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REGIONAL ENVIRONMENTAL MONITORING AND ASSESSMENT PROGRAM - REGION 6
1993-1994 TEXAS COAST RIVERS AND ESTUARIES STUDY
BENTHIC COMMUNITY DATA

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1. DATA SET IDENTIFICATION

1.1 Title of Catalog Document

Regional Environmental Monitoring And Assessment Program - Region 6
1993-1994 Texas Coast Rivers And Estuaries Study
Benthic Community Data

1.2 Authors of the Catalog entry

Melissa M. Hughes, OAO Corp.

1.3 Catalog Revision Date

April 2, 1998

1.4 Data File Name

BENTHIC

1.5 Task Group

Region 6

1.6 Data set identification code

00007

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 R-EMAP 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

Charlie Howell
U. S. Environmental Protection Agency - Region 6
Environmental Services Division

2.2 Investigation Participant-Sample Collection

Not applicable

3. DATA FILE ABSTRACT

3.1 Abstract of the Data File

The BENTHOS data file summarizes at the community level the data collected from the benthic grabs taken at each station. Benthic diversity and abundance across all taxa were reported from samples (one or three) collected at a station. Silt/clay content (%) was estimated from one or three grabs. Redox potential discontinuity (depth in mm) was calculated in the the field from one grab or represents the average depth from three grabs collected at a station.

3.2 Keywords for the Data Set

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

4. OBJECTIVES AND INTRODUCTION

4.1 Program Objective

The R-EMAP Texas Coast project will:

1. Determine the extent and magnitude of tri-butyltin (TBT) contamination in Galveston Bay sediment and water column.
2. Determine the extent and magnitude of contaminant levels in the fish and sediment of the East Bay Bayou of Galveston Bay and whether the incidence of fish pathologies is correlated with sediment contamination.
3. Determine the levels of chlorinated hydrocarbons in fish tissue, conduct chemical and toxicity tests of sediments and determine benthic community structure in the tidal reaches of the Arroyo Colorado and the Rio Grande Rivers.
4. Determine the extent and magnitude of anoxia and concentrations of agriculture-related contaminants found in the tidal reaches of the Arroyo Colorado and Rio Grande Rivers.

4.2 Data Set Objective

The objective of the Benthic Community data file is to provide summary data about the bottom dwelling (benthic macroinvertebrate) community at each station sampled in the south Texas coast in 1993-1994.

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 and abundance were used as indicators of the biological conditions in the rivers and estuaries of the south Texas coast. 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 south Texas coast areas.

4.4 Summary of Data Set Parameters

Total and mean abundance and number of taxa are reported for each 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

None

5. DATA ACQUISITION AND PROCESSING METHODS

5.1 Data Acquisition

5.1.1 Sampling Objective

Collect one to three sediment grab samples suitable for the analysis of benthic assemblage data.

5.1.2 Sample Collection Method Summary

Each acceptable benthic grab sample was rinsed into a plastic dishpan for transport to the sieving station for immediate, on-board 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 adding 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 Dates

24 September 1993
10 August 1994

5.1.4 Ending Sampling Date

10 October 1993
16 August 1994

5.1.5 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, radar unit, 2 VHF radios, cellular phone, compass, a depth finder, a tool kit, and all required and suggested safety equipment.

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

NA

5.1.8 Key Variables

NA

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 which 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 References

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.

5.1.12 Sample Collection Method Deviations

None

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 practical taxonomic category.

5.2.2 Sample Processing Methods Summary

5.2.2.1 Field Summary

See Section 4.1.2 Collection Method Summary

5.2.2.2 Laboratory Summary

BENTHIC SAMPLES: The samples were washed through 500 um 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.

5.2.3 Sample Processing Method Calibration

NA

5.2.4 Sample Processing Quality Control

NA

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, NHEERL-AED, Narragansett, RI. EPA/620/R-95/008.

6. DATA ANALYSIS AND MANIPULATIONS

6.1 Name of New or Modified Value

BSPECABN	Organisms of the Taxon:Total #
BSPEC_MA	Organisms of the Taxon:Mean #/Grab
BSPECSTD	Organisms of the Taxon:STD of Mean/Grab

6.2 Data Manipulation Description

Measurements on a 'per grab' basis were received from taxonomic laboratories. Values in this data set were calculated in two (2) ways: 1) Total measurements were summed from replicate measurements for a parameter over 'n' grabs and 2) a mean of the measurement was taken across 'n' replicate values. Generally, total and mean values are based on the collection of three (3) grabs collected at a station.

