1979 - 3

NORTHWESTERN GULF OF MEXICO

TOPOGRAPHIC FEATURES

STUDY

QUARTERLY SUMMARY REPORT
3rd Report
(1 Mar 79 - 30 Jun 79)

SUBMITTED TO THE

U.S. DEPARTMENT OF THE INTERIOR

BUREAU OF LAND MANAGEMENT

OUTER CONTINENTAL SHELF OFFICE

NEW ORLEANS, LOUISIANA

CONTRACT NO. AA550-CT8-35

August 1979

RESEARCH CONDUCTED BY THE

COLLEGE OF GEOSCIENCES

TEXAS A&M UNIVERSITY COLLEGE STATION, TEXAS

Through The
TEXAS A&M RESEARCH FOUNDATION

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CHAPTER I

INTRODUCTION

J. LeBlanc

This report is to satisfy a requirement of the TAMRF-BLM Contract AA551-CT8-35. The Quarterly Summary Report (QSR) must be delivered to the Bureau of Land Management (BLM) thirty (30) days subsequent to each quarterly meeting. The quarterly meetings for the contract have been scheduled as follows: December 1978, March 1979, July 1979, and October 1979. The present Quarterly Summary Report covers the period 1 Mar - 30 June.

Since January 1979, two contract modifications have been approved and a third is in process. Contract Modification #1 to handle additional expenses caused by bad weather had no impact on time, but Contract Modification #2 to handle additional expenses caused by bad weather and underestimation changed the completion date from February 1980 to May 1980. Contract Modification #3 to handle additional BLM requirements will impact both time and cost.

In the previous Quarterly Summary Reports and in the Guidelines for Preparing Reports, the requirements for quarterly progress reports by each Principal Investigator (PI) are specified. The PI progress reports are included herein as chapters, with Chapter XII summarizing findings, problems, and recommendations.

ACTION ITEMS

Action items from previous reports which are covered herein include:

1. Management and Logistics Plan updates (see Chapter II).
2. Sample Inventory (see Chapter II).
3. Data management system (see Chapter III).

4. Status of contracts and subcontracts (See Chapter II).

5. Updates of inventory charts (see the relevant chapters).

CHAPTER II

PROJECT MANAGEMENT

J. LeBlanc

INTRODUCTION

This report period covered an extensive amount of administration and managerial activities. Several subcontracts were modified, two TAMRF-BLM contract modifications were executed, and a request by BLM for additional work through a contract modification was received. The status of these is presented in this chapter. Cruises conducted during this quarter are as follows: (1) 2nd Seasonal Cruise; (2) 3rd Diving Cruise; (3) 3rd Monitoring Cruise; (4) Summer Cruise; and (5) 4th Diving Cruise.

During this period (1 Mar 79 - 30 Jun 79), the TAMRF-BLM Contract AA551-CT8-35 and TAMRF-UAB subcontract were modified to cover an $11,290 cost overrun (Modification #1). Inclement weather during the 1st and 2nd Diving Cruises caused the cost overrun. Dr. T. Hopkins, UAB PI, had requested $13,103, but made alternative arrangements in an attempt to stay within the dollar constraints.

Another modification (Modification #2) to the TAMRF-BLM contract was executed to cover a $139,198 cost overrun and a time extension to May 1980. These requirements were caused by inclement weather during the 1st Seasonal Cruise and by unrealistic time and cost estimates imposed during contract negotiation. Practical experience now provides an excellent basis for estimating ship costs and time required to execute data collection functions at sea.

A request to expand the contract requirements was received by the TAMRF on 22 June 1979. This request will impact the present work effort and is being evaluated as Modification #3. BLM requested a condensed Technical and Cost Proposal by 9 July 1979.

The TAMRF-LORAC subcontract PS 6846 and the TAMRF-SealCraft subcontract L800164 were amended to cover the additional work specified in Modification #2. Other subcontracts are being reviewed for possible modification to accommodate Modification #3.

Table II-1 is a tabulation of reports or items of interest for this contract. Table II-2 provides contract or subcontract execution dates. These tables will be updated every quarter.

During this period we also (1) updated the Logistics Plan and Management Plan, (2) delivered the planned cruise reports, (3) modified the contract and subcontracts, (4) updated all ROSCOPs and sample inventories, (5) evaluated data management requirements, (6) accepted deliverables from subcontractors, (7) recommended subcontracts be terminated, and (8) participated in several cruises. The one planned action pending is the BLM FY 79 RFP, which we understand is being modified to go competitive.

DEVIATIONS/PROBLEMS/ALTERNATIVES

The major impact on project time and cost was addressed in Modification #2. The work efforts by UAB (Hopkins) and USF (Steinmetz/Doyle) remain on the original schedule, but the work of TAMU (Bright, Rezak, McGrail) will be delayed. Modification #3 will further affect the time and cost performances of PIs. The data management issue must be resolved by TAMU and BLM immediately.

RECOMMENDATIONS

1. BLM expeditiously approve the proposed Modification #3.

2. BLM expeditiously authorize the proposed monitoring program for biological, hydrographical, and geological work at the "Flower Garden Sanctuary." This work effort must be timely to satisfy valid scientific and technical plans so important data are not lost. The Meter Recovery Cruise should be delayed to December 1979, and the meters serviced during the 2nd Submersible Cruise (Modification #3). Another East Flower Garden Cruise should be authorized to maintain continuity.

3. BLM expeditiously release the FY 79 RFP.

MANAGEMENT IMPLICATIONS

If the existing work as presently defined is not extended, then BLM and the U.S. government will not collect sufficient data to arrive at sound, timely technical and scientific decisions. For example, Dr. D. McGrail will not have winter data from the time the meters are recovered in September 1979 to the time they are redeployed. The monitoring efforts by Dr. T. Bright would also be impacted without additional ship days.

PLANNED ACTIONS

During the 4th quarter of this contract we plan to:

1. Prepare a Technical/Cost Proposal and execute Modification #3.
2. Conduct a Mapping Cruise (#2).
3. Conduct a Submersible Cruise (#2).
4. Conduct a Monitoring Cruise (WFG #1).
5. Update the Management Plan.

6. Update the Logistics Plan to cover the 2nd Mapping Cruise, the 2nd Submersible Cruise, the 4th EFG Monitoring Cruise, the 1st WFG Monitoring Cruise, and the 2nd Meter Recovery Cruise.

7. Deliver the 3rd EFG Monitoring Cruise Report, the 4th FMG Diving Cruise Report, the 3rd Seasonal Cruise Report, the Summer Cruise Report, the 1st WFG Monitoring Cruise Report, and the 3rd Quarterly Summary Report.

8. Implement a data management system.

TABLE II-I STATUS OF REPORTS/PROPOSALS

DOCUMENT	CONTRACT	ORIGINAL DATE	UPDATES	
			DATE	NO.
Management Plan	CT8-35	Sep 78	30 Jun 79	1
Logistics Plan	CT8-35	8 Sep 78	29 May 79	9
Mapping Cruise Report	CT8-35	2 Nov 78		
Submersible Cruise Report	CT8-35	20 Feb 79		
Quarterly Summary Report	CT8-35			
(1)		2 Feb 79		
(2)		30 Mar 79		
(3)				
(4)				
Diving Cruise Report	CT8-35			
(1)		15 Feb 79		
(2)		20 Feb 79		
(3)		25 Apr 79		
(4)				
Monitoring Cruise Report	CT8-35			
(1)		31 Oct 78		
(2)		9 Mar 79		
(3)		29 Jun 79		
(4)				
Seasonal Cruise Report	CT8-35			
(1)		13 Feb 79		
(2)		29 May 79		
(3)				
Current Meter Retrieval Cruise #1 Report	CT8-35	7 Jun 79		
Summer Cruise	CT8-35			
Special Report (Coffee Lump)	CT8-35	22 Jan 79		
Executive Summary	FY76	13 Feb 79		
Final Report	FY76	13 Feb 79		
Executive Summary	FY77	26 Apr 79		
Final Report	FY77	13 Feb 79		
Proposal (UA)	L800166	21 Feb 79		
Proposal (TAMU)	CT8-35	30 Mar 79	26 Apr 79	
Proposal (BLM)	CT8-35	9 Jul 79		
Draft Final Report	CT8-35	1 Feb 80		
Final Report	CT8-35	1 May 80		
Executive Summary	CT8-35	1 May 80		

TABLE II-2

STATUS OF CONTRACTS/SUBCONTRACTS/PURCHASE ORDERS

SUBCONTRACTOR	DOCUMENT NUMBER	DATE FULLY EXECUTED	EFFECTIVE DATE	TERMINATION DATE
TAMRF (from BLM)	AA 551-CT8-35	7 Aug 79	27 Jul 78	
Univ. of Alab. @ Birm.	L800166	9 Jan 79	1 Aug 78	1 Feb 80
Univ. of Texas	L800167	19 Mar 79	1 Oct 78	1 Feb 80
Univ. of So. Florida	L800165	26 Jan 79	1 Aug 78	1 Feb 80
SealCraft, Inc.	L800164	5 Mar 79	30 Oct 78	1 Dec 79
Lorac Services	P36846	6 Oct 78	26 Sep 78	1 Dec 79
W. Hudgins	L800136	26 Sep 78	23 Sep 78	1 May 79
Oceanonics, Inc.	P36189	10 Aug 78	10 Aug 78	1 Oct 79
LGL, Inc.	L800137	10 Oct 79	1 Sep 78	1 Oct 79

CHAPTER III

DATA MANAGEMENT

J. LeBlanc

INTRODUCTION

This report covers the ongoing management of the data/samples being collected, reduced, analyzed, processed, inventoried and/or archived to arrive at information that can be integrated, synthesized, and used for decision making (see Table III-1). Some data can be handled manually while some requires extensive computer processing.

RESULTS

During this period an extensive analysis of the NODC formats was accomplished. J. Hagerbaumer extracted pertinent data from several sources and documented the NODC formats. These formats are now being reviewed in line with the data requirements of each researcher and those of BLM.

DEVIATIONS/PROBLEMS/ALTERNATIVES

The University of South Florida researchers (Steinmetz, Doyle) requested help in analyzing their data since computer time and costs were excluded in their proposal. We agreed to process the data with existing programs provided the data were verified and submitted in the right format. They will also need Dames and Moore MAFLA data (Files 020, 721, 810, 820, TAXA) to characterize the geological microenvironments (Re: 13 Jun 79 letter, Steinmetz and Doyle to LeBlanc).

TABLE III -I

STATUS OF ANALYTICAL SERVICES

TYPE OF ANALYSIS	AMOUNT CONTRACTED	DELIVERED	ANALYSED
I. Dissolved Oxygen and Nutrients (J. Brooks, TAMU)			
A. DOC-POC (Florida Middle Ground)			
1. Fall	32	28	28
2. Winter	32	11	11
3. Spring	32	Canceled	—
4. Summer	32	Being Collected	0
B. Nutrients (Florida Middle Ground)			
1. Fall	32	20	20
2. Winter	32	26	26
3. Spring	32	Canceled	—
4. Summer	32	Being Collected	0
C. Nutrients (East Flower Garden)			
1. Fall	6	6	6
2. Winter	6	6	6
3. Spring	6	6	in progress
4. Summer	6	Being Collected	0
II. HMW Hydrocarbons in Organisms (C.S. Giam, TAMU)			
A. Total Samples			
1. <u>Spondylus</u>	30	15	
2. Red Porgy	—	1	
3. Contaminants	6	0	
B. Chemical Analyses			
1. Aliphatic hydrocarbon	36		18
2. Aromatic hydrocarbon	36		18
3. GC-MS	8		4
III. Chemical Analyses of Sediments (P. Parker, R. Scalan, J. Winters, UTMSI)			
A. Delta C-13	32	9	9
B. HMW Hydrocarbons	34	16	6
C. Total Organic Carbon	8	9	9
IV. Trace Metals (B.J. Presley, P.N. Boothe, TAMU)			
A. Sediment	32	32	In Progress
B. <u>Spondylus</u>	15	19	
1. Atomic Absorption Analysis			19
2. Neutron Activation Analysis			In Progress
V. Geological Microenvironments: Florida Middle Ground (L. Doyle, J. Steinmetz)			
A. Geological Samples	200	140	104

Dr. G. Sharman is researching what can be done to satisfy the USF request. It appears that insufficient funds and time were budgeted by USF and there could be a time overrun.

The University of Alabama researchers (Hopkins, Schroeder) also indicated a potential data management problem. A claim was made that insufficient funds were available for computer analysis as much more data were collected than was planned. An impact statement with a cost/time proposal was requested.

As an aid to defining data requirements the data manager functions include, but are not limited to:

a. To work with researchers and identify, document, and support data and information requirements.

b. To define data collection, data reduction, data analysis, data reporting, data quality, data inventory/control, and data interfaces/integration requirements.

c. To assist researchers in handling digitized/analog data and presenting acceptable tabular or graphic representations of analytical data.

d. To assist researchers in integrating common data bases and in preparing supporting computer software.

e. To assist Project Manager in selecting correct hardware and software for data and information requirements.

RECOMMENDATIONS

1. Future Statements of Work and cost/technical proposals be evaluated for data and/or information system requirements by professional or

certified data processors.

2. BLM Program Office attempt to help USF and UA with the cost/ time overrun.

3. BLM provide a data set containing the requested MAFLA files for USF.

REFERENCES

FELDLAUSEN, P. H. 1979. Final Work Element Report (Draft), Data Synthesis, Bureau of Land Management Contract No. AA550-CT7-34. 102 p.

GRANT, J.B. 1979. Marine data managed, Geotimes, May: 26-27.

