Seagrass Die-back Troubles Researchers

Dr. Robert Orth and other seagrass researchers at VIMS observed a troubling die-back in lower Chesapeake Bay's dominant seagrass species during the past summer. The die-back also concerns VIMS blue-crab researcher Dr. Rom Lipcius, as seagrass beds are the primary nursery habitat for juvenile crabs.

Eelgrass (*Zostera marina*) in Chesapeake Bay typically loses some of its leaves during July and August each year as water temperatures approach their seasonal peak. The detached leaves form large floating wracks often encountered by beachgoers. This summer, however, leaf-loss in most eelgrass plants in the lower Bay was almost complete.

"Many areas that had robust eelgrass this past spring, including areas where we've had successful transplants, are now completely defoliated," writes Orth in his program's seagrass blog.

All that remains in most local eelgrass beds is the mat of root-like rhizomes that anchor the plants to the seafloor.

A few areas, notably at the mouth of Mobjack Bay (near New Point Lighthouse) and in VIMS' eelgrass restoration sites along the seaside Eastern Shore, retain some live eelgrass leaves. But plant density at these locations is far less than Orth and colleagues have observed during the autumn of previous years.

Orth and his colleague Dr. Ken Moore think that the die-back is probably the result of unusually warm water, combined with low winds and lower light levels. August in Virginia was the 8th-warmest in 111 years of record. Previous research by Moore suggests that these conditions are a recipe for eelgrass demise.

"[This] might explain why we observed plants only along the seashore and in more open areas of the Bay," notes Orth. Conditions in these areas are likely to be windier and cooler than in the Bay's more sheltered tributaries and coves.

Eelgrass in lower Chesapeake Bay is at the southern edge of its thermal range, making it susceptible to water temperatures even slightly higher than normal. Bay grasses in general are also suffering from increased turbidity, which blocks the sunlight they need in order to thrive. Turbidity in the Bay is on the rise due to sediment runoff from farmland and storm sewers, and nutrient-fueled blooms of algae.

"The die-back is likely a result of long-term increases in Chesapeake Bay turbidity and nutrient stresses combined with unusually high temperature conditions in 2005," says Moore. "The light requirements of eelgrass increase exponentially with temperature."

Orth and colleagues are now monitoring the eelgrass beds to test if they are rebounding from the die-back. Eelgrasses usually begin to send out new leaves from their rhizomes with the advent of cooler water temperatures in late November or December.

"Some of the rhizomes may still be alive," says Orth, "so we may see some re-growth." The full extent of recovery, however, may not be fully determined until next spring.

There is also hope that the eelgrass could come back through the germination of seeds. "We had a successful flowering season in 2005 well before the die-back," says Orth, "so we have seeds in the sediment." Eelgrass seeds typically germinate in November and December.

