CATALOG DOCUMENTATION
COASTAL BAYS DATABASE
1993 DELAWARE AND MARYLAND BAYS
BENTHIC ASSESSMENT STATISTICS BY SITE

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1. DATA SET IDENTIFICATION

1.1 Title of Catalog document

Coastal Bays Database
1993 Delaware and Maryland Bays
Benthic Assessment Statistics by Site

1.2 Author of the Catalog entry

Melissa Hughes, OAO Corporation

1.3 Catalog revision date

18 October 1996

1.4 Data set name

BENTHIC

1.5 Task Group

Mid-Atlantic Integration and Assessment (MAIA)

1.6 Data set identification code

205

1.7 Version

001

1.8 Requested Acknowledgment

If you plan to publish these data in any way, EPA requires a standard statement for work it has supported:

"Although the data described in this article have been funded wholly or in part by the U. S. Environmental Protection Agency through its EMAP-Estuaries Program, it has not been subjected to Agency review, and therefore does not necessarily reflect the views of the Agency and no official endorsement should be inferred."

2. INVESTIGATOR INFORMATION

2.1 Principal Investigator

Dr. Frederick W. Kutz
U.S. Environmental Protection Agency - Region III

2.2. Investigation Participant-Sample Collection

Janis Chaillou
Versar, Inc.

3. DATA SET ABSTRACT

3.1 Abstract of the Data Set

The BENTHIC data set presents information on some analysis variables calculated from the benthic macroinvertebrate and other physical data. The data are presented by site and can be identified by a unique event number. The number of infaunal taxa per sample is recorded, as well as values for abundance and biomass. Two indices are reported, the EMAP Benthic Index and the Shannon-Wiener Diversity Index. The per cent silt/clay content of each benthic sample is reported.

3.2 Keywords for the Data Set

Abundance measurement, biomass measurement, benthic index, Shannon-Wiener Diversity Index, silt/clay

4. OBJECTIVES AND INTRODUCTION

4.1 Program Objective

The objective of the Coastal Bays Joint Assessment was to assess the ecological condition of the Delaware and Maryland coastal bays, compare the current ecological condition of the bays with their historical condition and to evaluate indicators and sampling design elements that can be used to direct future monitoring activities in the system.

4.2 Data Set Objective

The objective of the Benthic data set is to provide assessment statistics related to a sampling site.

4.3 Data Set Background Information

Benthic invertebrates are important secondary consumers in most estuarine systems, represent the largest living reservoir of organic carbon in many estuarine systems, contain many commercially and recreationally important species and are prey for critical life stages of other commercially and recreationally important species.

Benthic invertebrate assemblages are sensitive to disturbance and stress from both natural and anthropogenic origins because of their taxonomic diversity, wide range of physiological tolerances to stress and multiple feeding modes and trophic levels. The condition of these communities is a reflection of local environmental conditions (since members of benthic assemblages generally have limited mobility). The communities respond to both sediment and water column conditions and contain long-lived species relative to most invertebrate communities in the water column. Consequently, benthic community studies have been used in many regional estuarine monitoring programs and have proven to be an effective indicator for describing the extent and magnitude of pollution impacts in estuarine ecosystems.

4.4 Summary of Investigation Parameters

Benthic species diversity and abundance were counted and biomass measured from one grab collected at a station. Summary statistics were calculated from these laboratory data.

5. DATA ACQUISITION AND SAMPLING METHODS

5.1 Data Acquisition

5.1.1 Sampling Objective

Collect sediment grab samples suitable for the analysis of benthic assemblages and biomass. One sediment sample was expected to be taken at each station.

5.1.2 Sample Collection Methods Summary

The grab sampler was lowered through the water column; the grab penetrated the sediment by gravity releasing a trigger allowing the jaws to close. When the grab was pulled from the sediment using the winch, the jaws closed, encapsulating the sediment sample. After the sampler was retrieved, it was lowered into an on-board cradle.