HITTELMAN, A. M., Chairman, MGD77 Task Group. 1977. The Marine Geophysical Data Exchange Format -- "MGD77" (Bathymetry, Magnetics, and Gravity), Key to Geophysical Records Documentation No. 10. National Geophysical and Solar - Terrestrial Data Center, Boulder, Colo. 18 p.

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION. 1978. NODC Taxonomic Code. National Oceanographic Data Center. 526 p.

NATIONAL OCEANOGRAPHIC DATA CENTER. 1979. TEXFORM (NODC File Types and Codes). Environmental Data and Information Service, Washington, D.C.

CHAPTER IV

CHEMICAL ANALYSES

PART A: TRACE METALS IN SPONDYLUS AND SURFICIAL SEDIMENTS

P. Boothe, B. Presley

INTRODUCTION

This report summarizes the progress made in trace metal analyses during the third quarter of the 1978-79 Topographic Features Study (TFS). This trace metal project involves determining the concentrations of selected trace elements (Al, Ca, Cd, Cr, Cu, Fe, Ni, Pb, V, Zn, and Ba in sediments only) in *Spondylus americanus* (spiny oyster) and surficial sediment samples from the East Flower Garden Bank (EFG). Most of the sediment samples are from two exploratory drilling sites in the vicinity of the EFG. This is the first year in which we have determined trace element levels in sediment for the TFS. Our laboratory has analyzed *Spondylus* samples from numerous banks in the northwestern Gulf of Mexico since 1976 as part of this ongoing study.

RESULTS

Atomic absorption (AA) analyses on the 19 *Spondylus* whole organism samples have been completed. The resultant data giving Cd, Cr, Fe, Ni, Pb, and Zn levels in these organisms will be tabulated and reported shortly. Determination of Al, Ca, and V in these samples will be by neutron activation analysis (NAA). This analysis requires special pre-irradiation preparative procedures which will be started in the near future.

Thirty-two surficial sediment samples were received this quarter. These samples were collected from one of the two EFG drill sites and from primary stations on the bank itself. The 12 remaining sediment samples from the second drill site will be delivered in late July. Preparation of the first 32 samples has been completed, and AA analysis is currently underway. These data will be reported in the next quarterly report. Preparation of these 32 samples for NAA will be started as soon as AA analyses are completed.

DEVIATIONS/PROBLEMS/ALTERNATIVES

As discussed in our last report, a loss of key laboratory personnel had slowed the progress of analyses. We are now on schedule in terms of AA determinations. Preparation of all samples on hand for NAA is in progress. However, because of personnel limitations, it will be necessary to wait until all samples have been received and prepared before conducting the actual irradiation and counting procedures. This situation means that we will be late in reporting Al, Ca, and V levels for the *Spondylus* samples.

RECOMMENDATIONS

Since the delay described above will not affect our completing the overall project on schedule, no corrective actions are needed.

MANAGEMENT IMPLICATIONS

None. The deviation in data reporting will involve no additional project costs and will have no effect on our completing this project on schedule.

CHEMICAL ANALYSES

PART B: HEAVY MOLECULAR WEIGHT HYDROCARBONS IN SPONDYLUS

C. S. Giam, G. S. Neff, Y. Hrung

INTRODUCTION

The purpose of this project has been to analyze samples of *Spondylus* for heavy molecular weight hydrocarbons. To this end, the techniques* used in earlier BLM studies (South Texas Outer Continental Shelf and Topographic Features) have been applied to the samples received.

RESULTS

The samples received and analyses completed are summarized below. Each *Spondylus* sample yields 2 analyses (one aliphatic and one aromatic), while the porgy yields 6 analyses (aliphatic and aromatic for muscle, liver and gonad tissue). Four GC-MS (for 10% of the samples) are also required for these samples.

SUMMARY OF ANALYSES

Samples Received:	15 *Spondylus*
	1 Red porgy (*Pagrus sedecim*)
Analyses Completed:	18 aliphatic hydrocarbons**
	18 aromatic hydrocarbons
	4 GC-MS

*Details of the procedures used were submitted with the project proposal and are also available in the Topo Hi final report for 1977. They will also be included in our final report.

**The results of these analyses will be submitted when interpretations are completed.

CHEMICAL ANALYSES

PART C: HMW HYDROCARBONS AND DELTA C-13 IN SEDIMENTS

P.L. Parker, R.S. Scalan, J.K. Winters

INTRODUCTION

Sixteen sediment samples have been received from TAMU/BLM for hydrocarbon, total organic matter, and Delta C-13 analysis. The samples were picked up at College Station on May 5, 1979.

RESULTS

Of the sixteen samples received, 11 have been extracted and saponified, column chromatography has been performed on 8, and GC analyses on 6 (see Table IV-C-1). Total organic carbon and Delta C-13 analyses have been completed on nine samples (see Table IV-C-2). Work is going well with no unexpected problems.

DEVIATIONS/PROBLEMS/ALTERNATIVES

Several of the jars holding sediments were cracked due to extreme cold, but none caused a sample loss. This breakage does point out the need to design stainless steel jars for future work.

RECOMMENDATIONS

[None reported.]

MANAGEMENT IMPLICATIONS

[None reported.]

TABLE IV-C-1

STATUS OF SIXTEEN SAMPLES FOR HYDROCARBON ANALYSES
IN THE BLM/TAMU/TOPO/UT PROGRAM

Sample	Received	Extracted	Saponified	Column Chromatography	GC
EFG-DS1-1G1	x	x	x	x	x
EFG-DS1-2G	x	x	x	x	x
EFG-DS1-3G	x	x	x	x	x
EFG-DS1-4G	x	x	x	x	
EFG-DS1-5G	x	x	x	x	
EFG-DS1-6G	x				
EFG-DS1-7G	x	x	x		
EFG-DS1-8G	x	x	x		
EFG-DS1-9G	x				
EFG-DS1-10G	x	x	x	x	x
EFG-DS1-11G	x	x	x	x	x
EFG-DS1-12G	x	x	x	x	x
EFG-1G	x				
EFG-2G	x	x	x		
EFG-3G	x				
EFG-4G	x				

TABLE IV-C-2

TOTAL ORGANIC CARBON AND DELTA C-13 DATA FOR NINE SEDIMENT SAMPLES FROM BLM/TAMU/TOPO/UT STUDY

Sample	TOC *	$\delta^{13}C$ **
EFGDS1-1G1	1.35	-20.89
EFGDS1-2G	1.49	-21.32
EFGDS1-3G	1.18	-20.47
EFGDS1-4G	1.15	-21.23
EFGDS1-5G	1.33	-20.74
EFGDS1-8G	1.13	-21.50
EFGDS1-10G	1.35	-20.85
EFGDS1-11G	1.18	-20.04
EFGDS1-12G	1.28	-20.10

* Total organic carbon in percent on a dry, carbonate free basis

** Delta C-13 values are relative to the PDB carbonate standard

CHAPTER V

LONG TERM SUSPENDED SEDIMENT DISPERSAL (FOSSIL COCCOLITHS)

S. Gartner

INTRODUCTION

The purpose of fossil coccolith studies on the continental shelf is to describe the dispersal of fine silt and clay size sediments and to ascertain whether any detectable anomalies or unexpected patterns exist such as those found on the South Texas continental shelf. The term "fossil coccoliths" includes coccoliths produced by modern coccolithophores in the waters over the continental shelf and which are incorporated in the modern sediment, as well as redeposited ancient (mostly Cretaceous) coccoliths which originate from the circum Gulf of Mexico coastal plain and find their way into modern continental shelf sediments by way of rivers draining this area, or possibly by reworking of older (late Pleistocene and subrecent) sediments on the continental shelf. In this connection three categories of samples have been studied from the east Texas-Louisiana continental shelf.

1. Surface sediment samples from a large area of the continental shelf have been analyzed to determine the distribution of modern and redeposited fossil coccoliths in the sediment. These data have been plotted and contoured for preliminary evaluation.
2. Surface sediment samples from the East Flower Garden and from five second priority banks are being analyzed to determine whether the fine detrital sediment over and near the banks contains a significant proportion of redeposited material and,

if so, whether there is a recognizable pattern to this distribution. In addition, a small suite of samples (z-transect) from the continental shelf shoreward of the banks will be studied. Some of these samples have now been received and are presently being studied.

3. Suspended sediment samples from above the banks and adjacent to the banks as well as from the continental shelf are analyzed as received. (The sampling design is approximately, but not precisely, the same as for item 2 above.) Those samples received to date from this last category either have been analyzed or are presently being analyzed. Preliminary results for the East Flower Garden Bank have been plotted on base maps for evaluation.

PRELIMINARY RESULTS

The surface sediment samples, chiefly from the outer continental shelf area, do not seem to indicate any anomalous patterns of suspended sediment dispersal on the Louisiana and eastern Texas continental shelf. Topographic highs such as banks on the shelf edge have somewhat higher numbers of redeposited (ancient) fossil coccoliths whereas areas between topographic highs are characterized by a larger proportion of indigenous or modern coccoliths. No major cross-shelf trends seem to be indicated in the abundance ratios of redeposited fossil to modern coccoliths, although data from the middle and inner shelf area are rather sparse. A sharp narrow tongue that seems to be extending diagonally across the shelf in the region directly south of the Texas-Louisiana border, though based on a relatively small number of points, is too prominent to be ignored. However, the direction of sediment transport required to produce such a tongue is a narrow, sharply confined up-shelf, on-shore transport. This would not be a reasonable interpretation, and a more likely cause for this anomalous distribution must be sought.

In the vicinity of the East Flower Garden Bank suspended sediment samples for January and March seem to indicate that a larger proportion of redeposited fossil coccoliths is present just north of the bank than on the bank and immediately south of the bank. Whether this is attributable to relict sediments is unclear as yet; however, a more likely interpretation would be that detrital sediments derived from land are more abundant north of the bank, which may in turn lead to the inference that land-derived suspended sediment transport is more active immediately shoreward of the shelf edge than is the case seaward of the bank.

Surface sediment sample data in the immediate vicinity of the bank, which we are in the process of gathering now, should aid the interpretation of the suspended sediment data.

DEVIATIONS/PROBLEMS/ALTERNATIVES

None.

RECOMMENDATIONS

Find a more likely cause for the anomalous distribution cited above.

MANAGEMENT IMPLICATIONS

None can be made until this study is completed.

CHAPTER VI

BATHYMETRIC MAPPING AND SUB-BOTTOM PROFILING

T. Hilde

INTRODUCTION

During this quarter, measuring and plotting of the depth of the significant sub-bottom structural and depositional features of the Florida Middle Ground has been completed and contouring started. No further interpretations beyond those preliminary interpretations presented in the previous quarterly reports are warranted until the structural contours and illustrative profiles are completed. Florida Middle Ground bathymetric and shot point maps have been combined into a single map at a reduced scale (1:40,000). This allows a better view of the distribution and trend of structures throughout the region, and the structural maps are being done at this scale.

Measurement, plotting, and interpretation of the sub-bottom structural and depositional features of the banks at the edge of the Texas-Louisiana shelf is underway. Preliminary interpretations of the sub-bottom structure comprise the results being reported this quarter.

RESULTS

While the banks being studied vary in size, shape, elevation above the surrounding shelf, and topographic expression (slopes and roughness), it is likely that they are all the seafloor expression of diapiric intrusion. Diapirs outcrop on several of the banks, forming the major body of the bank with little or no sedimentary or carbonate cover. Other banks are primarily uplifted and faulted sedimentary blocks with scattered diapiric intrusions, particularly along the bank edges, and one bank (Coffee Lump) is simply a large anticlinal dome which has been severely eroded, apparently during a former low stand of sea level.

Sedimentary beds have been steeply tilted upward around those banks composed primarily of diapiric piercements (Alderdice, Fishnet, Elvers, and possibly Geyer and Jakkula), and in places at the margins of the banks the uplifted and tilted structures have been eroded and uncomformably overlain by later sediments. Faulting occurs locally in the intruded sediments. These faults occasionally exhibit a radial pattern away from the banks, and in places large grabens have been formed. Large grabens exist on the east and west flanks of Jakkula and on the east flank of Alderdice. There are also numerous faults around Fishnet forming small grabens and a major graben extending E-W through the central portion of Elvers.

Progressive uplift in discrete stages is evidenced for all of the banks except Diaphus and Coffee Lump by successively greater upward tilting of the surrounding sediment units with depth. These sedimentary units are separated by uncomformities with uppermost unit often onlapping the margins of the banks with little or no apparent uplift.

There is little evidence in the seismic reflection records of post-uplift sedimentary cover or carbonate buildup on top of most of the banks. Exceptions are a few isolated pockets of recent sediments filling structural lows and possibly 5-20 ms of carbonate buildup on Alderdice, Geyer, and possibly Jakkula.

Rezak-Sidner and Diaphus banks are large, fault bounded, uplifted blocks of well-stratified sediments. The distribution of sediment sequences and evidence of erosional truncation on Rezak-Sidner suggest that much of this bank may have been exposed well above sea level. Diapiric structures underly the margins of these two banks with numerous isolated exposures on Diaphus.

Coffee Lump is distinctly different from the other banks in that it is a broad swell in the seafloor with very gentle slopes. It is underlain by a broad, locally folded anticlinal structure with little or no evidence of diapirs within the depth range of penetration of the boomer. The top of the anticline has been severely eroded, and the roughness of the seafloor on Coffee Lump is primarily due to outcrops of the dipping sedimentary rock. The extensive erosion of the structure suggests earlier subaerial exposure. Exposure of the eroded anticline on the seafloor requires a lengthy period of non-deposition in this area.

