Chapter 8.5

Summary of benthic community index results for the Maryland Coastal Bays

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Abstract

Benthic communities play an important role as food for fish and in cycling nutrients between sediments and the water column. Benthic organisms were sampled and identified in the laboratory. The Mid-Atlantic Integrated Assessment (MAIA) benthic index was then calculated based on the abundance of species as well as the occurrence of certain tolerant or intolerant species. Open bays met the MAIA benthic index goal, while tributaries were degraded to severely degraded. Severely degraded sites either had few organisms and dominance of one species or had an unbalanced community heavily dominated by a small number of species, usually annelid worms. Regions subjected to large environmental fluctuations are best monitored over time to assess the long-term response of the community and the relative influence of human-induced factors over the natural range of variability.

Introduction

Benthic communities play an important role as food for fish and in cycling nutrients between the sediment and the water column. The benthos is a good indicator of system health because conditions are integrated over time.

Monitoring of benthic communities is currently not a long-term part of the monitoring program. Benthic monitoring data has been collected as part of U.S. EPA Environmental Monitoring and Assessment Program (EMAP), and EMAP-style monitoring programs: Joint Assessment, Mid-Atlantic Integrated Assessment (MAIA), and the National Coastal Assessment, (NCA). The results presented in this report focuses on data collected during the National Coastal Assessment surveys between 2000 and 2001.

Management Objective: Maintain healthy benthic communities.

***Draft* Indicator:** MAIA benthic index > 3

Analyses

Benthic community condition analyses used the MAIA benthic index of biotic integrity (B-IBI). This index combines measures of abundance, number of taxa, Shannon-Wiener diversity index, percent dominance, percent abundance of pollution indicative taxa, percent abundance as pollution sensitive taxa, percent abundance of deep deposit feeders, percent abundance of bivalves and the percent abundance ratio of *Tanypodinae* to *Chironomidae* (Llansó et al. 2002). Epifaunal organisms were eliminated from the analyses. The mean benthic index was calculated by averaging index scores for each of the 54 fixed stations visited in 2000 and 2001.

Status of benthic community

The status of the mean benthic index for 2000/2001 are presented below for each bay segment. Results for 2002 and 2003 are summarized separately since these studies were based on different stations than in 2000 and 2001 and therefore index scores could not be averaged for all years (see Llansó et al. 2003 and Llansó et al.2004 for annual conditions during these years).

Assawoman Bay

All sites met the benthic index goal in Assawoman Bay (Figure 8.5.1).

St. Martin River

Sites in the lower mainstem of the river met the benthic index goal, while sites in the prongs were either degraded or severely degraded (Figure 8.5.1). The upper Bishopville site that met the goal is a tidal fresh and may be inappropriately classified using this method. The sites in the upper river and prongs were classified as severely degraded both years - scoring low on almost every measure. The station at the mouth of Bishopville Prong that was classified as degraded had low abundance, low taxa and low bivalve scores. The upper Shingle Landing Prong station (on Middle Branch) was classified as degraded but may be inappropriately classified using this method because it is a tidal fresh water station although stream indices rate this area as very poor (see Chapter 3.1)

Isle of Wight Bay

All sites met the benthic index goal, except Manklin Creek, upper Turville Creek, and Herring Creek (Figure 8.5.1). Manklin Creek had low diversity and bivalve scores. Herring Creek contained acceptable levels of bivalves, while Turville Creek scored low for all measures.

Sinepuxent Bay

All sites, except two, met the benthic index goal (Figure 8.5.1). One site that did not meet the goal was in the commercial harbor and was dominated by annelid

worms resulting in a low diversity score. The other site was in the middle of Sinepuxent Bay, which was only moderately degraded due to a low bivalve metric score (indicating an impaired condition).

Newport Bay

All sites in this bay proper passed the benthic index goal (Figure 8.5.1). Sites in Trappe, Ayer, and Newport Creek were degraded (the upper Newport Creek site that passed is classified as oligohaline and may be inappropriately classified using this method).

