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MIDNIGHT PASS POSITION PAPER

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GRACILARIA IN LITTLE SARASOTA BAY- THE GOOD, THE BAD AND THE UGLY

SYNOPSIS

A recent Society-sponsored field study found sizeable accumulations of Gracilaria in Little Sarasota Bay, confirming the findings of earlier investigations. Masses of Red Drift Algae are frequently found in embayments known to have "poor" water quality.

Gracilaria can provide significant habitat for a diversity of marine animals. It's also an abundant food source. Drift algae serves as a nutrient "sponge". Large quantities of Gracilaria can displace rooted vegetation in the Bay. Drift algae suffers a rapid die-off period associated with our rainy season. With decomposition comes oxygen depletion, loss of habitat, the return of nutrients to the water column and noxious odors.

Gracilaria tends to thrive in nutrient-enriched waters that are poorly circulated. The effects of its annual die-off further degrades the water column. Accordingly, when found in significant accumulations, Gracilaria can be a biological indicator of poor water quality.

INTRODUCTION (Restated from field study paper)

Embayments with poor circulation tend to allow nutrients to accumulate, enriching their waters. You will often find accumulations of drift algae in these waters deemed to be of "poor" quality. The Gladiola field area of Manatee County. The northern portion of Lemon Bay. Little Sarasota Bay. The waters in all three areas are generally considered either poor or degraded; macroalgae accumulates here far more than in other areas. In two of these areas, "Man" has played a key role in exacerbating the situation.

The Gladiola fields are irrigated with nutrient-enriched sewage effluent. The nutrients drain to an area of the bay with historically poor water circulation. Simplistically, we're dumping in more nutrients than the natural system can absorb.

In Little Sarasota Bay just the opposite is true. The natural flushing system had been up to the task of absorbing at least a major portion of our pollutants. Then, in 1983, "Man" shut down the natural flushing mechanism, greatly reducing tidal circulation. What is still being dumped into Little Sarasota Bay (naturally or otherwise) can no longer get out.

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Quite a bit has recently been written on Gracilaria; its seasonal abundance; dessication tolerance; agar production; cultivation and farming; market value; value as habitat; and so on. The identification of significant macroalgae growth areas in Little Sarasota Bay was performed as part of a seagrass mapping project comparing 1972 levels to 1987. We also have our own field observations of Red Drift Algae in Little Sarasota Bay, especially over the past two years during our water monitoring and field study efforts. The purpose of this paper is to pull all this data together to form an opinion as to the role of Gracilaria in the ecosystem of Little Sarasota Bay.

THE GOOD.

Gracilaria grows best in nutrient-enriched, relatively shallow waters with poor tidal circulation. Under optimum conditions, reported growth rates of Gracilaria can exceed 2.5% per day. If that growth rate were maintained for three months, Gracilaria density would increase tenfold! Its primary growing season in this area is January through June. While Gracilaria may be found attached to the bottom to worm tubes, rocks or oyster shells, the vast majority in Little Sarasota Bay floats free near the bottom. Like seagrasses, masses of Red Drift Algae provide habitat for small marine animals: small fish and fish fry; small invertebrates like Amphipods, Isopods and snails; and juvenile shrimp. Its complex physical structure provides shelter from predators, contributes oxygen to the water column and is an abundant food source. Manatees are known to feed on Red Drift Algae, too!

THE BAD.

As the Gracilaria proliferates during its primary growing season, it competes with the rooted vegetation, the seagrasses, for nutrients. As it drifts near the bottom and accumulates in masses, it can effectively invade an area and smother out, displace rooted seagrasses. Besides blocking the available sunlight, Red Drift Algae acts as a nutrient "sponge," taking up the dissolved phosphates and nitrates before they become available to the seagrasses. Dense accumulations of Gracilaria can destroy entire seagrass beds.

