Chapter 6.3

Results of recent macroalgae surveys in the Maryland Coastal Bays

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Abstract

Macroalgae, also known as seaweeds, are abundant and well distributed in the Coastal Bays. Estuarine ecosystems with generally well-illuminated shallow bottoms and moderate to high nutrient loadings can be optimal environments for the development of high concentrations of macroalgae. Macroalgae (seaweeds) are large plant-like structures found in coastal waters worldwide. Three main types, divided by coloration, are present along the Atlantic coast – green, red, and brown. Experts believe that a shift in the dominant primary producers, from slower growing sea grasses to faster growing phytoplankton, is indicative of eutrophication (i.e., excessive nutrient concentration) in a system. The presence of macroalgae blooms may be a sign of a system's progression toward a degraded state. Macroalgal distribution and biomass were investigated in tidal locations throughout the Coastal Bays during the winter, spring, summer, and fall seasons. Eighteen genera of macroalgae were identified in Maryland's Coastal bays including six green macroalgae, eight red macroalgae, and four brown macroalgae. There was no statistical difference in the abundance of macroalgae among seasons; however, there were distinct seasonal shifts in which genera were dominant. The amount of macroalgae averaged 4.3 grams per liter (g/L) for all samples, with peak biomasses of 316.1 g/L in Turville Creek and 443.5 g/L in Chincoteague Bay. Nutrient responsive species were accountable for 39% of the overall biomass and were dominant in the northern coastal bays and sea grass beds in Chincoteague Bay. Biomass estimates revealed that the relative dominance of primary producers in each bay segment shifted from sea grass to phytoplankton with increasing nutrient loads.

Introduction

Macroalgae appear in a variety of colors and forms. They are divided into three groupings: red, brown and green -based on pigments (e.g. color of the plant). Benthic macroalgae are recognized as important primary producers in shallow aquatic ecosystems (Duarte 1995 and Valiela et al., 1997). Estuarine ecosystems with generally well-illuminated shallow bottoms and moderate to high nutrient loadings, can be optimal environments for the development of high concentrations of benthic macroalgae. Experts believe that a shift in the dominant primary producers, from slower growing vascular macrophytes to faster growing one-celled phytoplankton, is indicative of eutrophication in a system (Duarte 1995; Valiela et al.1997). The presence of macroalgae blooms may be indicative of a systems progression toward the final eutrophied state.

Macroalgae can appear as small "fur like clumps," moderate-sized branched specimens, or large leaf-type structures. An excess of macroalgae can be problematic for aquatic life (organisms can be impaired or killed as a result of decreased oxygen levels when algae die and decompose), boaters (prop fouling), citizens and tourists (odor). Such excessive levels are categorized as Harmful Algae Blooms. This can particularly be a problem in dead end canals where high nutrient loads and limited flushing make ideal environments for some macroalgae species. Macroalgae are listed as a "nuisance species" in the CCMP (FW 5.2).

Macroalgae monitoring by DNR and ASIS in 199819/99, 2001/2002 and 2003. Distribution of genera and relative abundance information was recorded. Benthic macroalgae distribution and biomass were investigated at 600 tidal locations throughout the Maryland Coastal Bays.

Management Objective: *None*

Data Analysis

Data were converted to biomass by applying unpublished coefficients developed by the Virginia Institute of Marine Science (Goshorn et al. 2000; McGinty and Wazniak 2002). Bay segment estimates were estimated by extrapolating point data for each grid cell, then adding grid cells together (Goshorn et al. 2000; McGinty and Wazniak 2002).

Results: Status of macroalgae

Eighteen genera of benthic macroalgae were identified in Maryland's Coastal Bays including 6 chlorophytes (*Ulva*, *Chaetomorpha*, *Enteromorpha*, *Cladophora*, *Bryopsis*, *Codium*), 8 rhodophytes (*Ceramium*, *Agardhiella/Gracilaria*, *Polysiphonia*, *Champia*, *Ceramium*, *Spyridia*, *Hypnea*, *Chondria*), and 4 phaeophytes (*Desmarestia*, *Ectocarpus*, *Stilophora*, *Sphaerotrichia*). No difference in biomass was observed among seasons; however, there were distinct seasonal shifts in which genera were dominant.

Assawoman Bay

Several genera were observed, dominated by *Agardhiella* and *Ectocarpus*

St. Martin River

Biomass was generally low in the river. *Agardhiella* was present and *Cladophora* was reported in the canals.

