WILL WE SAVE THE CHESAPEAKE?

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The Chesapeake is the largest estuary, the largest bay on the eastern coast of the United States. Its shoreline is 4600 miles long, more than enough to stretch across our country.

It produces more oysters than any other body of water in the world. In fact, the Maryland portion alone can claim this distinction, year after year. It also produces more Atlantic blue crabs, by far, than any other place in the nation. It is the prime habitat of the rockfish or striped bass, and a very important feeding ground for a host of other fish.

The Chesapeake and the adjoining marshes and backbays of the Atlantic coast are the central trunk of the Atlantic waterfowl flyway; that is to say, migrating waterfowl come down in the autumn from all across the top of this continent to converge precisely at the latitudes of Chesapeake Bay. This means that if you go to the right places at the right times, you can see waterfowl migrations of a volume and variety not to be found elsewhere in the U. S.

The Bay is also unique along our East Coast as a common ground or meeting place for northern and southern species. For example, within Bay waters we find lobsters and "steamers" or soft-shell clams, so often associated with New England, and garfish, halfbills, and even the great loggerhead, green and hawksbill sea turtles, which we usually associate with the tropics. All of this can be summed up very simply by saying that the Chesapeake is the most productive estuary in the country. Indeed, to quote Dr. Eugene Cronin, Director of the University of Maryland's Chesapeake Biological Laboratory, "the Chesapeake is probably the most valuable *and vulnerable* large estuary in the world." Why does Dr. Cronin call it the most vulnerable? The answer is one word: Man. Man, in ever increasing numbers and with ever conflicting interests, takes what he wants from the Bay.

Let us begin with the simple harvest, or what man takes directly from the Bay. First, in terms of national importance, is *Crassostrea virginica* or the succulent American oyster.

There are voices to be heard every day clamoring for oyster management, oyster farming on privately leased bottoms, rather than the present system of open waters. Actually, Maryland *does* have oyster management, begun in 1953, and for the present it satisfies all parties, public and private. It is management that was born of a rather peculiar idiosyncracy of *Crassostrea virginica*, namely, that he—or "he-she," because an oyster can and does change its sex a number of times during its happy life—does not necessarily grow well in the areas where he-she reproduces well.

This was not always the case. In times past, there were more areas where both reproduction, a good set or "spatfall," and subsequent growth all went on in the same place. These were called natural bars. There are very few today. The Bay has already been altered too much with channel dredging or overworking of the bars.

So today there are certain areas that are known for their good set for seed oysters. We say "set" because the newly born oyster starts its life in a larval, free-swimming stage, which lasts about two weeks. Then comes the critical moment. This little free-swimming speck falls to the bottom and has to find a good "cultch" or something hard to attach to.

At this point the oyster is called a spat and is barely visible to the naked eye. In a month it is the size of a pea, getting very crowded by its neighbors, and if it survives the crowding, it will be about the size of a quarter in three months, at which point we may begin to call it a seed oyster.

This is the time to move it for better growth. And move it the State does, to the tune of over a million bushels a year, from State-owned seed areas at such places as Harris and Broad Creek off the Choptank, Eastern Bay, the Little Choptank, Holland Strait, and the St. Mary's and Wicomico Rivers in the lower Potomac. From these areas, the seed oysters are taken to open or public bars. For decisions on where to plant them, the State relies heavily on the watermen themselves, through county committees of oystermen. The State also has to take care of providing good cultch or bottom, and not leave this task to nature alone. And nothing is better cultch than old oyster shells.

These combined operations—harvesting and transport of seed oysters and old-shell planting for cultch—cost the State about $1.3 million annually, not a bad investment or subsidy program when one considers that the annual catch has a dockside value (to the watermen) of about $13.5 million.

Maryland and a number of private and federal research institutions also watch very closely the MSX epidemic, and are spending considerable sums in an effort to breed disease-resistant varieties and thus restore oystering to the lower Bay. MSX stands for "multinucleate sphere, unknown," a parasite that entered the Bay in 1957. It has since been identified and is known to prosper only in saltier waters.

By 1966, it went up the western shore, jumping across the mouths of the Potomac and the Patuxent, then across to the Little Choptank. It has since retreated somewhat, but Virginia waters have yet to recover.

The lower Maryland waters around Tangier Sound also have not recovered from the blight. This is especially tragic because a large percentage of the 8000 Maryland watermen, those who depend entirely on the Bay for their livelihood, live there.