Several of the banks are surrounded by or locally have moats at the base of the side slopes. While this may be structurally controlled by faulting in some cases, it is generally due to thinning of the uppermost sediment sequence, suggesting reduced depositional rates at the base of the slopes due to topographically controlled currents. This is well developed around Diaphus. Slumps and talus material are found only locally around the banks.

It is emphasized that the above interpretations are preliminary and will be modified and expanded as work continues. These interpretations are also based primarily on the boomer records, and a more detailed picture of the distribution of the unconsolidated sediment cover and carbonate growth areas will evolve as the 3.5 kHz data analysis progresses.

DEVIATIONS/PROBLEMS/ALTERNATIVES

Some interruptions in data reduction and analysis were experienced because Oceanonics Inc. required the sub-bottom records to check seafloor depths against values read from the bathymetric data for construction of the bathymetric maps.

RECOMMENDATIONS

It has become increasingly obvious that the structure of the banks relates directly to the bathymetry and that evidence for the recent depositional, erosional and tectonic history is important for accurate characterization of the relief on the banks. The structural data also contain evidence for recent processes which may be operating at this time. This information reinforces the earlier recommendation that future bathymetric and sub-bottom mapping should be done well ahead of other investigations. The structural data provide important information for selecting sampling and other station locations.

MANAGEMENT IMPLICATIONS

See previous quarterly report. Following those comments and the above suggestions would lead to a two or more phased program with sufficient intervening time for analysis of the bathymetric and sub-bottom data.

CHAPTER VII

SEDIMENTOLOGY

R. Rezak

INTRODUCTION

During this quarter, the effort has been divided between analysis of samples collected during the second seasonal cruise and preparation for and completion of the summer sampling cruise.

RESULTS

Sediment Texture

Forty-eight (48) bottom samples have been analysed with the Coulter Counter and the Rapid Sediment Analyser.

X-ray Mineralogy

Twenty-six (26) bottom samples have been analysed for bulk mineralogy and clay mineralogy. An additional 8 samples have been prepared for x-ray analysis but have not been completed due to a malfunction in the x-ray generator. We have ordered a replacement x-ray tube, and it should be installed by July 10.

Suspended Sediment Mineralogy

Twelve (12) samples have been analysed for clay minerals, and 12 additional samples have been filtered and prepared for clay mineral analysis.

Sediment Total Carbonate

Fifteen (15) analyses have been completed, and 8 additional samples have been prepared for analysis.

Sediment Particle Type

Fifteen (15) analyses have been completed, and 8 additional samples have been prepared for analysis.

DEVIATIONS/PROBLEMS/ALTERNATIVES

We have had recurring problems with the Smith-McIntyre bottom sediment sampler. It frequently trips without obtaining a sediment sample, requiring several casts before obtaining a sample from the bottom. There are a variety of problems associated with the design of this sampler. Although it is very heavy for its size, its poor hydrodynamic design gives it a tendency to descend in a falling leaf pattern; frequently it strikes the bottom in a non-vertical attitude. In addition, the design of the tripping mechanism is too complex and sometimes trips without closing the jaws of the sampler. When the sampler is brought on deck, this problem with the tripping mechanism creates a hazard which could result in serious injury to one of the handlers.

There are several small box samplers available that can not only recover a better sample than the Smith-McIntyre, but are more reliable and safer to use. One of these is the Gray-O'Hara sampler, which we have used as a back-up for the Smith-McIntyre.

RECOMMENDATIONS

We recommend that BLM should not specify use of a Smith-McIntyre sampler in future statements of work.

MANAGEMENT IMPLICATIONS

The Smith-McIntyre sampler is no longer being produced by its inventors because of serious problems in its design. The cost of building one of these units in our own shop is about double the cost of building a simpler and more reliable unit. The quality of the Smith-McIntyre sample is frequently inferior to that of samples taken with other types of box samplers. The time saved at sea using a simpler type of sampler would be considerable.

In summary, the Smith-McIntyre sampler is a poor choice for bottom sampling for the following reasons:

1. Initial cost is much higher than better bottom samplers.

2. Poor design causes problems in sampling as well as hazard to deck handling personnel.

3. Unreliability wastes valuable time on station.

CHAPTER VIII

HYDROGRAPHY

D. McGrail

INTRODUCTION

Operations during this quarter were considerably smoother than last. The two primary reasons for this were improved meteorological conditions and the addition of an electronics technician (ET) to the staff. The latter made it possible to complete pre- and post-cruise maintenance and calibration on all of the electronics. This practice resulted in vastly improved data quality and recovery rates. In addition, it freed Mr. Barrow to act in the capacity of marine technician (M.T.), improving his ability to carry out logistical support and deck support.

The first current meter recovery was less than an overwhelming success. The problems encountered have been largely resolved through redesign of the arrays and negotiations with equipment manufacturers.

Data reduction time has been reduced through implementation of digitizing techniques and processing programs designed by Mr. Horne. Use of these new methods resulted in having all of the data collected on the April cruise in the initial stages of interpretation by the end of May.

The results of the analyses of data collected during this quarter have been both gratifying and puzzling.

RESULTS

Seasonal Sampling at the East Flower Garden

Locations of the 4 primary and 8 secondary stations occupied on the April cruise are shown in Figure VIII-1 (p. 36).

From the temperature and salinity plots (Figs. VIII-2 - VIII-13, pp. 37 - 48), it can be seen that this sampling occurred near the beginning of the onset of stratification. Surface temperatures hovered around 23° and bottom temperatures at the deep stations clustered near 18° C. The surface mixed layer averaged about 15 m in thickness. The pycnocline extended from the bottom of the mixed layer to approximately 30 m depth though there was considerable scatter in the depth of its lower limit. This scatter suggests that even in these early stages of stratification, internal waves were present.

The most surprising aspect of the observations is that the currents during the sampling period were significantly greater in magnitude than previously observed and were barotropic. Speeds of nearly 100 cm/sec (2 knots) extend from the surface to less than 1 m from the bottom at every station. The flow was uniformly to the west except in the bottom boundary layer at some stations where a southwesterly trend was observed. This angular shearing is consistent with classical Ekman theory. The uniformity of speed and direction top to bottom suggests that the pressure gradient driving the flow derived from an inclination of the sea surface rather than isopynal surfaces. Considering the relatively calm meteorological conditions prevailing during the cruise, it is difficult to explain this strong flow.

Examination of the transmissivity plots provided a particularly gratifying confirmation. Even under the most adverse conditions, very high velocity flow and weak stratification, the sediment is not lifted into the water column to any great height above the bottom. It appears that our hypothesis that near bottom advection during high velocity flow precludes vertical transport of significant quantities of suspended sediment has been confirmed. More plainly, under the worst reasonable case, bottom sediment did not encroach onto the bank above ~80 m.

Stations on the east side of the bank (1, 2, 13-17), possessed thin surface mixed layer structures. In general, the nepheloid layer was thicker and better developed on the east side of the bank. All of this appears to be related to the influence of the bank on the flow structure.

In addition to the previously cited reasons for supposing that the nepheloid layer does not continue to thicken with increased current velocity, there is the nature of the substrate around the bank. The surficial sediment is little more than a clay thickened fluid that is easily resuspended. Below this layer of fluff however, the sediment is quite cohesive. If the surficial sediment is suspended during high velocity flow, little additional material is likely to be eroded under realistically projected conditions. It might therefore be possible for the nepheloid layer to actually decrease in thickness and concentration under prolonged high velocity flow.

Because the electromagnetic current meter record had to be transcribed from data cassette to computer compatible tape by the manufacturer, the graphic display of that record could not be prepared in time for this report.

A portion of the unfiltered current velocity and temperature records from array CM 2 is shown in Figure VIII-14. The upper trace is temperature from the uppermost meter, the middle trace is the velocity from the uppermost meter (~40 m depth), and the bottom is the temperature record from the lowest meter(~2 m from the bottom) Location of the mooring is shown in Figure VIII-1.

Several bits of information are contained in this graphic display. First, over the whole duration of the recording, the flow polarized along the local isobaths. That is, the flow oscillates from ~ northerly flow to ~ southwesterly flow. This correlation of direction of flow and isobath orientation is a sure indication of topographic deformation of the mesoscale flow phenomena by the bank. It is clear from the record that, as anticipated, the currents at the East Flower Garden Bank are neither undirectional nor steady.

The temperature recorded by the upper meter contained little variance until about the middle of February. After that time it possessed a rather strong signal. The temperature from the bottom meter starts out with a rather rich signal but flattens out somewhat with time. This probably reflects the very early onset of stratification. A very strong event which is evidenced in all three records occurred at about the 10th day of recording. In this short piece of raw data it is obvious that the currents and temperature fluctuations are locked together over many orders of frequency scales.

Figure VIII-15 is a graphic display of the low pass filtered record of the first 40 days from the upper meter on array CM 2. With the high frequency fluctuations removed, it can be seen that the temperature and velocity signals are highly correlated.

Spectral analyses of these records reveal that there is considerable energy at the semidiurnal frequency. There is also a significant, but smaller energy density at the diurnal/inertial frequency (24-25 hour period). Greater energy concentrations, which may be atmospherically forced motions, occur in rather broad bands in the 3 to 5 day periods. From this record it can also be seen that the minimum temperature in the long period signal occurs near hour 720 or sometime in March. The preference for clockwise rotation in the low frequency range oscillations may indicate the presence of shelf waves.

DEVIATIONS/PROBLEMS/ALTERNATIVES

During this quarter the first recovery and redeployment of the current meters was accomplished. Current meter array I failed to surface upon release command from the deck module. Although repeated efforts were made to get the acoustic release to function, it would not. The acoustic release from array CM II was examined on deck after recovery and it would not rerelease. It was found that the problem lay in the microswitches which actuate the motor. The faulty switches would jam open so that the motor would not turn on. The switches for the release on array CM II were modified and the unit redeployed. Grappling hooks were used without success to drag for array CM I from the MEDITERRANEAN SEAL and the Zodiac. It was therefore necessary to charter a shrimpboat and drag for array CM I after the April Cruise. This was done in May and the array was retrieved.

The manufacturer (InterOceans, Inc.) of the acoustic release system was caustically informed of the malfunction and its cause. They provided new switches and triggering arms which are satisfactory.

Because of the malfunction of the release, it was not possible to redeploy array CM I on the April cruise.

Several problems have been encountered with the HydroProducts current meters. One of the meters came from the factory with the magnetodiodes wired directly to the power source instead of to a 5 volt source. This permitted the meter to pass predeployment checkout but burned out the magnetodiodes almost immediately after deployment. Because magnetodiodes are not part of the standard spare parts complement, this meter could not be redeployed during the April cruise.

The two lower meters on array CM I fell off the array prior to recovery because of a design flaw in the instruments. These were immediately replaced by the manufacturer under warranty and the faulty part relaced on the remaining original meters.

Of the meters recovered only 1 meter from array CM II and the electromagnetic current meter returned velocity records. The meter from array CM II possessed only 42 days of usable velocity data from 90 days deployment. Mr. James Stasny, our ET, suggests that this may have been the result of a miscalculation by the manufacturer on the power consumption of the acoustic data link. We are exploring this possibility with the manufacturer. Complete temperature records were recorded from all of the HydroProducts current meters. .

Mr. George Hatchett of HydroProducts, supervisor for the SeaTrak product line, has been contacted regarding our problems. From past experience with this supplier we anticipate rapid resolution of the problems encountered.

In order to eliminate the cost of a crane and increase deck safety during handling, the current meter arrays were redesigned. The new configuration is a single point, taut-line array designed to minimize meter motion through high tension on the mooring line. The anchor is expendable so that recovery of the arrays can be accomplished with a minimum of deck equipment.

RECOMMENDATIONS

On future contracts, XBT surveys of the bank should be carried out as synoptically as possible so that spatial and temporal variations of the temperature field can be resolved.

MANAGEMENT IMPLICATIONS

The confirmation of our hypothesis regarding the limitation of the nepheloid layer suggests that present shunting stipulations are well founded and reasonable.