5.1.3 Sampling Start Date

12 July 1993

5.1.4 Sampling End Date

30 September 1993

5.1.5 Platform

Sampling was conducted from 7 m (21 ft) Privateer equipped with an electric winch with a 12-foot boom.

5.1.6 Sampling Gear

A 1/25 m2, stainless steel, Young-modified Van Veen Grab sampler was used to collect sediment grabs for benthic analyses. This grab sampled an area of 440 cm2 and a maximum depth of penetration in the sediment of 10 cm. Samples were sieved through a 0.5 mm round stainless steel sieve.

5.1.7 Manufacturer of Sampling Equipment

Young's Welding, Sandwich, MA

5.1.8 Key Variables

No data were recorded at the time of sample collection.

5.1.9 Collection Method Calibration

The sampling gear did not require any calibration. It required inspection for deformities incurred due to mishandling or impact on rocky substrates.

5.1.10 Sample Collection Quality Control

The sieve was inspected immediately following the removal of the sample to ensure no organisms were left clinging to the sieve. The sieve was also thoroughly scrubbed with a stiff brush between samples.

At least once during the field season, QA evaluation of each field crew will be performed by either the QA officer or a designee to insure compliance with prescribed protocols. Field crews will be re-trained whenever discrepancies are noted.

5.1.11 Sample Collection Method Reference

Weisberg, S.B., A.F. Holland, K.J. Scott, H.T. Wilson, D.G. Heimbuch, S.C. Schimmel, J.B. Frithsen, J.F. Paul, J.K. Summers, R.M. Valente, J. Gerritsen and R.W. Latimer. 1993. EMAP-Estuaries, Virginian Province 1990: Demonstration Project Report. EPA/600/R-92/100. U.S. Environmental Protection Agency, Washington, D.C.

5.1.12 Sample Collection Method Deviations

NA

5.2 Data Preparation and Sample Processing

5.2.1 Sample Processing Objective

Process sediment samples to accurately identify and enumerate all macrobenthic organisms found to the lowest taxonomic category which was possible.

5.2.2 Sample Processing Methods Summary

5.2.2.1 Field Summary

A clear plastic core was inserted into a random location in the grab. The sediment within the core was extruded into a "Whirl Pack" for benthic grain size analysis and frozen.

The sieve was inspected immediately following the removal of the sample to ensure no organisms were left clinging to the sieve. The sieve was also thoroughly scrubbed with a stiff brush between samples.

At least once during the field season, QA evaluation of each field crew will be performed by either the QA officer or a designee to insure compliance with prescribed protocols. Field crews will be re-trained whenever discrepancies are noted.

5.2.2.2 Laboratory Summary

Procedures for sorting and identifying of benthic macroinvertebrates used methods outlinedin the EMAP Near Coastal Laboratory Methods Manual (Klemm et al., 1993) and updated in Frithsen et al., (1994). The macrobenthos were identified to the lowest practical taxonomic category and counted.

BIOMASS: Identified and counted organisms were grouped by categories for biomass determination. placed in vials and preserved. To standardize the biomass measurements, all samples were preserved in a 10% solution of buffered formaldehyde for at least two months before measuring biomass.

SILT/CLAY: The procedure used to determine per cent silt/clay content is summarized below. The sediment sample was stirred, homogenized in a clean beaker and sieved using a 63 um mesh sieve. The fraction retained on the sieve (> 63 um) was transferred to a tared evaporating dish, dried in an oven and weighed as the sand weight. The filtrate fraction (< 63 um) was transferred to a 1 liter graduated cylinder, shaken to evenly distribute the particles and a set volume removed to a tared evaporating dish. The sample was dried and weighed as the silt/clay weight.

5.2.3 Sample Processing Method Calibration

NA

5.2.4 Sample Processing Quality Control

To ensure that measurements were standardized, biomass measurements were made only after samples had been preserved for a minimum of two months in a 10 % solution of buffered formaldehyde.