Ayer and Newport sites changed salinity classification between 2000 and 2001 (Newport changed from mesohaline to polyhaline and Ayer Creek from oligohaline to mesohaline). One station, ASIS 4, at the mouth of Trappe Creek also changed salinity classification from mesohaline to polyhaline. Results should be interpreted with caution since strong shifts in salinity at these locations affect the way the results are calculated more than environmental degradation.

Newport Creek contained mostly annelid worms and Ayer Creek had low abundance and bivalve scores. Trappe Creek was only moderately degraded.

Chincoteague Bay

All sites meet the benthic index goal (Figure 8.5.1).

2000 and 2001 annual results: Of the 54 stations sampled, 42 and 33 sites exhibited healthy benthic communities in 2000 and 2001 respectively, (77.8 and 61%) and between 12 and 21 sites (22.2 and 39% respectively) exhibited degraded conditions (Llansó et. al 2001, Llansó et. al 2002).

2002 spatial distribution: Of the 124 sites sampled in 2002, 95 sites (77%) exhibited healthy benthic communities (index score equal to or greater than 3.0) and 29 (23%) exhibited degraded benthos (index score < 3.0) (Figure 8.5.2). Of the 29 sites that failed, 18 were classified as severely degraded and 11 were classified as degraded by the index (Llansó et. al. 2003).

2003 spatial distribution: Of the 152 sites sampled in 2003, 136 sites (89.5%) exhibited healthy benthic communities (index score equal to or greater than 3.0) and 16 (10.5%) exhibited degraded benthos (index score < 3.0) (Figure 8.5.3). Of the sites that failed, 10 were classified as severely degraded and 6 were classified as moderately degraded by the index (Llansó et. al. 2004).

Summary

Open bays met the benthic index goal while tributaries were considered degraded to severely degraded. Sites that were severely degraded either had few organisms and

dominance of one species or had an unbalanced community heavily dominated by 1-3 species, usually annelids.

Monitoring of biological communities in regions subject to large environmental fluctuations are best monitored over time to assess the long-term response of the community and the relative influence of anthropogenic factors over the natural range of variability (Llansó *et al.* 2002).

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References

Llansó, R.J., L.C. Scott, J.L. Hyland, D.M. Dauer, D.E. Russell, and F.W. Kutz. 2002. An estuarine benthic index of biotic integrity for the mid-Atlantic region of the United States. II. Index development. Estuaries 25:1231-1242.

Llansó, R.J., L.C. Scott, and F.S. Kelley. 2004. National Coastal Assessment 2003, Benthic Community Condition in Maryland's Coastal Bays, Versar Inc. for Maryland Department of Natural Resources. 26 pp.

Llansó, R.J., L.C. Scott, and F.S. Kelley. 2003. National Coastal Assessment 2002, Benthic Community Condition in Maryland's Coastal Bays, Versar Inc. for Maryland Department of Natural Resources. 22 pp.

Llansó, R.J., L.C. Scott, and F.S. Kelley. 2002. National Coastal Assessment 2001, Benthic Community Condition in Maryland's Coastal Bays, Versar Inc. for Maryland Department of Natural Resources. 14 pp.

Llansó, R.J., L.C. Scott, and F.S. Kelley. 2001. National Coastal Assessment 2000, Benthic Community Condition in Maryland's Coastal Bays, Versar Inc. for Maryland Department of Natural Resources. 14 pp.

