CATALOG DOCUMENTATION
EMAP-ESTUARIES PROVINCE LEVEL DATABASE
LOUISIANIAN PROVINCE 1991-1994
BENTHIC COMMUNITY DATA

TABLE OF CONTENTS

1. DATA SET IDENTIFICATION

1.1 Title

EMAP-Estuaries Province Level Database
Louisianian Province
Benthic Community Data

1.2 Catalog Author

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Tom Heitmuller, U.S. Geological Survey - BRD/GBPO

1.3 Catalog Revision Date

March 4, 1999

1.4 Data set name

BENTHOS

1.5 Task Group

ESTUARIES

1.6 Data set identification code

00049, 00089, 00129, 00169

1.7 Version number for a data set

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

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2.2 Sample Collection Investigator

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2.3 Sample Processing Investigator

Tom Heitmuller
U. S. Geological Survey
BRD - GBPO

2.4 Data Analysis Investigator

Virginia D. Engle
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NHEERL - GED

2.5 Additional Investigators

N/A

3. DATA SET ABSTRACT

3.1 Abstract of the Data Set

The BENTHOS data file summarizes at the community level the data collected from the benthic grabs taken at each station. Benthic diversity, abundance and biomass across all taxa were estimated from taxonomic data from samples (generally three) collected at a station. Sediment moisture and silt/clay content were estimated from all grabs collected at a station (See Metadata for Sediment Grain Data). Redox potential discontinuity (depth in mm) was calculated in the field and represents the average depth from all grabs collected at a station.

3.2 Keywords for the Data Set

Benthic Species, Mean Species Abundance, Species Abundance, Species Composition, Taxon Abundance, Benthic Taxon Abundance, Mean Benthic Taxon Abundance

4. OBJECTIVES AND INTRODUCTION

4.1 Program Objective

The Environmental Monitoring and Assessment Program (EMAP) was designed to periodically estimate the status and trends of the Nation's ecological resources on a regional basis. EMAP provides a strategy to identify and bound the extent, magnitude and location of environmental degradation and improvement on a regional scale based on randomly located station sites. Only the randomly located Base Sampling Sites were included in this data set.

4.2 Data Set Objective

The objective of the Benthic Community data file is to provide summary data about the bottom dwelling (benthic macroinvertebrate) communities at each station sampled in the Louisianian Province in 1991-1994.

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 important commercial and recreational species and are prey for critical life stages of other important commercial and recreational 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 health of these communities is a reflection of local environmental conditions because members of benthic assemblages generally have limited mobility. The communities respond to both sediment and water column conditions and contain long-lived species. Consequently, benthic community inventories have been used in many regional estuarine monitoring programs and have proven to be effective as an indicator

of the extent and magnitude of pollution impacts in estuarine ecosystems.

Benthic monitoring data describing species composition, abundance and biomass were used as indicators of the biological conditions in the estuaries of the Louisianian Province. These descriptions, along with additional measurements in other data files describing habitat indicators (depth, salinity) and pollution exposure indicators (oxygen concentrations, sediment toxicity, sediment contaminant concentrations) were used to develop a benthic index of environmental condition for the Province.

4.4 Summary of Data file Parameters

Benthic diversity, abundance and biomass across all taxa were estimated from taxonomic data from all grabs (generally three) collected at a station. Sediment moisture and silt/clay content were estimated from all grabs collected at a station. Redox potential discontinuity (depth in mm) was calculated in the field and represents the average depth from all grabs collected at a station.

4.5 Year-Specific Information about Data

Benthic biomass parameters were only measured in 1991 and 1992. Separation of abundance and number of species measures into epifauna and infauna was not done in any year.

In 1991-1992, a plastic core sampler was inserted in each benthic grab to extract a subsample (70 cc) for sediment characterization analyses. In 1993, the procedure was dropped; instead, sediment characterization samples were taken from a composited homogenate of surficial sediment (see metadata for Sediment Grain data).

5. METHODS

5.1 Data Acquisition

5.1.1 Sampling Objective

Collect three sediment grab samples suitable for the analysis of benthic assemblage and biomass.