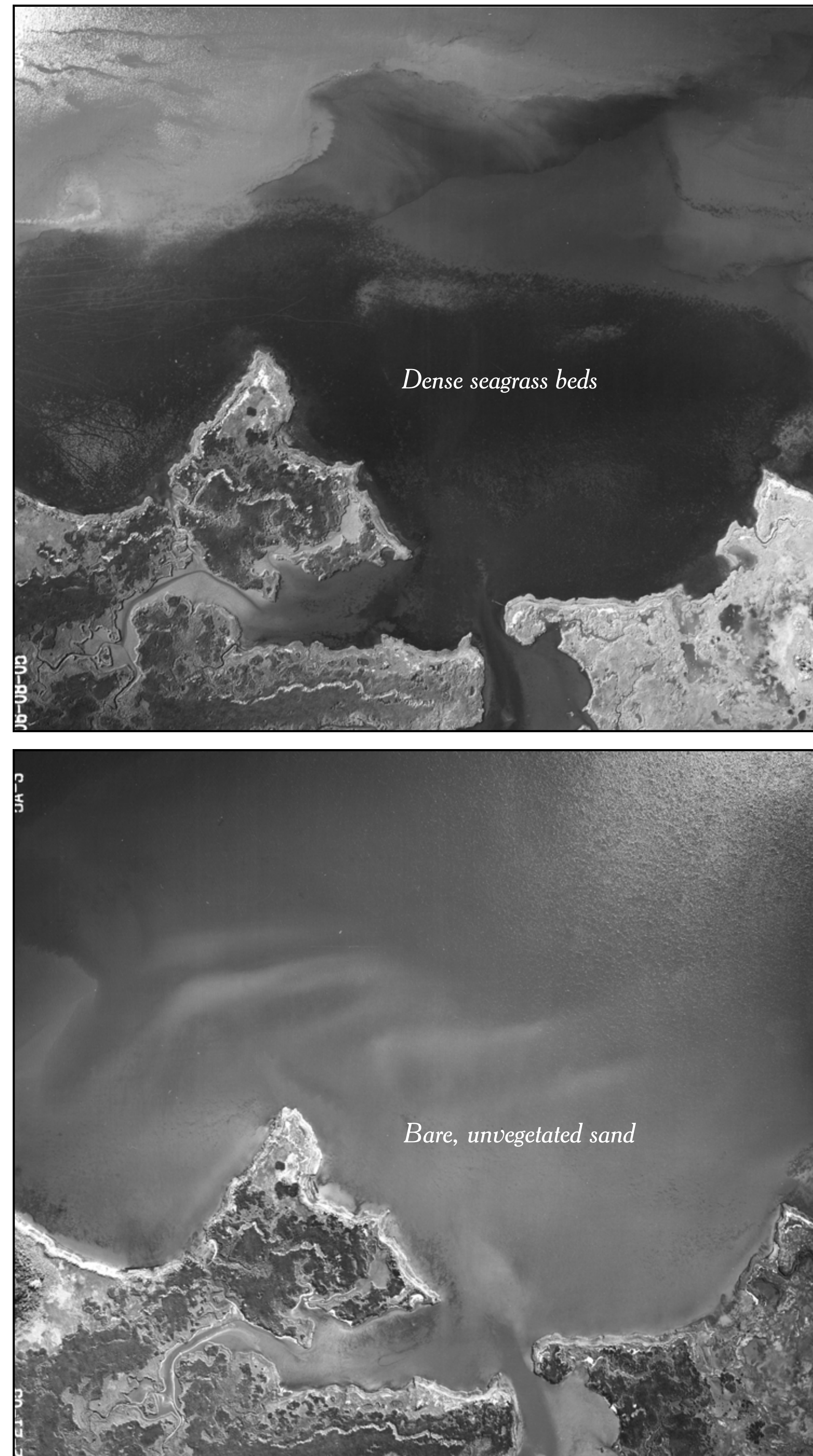
A late November survey of eelgrass beds in the lower Bay showed some new growth from what appeared to be dead rhizomes, as well as some new seedlings. However, shoot densities were only 1 to 18 shoots per square meter, 2-3 orders of magnitude less than what is noted in an average fall. Many plots had no shoots at all.

Moore contends that this summer's unusual die-back may be a sign of things to come. "Given the long-term potential for continuing high summertime temperatures as a result of global warming, the impacts of light reduction through algal blooms and excessive suspended sediments will likely continue," he says. "The eelgrass population can survive here only if spring and summertime light conditions improve through reductions in turbidity."

The continued success of eelgrass beds is crucial to the recovery of the blue crab C*allinectes sapidus*, whose spawning stock is at an all time low in the Bay. The population of female blue crabs in the Chesapeake has declined more than 80% during the last 10 years.

Blue crabs depend on eelgrass beds for protection during their vulnerable juvenile stage. Lipcius is concerned that loss or thinning of eelgrass beds will force young crabs into neighboring sand flats, where they are more susceptible to predation by striped bass, drum, spot, sea trout, croaker, and larger blue crabs.

Lipcius and colleagues are in the midst of a series of experiments designed to test whether the release of hatchery-raised blue crabs into seagrass beds and sheltered coves can help enhance the wild population.



This pair of before (June, top) and after (December, bottom) aerial photos from the bayside eastern shore of Maryland clearly shows the seagrass die-back observed by VIMS researchers throughout the lower Bay during the summer of 2005.

Orth last observed an eelgrass die-off of this magnitude in 1975. Eelgrass did rebound the following spring, but the extent of the rebound is unknown as the event predates VIMS' annual survey of Chesapeake Bay seagrasses. The survey, which began in 1978, is based on analysis of more than 2,000 black-and-white aerial photographs taken each year between May and October.

The poor health of eelgrass beds in the lower Bay contrasts with the unparalleled recovery of other seagrass species in the upper Bay, particularly near the Susquehanna Flats. Data from VIMS' bay-grass monitoring program show that underwater grass acreage in upper Chesapeake Bay doubled between 2003 and 2004.