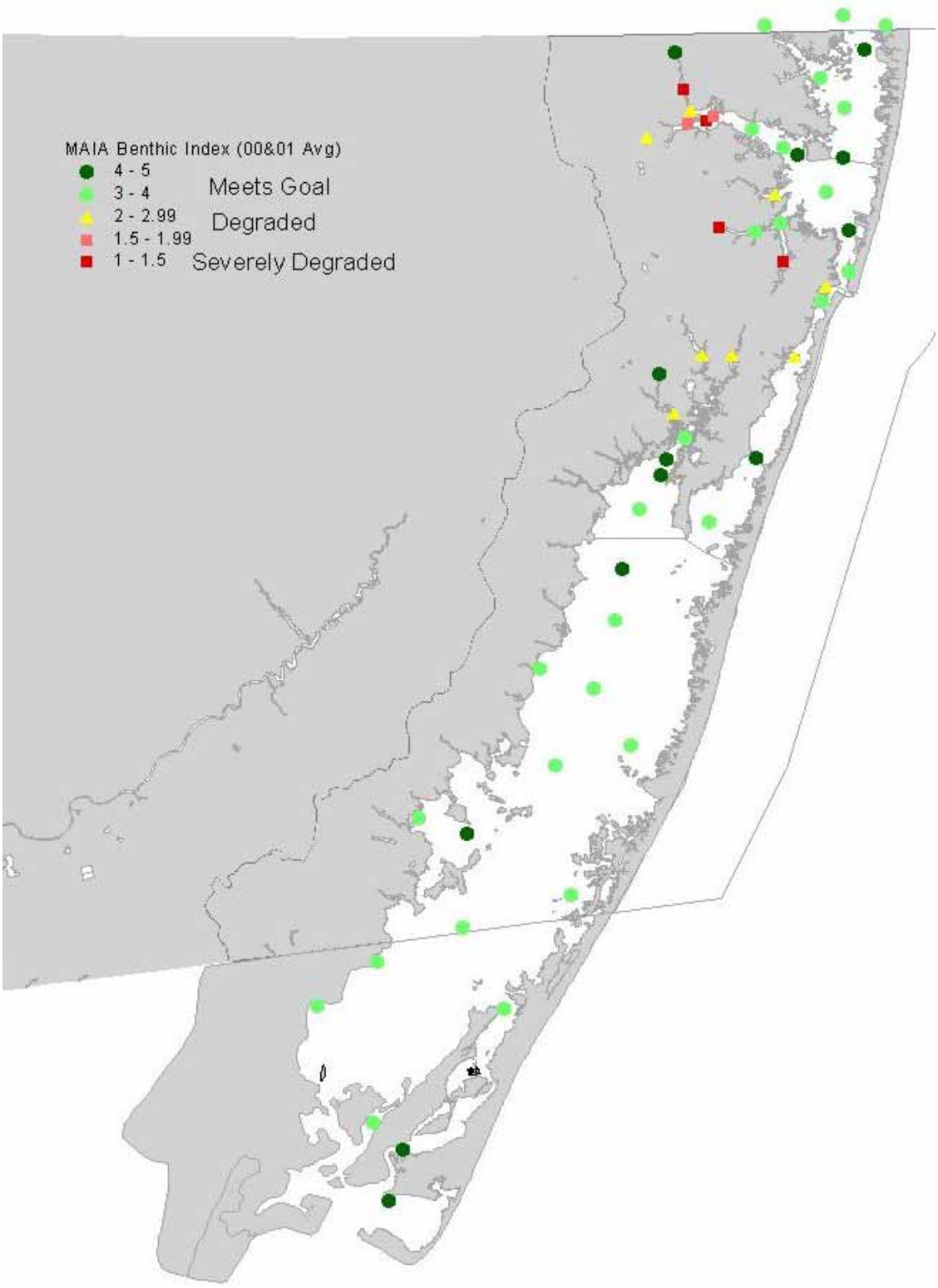

Figure 8.5.1: Benthic index of biotic integrity values calculated based on 2000-2001 mean survey results for 54 stations throughout the Coastal Bays.