Isle of Wight Bay

Hot spot for *Agardhieilla* in Turville Creek. Long Term fisheries trawl site had to be moved in 1999 – 2002. Multiple species were observed, dominated by *Agardhiella* and *Ulva*

Sinepuxent Bay

Numerous genera were observed, dominated by *Agardhiella*, *Ectocarpus,* and *Ulva.*

Newport Bay

Little macroalgae was observed, dominated by *Agardhiella* and *Ectocarpus*

Chincoteague Bay

Hot spot for *Chaetomorpha* in 1998 – 2001. Numerous genera were observed, dominant species included *Chaetomorpha*, *Agardhiella*, and *Ectocarpus*

Summary

Benthic macroalgae biomass averaged 4.3 g/L for all (Figure 6.3.1). *Agardhiella* was most consistently found in Turville Creek with a peak biomass of 316.1 g/L (Figure 6.3.2), and *Chaetomorpha* in Chincoteague Bay at 443.5 g/l (Figure 6.3.3). Macroalgae appeared to show an inverse relationship with water column chlorophyll *a* in all segments; however, no other relationship to water quality parameters were noted. Nutrient responsive species were accountable for 39% of the overall biomass and were dominant in the northern Coastal Bays and seagrass beds in Chincoteague Bay. Biomass estimates revealed that the relative dominance of primary producers in each bay segment shifted from seagrass to phytoplankton with increasing nutrient loads.

Distinct seasonal shifts in which genera were dominant makes it difficult to pinpoint a "reference" sampling season.

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Lewandowski tested its efficiency in the field. Chris Tanner provided identification training and QA of samples.

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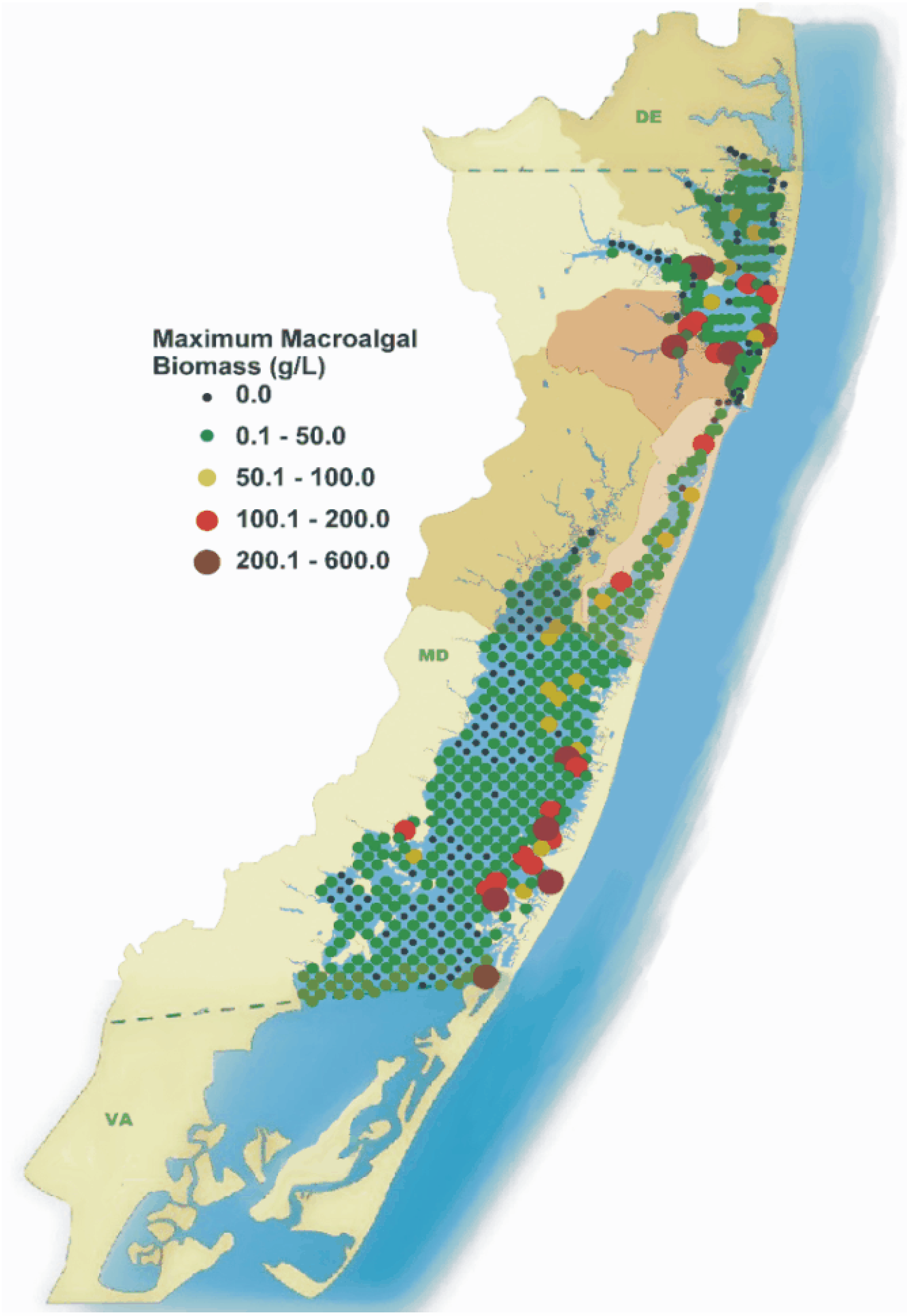