But the watermen are nothing if not adaptable. The Maryland skipjack fleet, based mainly on Deal Island, simply sails to further waters, notably Anne Arundel county around Annapolis, which have been very good in recent years, or the lower Potomac. They live aboard their boats during the week and drive home for the weekend and the Sunday gospel service.

Maryland's managed oyster production is but one example; add crabbing and the striped bass or other fisheries. Study them carefully and weigh them against other factors. You will conclude that it is not the waterman and his harvest that is the prime danger to the

Bay. It is not sport fishing per se, nor sport hunting of waterfowl. These activities must be watched—there is no room for complacency, to be sure—and they must be managed. But this is being done, by and large.

(2) Entrained Organisms: This is the term used by biologists and engineers for the microscopic plants and animals that have to go through the steam electric plant; that is, the phytoplankton and zooplankton that get sucked in at the intake and discharged at the effluent station. Sampling at the intake and effluent stations on the Patuxent has shown a 68 percent reduction in capacity for photosynthesis of plant plankton in the autumn and a *94 percent reduction* in summer. And certain animal plankton species, notably some tiny crustaceans that serve as fish food, showed 100 percent mortalities after passing through the system.

(3) Toxic Properties: Tests made by placing oysters in the effluent area showed a 100 percent increase in greening and concentration of copper over oysters at the intake area.

Now, enter the nuclear-powered plant, or Calvert Cliffs. When this threat first came to public notice, I discussed it with an oceanographer, who typically is a chronic optimist about great harvests from the seas. He told me that with adequate controls no one could say that Calvert Cliffs or any other proposed or established nuclear power plant will damage or is damaging marine biota. Quite the contrary, he went into rhapsodies about the possibilities of increased yields of plankton and fish through the warming of cold waters. I respectfully pointed out that for the greater part of the year we have in the Chesapeake a *warm* body of water, with *natural* optimum permissible levels. He then countered with the fact that the area of heated water would be very small in relation to total Bay surfaces.

This is perhaps true. But let us think again about those entrained organisms, the forms of life that have to pass through the power plant. Most conventional steam plants pump through about 500,000 gallons of water per minute for their cooling system. Calvert Cliffs is designed to pump through up to *3 million gallons* per minute. This is a volume of water almost equal to the James River.

We must therefore think of Calvert Cliffs as a giant vacuum cleaner, with all the power of a huge river. Waiting for the Bay's vital plant and animal plankton at this strategic point along the western shore, then, is that vacuum cleaner, ready to crop off that 94 percent in photosynthetic capability or to destroy much of the animal plankton altogether. It is true that Calvert Cliffs engineers and scientists are experimenting with different levels and may locate the plant intake at a depth of 40 feet. But if this will reduce damage to the plant plankton of surface waters, what do we know about what it will do to bottom-dwelling forms of life?

There are other problems, such as industrial wastes and pesticide runoff, but sewage is the single threat to the health of the Bay. This threat is diffuse and rather invisible. We know about oil spills. There is public clamor about nuclear power plants. But sewage systems are many in number, difficult to observe, and of great variety, ranging from raw, untreated dumping all the way to advanced three-stage operations, such as at Blue Plains, which, alas, is all by itself or one of a kind.

Yet sewage represents the most important problem we have to face today if we are to preserve the Bay. Why? Because of what our scientist friends call nutrient load. The District of Columbia sewage system, for example, annually discharges 25 million pounds of nitrates and 8 million pounds of phosphates into the Potomac. Phosphorus has risen dramatically, thanks to "miracle" detergents.

What happens? These excessive nutrients fertilize with spectacular success the wrong kind of organisms, namely the green algae. These algae rapidly explode in population. They crowd out other microorganisms, and they crowd themselves out so that they die off in huge quantities. Their decom-

The full dredge is hauled up by a power winch and dumped on deck. The empty shells and undersized oysters are deftly picked out and tossed overboard. Photo by Porter Kier.

position makes obnoxious odors and takes up huge amounts of oxygen, choking off all life around them.

We public citizens are the prime danger. It is all of us in our increasing numbers. It is all of us arond the immediate shores of the Bay, where population is increasing at an annual rate of 1.7 percent, or well above the national average.