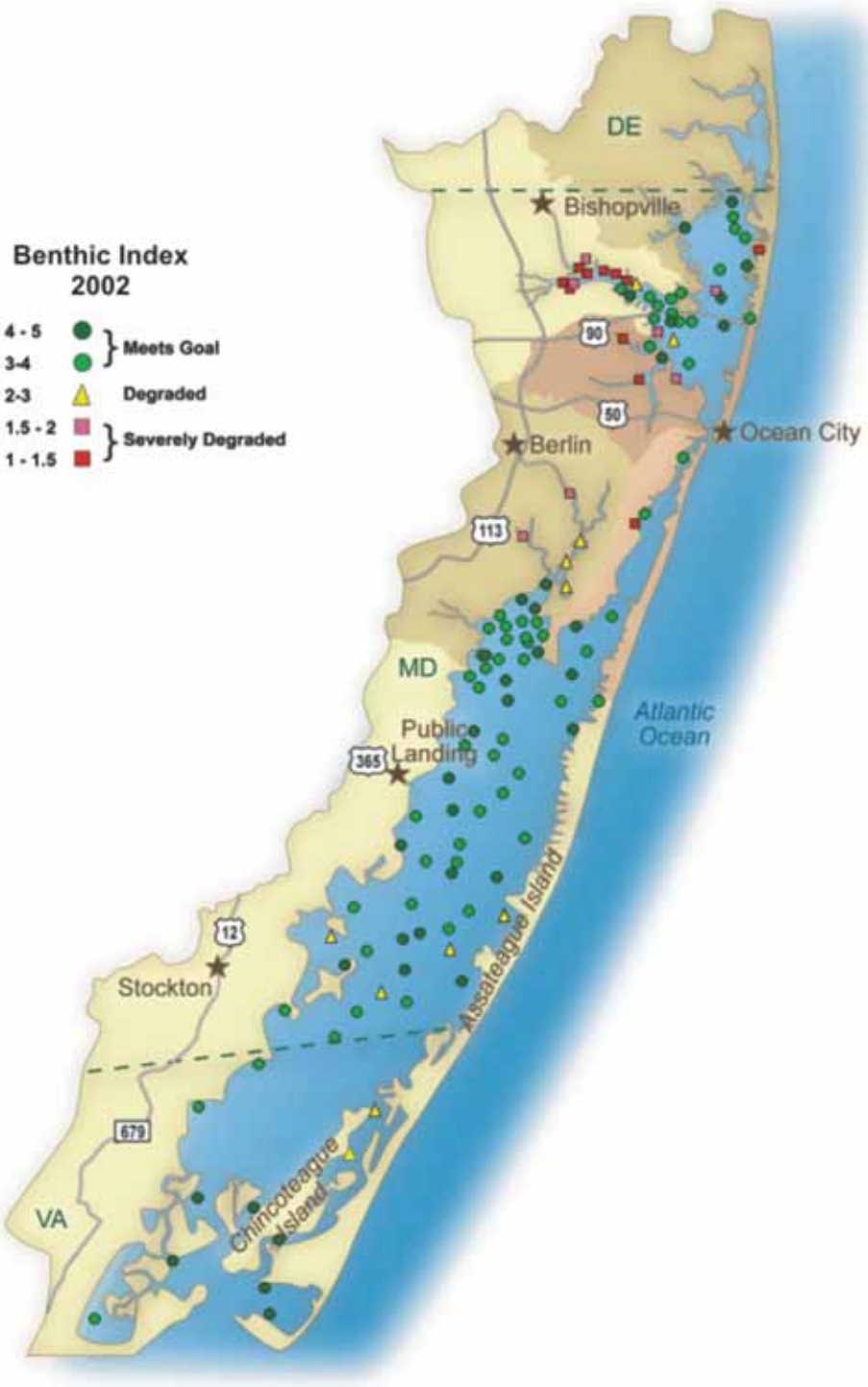

Figure 8.5.2: Benthic index of biotic integrity values calculated based on 2002 survey results for 124stations throughout the Coastal Bays.