6.3 Data Manipulation Examples

6.3.1 Total value for total abundance (BSP_TABN)

BSP_TABN

BSP_TABN represents the arithmetic sum of the number of individuals identified in each grab. The number of individuals of each unique taxa (identified by EMAP SPECCODE) were combined from all of the successful grabs as follows:

SPECCODE	Grab 1	Grab 2	Grab 3
STREBENE	13	.	42
MULILATE	10	11	12
MEDIAMBI	28	.	51
SIGATENT	1	.	.
PARAPINN	23	.	.
XXXXPOLY	.	6	.

The value for BSP_TABN in this example would be 197 because there are 75 individuals in grab 1, 17 in grab 2, and 105 in grab 3 and 3 grabs (75+17+105 = 197).

6.3.2 Value for mean abundance (BSP_MABN)

BSP_MABN represents the arithmetic mean of the number of individuals identified in each grab. The number of individuals of each unique taxa (identified by EMAP SPECCODE) were combined from all of the successful grabs as follows:

SPECCODE	Grab 1	Grab 2	Grab 3
STREBENE	13	.	42
MULILATE	10	11	12
MEDIAMBI	28	.	51
SIGATENT	1	.	.
PARAPINN	23	.	.
XXXXPOLY	.	6	.

The value for BSP_MABN in this example would be 65.67 because there are 75 individuals in grab 1, 17 in grab 2, and 105 in grab 3 and 3 grabs ((75+17+105)/3) = 65.67).

6.3.3 Value for mean number of taxa (BSP_MABN)

BSP_MEAN represents the arithmetic mean of the number of individual benthic taxa identified in the number of grabs in BSP_GRAB. This is not strictly the number of species because the benthic data were identified to the lowest practical taxa which was not always species. The unique taxa (represented by the EMAP SPECCODE) were combined from all of the successful grabs as follows:

SPECCODE	Grab 1	Grab 2	Grab 3
STREBENE	13	.	42
MULILATE	10	11	12
MEDIAMBI	28	.	51
SIGATENT	1	.	.
PARAPINN	23	.	.
XXXXPOLY	.	6	.

The value for BSP_MEAN in this example would be 3.33 because there are 5 unique taxa in grab 1, 2 in grab 2, and 3 in grab 3 and 3 grabs ((5+2+3)/3) = 3.33).

6.3.4 Value for total number of taxa (BSP_TOT)

BSP_TOT represents the total number of individual benthic taxa identified in the number of grabs in BSP_GRAB. This is not strictly the number of species because the benthic data was identified to the lowest practical taxa which was not always a species. The unique taxa (represented by the EMAP SPECCODE) were combined from all of the successful grabs as follows:

SPECCODE	Grab 1	Grab 2	Grab 3
STREBENE	13	.	42
MULILATE	10	11	12
MEDIAMBI	28	.	51
SIGATENT	1	.	.
PARAPINN	23	.	.
XXXXPOLY	.	6	.

The value for BSP_TOT in this example would be 6 although only 5 taxa occur in grab 1, 2 in grab 2, and 3 in grab 3. Six unique taxa occur in all 3 grabs combined.

6.3.5 The silt/clay content (SICL_B_M) calculation was:

SICL_B_M represents the arithmetic mean of the silt/clay content (%) of the sediments from each core.

The silt-clay weight calculation is as follows:

Silt-clay weight = (gross wt. - tare wt.) * (total volume in cylinder)/(sample volume from cylinder)

The percent silt-clay calculation is as follows:

% silt-clay = silt-clay wt/(sand wt + silt-clay wt) * 100

6.3.6 The mean Redox Potential Discontinuity (RPDDEP_M) depth:

RPDDEP_M represents the arithmetic mean of the Redox Potential Discontinuity Depth (mm) measured in the field in each of the benthic grabs. The Redox Potential Discontinuity Depth is defined as the depth in mm from the surface of the sediment to the anoxic (black) layer of sediment.

