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Eel Grass Destruction Upset Balance Of Nature All Along Cape Cod Shores

Less than two decades ago the shores of Provincetown, below high water, were densely covered with a heavy vegetation of eel grass. A great variety and abundance of sea life abounded in this grass — crabs, bay scallops and all around clams and quahogs were plentiful. Then came a virulent plague that wiped out this rich eel grass. What its destruction did to the delicate balance of nature is told in this article by Lorus J. and Margery Milne in the Scientific American.

The eminent bacteriologist Hans Zinnsser once argued convincingly that epidemics of disease have done more to mold man's history than all the dictators, generals and feats of conquest. Epidemiologists look back with a kind of fascination on the Black Death just six centuries ago, which killed between a quarter and a half of the population of Europe alone and "came nearer to the extirpation of mankind than any other evil has ever come." The great influenza pandemic that followed World War I is still a fearful memory. Yet these dramatic catastrophes are not the whole story of the plagues that shape man's destiny. Occasionally nature produces one which passes almost unnoticed yet is fully as disastrous in its effects.

In 1931 along the eastern seaboard of North America there occurred a "Black Death" on a far more devastating scale than the plagues of the Middle Ages. In a single year the epidemic wiped out about 90 percent of the populations it attacked. It evoked no headlines, and even now comparatively few persons are aware that it took place. But for a whole generation the plague of 1931 has influenced the lives and livelihood of millions of Americans.

The pestilence escaped general notice because its victim was only a plant. The plant was **Zostera marina**, better known as eelgrass. A common weed of the sea, it grew so rich and thick around the river mouths and shallow bays of the Atlantic Coast that it often impeded boat travel. Suddenly, in the summer of 1931, the plant began to disappear rapidly. Biologists and conservationalists were inclined to blame river pollution or the murkiness of the silt-laden water, but eventually they traced the plant's death to a parasitic fungus, the slime mold called Labyrinthula, which had suddenly grown virulent. This itself was astonishing, for a parasite seldom commits the suicidal folly of destroying the host on which it depends for life.

The destruction of the eelgrass led promptly to other disasters. Hunters soon noticed that the variety of geese called brant, one of the most prized game birds of New England, began to die off; in three years the brant declined to a fifth of their former numbers. Fishermen found that the abundance of cod, shellfish, scallops, crabs and other sea staples fell sharply. Plant and animal life at the river mouths was overwhelmed by raw, unfiltered sewage. In short, the eelgrass catastrophe played such havoc with the marine life of this part of the world that it has not yet recovered.

The importance of eelgrass is that it forms the food base for a great many fish and waterfowl, exactly as the floating plant life of the sea called plankton sustains much of the marine life in deeper waters. Botanists had not paid much attention to eelgrass, regarding it merely as a biological curiosity. It grew profusely along the Atlantic coast from North Carolina to Greenland and down the eastern shores of Europe, as well as on the northern coasts of the Pacific.

Eelgrass is not actually a grass, but it has slender, grasslike leaves up to five feet long growing from a creeping rootstock in the bottom mud. It lives in salty or brackish water and likes a sheltered situation where the waves are not too violent. In salty bays and estuaries it appears to spread chiefly by sending out runners like strawberry plants, but in the brackish water near river mouths it bears underwater flowers and reproduces by means of pollen distributed by the tidal currents.

Food For Shellfish

Growing like a veritable weed, it transforms the energy of sunlight and the carbon dioxide and nutrients dissolved in the water into prodigious masses of rich food —carbohydrates, fats and protein —for a great pyramid of higher life that rests upon it. Periwinkles munch its leaves; microscopic plants and animals swarm over its foliage; clams, scallops, mussels and worms live on the rain of decaying organic matter it deposits on the bay bottoms. And these small fry in turn furnish the food for larger sea animals such as cod and flatfishes and waterfowl.

