore the beaches, bays, and wetlands of the Chincoteague National Wildlife Refuge for birds, Sika deer, the rare Delmarva fox squirrel, and wild ponies. With a stop at Bombay Hook Natural Wildlife Refuge (snow geese, avocets, and eagles).

Coming February 2006: a weekend atop Mount Washington, NH – windy, cold, wonderful.

For details, check your field trip schedule or our website (www.littoralsociety.org), email Pat (Pat@littoralsociety.org), or phone her at 732-291-0055.

AMERICAN LITTORAL SOCIETY

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