5.1.2 Sample Collection Methods Summary

Each acceptable benthic grab sample was rinsed into a plastic dishpan for transport to the sieving station for immediate, aboard processing. The sediment from an individual grab was sieved through a 500 m sieve to wash away sediments and leave organisms, detritus, sand and shell particles larger than 500 m. The contents on the sieve were rinsed with site water, into 500-ml wide-mouth polypropylene jar(s). The contents of each jar were preserved by the addition of 100 ml of formalin:seawater (50:50) containing Rose Bengal vital stain to yield a final formalin concentration of 10% by volume.

5.1.3 Beginning Sampling Date

09 July 1991
08 July 1992
06 July 1993
06 July 1994

5.1.4 Ending Sampling Date

10 September 1991
11 September 1992
19 August 1993
15 September 1994

5.1.5 Sampling Platform

Each team was supplied with a 25-foot SeaArk work boat equipped with a 7.5 L gas engine fitted with a Bravo outdrive, an "A" frame boom assembly and hydraulic winch. On-board electronics consist of: a Loran C unit, GPS (beginning in 1993), radar unit, 2 VHF radios, cellular phone, compass, a depth finder, a tool kit, and all required and suggested safety equipment. One completely outfitted spare boat was stored at the Field Operations Center (EPA Lab) as backup.

5.1.6 Sampling Equipment

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 413 cm2 with a maximum depth of penetration in the sediment of 10 cm.

5.1.7 Manufacturer of Sampling Equipment

Young's Welding, Sandwich, MA

5.1.8 Key Variables

Number of grabs collected.

5.1.9 Sampling 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

To ensure the integrity of the sediment samples collected, the interior surfaces of the grab sampler (including the underside of the hinged top) were rinsed prior to use to assure that no sediment remained from the previous station. To minimize the effects of bow wave disturbance to surficial sediments, the speed of grab through the water column was reduced as it neared the bottom. To minimize the chance of sampling the exact same

location twice, after three (3) grabs were taken, the boat was moved five (5) meters downstream by letting out the appropriate length of anchor line. Sediment grabs used for benthic samples were randomly interspersed with the grabs used for sediment chemistry/toxicity samples.

A successful grab had relatively level, intact sediment over the entire area of the grab and a sediment depth at the center of between 7-10 centimeters. Unacceptable grabs included those containing no sediments and those where were partially filled or had shelly substrates or grossly slumped surfaces. Grabs that were overfilled in which excessive amounts of sediment extruded from the hinged top were also unacceptable. The sieve was inspected immediately following the removal of the sample to ensure no organisms were left clinging to the sieve. Any organisms found were placed in the sample jar. The sieve was also thoroughly scrubbed with a stiff brush between samples.

Additionally, each crew was visited during the sampling period by the QA Coordinator or Logistics Coordinator. Part of the review included observing sample collection procedures to ensure samples were being processed properly.

5.1.11 Sample Collection Method Reference

Macauley, J.M. 1991. Environmental Monitoring and Assessment Program-Near Coastal Louisianian Province: 1991 Monitoring Demonstration. Field Operations Manual. EPA/600/X-91/XXX. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

Macauley, J.M. 1992. Environmental Monitoring and Assessment Program: Louisianian Province:1992 Sampling: Field Operations Manual. EPA/ERL-GB No. SR-119. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

Macauley, J.M. 1993. Environmental Monitoring and Assessment Program: Louisianian Province:1993 Sampling: Field Operations Manual. EPA/ERL-GB No. SR-XXX. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

Macauley, J.M. 1994. Environmental Monitoring and Assessment Program: Louisianian Province:1993 Sampling: Field Operations Manual. EPA/ERL-GB No. SR-XXX. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

5.1.12 Sample Collection Method Deviations

None

5.2 Data Preparation and Sample Processing

5.2.1 Data Preparation Objective

Process sediment samples to accurately identify and enumerate all macrobenthic organisms found to the lowest practical taxonomic category. Process sediment samples to characterize silt/clay content.

5.2.2 Data Processing Methods Summary

BENTHIC SAMPLES: The samples were washed through 500 µm mesh sieves. Benthic fauna were sorted from the sediments, identified to lowest practical taxa, and enumerated. Only benthic macrofauna were identified. Meiofauna and taxonomic groups having only planktonic forms were excluded from the identification process. Benthic fauna were identified to the lowest practical taxonomic level.