It was a Danish biologist, C. G. J. Peterson, who first called attention to the great usefulness of eelgrass to man. In 1918 he traced the diet of cod and certain other important fish consumed by man and found that the food chain led back principally to eelgrass. He also determined that it takes roughly 10 tons of food plants to produce one ton of plant-eating animals. In turn, 10 ton of these herbivores (the equivalent of 100 tons of plants) are required to produce one ton of carnivourous animals. Since cod feed only on carnivorous animals, a ton of cod represents at least 1,000 tons of plant food.

It is therefore not surprising that the destruction of the eelgrass should have been followed by a decline in the catch of cod, flounder and the like in the North Atlantic. Other causes, notably overfishing, have been blamed for this decline, but there can hardly be any doubt that the eelgrass catastrophe played a major part.

Famine among the sea animals was not the only mischief caused by the eelgrass annihilation. The disappearance of the weed accelerated and brought to full harvest the long-accumulating fruits of civilization's pollution of our coastal waters.

In the first centuries of man's settlement of New England, two things, mainly, made life and freedom possible, trees and fish. The colonists chopped down the trees in the magnificent virgin forests and rafted the great trunks down broad rivers to water-powered sawmills for lumber or shipped them across the ocean as masts for the King's Navy.

Water Swarmed With Fish

The fish were even more fabulous. In the river the colonists found astonishing numbers of salmon, trout, muskellunge and sturgeon; offshore the waters swarmed with cod, herring, shad, smelt and other delectables. They ran in schools near the surface, and catching them was so easy that ships came all the way across the Atlantic to fill their holds with dried, salted and smoked fish to feed the peoples of Europe. Massachusetts took the cod for its state emblem and for the name of its most spectacular cape. The chain of islands off the coast of Maine and New Hampshire was named the Isle of Shoals for the great shoals of fish found there.

As the trees came down and the soil was exposed, the melting winter snows in the New England watershed began to wash the topsoil of thousands of square miles into the rivers and the sea. Gradually the lakes and river estuaries filled with silt. Mud flats spread where previously there had been clean gravel bottoms. Smelt and other fish could no longer cement their eggs to stones on the bottoms near river mouths, as they had been accustomed to do each spring, and the fish diminished to a tiny fraction of their former abundance. Oceangoing fishermen had to journey farther out to sea at greater expense to garner a similarly dwindling harvest.

To the silt the industrial communities that burgeoned along the river banks and coast began to add sewage. Eventually all the pollution of the waters became so bad that the towns had to treat the water chemically to make some of it fit to drink and swim in. But this did not help the fish.

The thick growths of eelgrass did help them. The eelgrass leaves acted as a friction filter for silt and sewage sediments, which clung to their surfaces. This filter doled out polluted food to the shellfish burrowing in the bottom between the eelgrass roots. Though it made the shellfish inedible, at least it kept them alive. But with the destruction of the eelgrass in 1931 came the deluge. Silt and sewage swept unimpeded over the river mouths and smothered hordes of clams and oysters. It all but wiped out marine life in the bays and estuaries. Their bottoms became an underwater wasteland.

The Eelgrass Comes Back

After almost 20 years of desolation the eelgrass fortunately has begun to come back. In less salty waters near the river mouths a few plants survived the epidemic, and their offspring are gradually repopulating the mud flats. They are beginning to act again as friction filters and to provide root systems that stabilize the silt. The results, in terms of fish and wildlife, differ greatly according to the density of nearby human populations and the degree of pollution of the water. For contrast let us consider two representative bays, one polluted, the other not.

The first is New Hampshire's Great Bay. Into this irregular estuary, with nearly 110 miles of twisting shoreline, discharge six major rivers. They bring down sewage from a dozen towns and a smaller communities along their banks, and to this is added the contributions of Portmouth and Kittery on the bay itself. Thus the bay receives the wastes of about 70,000 people and their activities, including pulp mills and other commercial enterprises that dump in the rivers. The sewage, oozing into the ocean through the narrow neck of the bay, is regularly regurgittated back into the bay by the incoming tide.

