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ALLIANCE FOR THE CHESAPEAKE BAY

It's called a jubilee, but the crabs aren't happy & we shouldn't be

Past is Prologue / By Dr. Kent Mountford

When John Smith wrote of his Chesapeake explorations, he harked back to the many natural observations made during his voyages. In his accounts, he alluded to-not always with proper credit-the observations of other Jamestown settlers about various locations in the lower Chesapeake.

Smith recapped the principal species English settlers had encountered early in his description: "*Of such things which are naturally in Virginia...Crabs, Shrimps, Crevices* (lobsters) *Oysters, Cocles* (probably hard and soft-shell clams), *and Muscles*" (principally the blue mussel, *Mytilus edulis*).

Archaeology confirms that Native Americans had harvested crabs centuries before Jamestown. William Strachey, colonial chronicler, wrote that to "*(a)mend their diet, some disperse themselves in small companies and live on such beasts as they can kill with their bows and arrows, upon crabs, oysters...and suchlike.*" Ralph Hamor, in 1615, wrote of being entertained by the great Powhatan, who served them "*as much bread as might suffice a dozen hungry men; about an hour later after that roasted oysters crevises and crabs, his men in this time being abroad a-hunting some venison.*"

The Virginia settlers ate crabs and Smith had somewhat learned how to live off the Bay's resources. While president of the colony and during hard times, he sent some men to near the mouth of the James River to live on sturgeon and sea-crabs. While 50 died at Jamestown, all those residing downriver survived.

Onetime colony leader George Percy, also mentions the James mouth as a resource during the "starving time," where a settlement called Algernon's Fort was kept, "*being so well stored with the crab fishes wherewith they had fed their hogs,*" an abundance which they had not seen fit to mention to those starving upriver.

Elsewhere in the early colonial record are accounts of horseshoe crabs *(Limulus polyphemus*), which come ashore to lay eggs each spring at the high tide mark and, and as John Smith put it, have a "*crustie taile*" or "*telson*" that protruded up to 9 inches. This is not a weapon, but serves as a lever to turn the crab over, should it become capsized ashore and thus vulnerable to expiring in the hot sun or being torn apart by predators.

These animals are more closely related to spiders than the blue crab (*Callinectes sapidus*). Colonist Gabriel Archer was probably referring to a male horseshoe crab when he wrote that there are "many great crabs rather better in taste than ours, one able to suffice four men." That would make a slim meal of one *Callinectes* or even the very large female *Limulus*, which despite her size, (some near 30") contains very little edible meat.

Strachey got it right when he described: "*There be two sorts of sea crabs and the one our people call a king crab, and they are taken in shoal waters from off the shore a dozen at a time hanging one upon another's tail. They are a foot in length and half a foot in breadth, having many legs and a long tail. The Indians seldom eat of this kind.*"

The remains of blue crabs are found in the trash pits of Europeans living along the coast throughout the colonial period.

Novelist James Hungerford, writing about the Patuxent River in 1832, tells how slaves fished for crabs moving in or out of a narrow passage on tidal currents at today's Mears Creek. They used a forked stick to pin the crab to the bottom, then reached down with both hands and inserted the "tip of a foreleg into the first joint of the claw," immobilizing the creature.

In response to the sudden arrival of local notable Colonel Fitzhugh in the late 18th century, Hungerford wrote that "Jack was off to the river flat for crabs." When someone wanted crabs in the 19th century, men routinely went to "have a frolic with the crabs."

Crabs, not an easily shipped resource, were consumed locally. The advent of railroads made it possible to rapidly move perishable goods until the Civil War broke out, creating setbacks. Still the creature's tasty reputation spread. Union prison guards at Point Lookout, on the tip of Southern Maryland, introduced the blue crab to Confederate prisoners of war incarcerated there. Many of these prisoners, from rural inland localities, had never seen saltwater let alone a live blue crab, and were victims of a nip or two.

The Chesapeake of the 19th century, and earlier was very different from today. Virtually no one wrote about the ecological state of this great estuary, and the first descriptions focused on the yields of various fisheries and surveys of the available harvestable oyster grounds.

The bucolic farmland bordering the Patuxent River was mentioned by marauding British naval officers during the War of 1812. Hungerford, writing about the same area in 1832, recalled: "*so transparent are its waters that far out from shore you can see, in the openings of the sea-weed forest on its bottom, the flashing sides of the finny tribes as they glide over the pearly sands.*"

Methods of ascertaining water quality, such as the Secchi disk for visibility (conceived in the 1850s) or measuring dissolved oxygen (developed in 1888) were not used in the Bay until well into the 20th century. Thus, it is only geochemical traces in Chesapeake sediments from the post-colonial period through the 19th century that reveal the absence of low oxygen and poor water clarity in the Bay. Oxygen problems occurred later, more or less in lockstep with increased population and development in the watershed.

It's not clear when anoxic events (periods of no oxygen) began to affect the survival of the Bay's crab populations. Early monitoring of Chesapeake-some data are available as early as 1915-did not include dissolved oxygen measures.

Carroll Blue Nash began taking oxygen samples in 1932 in the lower Patuxent River, and over the next 10 years found that bottom oxygen values plummeted in summer-sometimes to 1.54 milligrams per liter. His work was lost for decades on a dusty shelf until Chesapeake Biological Laboratory scientists Don Heinle and Chris D'Elia found his data in the mid-1970s.

When Dr. Don Pritchard, at the Johns Hopkins Chesapeake Bay Institute, began regular survey cruises along the Bay's central axis in the 1950s, he and his colleagues found summer hypoxia-periods of low oxygen-a regular feature. This invaluable continuity of data was lost as Pritchard and his staff were scattered when Johns Hopkins dissolved the Chesapeake Bay Institute.