BIOMASS: Species were combined into taxonomic and ecologically significant groupings to determine the biomass for each group. Biomass was determined as shell-free dry weight after drying to a constant weight at 60 degrees C.

5.2.3 Sample Processing Method Calibration

N/A

5.2.4 Sample Processing Quality Control

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. United States Environmental Protection Agency, Office of Research and Development, Narragansett, RI. EPA/620/R-95/008.

5.2.6 Sample Processing Method Deviations

None

6. DATA MANIPULATIONS

6.1 Name of New or Modified Value

BSP_TOT	Total # Benthic Taxa in 'n' Grabs
BSP_MEAN	Mean # Benthic Taxa in 'n' Grabs
BSP_TABN	Total # Organisms in 'n' Grabs
BSP_MABN	Mean # Organisms in 'n' Grabs
BIOM_TOT	Total Biomass (g) of 'n' Grabs, all Taxa
BIOMMEAN	Mean Biomass (g) of 'n' grabs, all Taxa
SICL_B_M	Mean Silt/Clay Content (%) in 'n' Cores
MOIST_M	Moisture Content (%) in Sed. Sample
GRBDEP_M	Grab Penetration: Mean Depth (mm)
RPDDEP_M	Redox Pot'nt'l Discont'y:Mn.Depth (mm)

6.2 Data Manipulation Description

Measurements on a 'per grab' basis were received from taxonomic laboratories. Values in this data set were calculated by 1) Summing replicate abundance over 'n' grabs, 2) taking the mean of the abundance across 'n' replicates and 3) generating a standard deviation based on the replicate abundances for each taxon.

6.3 Data Manipulation Examples

6.3.1 Total abundance for a taxon:

Abundance counts for a taxon were summed for all replicates collected at a station.

6.3.2 Mean and Standard Deviation (SD) values for abundance

The mean for each taxon identified at a station was calculated by summing the replicate abundances and dividing by the number of grabs collected.

6.4 Data Manipulation Computer Code File

6.5 Data Manipulation Computer Code Language

6.6 Data Manipulation Computer Code

7. DATA DESCRIPTION

7.1 Description of Parameters

7.1.1 Parameter Name

Field Name	Data Type	Max Field Len	Format	Variable Field Label
STA_NAME	Char	8	8.	The Station Identifier
VST_DATE	Num	8	YYMMDD6.	The Date the Sample was Collected
BSP_GRAB	Num	8	2.	Grabs (#) included in Summary Data
BSP_TOT	Num	8	5.	Total # Benthic Taxa in 'n' Grabs
INF_TOT	Num	8	4.	Total # Infaunal Taxa in 'n' Grabs
EPI_TOT	Num	8	4.	Total # Epifaunal Taxa in 'n' Grabs
BSP_MEAN	Num	8	7.2	Mean # Benthic Taxa in 'n' Grabs
INF_MEAN	Num	8	7.2	Mean # Infaunal Taxa in 'n' Grabs
EPI_MEAN	Num	8	7.2	Mean # Epifaunal Taxa in 'n' Grabs
BSP_TABN	Num	8	5.	Total # Organisms in 'n' Grabs
INF_TABN	Num	8	5.	Total # Infaunal Organisms in 'n' Grabs
EPI_TABN	Num	8	5.	Total # Epifaunal Organisms in 'n' Grabs
BSP_MABN	Num	8	7.2	Mean # Organisms in 'n' Grabs
INF_MABN	Num	8	7.2	Mean # Infaunal Organisms in 'n' Grabs
EPI_MABN	Num	8	7.2	Mean # Epifaunal Organisms in 'n' Grabs
BIOM_TOT	Num	8	8.4	Total Biomass (g) of 'n' Grabs, all Taxa

Field Name	Data Type	Max Field Len	Format	Variable Field Label, continued.
BIOMMEAN	Num	8	8.5	Mean Biomass (g) of 'n' grabs, all Taxa
SICL_B_M	Num	8	6.3	Mean Silt/Clay Content (%) in 'n' Cores
MOIST_M	Num	8	5.2	Moisture Content (%) in Sed. Sample
GRBDEP_M	Num	8	4.	Grab Penetration: Mean Depth (mm)
RPDDEP_M	Num	8	3.	Redox Pot'nt'l Discont'y:Mn.Depth (mm)

7.1.6 Precision to which values are reported

Total abundance is reported as a whole number. Means and standard deviations are reported to 2 decimal places. Total biomass reported to 4 decimal places, mean biomass reported to 5 decimal places. Percent silt/clay reported to 3 decimal places. RPD depth is a whole number.