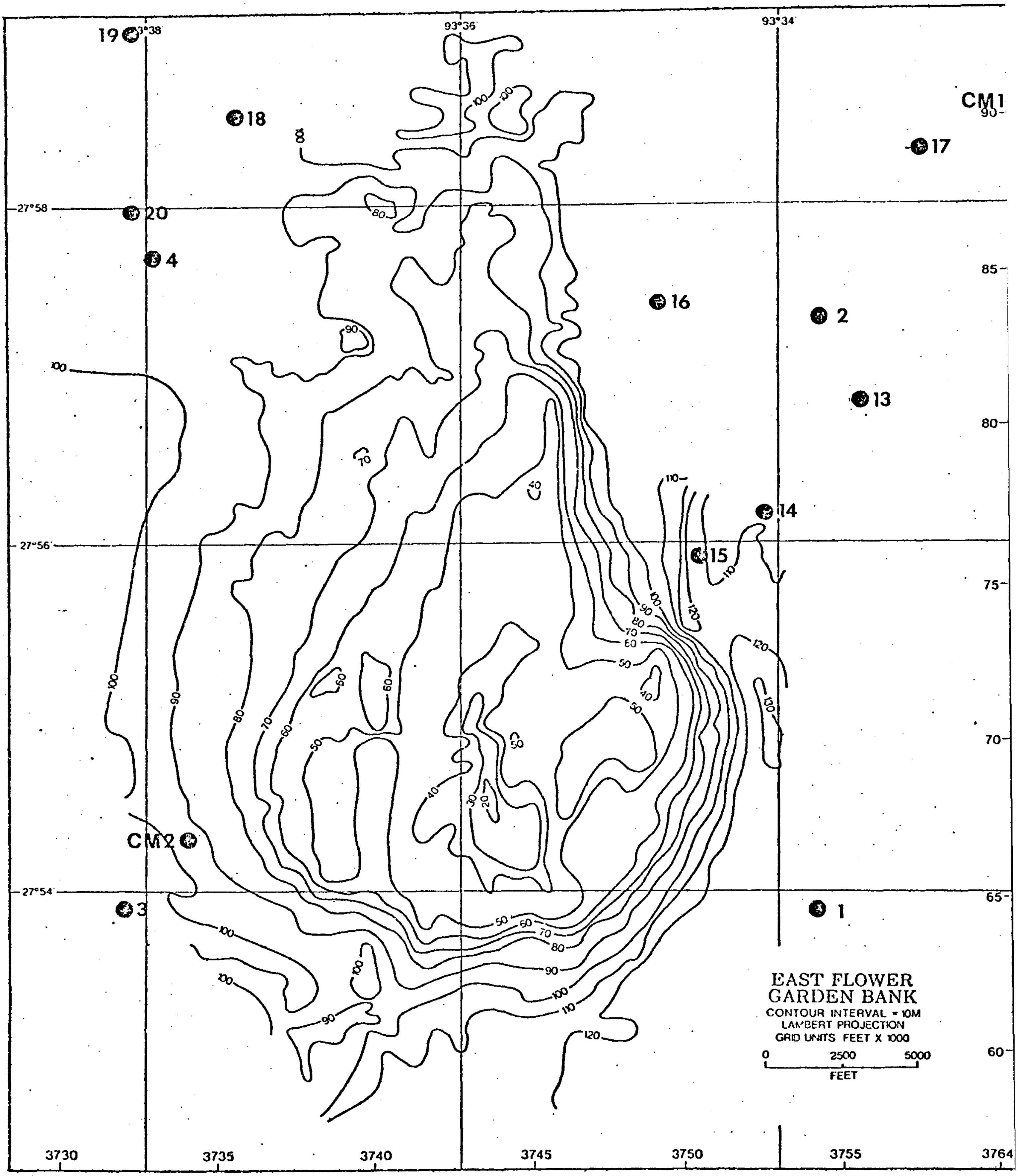


Fig. VIII-1. Location map for stations occupied on the April cruise and current meter arrays. Current meter moorings are prefixed by "CM".

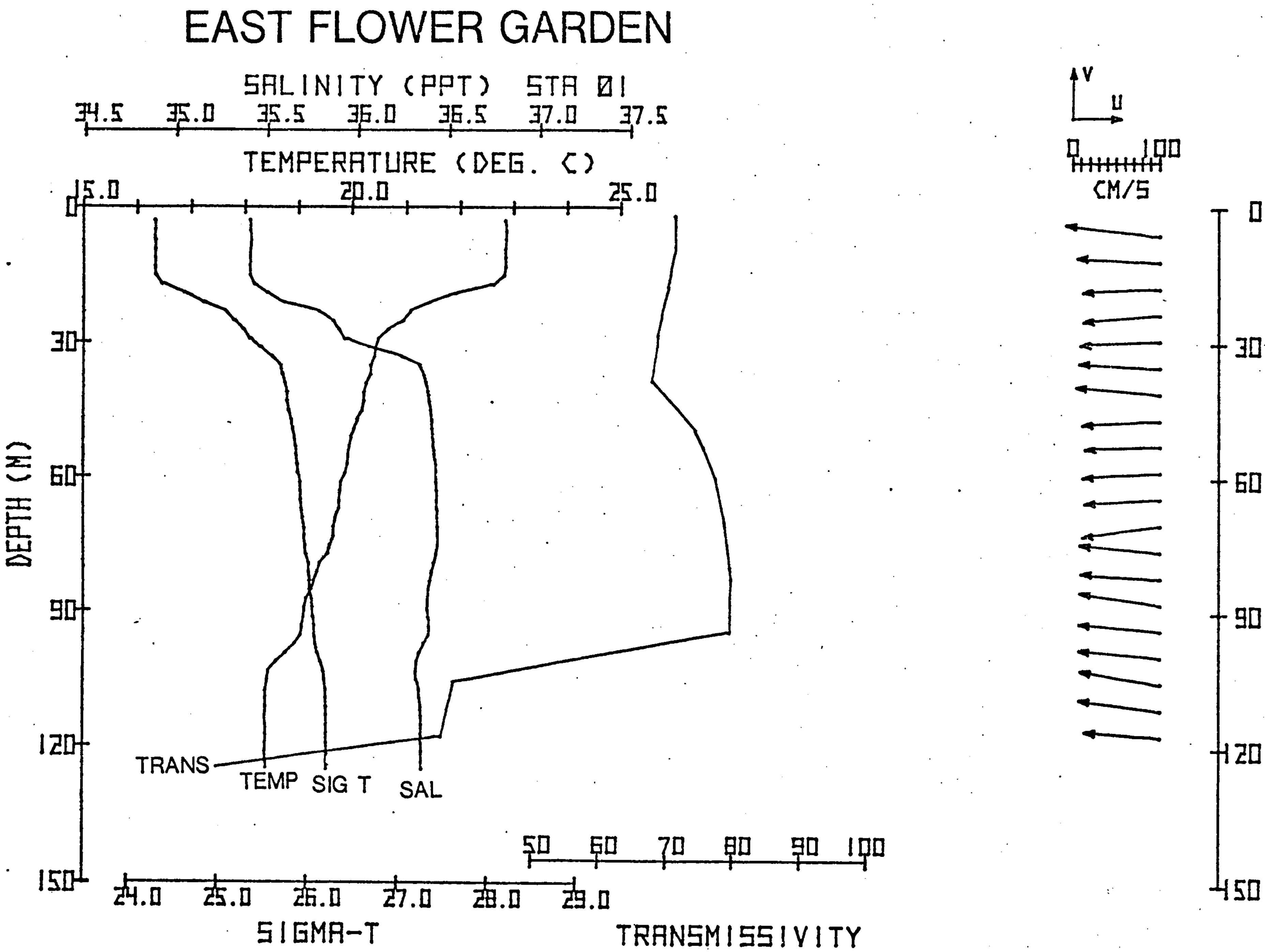

EAST FLOWER GARDEN
SALINITY (PPT) STA 01
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0 30 60 90 120 150
TRANS
TEMP
SIG T
SAL
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY
V
U
0 100
CM/S
0 30 60 90 120 150

Fig. VIII-2.

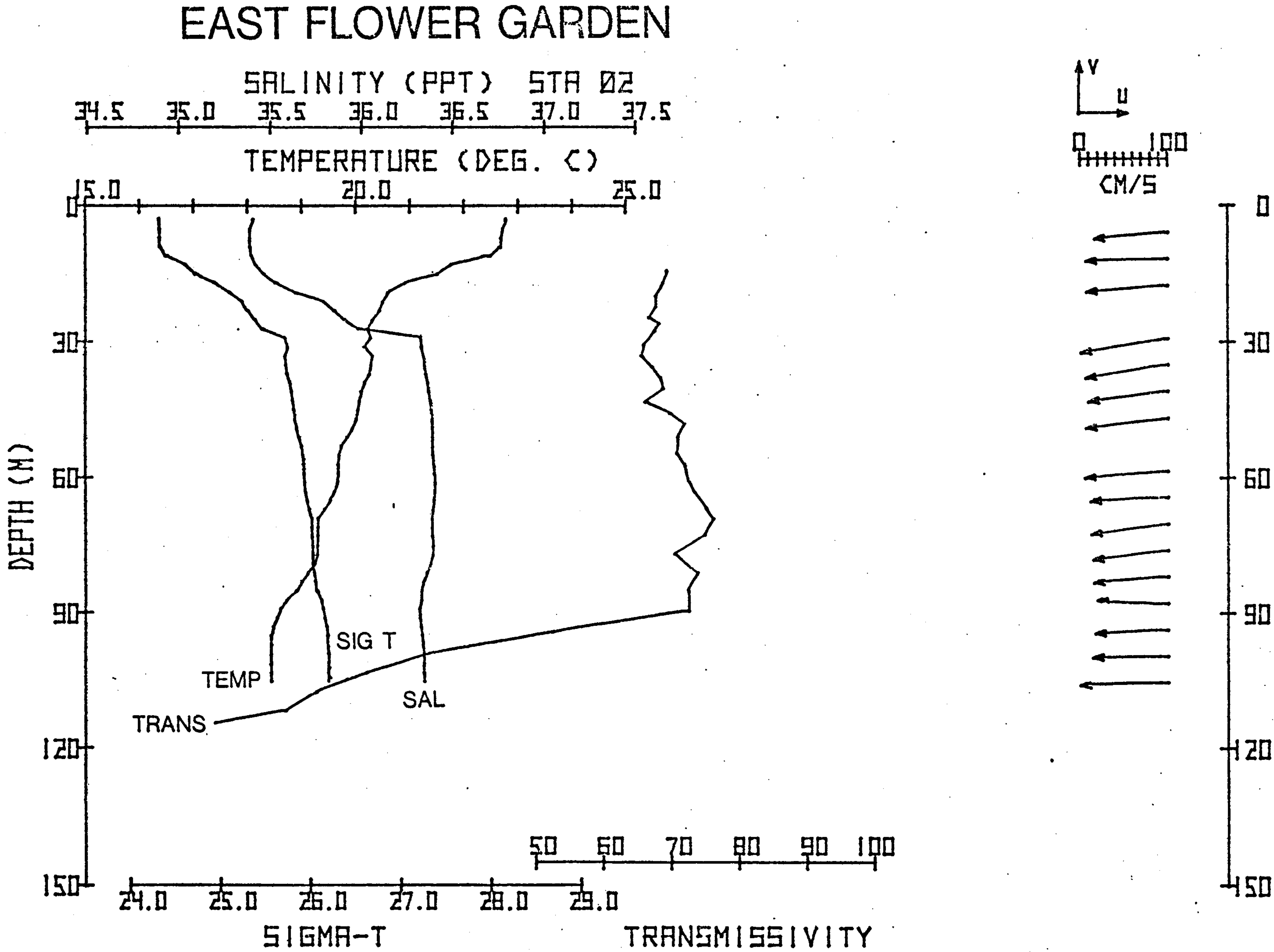

EAST FLOWER GARDEN
SALINITY (PPT) STA 02
34.5
35.0
35.5
36.0
36.5
37.0
37.5
TEMPERATURE (DEG. C)
15.0
20.0
25.0
DEPTH (M)
0
30
60
90
120
150
SIG T
TEMP
SAL
TRANS
24.0
25.0
26.0
27.0
28.0
29.0
SIGMA-T
50
60
70
80
90
100
TRANSMISSIVITY
V
U
0
100
CM/S
0
30
60
90
120
150

Fig. VIII-3.

EAST FLOWER GARDEN

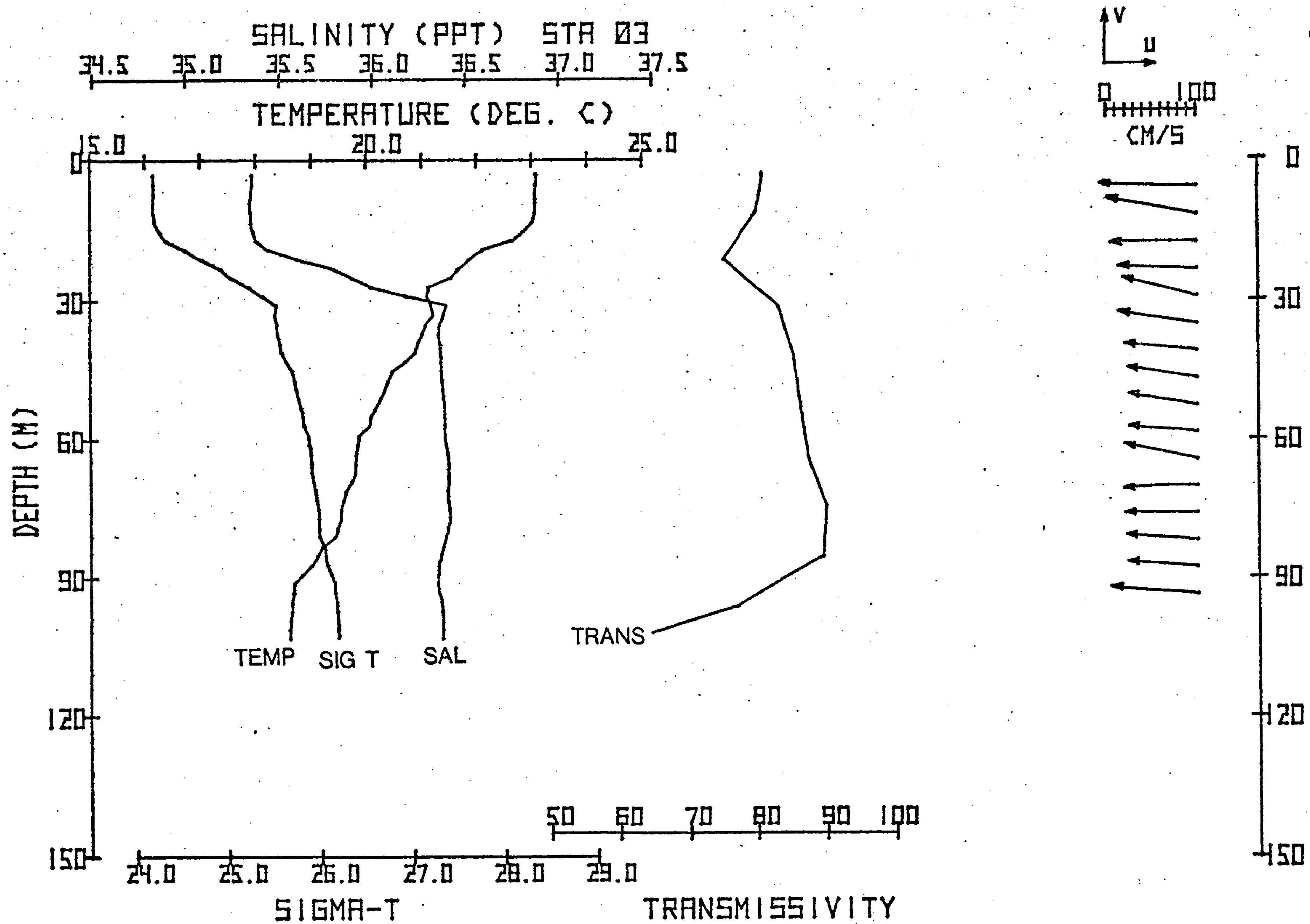


Fig. VIII-4.