6.3.7 The sediment water content (MOIST_M) calculation was as follows:

MOIST_M represents the percent moisture content of the sediment grab. Moisture was measured by the laboratory responsible for sediment chemistry (see metadata for SED_CHEM) based on a single sediment sample (it does not represent the mean of 3 cores). In 1993, MOIST_M was calculated from the dry and wet weights reported by the sediment chemistry laboratory as:

MOIST_M = 1 - (drywt / wetwt) * 100.

7. DATA DESCRIPTION

7.1 Description of Parameters

	Field Name	Data Type	Field Len	Format	Variable Label
1	STA_NAME	Char	8	$8.	The Station Identifier
2	BSP_TABN	Num	8	5.	Total # Organisms in 'n' Grabs
3	BSP_TOT	Num	8	5.	Total # Benthic Taxa in 'n' Grabs
4	RPDDEP_M	Num	8	3.	Redox Pot'nt'l Discont'y: Mean Depth(mm)
5	SICL_B_M	Num	8	6.3	Mean Silt/Clay Content (%) in 'n' Cores
6	BSP_MABN	Num	8	7.2	Mean # Organisms in 'n' Grabs
7	BSP_MEAN	Num	8	7.2	Mean # Benthic Taxa in 'n' Grabs
8	BSP_GRAB	Num	8	2.	Grabs (#) included in Summary Data
9	VST_DATE	Num	8	YYMMDD6.	The Date the Sample was Collected

7.1.6 Precision to which values are reported

Total abundance and # taxa are reported as whole numbers. Mean abundance and standard deviation (SD) are reported to 2 decimal places.

7.1.7 Minimum Value in Data Set

Variable	Minimum
BSP_TABN	0
BSP_TOT	0
RPDDEP_M	0
SICL_B_M	2.600
BSP_MABN	0.00
BSP_MEAN	0.00
BSP_GRAB	1

7.1.8 Maximum Value in Data Set

Variable	Maximum
BSP_TABN	2243
BSP_TOT	110
RPDDEP_M	91
SICL_B_M	99.300
BSP_MABN	793.00
BSP_MEAN	69.33
BSP_GRAB	3

7.2 Data Record Example

7.2.1 Column Names for Example Records

STA_NAME	DATE	BSP_GRAB	BSP_TOT	BSP_TABN	BSP_MABN	BSP_MEAN	SICL_B_M	RPDDEP_M

7.2.2 Example Data Records

STA_NAME	DATE	BSP_GRAB	BSP_TOT	BSP_TABN	SICL	RPDDEP_M	BSP_MABN	BSP_MEAN
LA93AC1	931007	1	0	0	96.70	0	0	0
LA93AC10	931008	1	0	0	90.60	0	0	0
LA93AC2	931007	1	2	13	85.70	1	13	2
LA93AC3	931007	1	0	0	78.80	0	0	0
LA93AC4	931008	1	4	12	10.00	0	12	4

8. GEOGRAPHIC AND SPATIAL INFORMATION

8.1 Minimum Longitude

-97 Degrees 36 Minutes 16.20 Decimal Seconds

8.2 Maximum Longitude

-94 Degrees 24 Minutes 33.00 Decimal Seconds

8.3 Minimum Latitude

25 Degrees 57 Minutes 28.80 Decimal Seconds

8.4 Maximum Latitude

29 Degrees 43 Minutes 49.80 Decimal Seconds

8.5 Name of area or region

Coastal distribution of sampling is in Galveston Bay, the East Bay Bayou of Galveston Bay and the Arroyo Colorado and the Rio Grande River systems in Texas.

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 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

Not applicable.

10. DATA ACCESS

10.1 Data Access Procedures

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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(214) 655-8354

10.4 Data file Format

Data can be downloaded as ASCII fixed format files.

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 file

Data not available on CD-ROM.

11. 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. 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.

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.

12. TABLE OF ACRONYMS

ACRONYM	DESCRIPTION
EMAP	Environmental Monitoring and Assessment Program
EPA	Environmental Protection Agency
FTP	File Transfer Protocol
GPS	Global Positioning System
REMAP	Regional Environmental Monitoring and Assessment Program
WWW	World Wide Web

13. PERSONNEL INFORMATION

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