However, the onset of the rainy season begins a period of rapid decline for Gracilaria. A multiplicity of factors interacting together is responsible for the high die-off rate of Red Drift Algae: summer temperatures over 30°C; excessive light levels and freshwater runoff. Salinity depressions below 12°/°° will kill Gracilaria. The primary killing agent is fresh water... Gracilaria just cannot survive low salinity regimes.

THE UGLY.

During the rainy season the standing crop of Gracilaria is greatly reduced. Decomposition of the dead plants results in oxygen depletion which can adversely affect, even kill, area marine life. During the

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immense fish kill of 1987 (see separate paper), there was considerable speculation that oxygen depletion associated with a cuncurrent die-off of Red Drift Algae may have been the causative agent. As the Gracilaria dies off the habitat is lost, the nutrients earlier soaked up are now returned to the water column and the decaying vegetation produces sulfides. Extremely objectionable odors can result: a rotten vegetative odor from the Gracilaria decaying on shore and a hydrogen sulfide stench from the Gracilaria decaying in the oxygen-depleted water.

A FAIR WEATHER FRIEND.

One might call Gracilaria a "fair weather friend." In the late winter and spring it makes a real contribution to the ecosystem, as described above. But, when the Gracilaria rapidly dies off during the rainy season, it can not only be a problem, it can be a killer. Doubling the disaster, if it had flourished in sufficient quantities so as to displace rooted seagrasses, the affected area of the embayment would suffer a net loss of marine habitat.

MACROALGAE LEVELS.

In September, 1988, Mangrove Systems, Inc. prepared a Marine Habitat Trend Analysis Report. A portion of that report was devoted to Macroalgae coverage in Little Sarasota Bay, 1987 compared to 1972. Dense macroalgae coverage in 1972 was estimated at **120** acres; in 1987 it had grown to **293** acres. While the 1972 statistics reported 255 acres of sparse-to-medium macroalgae coverage, no similar category was reported for 1987. However, it's the dense masses of Gracilaria that can upset the balance of nature and harm the ecosystem.

From 120 acres to 293 acres in fifteen years is a significant increase. The dense macroalgae masses enlarged by nearly 2½ times! This is especially revealing when you consider that the only factor peculiar to this area during the measured time span was the closing of Midnight Pass. And, with the exception of north Lemon Bay, there were **NO** other macroalgae masses reported in the other embayments at all!

This data is confirmed by information gleaned during conversations with commercial fishermen from the Vamo area. They recall the existence of Red Drift Algae... they call it "Sea Moss"... in the Bay for many years. It got into their nets. They also remember an annual "happening." When Midnight Pass was free-flowing, the dead and dying Drift Algae floating near the surface...They called "Gumbo"... would be carried out of Little Sarasota Bay on the spring ebb tides; removed to the Gulf where it became fertilizer for the critters near shore. Since the Pass was closed in 1983, the fishermen have noted a steady increase in "Sea Moss" in Little Sarasota Bay.

FIELD OBSERVATIONS.

In February, 1990, the Society conducted a field study of the Gracilaria crop in Little Sarasota Bay (see separate paper). We found

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significant accumulations of Red Drift Algae in various parts of the Bay. We also noted that, where large accumulations of Red Drift Algae are found, the rooted forms of bottom vegetation are absent. This suggested to us that the Red Drift Algae had replaced the seagrasses in those areas.

Our observation of Gracilaria in this embayment is far broader than the recent field study. For more than two years now the Society has had water monitoring stations in place around the Bay. We've also conducted several other field studies. Red Drift Algae tends to get hung up on oyster bars and to accumulate on shorelines, in shallow spots and intertidal areas. In lesser densities it was often mixed with sparse stands of Cuban Shoal Weed. The larger masses appear to be either wind-driven or moved by boat wakes and prop wash.