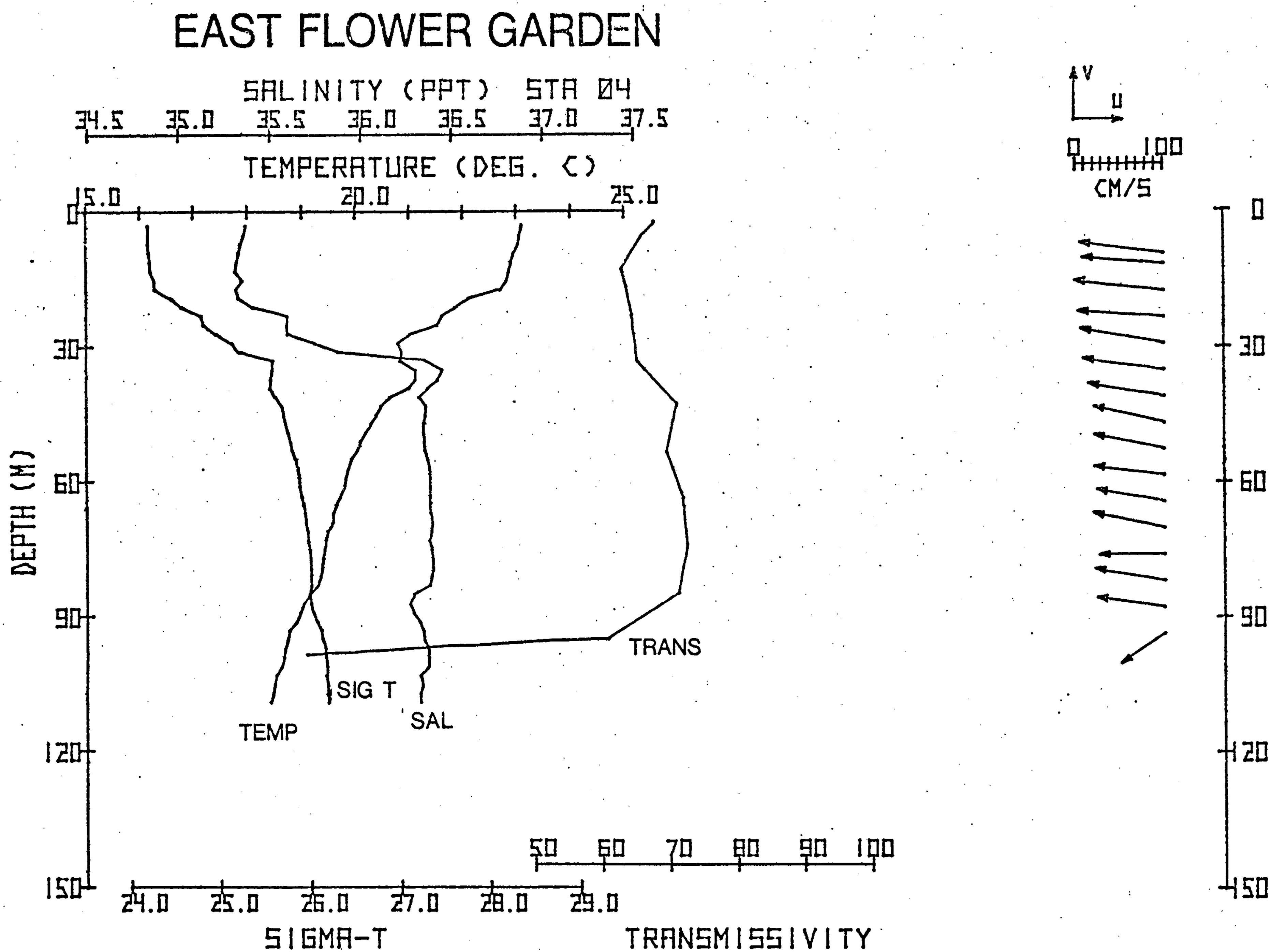

EAST FLOWER GARDEN
SALINITY (PPT) STA 04
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0
30
60
90
120
150
TRANS
SIG T
SAL
TEMP
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY
V
U
0 100
CM/S
0
30
60
90
120
150

Fig. VIII-5.

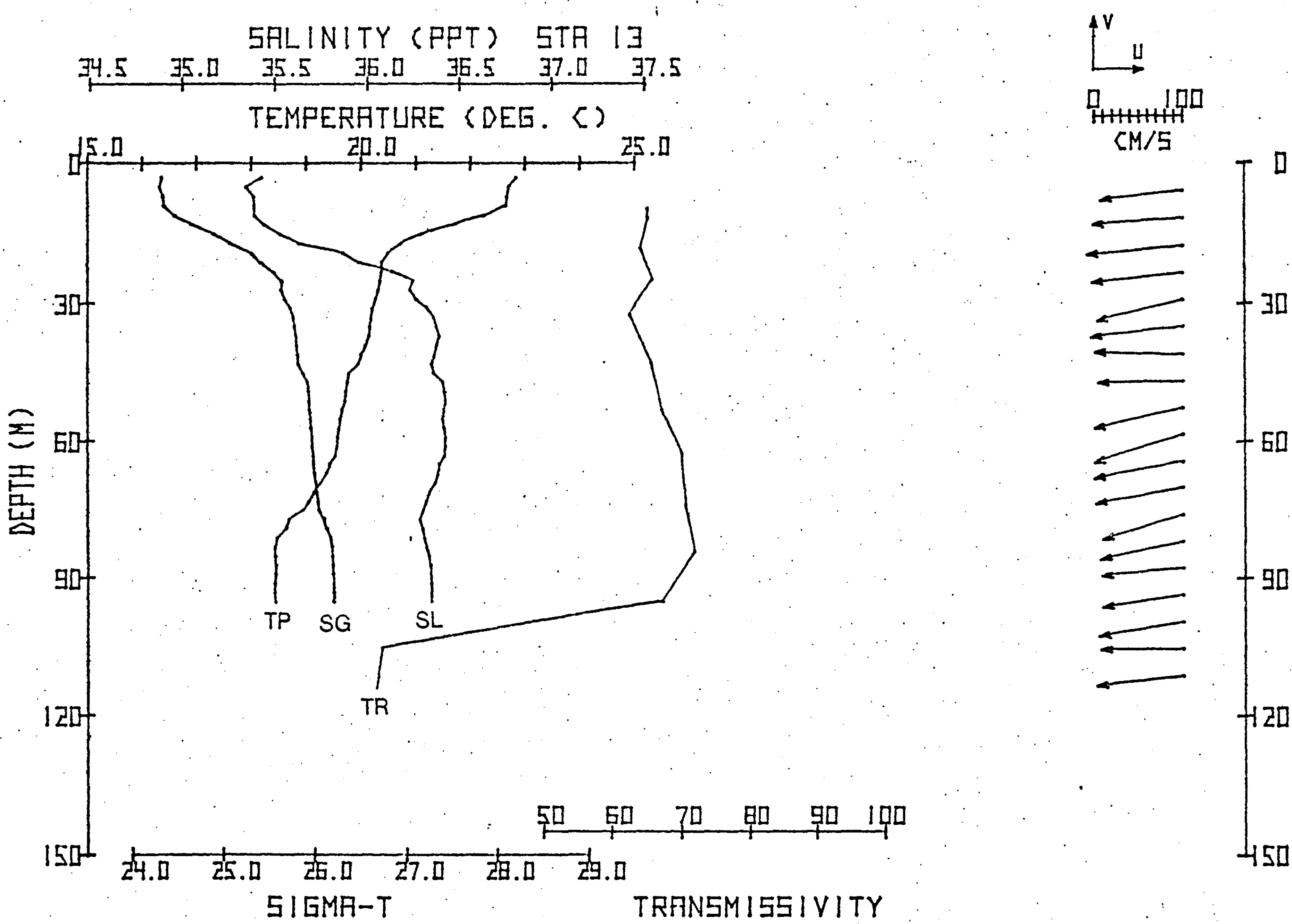

SALINITY (PPT) STA 13
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0
30
60
90
120
150
TP
SG
SL
TR
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY
V
U
0 100
CM/S

Fig. VIII-6.