Figure 6.3.1: Maximum total macroalgae biomass per station over all seasons for three survey years (1999/2000, 2001/2002, and 2003). Biomass was converted from sample volume collected on-site (see text).

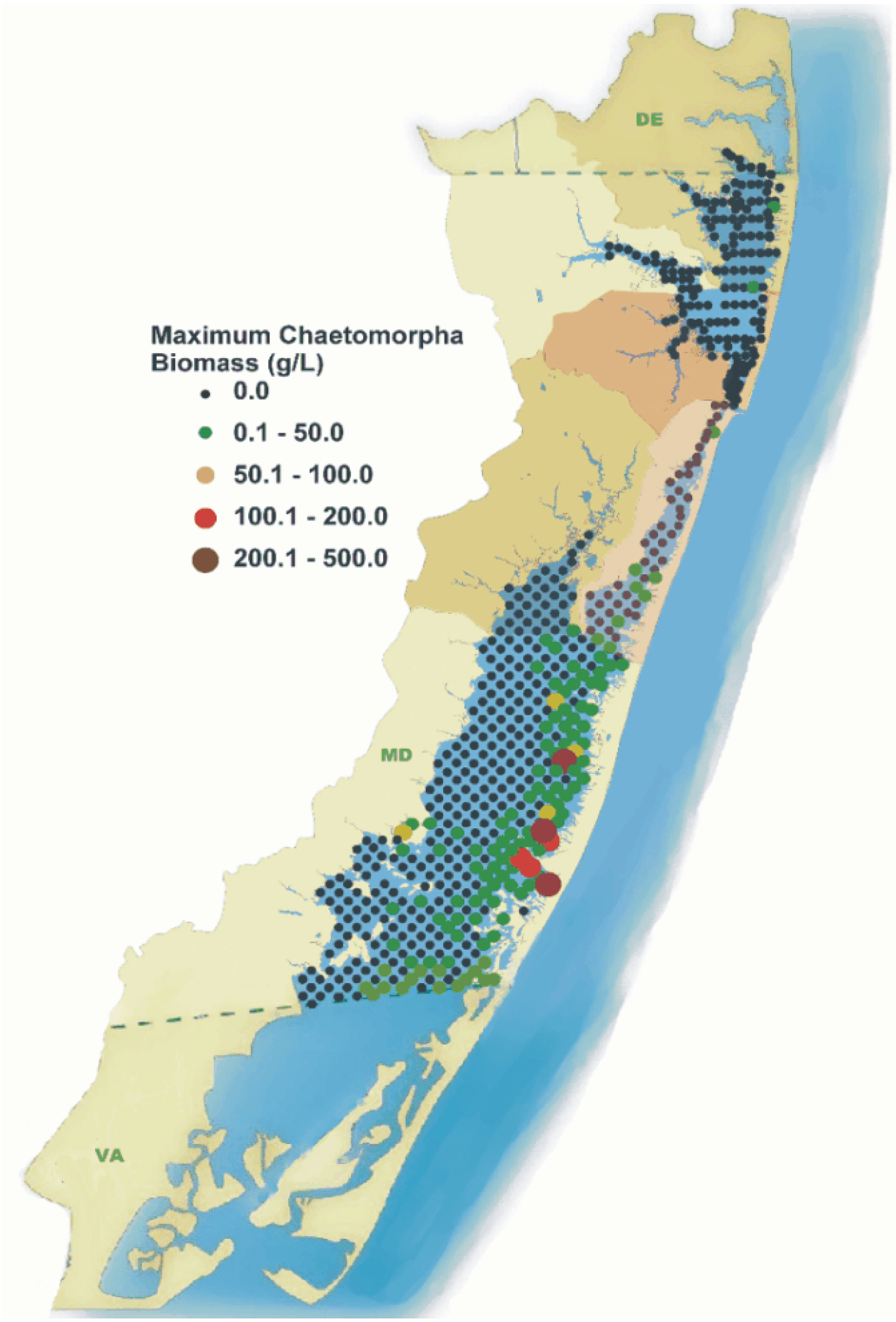

Figure 6.3.2: Maximum total *Chaetomorpha spp*. biomass per station over all seasons for three survey years (1999/2000, 2001/2002, and 2003). Biomass was converted from sample volume collected on-site (see text).