7.1.7 Accuracy of the data values

7.1.8 Minimum Value in Data Set

1991
1992
1993
1994

BSP_GRAB
3
3
3
3

BSP_TABN
0
0
1
0

BSP_MABN
0
0
0.33
0

BSP_MEAN
0
0
0.33
0

BSP_TOT
0
0
1
0

BIOM_TOT
0
0
.
.

BIOMMEAN
0
0
.
.

SICL_B_M
5.167
1.600
0.10
0.400

RPDDEP_M
0
0
0
0

MOIST_M
.
19.5
11.88
.

7.1.9 Maximum Value in Data Set

1991
1992
1993
1994

BSP_GRAB
3
3
3
3

BSP_TABN
2770
4292
6582
2856

BSP_MABN
923
1430.67
2194
952

BSP_MEAN
75.67
85.33
83.67
83.00

BSP_TOT
131
160
159
141

BIOM_TOT
31.1039
5.8759
.
.

BIOMMEAN
10.36797
1.95
.
.

SICL_B_M
98.80
99.27
99.80
98.80

RPDDEP_M
101
93
96
100

MOIST_M
.
79.70
83.04
.

7.2 Data Record Example

7.2.1 Column Names for Example Records

OBS STA_NAME VST_DATE BSP_GRAB BSP_TOT BSP_MEAN
BSP_TABN TSP_MABN BIOM_TOT BIOM_MEAN SICL_B_M RPDDEP_M

7.2.2 Example Data Records

OBS	STA_NAME	VST_DATE	BSP_GRAB	BSP_TOT	BSP_MEAN
1	LA91LR01	910721	3	63	32.67
2	LA91LR02	910721	3	41	21.00
3	LA91LR03	910722	3	72	37.33
4	LA91LR05	910818	3	9	4.00
5	LA91LR06	910822	3	26	17.00

BSP_TABN	BSP_MABN	BIOM_TOT	BIOM_MEAN	SICL_B_M	RPDDEP_M
200	66.67	0.0710	0.0237	76.667	73
185	61.67	0.0803	0.0268	42.400	51
256	85.33	0.0764	0.0255	17.233	22
24	8.00	0.0871	0.0290	85.000	73
412	137.33	2.8072	0.9357	75.633	45

7.3 Related Data Sets

7.3.1 Related Data Set Name

7.3.2 Related Data Set Identification Code

8. GEOGRAPHIC AND SPATIAL INFORMATION

8.1 Minimum Longitude

-97 Degrees 27 Minutes 13.20 Decimal Seconds

8.2 Maximum Longitude

-82 Degrees 39 Minutes 28.2000 Decimal Seconds

8.3 Maximum Latitude

30 Degrees 48 Minutes 30.00 Decimal Seconds

8.4 Minimum Latitude

26 Degrees 02 Minutes 55.80 Decimal Seconds

8.5 Name of the area or region

Louisianian Province- Coastal distribution of sampling is along the Gulf of Mexico from the Rio Grande, TX to Anclote Key, FL. States represented: Texas, Louisiana, Alabama, Mississippi, Florida

8.6 Direct Spatial Reference Method

Point

8.7 Horizontal Coordinate System Used

Universal Transverse Mercator

8.8 Resolution of Horizontal Coordinates

0.5

8.9 Units for Horizontal Coordinates

Meters

8.10 Vertical Coordinate System

N/A

8.11 Resolution of Vertical Coordinates

N/A

8.12 Units for Vertical Coordinates

N/A

9. QUALITY CONTROL/QUALITY ASSURANCE

9.1 Measurement Quality Objectives

Measurement Quality Objectives were outlined in the Quality Assurance Project Plan. Accuracy and precision goals are outlined below:

Benthic Species Composition	Accuracy Goal	Completeness Goal
Sorting	10%	100%
Counting	10%	100%
Taxonomy	10%	100%

9.2 Quality Assurance/Control Methods

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 processed from the last successful QC check were resorted and any additional organisms found were added to each sample. If QC sorting passes, but some organisms were found, these animals WERE NOT added to the original sample sort.