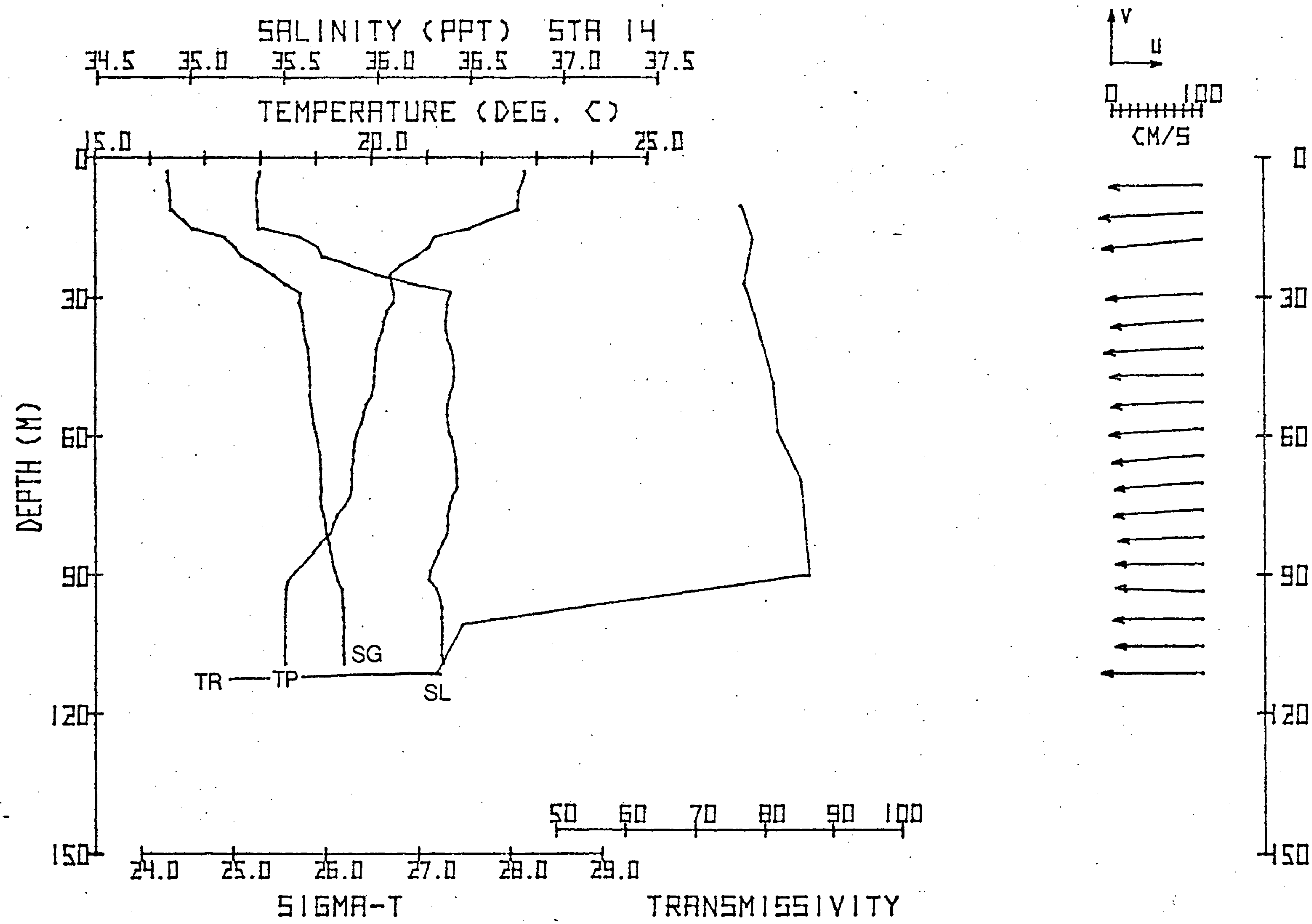
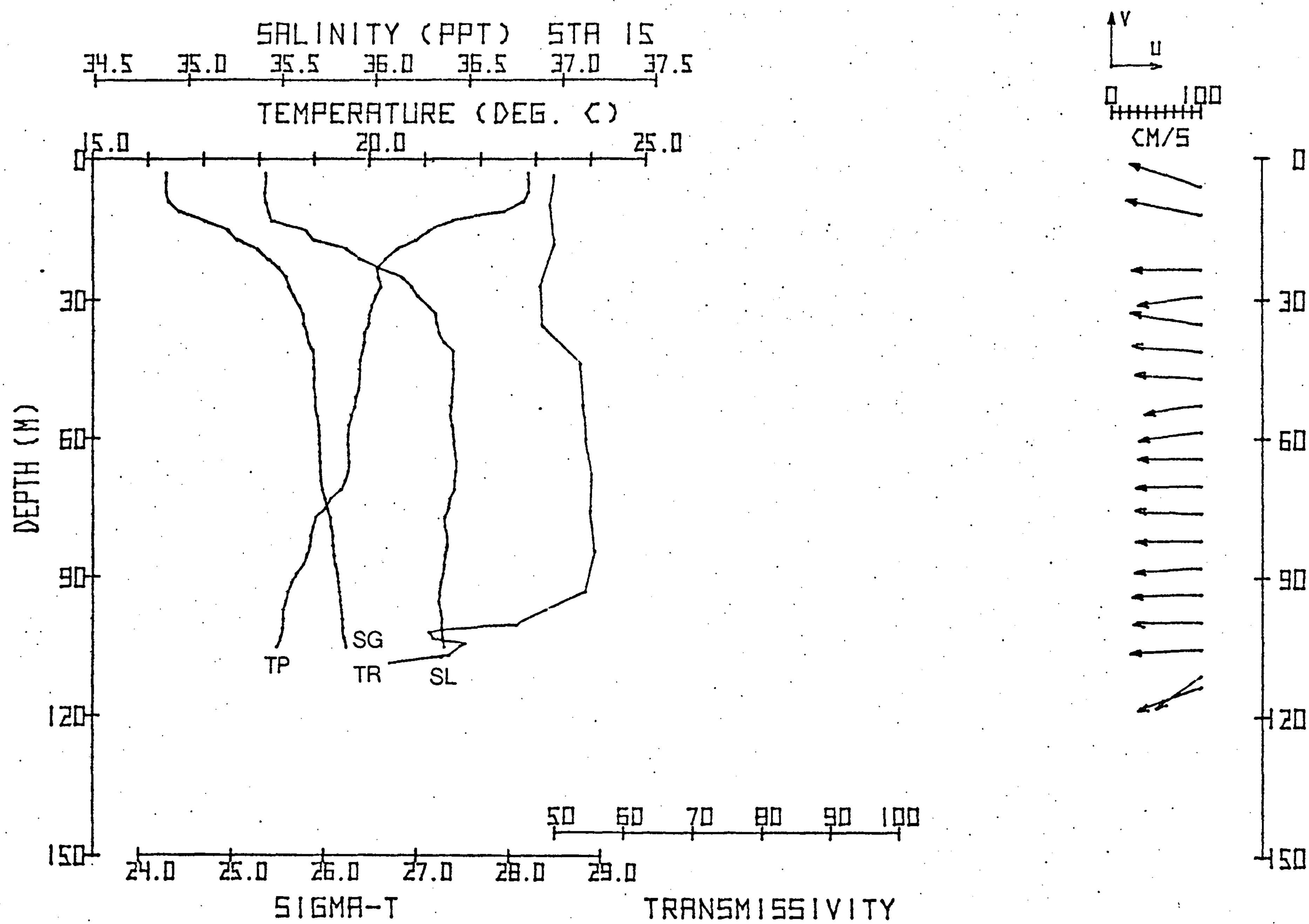
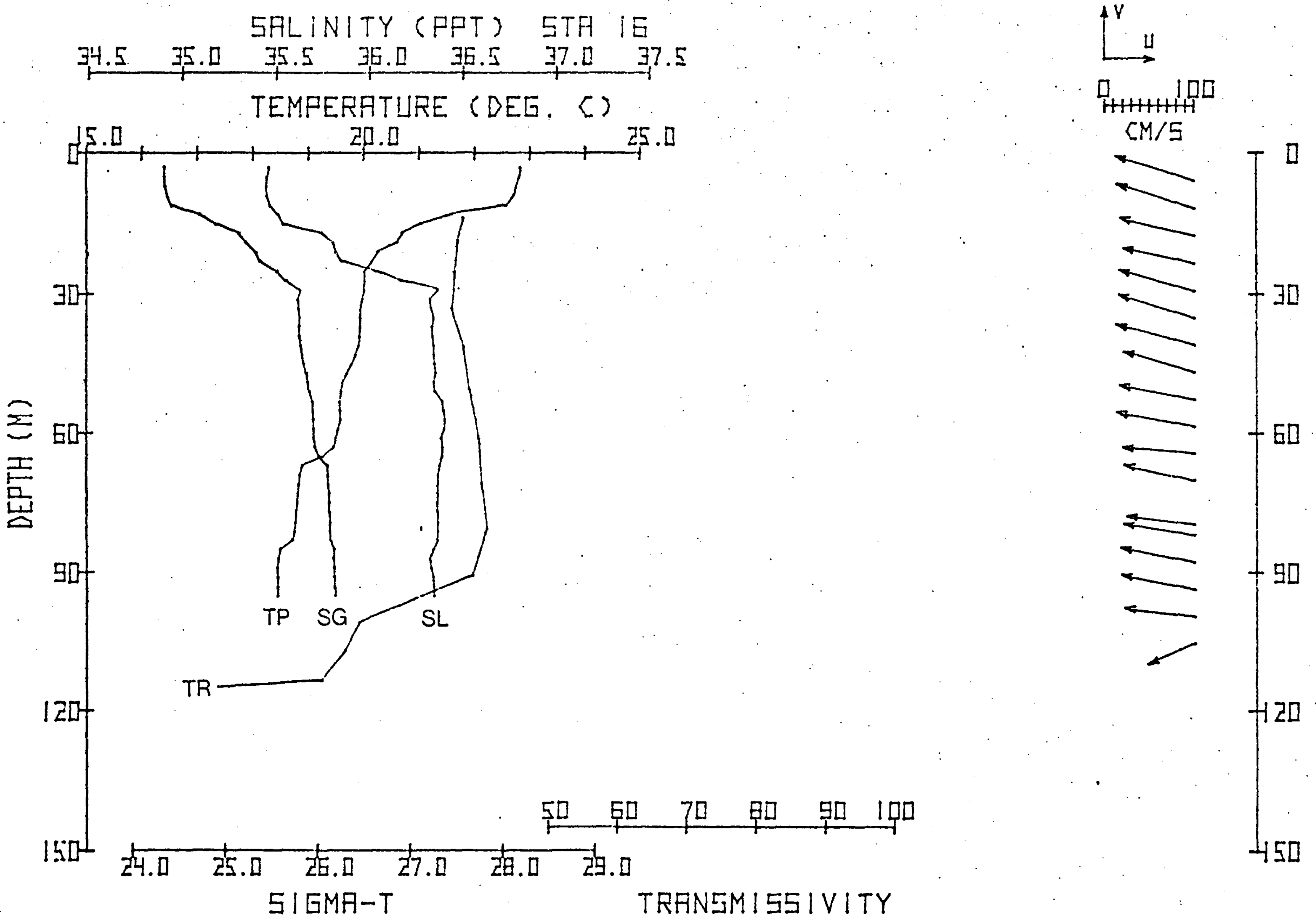

SALINITY (PPT) STA 14
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0 30 60 90 120 150
SG
TR
TP
SL
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY
V
U
0 100
CM/S
0 30 60 90 120 150

Fig. VIII-7.



SALINITY (PPT) STA 15
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0
30
60
90
120
150
SG
TP
TR
SL
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY
V
U
0 100
CM/S

Fig. VIII-8.



SALINITY (PPT) STA 16
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0
30
60
90
120
150
TP
SG
SL
TR
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY
V
U
0 100
CM/S

Fig. VIII-9.

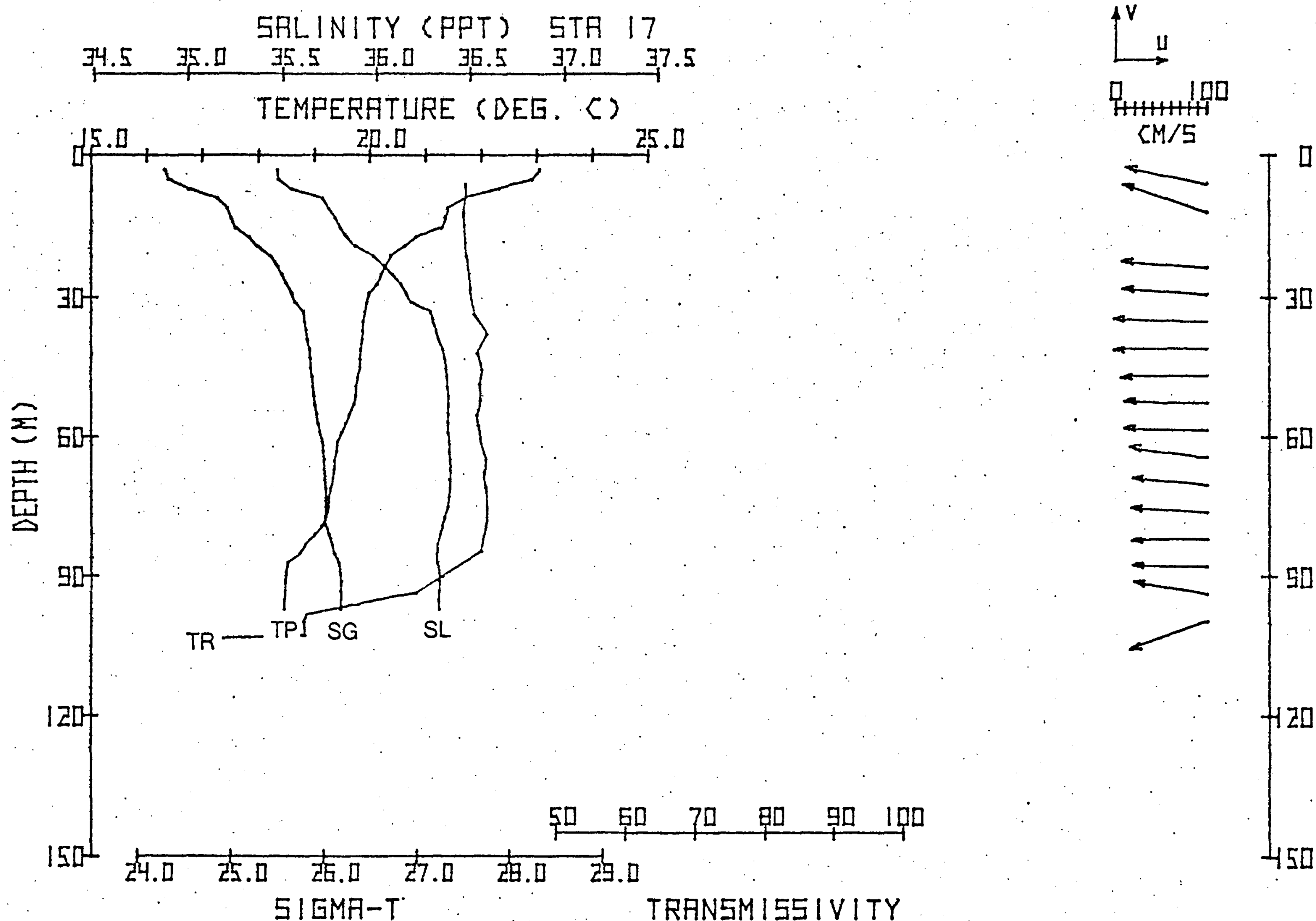

SALINITY (PPT) STA 17
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0 30 60 90 120 150
TR
TP
SG
SL
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY
V
U
0 100
CM/S
0 30 60 90 120 150

Fig. VIII-10.

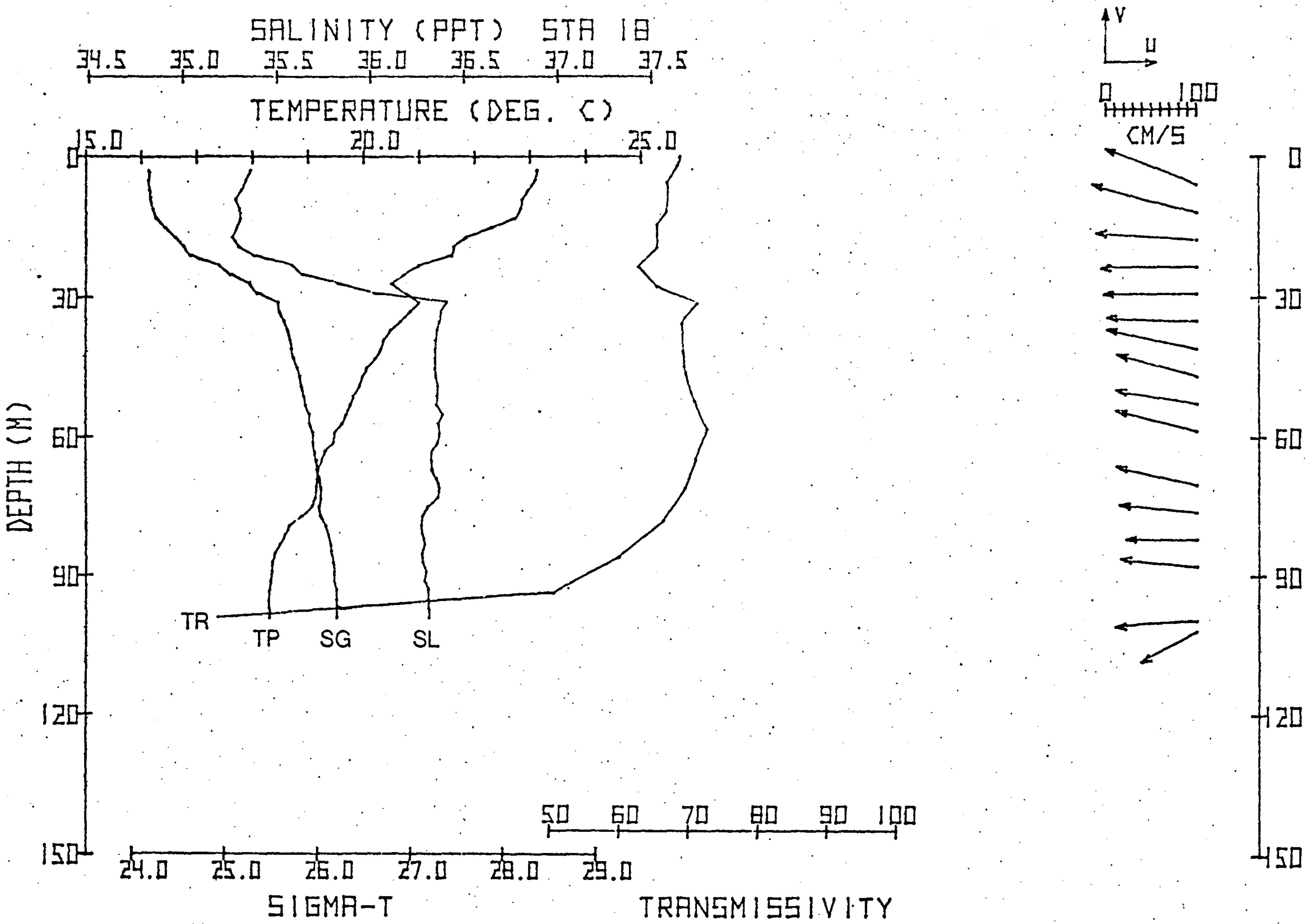

SALINITY (PPT) STA 18
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0 30 60 90 120 150
TR
TP
SG
SL
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY
V
U
0 100
CM/S
0 30 60 90 120 150

Fig. VIII-11.