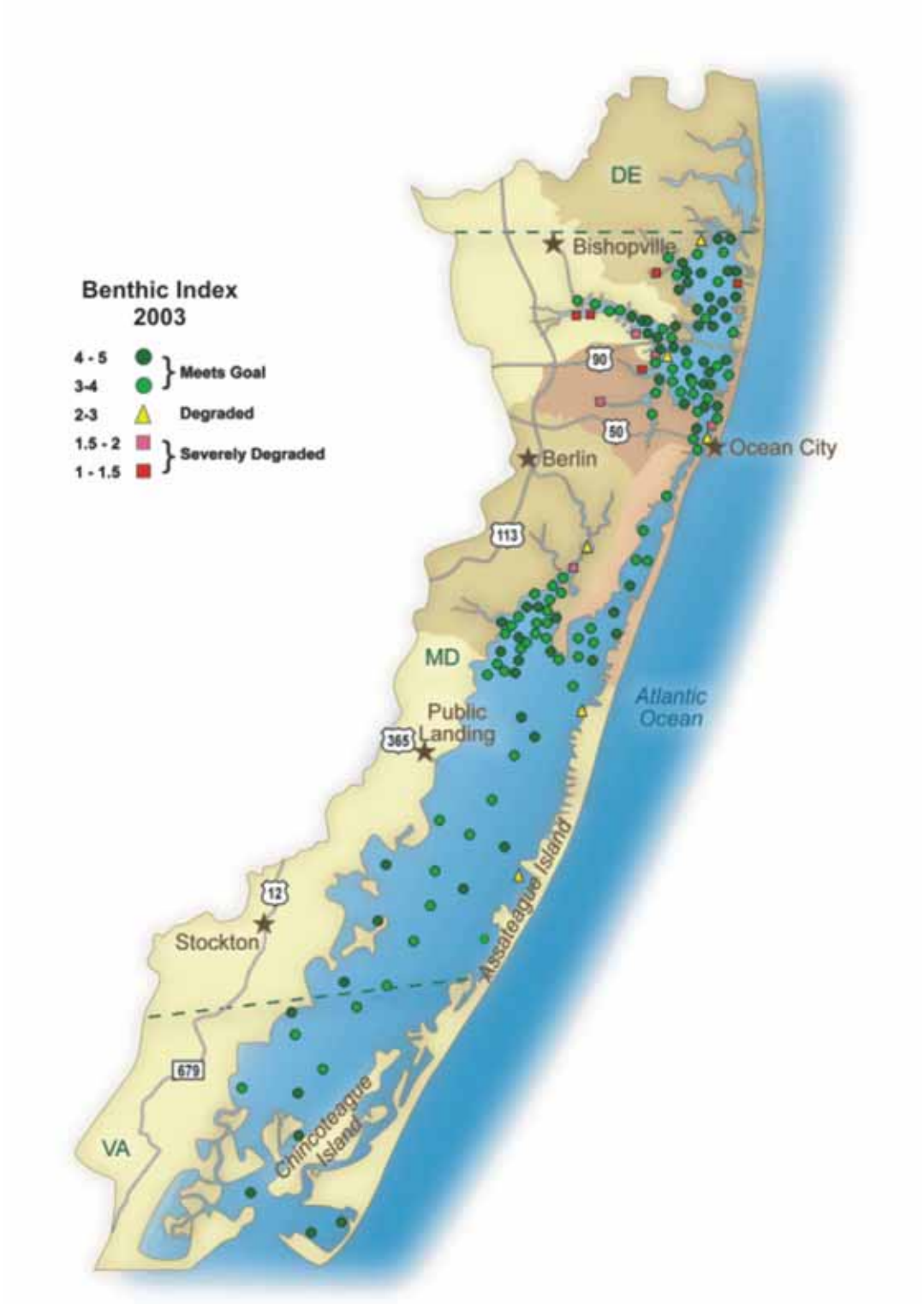

Figure 8.5.3: Benthic index of biotic integrity values calculated based on 2003 survey results for 152 stations throughout the Coastal Bays.