5.2.5 Sample Processing Method Reference

U.S. EPA. 1995. Environmental Monitoring and Assessment Program (EMAP): Laboratory Methods Manual-Estuaries, Volume 1: Biological and Physical Analyses. U.S. Environmental Protection Agency, Office of Research and Development, Narragansett, RI. EPA/620/R-95/008.

5.2.6 Sample Processing Method Deviations

NA

6. DATA ANALYSIS AND MANIPULATIONS

6.1 Name of New or Modified Value

ABUN_MSQ	Abundance (#/m**2)
BIOM_MSQ	Biomass (#/m**2)
NUM_SPP	Infaunal Taxa per Sample (#)
EMAPIND2	EMAP Benthic Index 2
SHANNON	Shannon-Wiener Diversity Index (Log2)

6.2 Data Manipulation Description

Species identification were conducted on each grab. Values in this data set were calculated

6.3 Data Manipulation Examples

6.3.1 Abundance mean squared:

6.3.2 Biomass mean squared:

6.3.3 Mean Infaunal Taxa per Sample:

7. DATA DESCRIPTION

7.1 Description of Parameters

#	Parameter SAS Name	Data Type	Len	Format	Parameter Label
1	SITE	Num	8	8.	The Site Number
2	EVNTDATE	Num	8	YYMMDD6.	Date when Sample Collected
3	EVNTNUM	Num	8	5.	Event Number
4	SILTCLAY	Num	8	6.2	Silt Clay Content
5	NUM_SPP	Num	8	3.	Number of Infaunal Taxa per Sample
6	ABUN_MSQ	Num	8	10.2	Abundance (#/m**2)
7	BIOM_MSQ	Num	8	6.2	Biomass (#/m**2)
8	EMAPIND2	Num	8	7.2	EMAP Benthic Index 2
9	SHANNON	Num	8	5.2	Shannon-Wiener Diversity Index (Log2)

7.1.6 Precision to which values are reported

Mean Number of Infaunal Taxa per Sample

7.1.7 Minimum Value in Data Set

ABUN_MSQ	0
BIOM_MSQ	0
NUM_SPP	0
EMAPIND2	-18.11
SHANNON	0
SILTCLAY	1.38

7.1.8 Maximum Value in Data Set

ABUN_MSQ	184421.82
BIOM_MSQ	174.83
NUM_SPP	52
EMAPIND2	3.47
SHANNON	4.21
SILTCLAY	99.87

7.2 Data Record Example

7.2.1 Column Names for Example Records

SITE EVNTDATE EVNTNUM SILTCLAY NUM_SPP ABUN_MSQ BIOM_MSQ EMAPIND2 SHANNON

7.2.2 Example Data Records

OBS	SITE	EVNTDATE	EVNTNUM	SILTCLAY	NUM_SPP	ABUN_MSQ	SHANNON	BIOM_MSQ	EMAPIND2
1	101	08/10/93	1091	81.19	15	2340.91	3.52	1.10	0.80
2	102	08/10/93	1092	79.18	12	3931.82	1.86	0.31	0.18
3	105	07/15/93	2016	5.83	4	500.00	1.73	0.08	-0.41
4	106	08/17/93	1117	87.84	20	47954.55	1.44	5.27	-3.61
5	107	08/04/93	1080	85.99	23	25500.00	2.48	4.81	0.01

8. GEOGRAPHIC AND SPATIAL INFORMATION

8.1 Minimum Longitude

-75 Degrees 17 Minutes 4.80 Decimal Seconds

8.2 Maximum Longitude

-75 Degrees 04 Minutes 18.60 Decimal Seconds

8.3 Minimum Latitude

38 Degrees 49 Minutes 54.60 Decimal Seconds

8.4 Maximum Latitude

38 Degrees 38 Minutes 33.00 Decimal Seconds

8.5 Name of area or region

Delaware and Maryland Coastal Bays

Stations were located in coastal bays along the East Coast of the United States in the States of Delaware and Maryland. Four major subsystems included Rehobeth Bay, Indian River Bay, Assawoman Bay and Chincoteague Bay. Areas of interest included Indian River, St. Martin River, Trappe Creek and artificial lagoons.