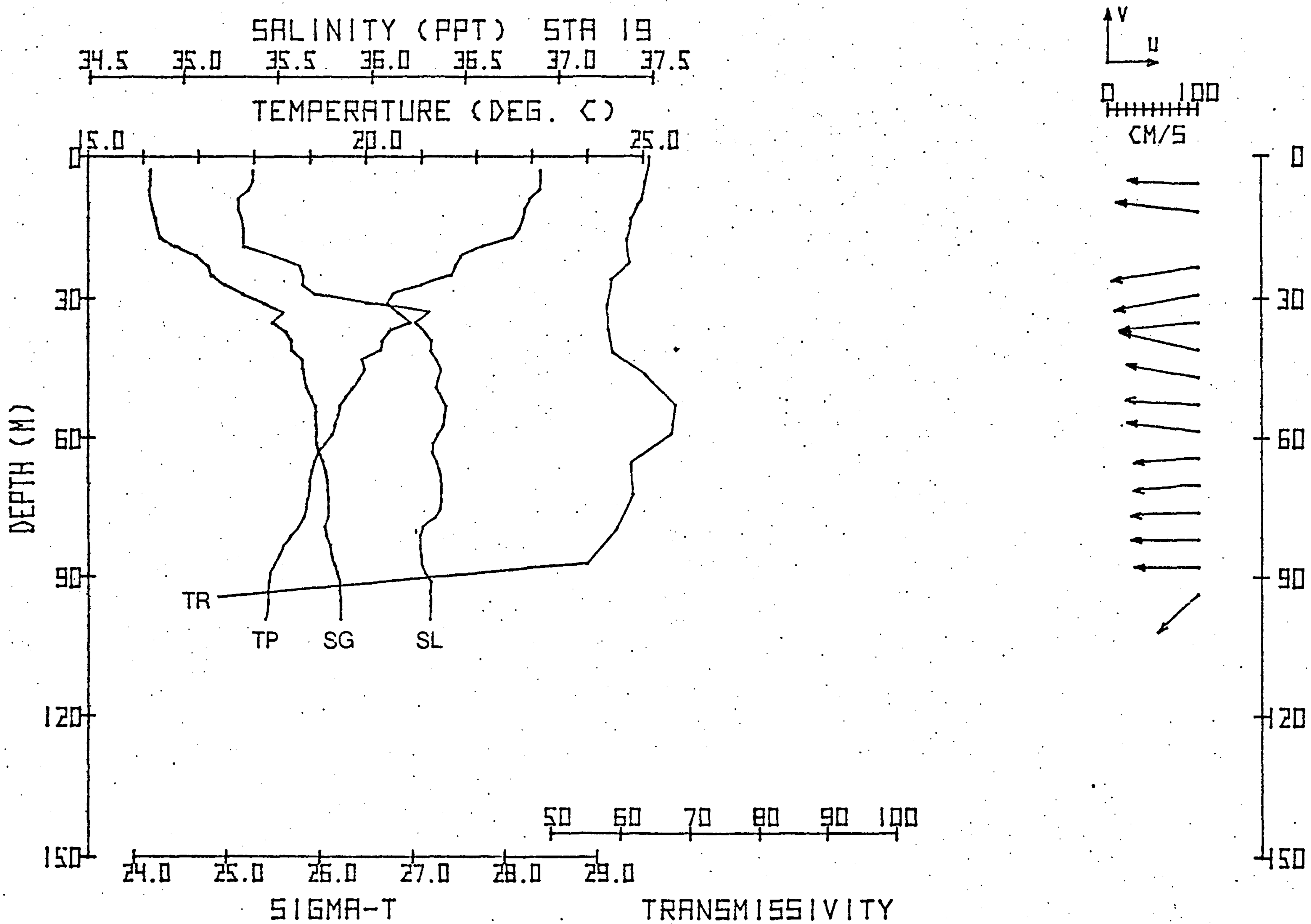

SALINITY (PPT) STA 19
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0 30 60 90 120 150
TR
TP
SG
SL
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
50 60 70 80 90 100
TRANSMISSIVITY
V
U
0 100
CM/S
0 30 60 90 120 150

Fig. VIII-12.

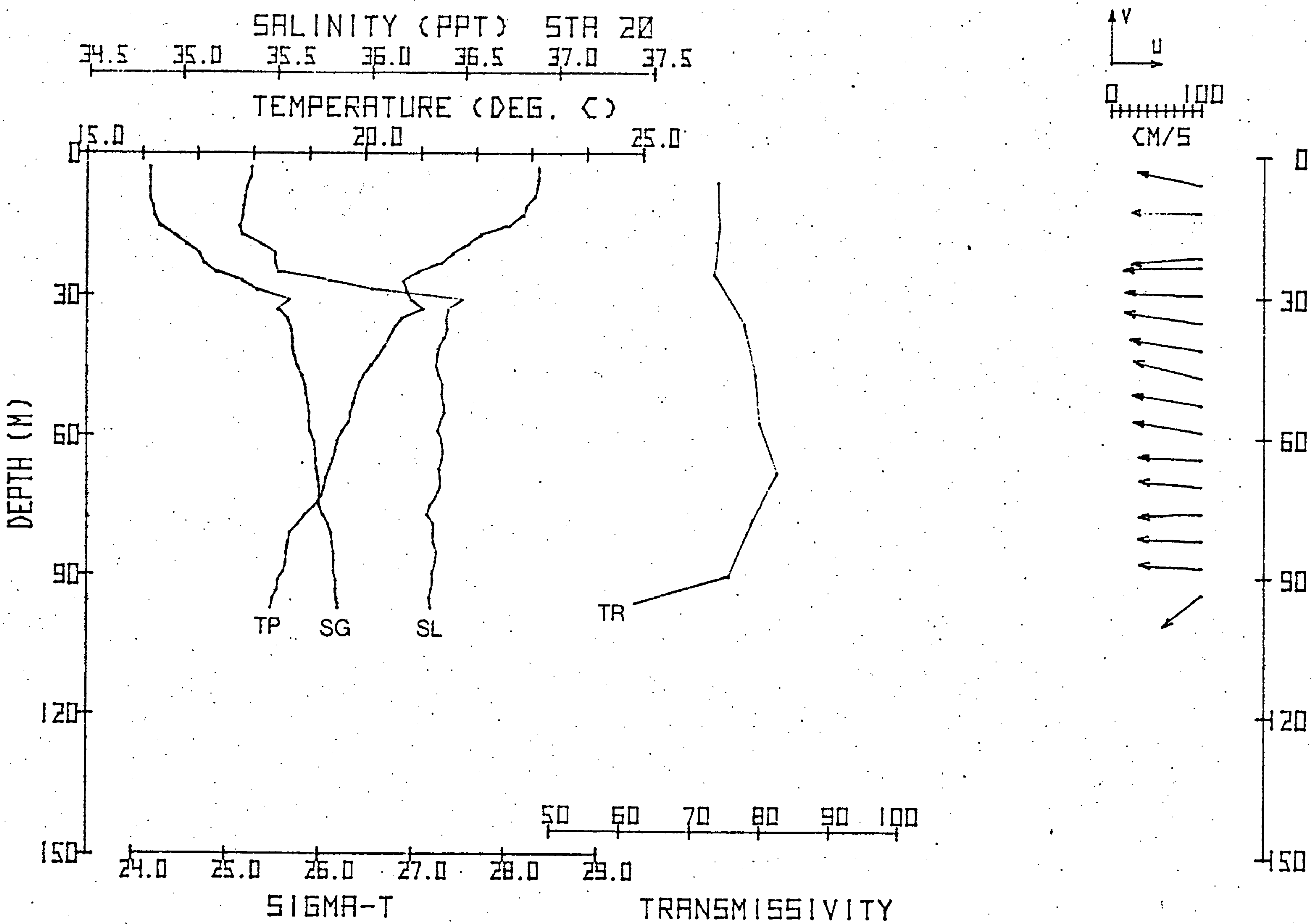
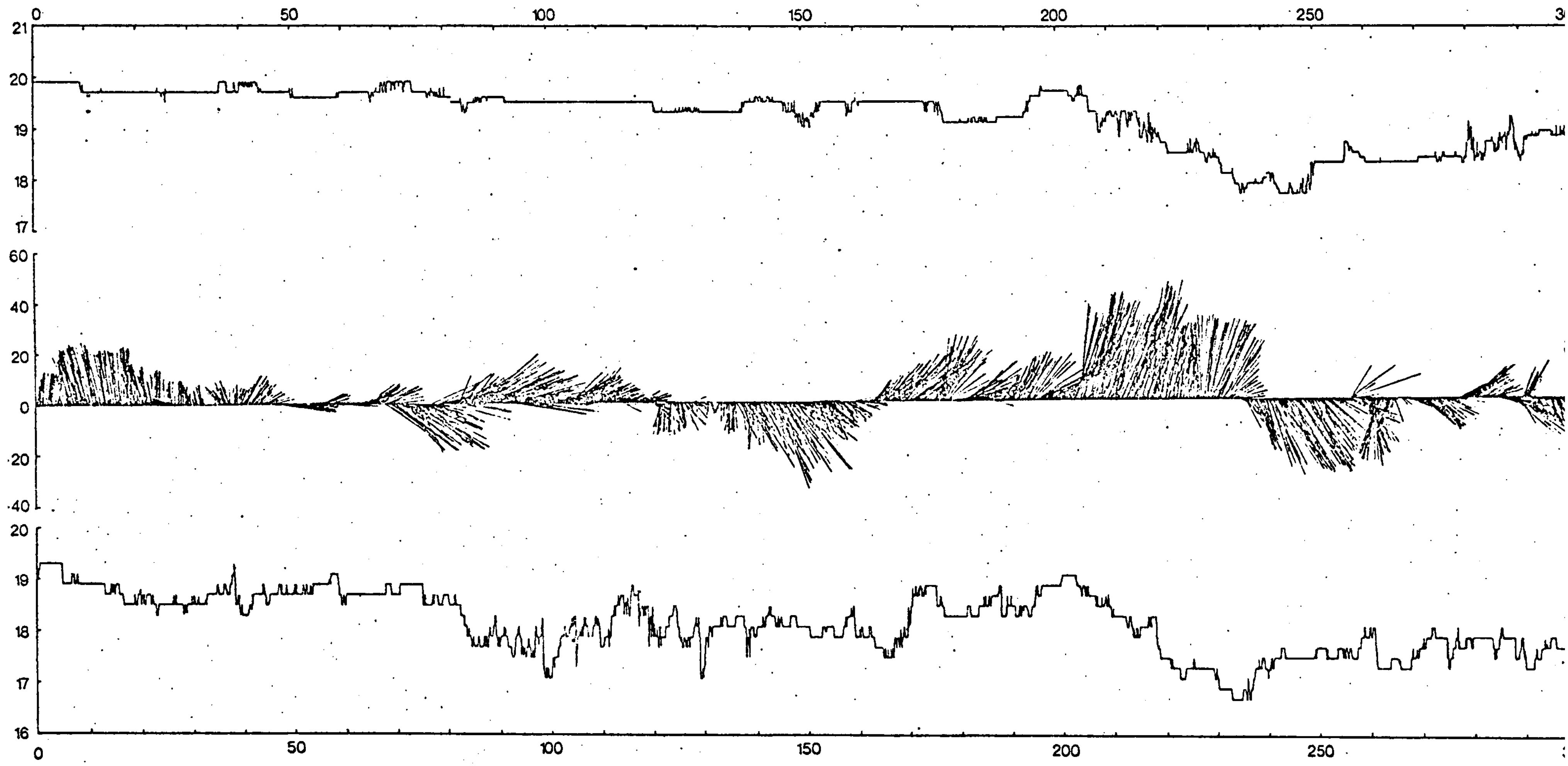

SALINITY (PPT) STA 20
34.5 35.0 35.5 36.0 36.5 37.0 37.5
TEMPERATURE (DEG. C)
15.0 20.0 25.0
DEPTH (M)
0 30 60 90 120 150
TP
SG
SL
TR
V
U
0 100
CM/S
50 60 70 80 90 100
24.0 25.0 26.0 27.0 28.0 29.0
SIGMA-T
TRANSMISSIVITY

Fig. VIII-13.