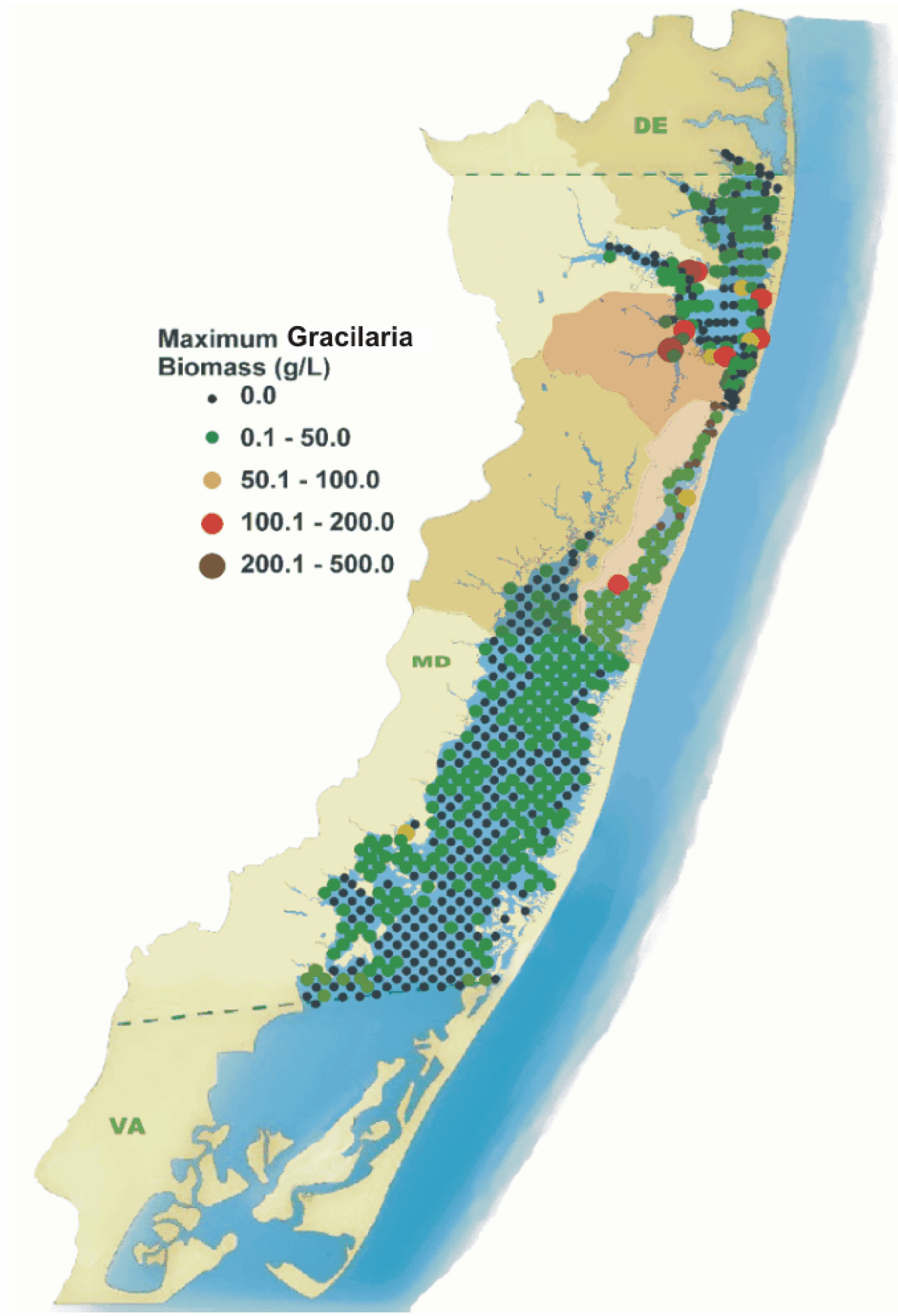

Figure 6.3.3: Maximum total *Gracilaria spp*. biomass per station over all seasons for three survey years (1999/2000, 2001/2002, and 2003). Biomass was converted from sample volume collected on-site (see text).