The construction of the Calvert Cliffs Nuclear Power Plant beginning in the 1960s included a deep channel and a curtain wall extending deep below the surface so that during the summer, cooler water from the Bay’s bottom would be pumped in to absorb some of the immense amount of waste heat from this huge facility.

To the company's surprise, low dissolved oxygen water from the bottom pooled behind the curtain wall,

creating a death trap for thousands of fish drawn by the inflowing currents to feed at the site. Their bodies packed up against mechanical screens designed to keep debris out of the plant's pumps. The resulting suction collapsed the machinery and interrupted operations.

Late one night at the plant, our instruments showed no oxygen in the water. Under bright floodlights, the water appeared milky. Later, under a microscope, instead of the plankton organisms we were used to seeing in our samples, there were millions of what we presumed were decomposing bacteria.

Expensive modifications had to be made-including the elimination of the deep water intake structure-simply because knowledge of how the Bay works had been unavailable.

Meanwhile, there were also reports from Western Shore watermen who, in hot weather, pulled up crab pot lines only to find all of the crabs dead. Talk of "the Bay slowly dying" began to circulate.

In 1972, Tropical Storm Agnes dealt a severe blow to the entire Chesapeake ecosystem.

Shellfish and finfish fisheries were in dire straits, and submerged aquatic vegetation all but vanished Baywide.

This was a wake-up call for millions of basin citizens. The Chesapeake Bay Program effort was ramped up, the summer anoxic zone was mapped, and its relationship with development and agriculture-linked nutrients entering the Bay was convincingly made. The growth of this huge "dead zone" each year has become one of the bellwethers for the Chesapeake's decline.

In July 1981, while working on a modeling contract for the District of Columbia, I took Paul Freedman, president of Limnotech, to the Bay, so he could personally experience what until that point he'd encountered only in the mathematical abstract.

There is a break in the Western Shore phalanx of Calvert Cliffs that offers access to the beach at Flag Harbor. We were in a heat wave and Freedman, from the cooler Great Lakes region, was experiencing the steamier side of our climate.

As we descended a steep road to the Bay, the water looked different: It was bright Caribbean blue. At the water's edge, the water had that milky appearance again. People were wading in the shallows with crab nets. Some had bushel baskets jammed in the doughnut hole of an automobile inner tube. This was towed along as crabs were scooped up to fill the container.

In the shallows, submerged in only a few inches of water, crabs were stacked up in rows as dense as cars in a parking lot. There were a lot of other species: small fish and flounder struggling along at the edge where tiny waves lapped the shore, their upper gill covers literally rising into the air in a desperate search for oxygen.

Most people along that shore that afternoon, thought only of the largesse the Chesapeake was providing for their dinner. The term for such an event is "jubilee," although I doubt the poor crabs and fish were celebrating. To this day, the memory of it still strikes me as remarkably sad.

In Mobile Bay, AL, Edwin May wrote in 1973 that that crab jubilees had been known for more than a century and were considered endemic. But in 1973, there was only one report in the literature (Loesch, 1960). Crabs in Mobile Bay, it was reported, became moribund but were "seldom killed" by these events, and those fortunate to observe jubilees could capture large numbers of edible species.

Crab jubilees usually occur when a combination of factors coincide: A large shock of runoff nutrients results in widespread plankton blooms, which decay and settle beneath the Bay's stratified layer. Next

comes hot weather, the solar and thermal reactor that cooks these products and consumes millions of pounds of life-giving oxygen. Offshore winds sweep oxygenated surface waters away from the coast. The Bay seeks to maintain its surface level in equilibrium (like sloshing in a disturbed bathtub) and replaces the blown away water with deeper-in this case anoxic-water that flows up along the shallow shelving bottom until it fills the void. The result is a barrier of oxygen-poor water completely inundating and trapping resident organisms.

In July 2008, I received an e-mail from geologist Dr. Peter Vogt about a "crab walk" near his home along Calvert Cliffs. His observant and environmentally sensitive neighbors had witnessed crabs in great numbers right at the waters' edge. Indeed, Vogt just a day or so earlier had written that he expected such a "crab walk." It was hot and calm at dawn, the time of greatest respiratory stress when no plankton photosynthesis had added new oxygen to the water column throughout the dark night.

I was immediately en route. A southerly breeze had sprung up, ruffling the water and most of the larger crabs-I saw five dozen or so along the edge-had moved offshore, away from predators. The casualties, and there were many, were mostly juveniles and soft-shelled crabs, which had been suffocated while shedding, the most sensitive moments in their lives.

There were also young croaker, juvenile American eels and small palaemonid shrimp. Most evident were the thousands-I suppose millions when one takes the entire shore into account-of polychaete worms, which are a major prey for crabs and bottom-feeding fish targeted by fisherman. These burrowing creatures live in the bottom sediments, some feeding within the sand, others poking out to seize passing prey.

Most of the worms were small species, *Leitoscoloplos robustus* and *Marenzelleria viridis*, but the larger predatory common clam worm, *Nereis succinea* was also found thrashing about.

During low-oxygen events in the York River, VA, benthic ecologist Bob Diaz has found stressed worms hanging out of their burrows, desperate to reach oxygen from the unattainable, well-aerated waters above them. Predator fish would dive down and bite off the exposed parts of these struggling worms. Some of these organisms could actually regenerate body parts and thus live to be preyed upon again.

In upper Chesapeake jubilees, the potential predators are in just as much trouble as the potential prey. Thousand of predators have washed ashore and died on the beach during these events.

The deeper and more extensive the Bay's oxygen-deprived zone becomes, the more frequent, severe and prolonged these stressful or lethal events will be.

Dr. Kent Mountford is an environmental historian and estuarine ecologist.