It is also all of us living within the drainage area of the Chesapeake, which includes two cities well over the million mark, Washington and Baltimore, and one over the half-million mark, Norfolk. The drainage area extends through Pennsylvania, including Harrisburg, Wilkes-Barre, and Scranton, and way on up into central New York state, including the Elmira-Binghampton complex, all this by virtue of the Susquehanna, or the mother river whose valley was flooded in Pleistocene times to create the Bay as we know it now. This watershed area population was given as 11 million persons in the 1960 census. Doubling time is estimated by some experts at 25 years, or over 20 million by 1975. More conservative estimates place the drainage area population at 30 million, at least, by the end of the century.

What do we all want from the Bay?

First, we want to ply the Bay waters, for recreation and for commerce. One hundred and ten million tons of shipping, more than 5000 oceangoing ships, move in and out of Baltimore alone each year. The controlling depth of the main north-south Bay navigation channel is now 35 feet. This will not take either supertankers or the ever-increasing fleet of new containerized cargo ships. There is plenty of dredging going on now, and there will be pressures for more dredging from the supership industry. And dredging means death, death by smothering, to oysters and clams. It also greatly reduces photosynthesis—a threat to the primary life process. It also kills or seriously interferes with fish eggs and the larval forms of many species.

What is the answer? I suggest that it is not too soon to consider a moratorium on all main shipping-channel dredging in the Chesapeake. What happens in ports all over the world where supertankers or container cargo ships cannot come dockside? They tranship to barges. Is this such a difficult prospect, against the threat of continual dredging?

Second, all of us have a seemingly insatiable thirst for more power. We want air-conditioning, deep freezers, washing machines, and all those other electrical conveniences. A power crisis is looming.

Meanwhile, what is the power industry doing about it? It is running out of fresh water and turning more and more to estuarine waters. The Chesapeake is a prime target.

We already know some of the effects of conventional steam electrical systems. Some fairly comprehensive studies have been carried out by the University of Maryland's Chesapeake Biological Laboratory on the Patuxent River near the site of a steam power plant. Although one cannot say that this conventional steam plant has ruined the fishery biota of the Patuxent, there are some very disturbing results. The threats, briefly, involve:

(1) Thermal Rise or Water Temperature: Present Maryland regulations state that "for natural water temperature greater than 50 degrees Fahrenheit, the temperature elevation must not exceed 10 degrees above the natural water temperature, with a maximum temperature of 90 degrees F." The Patuxent studies have shown that this is a borderline regulation. Two small species of shrimp, one of which is food for rockfish, have no tolerance for 90-degree water. If the water is allowed to remain for a long period at 90 degrees—let's say that 90 degrees becomes a chronic summer temperature—it appears likely that there would be damage to about *half of all marine organisms*.

Looking to the immediate future, a water quality expert has said that if the present nitrogen and phosphorus loading double—and we may certainly expect this with present treatment facilities and the projected population increases—general eutrophication of at least the upper half of the Bay may be expected.

What is eutrophication? Eutrophication is Lake Erie—or biological death.

We must concentrate on sanitation, therefore, if the Bay is to survive. Time is running out. We have to speak in louder voices about sewage treatment, as we have on nuclear power plants. We must urge closer studies and observation of local systems. We have to demand comprehensive state surveys. We have to urge private industry to get over their hangups on caustic sodas, which can replace the present phosphate-loated detergents. We have to help the Environmental Protection Agency by writing Congress, because EPA's best efforts are presently hamstrung by inaction on the Senate and House water-quality bills.

Time is short, but we do not have to be pessimistic. The recent Great Lakes Pact is most encouraging. We must urge Congress to support this great international agency with the necessary appropriations.

But can we at the same time urge Congress, as well as the executive branch, appropriate state authorities, and private industries to look a little closer at a purely domestic problem, entirely within the confines of the greatest population concentration of the nation, our eastern seaboard? If our Government will spend $2 billion in public funds, with additional sums from Canada and private industry, nearly all of which will go to improving or modernizing municipal waste systems along the Great Lakes, can we not think of perhaps one third of that amount, which might do the job for our most valuable estuary?

There is some question as to whether or not Lake Erie can be cured or reconstituted, but all power to those who want to try to save it and the other Great Lakes. But wouldn't it be exemplary if for once we were forehanded and started to concentrate on our fair Chesapeake Bay, before it, too, becomes a giant sump?

Skipjacks under sail and motor powered patent tongers at dawn off Tilghman Island in the Chesapeake. Photo by Ralph Rinzler.