For many years there have been no edible oysters in Oyster River and no salmon at Salmon Falls on the Piscataqua. Great Bay used to be a major channel for navigation, with boat yards and ocean shipping facilities. Today even a lobsterman's launch is hard put to find a channel through the ooze that covers its bottom. The sewage slime and shifting silt have also largely ended the annual invasion of ocean fish for which Great Bay was once a major spawning ground. And in Great Bay the eelgrass has yet to make any appreciable comeback from its 1931 disaster.

Recovery At Pleasant Bay

Like Great Bay, Pleasant Bay, an inlet of comparable size on the outer side of Cape Cod, also is full of silt, for the trees that once surrounded it and held the topsoil are gone, and no serious attempt has been made to rebuild the land. But it receives no sewage, because no river or community of any size dumps into it. Its water is clear and except in the gutters between the barren hillsides its bottom is firm. In Pleasant Bay the eelgrass is now recovering rapidly.

The gravelly bottom through which eelgrass spears began to thrust upward in 1947 became a "scallop garden" in 1948; half-inch members of this attractive, blue-eyed swimming clam cavorted in every direction. In 1949 the scallops were more mature and plentiful, feeding on the microorganisms that slid from the growing, waving leaves of eelgrass. Periwinkles reappeared. Blue crabs scuttled about. Hermit crabs dragged snail-shell coverings from place to place, trying newfound empty ones for fit or competing with one another for possession of these slimy shelters. Waterfowl waded, swam and dived in the bay. Pipefish returned in large numbers.

These pipefish neatly demonstrate the complex interrelationships of the eelgrass community and man's general lack of information about the matter. They are relatives of the familiar sea horse, and, like it, they feed on microscopic organisms that thrive on eelgrass blades. The pipefish suck their food daintily through round mouths that look very much like built-in soda straws. The most remarkable fact about them is that few fishermen had ever seen a pipefish before the eelgrass disappeared. In shape and coloring they simulate the eelgrass leaves so closely that they are practically invisible. When the eelgrass disappeared in 1931, the pipefish were suddenly exposed. But they did not last long. With the loss of their food supply, they soon went, too. Now they are coming back with the eelgrass.

Loss Of A Cash Crop

Fish and wildlife experts and some fishermen have now become keenly aware of how much the loss of the eelgrass has meant to New England. Clam beds or oyster beds yield more cash per acre than any other crop man can find. When eelgrass is present as a barrier to the shifting of sediments and sewage, these mollusks can grow large and fat, even on the bacteria and other microorganisms that pollute the water. The eelgrass may make a general recovery in these waters. But the problem of pollution will still remain. So long as the water is polluted and shellfish can therefore not be taken for human consumption, there is no incentive to seed these areas with clams and oysters. And without shellfish, fish and wildfowl can not thrive. Moreover, the sewage prevents the production of fish in another way; it smothers the fish eggs laid on the eelgrass leaves or coats the leaves with a slippery surface so the eggs do not stick to them.

There are ways, however, in which man could help the eelgrass and restore the safety of the coastal waters for marine life and for human recreation. These ways all involve treatment of the sewage at the source. One method even puts the sewage bacteria to use. The sewage is run into covered tanks. Bacteria soon exhaust the oxygen in the sediments. Then anaerobic bacteria (those that can live without oxygen) take over, breaking down the chemical compounds in the solid sewage. The disease-producing types of bacteria die. Ultimately the solids liquefy ,and this material, as well as the original liquid part of the sewage, can be made harmless and odorless by mild chemical treatment.

By attending to the sewage and industrial wastes in such manner, and by building back the topsoil and the trees on the watersheds, we can, if we will, bring back the conditions under which fish and wildfowl thrived so mightily before that landing on Plymouth Rock.