9.3 Actual Measurement Quality

The field sample collection and laboratory processing (i.e., sorting, identifying, and enumeration) of the benthic community assemblages for 1991-1993 EMAP-Estuaries Monitoring in the Louisianian province fully met the prescribed QA/QC guidelines and all macrobenthic community data were acceptable without further qualification for EMAP assessments.

9.4 Sources of Error

None

9.5 Known Problems with the Data

None

9.6 Confidence Level/Accuracy Judgement

Routine QC monitoring indicated that sorting efficiencies were consistently better than 95%.

9.7 Allowable Minimum Values

N/A

9.8 Allowable Maximum Values

N/A

9.9 QA Reference Data

Heitmuller, P.T. and R. Valente. 1991. Environmental Monitoring and Assessment Program: EMAP-Estuaries Louisianian Province: 1991 quality assurance project plan. EPA/ERL-GB No. SR-120. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

10. DATA ACCESS

10.1 Data Access Procedures

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

10.2 Data Access Restrictions

Data can only be accessed from the WWW site.

10.3 Data Access Contact Persons

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10.4 Data Set Format

Data can be transmitted in a variety of formats derived from SAS data files when a Data Request Form is submitted.

10.5 Information Concerning Anonymous FTP

Not accessible

10.6 Information Concerning Gopher

10.7 Information Concerning World Wide Web

Data can be downloaded from the WWW

10.8 EMAP CD-ROM Containing the Data set

Data not available on CD-ROM.

11. REFERENCES

11.1 EMAP References

Heitmuller, P.T. and R. Valente. 1991. Environmental Monitoring and Assessment Program: EMAP-Estuaries Louisianian Province: 1991 quality assurance project plan. EPA/ERL-GB No. SR-120. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

Macauley, J.M. 1991. Environmental Monitoring and Assessment Program-Near Coastal Louisianian Province: 1991 Monitoring Demonstration. Field Operations Manual. EPA/600/X-91/XXX. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

Macauley, J.M. and J.K. Summers. 1991. Environmental Monitoring and Assessment Program, Near Coastal - Louisianian Province: 1991 Field Reconnaissance Report - East Region. EPA/600/04-91/XXX. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

Macauley, J.M. and J.K. Summers. 1991. Environmental Monitoring and Assessment Program, Near Coastal - Louisianian Province: Field Training Manual - Crew Chiefs. EPA/600/05-91/XXX. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

Macauley, J.M. and J.K. Summers. 1991. Environmental Monitoring and Assessment Program, Near Coastal - Louisianian Province: Field Training Manual - Crews. EPA/600/05-91/XXX. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561.

Summers, J.K., J.M. Macauley and P.T. Heitmuller. 1991. Environmental Monitoring and Assessment Program. Implementation Plan for Monitoring the Estuarine Waters of the Louisianian Province - 1991 Demonstration. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561. EPA/600/5-91/228.

Summers, J.K., J.M. Macauley, J.M., P.T. Heitmuller, V.D. Engle, A.M. Adams and G.T. Brooks. 1992. Annual Statistical Summary: EMAP-Estuaries Louisianian Province - 1991. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32561. EPA/600/R-93/001.

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

11.2 Background References

Engle, V.D., J.K. Summers, G.R. Gaston. 1994. A Benthic Index of Environmental Condition of Gulf of Mexico Estuaries. Estuaries. 17:372-384.

Summers, J. Kevin, John F. Paul, Andrew Robertson. 1995. Monitoring The Ecological Condition Of Estuaries In The United States. U.S. Environmental Protection Agency, Office of Research and Development, Environmental Research Laboratory, Gulf Breeze, FL 32651.

12. GLOSSARY AND TABLE OF ACRONYMS

12.1 Acronym used in the Detailed Documentation

12.2 Definition of Acronym

13. PERSONNEL INFORMATION

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