9. QUALITY CONTROL/ QUALITY ASSURANCE

9.1 Measurement Quality Objectives

Measurement quality objectives were the same for EMAP-Estuaries indicators and are outlined below:

Benthic Community Composition	Accuracy Goal	Precision Goal	Completion Goal
Sorting	10 %		90%
Counting	10 %		90%
Taxonomic Identification	10 %		90%
Biomass		10 %	

9.2 Quality Assurance/Control Methods

9.2.1 Sample Collection Quality Control

At least once during the field season, QA evaluation of each field crew will be performed by either the QA officer or a designee to insure compliance with prescribed protocols. Field crews will be re-trained whenever discrepancies are noted.

9.2.2 Sample Processing Quality Control

Quality control for processing grab samples involves both sorting and counting check systems. A check on the

efficiency of the sorting process was required to document the accuracy of the organism extraction process. Checks on the accuracy of sample counting were conducted in conjunction with taxonomic identification and used the same criteria.

The Quality control check on each technician's efficiency at sorting (i.e., separating organisms from sediment and debris) consists of a independent re-sort by a second, experienced sorter. To pass QC, the sorter's efficiency must be at least 90%, meaning no more than 10% of the organisms in the sample were missed. A minimum of 10 percent of samples processed by a given sorter should be subjected to a QC sort at regular intervals during sample processing. If a sorter fails QC sorts, then all samples in that batch were resorted.

Quality control checks for taxonomic accuracy will be performed on a minimum of 10% of samples processed by each taxonomic technician. Only senior taxonomists will be permitted to perform quality control checks on taxonomic identifications. Each taxonomic technician must maintain an identification and enumeration accuracy of 90% or greater. If results fall below this level, the entire QC batch will be re-identified and counted. If taxonomic efficiency is between 90% and 95%, the original technician will be advised and species identifications will be reviewed as part of continuous training.

9.3 Quality Assessment Results

Two QA steps were required: 10% recounts and independent verification of species identification. The recounts (multiple types) and preliminary species verification were performed by the laboratory responsible for the analyses. These in-house QC measures met the requirements established in the QA Plan.

9.4 Unassessed Errors

A source of error results from the process of removing an aliquot of sediment from each grab for silt-clay analysis. This sample (a 50 cc plug) was removed from each grab prior to sieving. No attempt was made to "correct" for the animals potentially lost to this sample.

10. DATA ACCESS

10.1 Data Access Procedures

Data can be requested from a contact under Section 10.3.
Data can be downloaded from the WWW site.

10.2 Data Access Restrictions

NA

10.3 Data Access Contact Persons

Dr. Frederick W. Kutz
U.S. Environmental Protection Agency
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(410)305-2742 (Tel.)

10.4 Data Set Format

The data sets are in a fixed column format.

10.5 Information Concerning Anonymous FTP

Not accessible

10.6 Information Concerning WWW

Data can be downloaded from the WWW.

10.7 EMAP CD-ROM Containing the Data Set

Data not available on CD-ROM.

11. REFERENCES

Chaillou, J.C., S.B. Weisberg, F.W. Kutz, T.E. DeMoss, L. Mangiaracina, R. Magnien, R. Eskin, J. Maxted, K. Price and J.K. Summers. 1996. Assessment of the Ecological Condition of the Delaware and Maryland Coastal Bays. U.S. Environmental Protection Agency. Prepared by Versar, Inc., Columbia, MD.

Frithsen, J.B., L.C. Scott and M. Young. 1994. Methods for processing estuarine benthic macroinvertebrate samples from the EMAP Estuaries Virginian Province. Versar, Inc, Columbia, MD.

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Valente, R., C.J. Strobel, J.E. Pollard, K.M. Peres, T.C. Chiang and J. Rosen. 1990. Quality Assurance Project Plan for Near Coastal: 1990 Demonstration Project. U.S. EPA NHEERL-AED, Narragansett, RI.

12. TABLE OF ACRONYMS

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