Our observations indicated that the Gracilaria in Little Sarasota Bay is almost always floating free. While we found that seagrasses tended to grow in relatively narrow spatial areas, we found no corresponding zonation for Gracilaria. It was found from the shoreline to thriving in 62" of water. While it is reputed to accumulate in dredged channels, we have never gone out to determine if it is in the Intracoastal Waterway. While we've witnessed a bloom in Gracilaria growth in the spring, except for 1987 we haven't noted a large population cutback.

During a follow-up visit to our December 2, 1989, Seagrass Study, on December 12, 1989, our field team collected a ¼ meter square of Red Drift Algae from a dense stand in the Bird Islands area. The sample was returned to the laboratory where it was properly dried, weighed and bagged. The sample weighed out at 70.1 g dry wt./ ¼m^2. This equates to a Red Drift Algae biomass of 280 g dry wt. per m^2. This is very heavy growth, especially for a sample taken in December before the growing season really takes off. The accumulations are likely high now due to the low rainfall we've experienced this past rainy season. The Little Sarasota Bay sample compares well against an Indian River sampling program conducted in April, 1982, while the Gracilaria was at its peak. Mean biomass for a dense area weighed out at 164g dry wt. m^2. A maximum density sample weighed 400 g dry wt. m^2. We may well be in for some heavy algae growth in Little Sarasota Bay this year!

THE LITERATURE.

Much has been written on the effects of Gracilaria on the ecosystem of embayments. In the 1969 Hillsborough Bay water quality study it was concluded that higher levels of enrichment have the effect of decreasing rather than increasing benthic plant diversity. They indicated the tendency was to change from a rooted aquatic system to one based on drifting algae. But, when you have heavy rains, extended periods of low salinity and rapid Gracilaria die-off, you end up with no habitat.

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Diversified plant systems are more conducive to sustaining an abundance and multipicity of aquatic organisms. In 1969, Old Tampa Bay was so described and had a 78 to 22 ratio of rooted seagrasses to algae. In Hillsborough Bay, on the other hand, it was estimated that Gracilaria made up 98% of the vegetation crop... this limited benthic plant ecosystem did NOT support a diversified population of marine animals.

The problem is that Gracilaria tends to flourish in those nutrient-enriched, eutrophic environments and to compete with the seagrasses already stressed to a degree from the degraded water quality. When it gains a foothold Gracilaria can displace the rooted vegetation. The lessened ecosystem will support less marine life and, in periods when the Gracilaria crop crashes, there will be an absence of habitat.

The solution, related to Little Sarasota Bay, is threefold. First, the historic tidal circulation must be returned by restoring Midnight Pass. This will restore past embayment conditions, reduce those factors tending to favor the proliferation of Gracilaria, reduce nutrient loading of the water column and flush excess accumulated "Gumbo" to the Gulf. Then we need to concentrate on reducing the amount of nutrients entering the Bay along with the stormwater runoff. And third, we should consider the feasibility of harvesting excess Gracilaria. This would remove the soaked up nutrients from the water and provide a by-product with at least nominal market value.

CONCLUSIONS.

1. While Gracilaria tended to historically grow in Little Sarasota Bay, the standing crop has greatly increased since, and at least partially due to, the closing of Midnight Pass.
2. In significant quantities, the presence of Gracilaria in an embayment can be a biological indicator of "poor" water quality.
3. The proliferation of Gracilaria can lead to the displacement of rooted vegetation. The reduction of a diverse plant community will reduce the multiplicity and abundance of marine animals that can be supported by the affected embayment.
4. In a eutrophic environment, dense beds of Red Drift Algae may be "hiding" the dissolved nutrient concentrations in the water column from standard tests of water quality.
5. The restoration of Midnight Pass will discourage, to a degree, Gracilaria growth and will restore the conditions required for the proliferation and colonization of rooted seagrasses.
6. Other courses of action that could be taken to promote a diversity of plant, and thereby animal life in Little Sarasota Bay include the significant reduction of nutrients in the stormwater directed into this embayment and the consideration of harvesting the Red Drift Algae and thereby reducing the nutrient loads already in the Bay.

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