UNFILTERED CURRENT & TEMPERATURE RECORD FROM ARRAY NUMBER 2



LOW PASS FILTERED CURRENT & TEMPERATURE

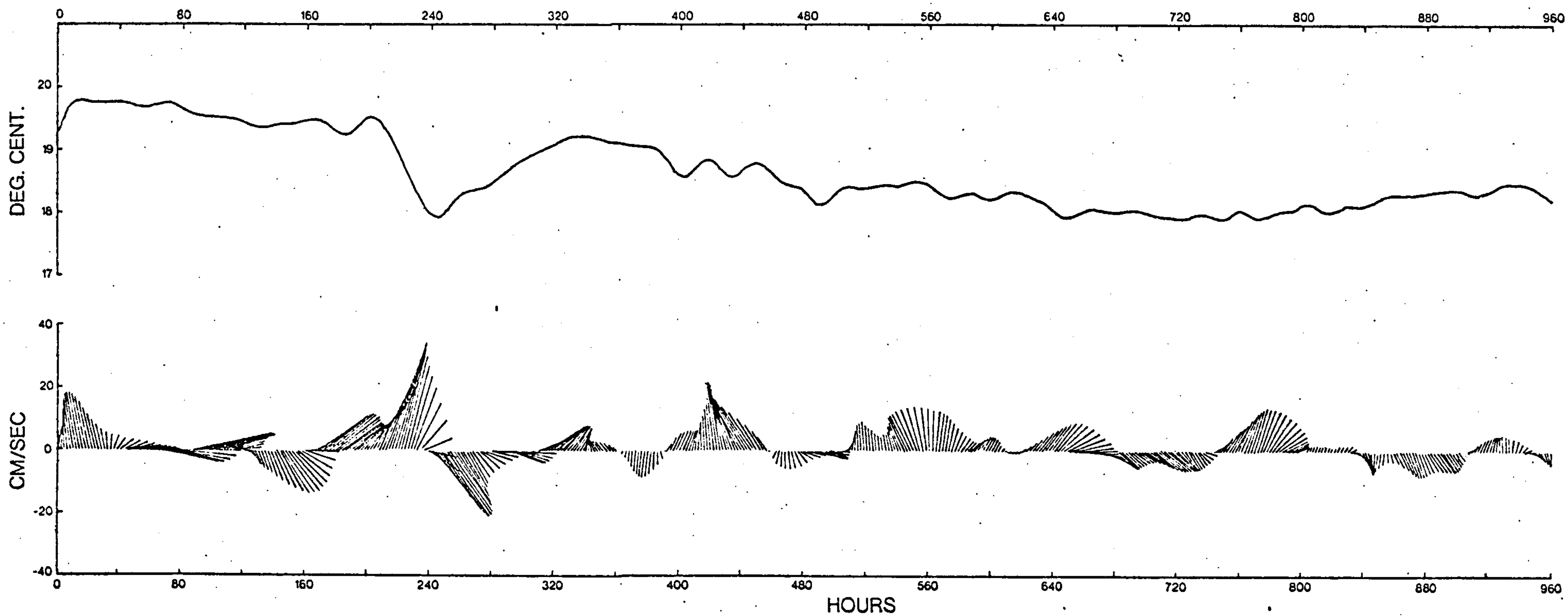


Fig. VIII-15.

CHAPTER IX

EAST FLOWER GARDEN MONITORING STUDY

T. Bright

INTRODUCTION

The work effort this quarter consisted of continuing the analysis of previously collected data, and undertaking the third of four LGL-TAMU cruises to the East Flower Garden Bank. The objectives and methods of the cruise were as reported in the third LGL-TAMU cruise report (29 Jun 79). New activities consisted of deploying the first of six coral recruitment arrays on the BLM Site sandflat, taking an additional two plankton samples utilizing light traps, and using divers to collect the nutrient water samples in Whirl-Pak bags rather than by Nansen casts.

SUMMARY OF ACTIVITIES

Sorting and preliminary identification of the biological samples collected during the fall 1978 submarine cruises have been completed, and the last of the specimens are being prepared for transit to taxonomic specialists (see Table IX-1). To date we have received partial reports from the asteroid, coral, crinoid and bryozoan specialists, and new distributional records in the Gulf of Mexico for some ahermatypic coral species and superspecific asteroid groups. (See Table IX-2 for list of specialists.)

Analysis of the photographic stations on the East Flower Garden Bank is proceeding. Of note are the results from the Short Term Time Lapse camera systems. These systems are deployed for 24 h periods and are giving excellent visual records of associations between corals and mobile invertebrates.

A revised coral recruitment study has been initiated. One array of twenty 10 x 10 cm settling plates molded from type 1 Portland cement was deployed on the BLM Site sandflat for test purposes. Later, the study will consist of two sets of three arrays. Each set will have one array with exclusively type 1 Portland cement as a control, one array with Baroid drilling mud added, and one array with chromium drilling mud added. Each array has four racks, each rack containing five settling plates. Each of the racks can be individually changed out seasonally according to experimental design.

The plankton studies have shown that planula larvae are found predominantly in the upper ten metres of the water column. Both planula and edwardsia stages were found. A new technique was initiated on the third LGL-TAMU cruise in which two plankton samples were collected at night using light traps. The technique was to attach a Cyalume Light-stick to the mouth of each net and then lower them to 47 m. Results of this experiment have not yet been returned.

DEVIATIONS/PROBLEMS/ALTERNATIVES

The only deviations from previous techniques were the expansion of the coral recruitment study as noted above, and the means of collecting the nutrient water samples. A winch suitable for Nansen casts is not available on the shrimp boat we employ for our SCUBA diving efforts. Therefore it was decided to have divers collect the samples using Whirl-Pak bags.

RECOMMENDATIONS

None.

MANAGEMENT IMPLICATIONS

None.

TABLE IX-1

BIOLOGICAL SAMPLE STATUS

BANK	SAMPLE TYPE	# CONTRACTED*	# COLLECTED	BALANCE REQUIRED	STATUS
Alderdice	Submarine Transect	Min:1 Max:4	3	0	Sorting and analysis in progre
Coffee Lump	"	"	3	0	"
Diaphus	"	"	2	0	"
Elvers	"	"	1	0	"
Fishnet	"	"	2	0	"
Geyer	"	"	3	0	"
Jakkula	"	"	1	0	"
Rezak	"	"	1	0	"
Sidner	"	"	1	0	"
Little Sister	Rock Dredge	**	4	0	"
32 Fathom	"	**	6	0	"
East Flower Garden	Submarine Transect	Min:2 Max:4	9	0	"
"	10 m Photographic Plotless Line Transects	56	42	14	Film development completed; analysis in progress
"	Ancillary Photographic Stations	0	60	0	Film development completed

TABLE IX-1 (Continued)

BANK	SAMPLE TYPE	# CONTRACTED*	# COLLECTED	BALANCE REQUIRED	STATUS
East Flower Garden	Long Term Time Lapse Photography	16	10	6	Film development completed; analysis in progress
"	Short Term Time Lapse Photography	0	6	0	Film development completed; analysis in progress
"	1/16 m^2 Algae Quadrats	0	9	0	Analysis in progress
"	Coral Competition Experiment	0	4 pairs of corals	0	Experiment destroyed by storm
"	Diseased Coral Experiment	0	5	0	Experiment set up
"	<u>Diadema</u> Collection	0	8	0	Gut contents analysed; some coral tissue found, but result inconclusive concerning predation on corals
"	1/2 m Plankton Tow	0	4	0	Analysis in progress
"	Plankton Array	0	23 samples	0	Analysis in progress
"	Coral Recruitment Study	0	----	0	First of six arrays deployed

* Total numbered required for contract

** At discretion of contractor

TABLE IX-2

BANK STUDY SPECIALISTS

TAXON	SPECIALISTS
1) PORIFERA	Dr. Joyce Teerling, U.S. Fish & Wildlife Service
2) COELENTERATA	
ANTHOZOA	
ACTINIARIA	
ALCYONARIA	Ms. Jennifer W. Smith, Florida Dept. of Natural Resources
ANTIPATHARIA	Dennis Opresko, Oak Ridge, Tennessee
SCLERACTINIA	Dr. Walter Jaap, Florida Dept. of Natural Resources Stephen Cairns, Smithsonian Institution
HYDROZOA (HYDROIDS)	Dr. Dale Calder, So. Carolina Wildlife & Marine Resources De
3) POLYCHAETA	Dr. Barry Vittor, Mobile, Alabama Fain Hubbard, Ter Eco Corp.
4) MOLLUSCA	Dr. William Lyons, Florida Dept. of Natural Resources
BIVALVIA	Dr. William Lyons, Florida Dept. of Natural Resources Dr. Donna Turgeon
GASTROPODA	Dr. William Lyons, Florida Dept. of Natural Resources
POLYPLACOPHORA	Dr. William Lyons, Florida Dept. of Natural Resources
SCAPHOPODA	Dr. William Lyons, Florida Dept. of Natural Resources
5) BRYOZOA	Dr. Arthur J. Leuterman, Houston, Texas
6) CRUSTACEA	
AMPHIPODA	Dr. Larry McKinney, Moody College of Marine Sciences
DECAPODA	Dr. Linda Pequegnat, Texas A&M University
ISOPODA	
TANAIDACEA	Mr. John Ogle, Gulf Coast Research Laboratory
7) ECHINODERMATA	
ASTEROIDEA	Ms. Maureen Downey, Smithsonian Institution
CRINOIDEA	Dr. Charles Messing, Smithsonian Institution
ECHINOIDEA	Dr. Dave Pawson, Smithsonian Institution
HOLOTHUROIDEA	Dr. Robert Carney, Smithsonian Institution
OPHIUROIDEA	Dr. Gordon Hendler, Smithsonian Institution

CHAPTER X

FLORIDA MIDDLE GROUND

PART A: BIOLOGICAL CHARACTERIZATION AND ENVIRONMENTAL MONITORING

T. S. Hopkins, W. W. Schroeder

INTRODUCTION

The Bureau of Land Management has conducted diving reconnaissance and chemical background studies on the Florida Middle Ground under contracts 08550-CT4-11 and 08550-CT5-03 from 1974 through 1976. Additionally, dredging was carried out under 08550-CT4-11 and dredging and trawling was carried out under contract numbers 08550-CT5-30 and AA550-RP7-10 from 1975-76 and 1977-78, respectively. Supportive water column efforts were carried out under all the above mentioned contracts.

Hopkins (1974) provided an early overview of the Florida Middle Ground *in situ*; however, Hopkins *et al*. (1977a) is a more detailed preliminary characterization and review. This characterization is further substantiated by (1) Cheney and Dyer (1974) for algae; (2) Austin and Jones (1974) for zooplankton and physical parameters; (3) Smith (1976) for fishes; (4) Grimm and Hopkins (1977) for Octocorallia and Scleractinia; (5) Hopkins *et al*. (1977b) for molluscs; (6) Shaw and Hopkins (1977) for corallicolous brachyura; and (7) Vittor and Johnson (1977) for corallicolous polychaetes. Additionally, there is a large amount of data to be gleaned, polished, and presented which currently resides in the final reports of the above cited contracts. That data is available for inspection in the BLM-OCS office in New Orleans, Louisiana.

RESULTS

During the period covered we collected samples from ten (10) 90 day exposed habitats from station 151 along with a few cryptofaunal hosts during FMG 04 (26-30 March 1979). That particular cruise also fell short of our expectations due to weather.

The majority of our time has been spent on a) development of data management format and analysis; b) rough sorting, fine sorting, and c) identification of biological materials collected to date. The data management format and proposed analytical scheme is about 95% complete and may be found in Appendix X-A-I (Techniques). With regard to the sorting effort, 98% of the rough sorting is complete (excluding 10 habitats from the March cruise), and 95% of the rough sort is fine sorted and in the analytical stage. An updated sample inventory is found in Appendix X-A-II. Turning to the biological materials analysis, we are very pleased with some significant early findings.

BIOLOGICAL CHARACTERIZATION

Polychaeta

All polychaetes are being taken to the family level, but due to their diversity and number we are emphasizing the Family Syllidae because of its importance as a cryptofaunal family. We have isolated 50 species from the FMG sample to date. We conservatively estimate that the species count among syllids could reach 60. As many as 25 of the 50 presently isolated species may be new to science.

Reproductive individuals were numerous in the fall (FMG-I and FMG-II) samples, but were not present in winter collections (FMG-III).

Of all the sponge hosts, *Agelas dispar* has yielded the highest syllid diversity. As for *Agelas* compared to *Madracis* there is a rather large overlap in the species complements; however, Branchiosyllis spp. are more abundant in Agelas and Haplosyllis spp. are more abundant in Madracis. In this view, Haplosyllis spongicola is a ubiquitous inhabitant which is a) represented by three distinct morphs, and b) an exclusive to dominant dweller of a variety of sponges.

Sediment samples and artificial habitats are yielding different and smaller forms than living hosts. It is believed that sediment may be a limiting factor in the colonization process. This seems to be indicated via the subfamily Exogoninae of the syllids.

Molluscs

The Madracis cryptofaunal molluscs have yielded more abundance and diversity than the Agelas samples, and this was to be expected. Hiatella artica is the most abundant species and accounts for 45% of the 9,513 individuals. Furthermore, 5 species account for 74% of the total individuals but only 4% of the species.

Crustacea

As might be expected, crustaceans, probably a vital link in the reef food chain, play a significant role in the cryptofaunal story. Because the shrimp are one of the more obvious and significant contributors, they are reviewed first.

Caridea

An astonishing diversity of caridean shrimp exist in the deep reef ecosystem of the Florida Middle Ground. A preliminary indication of this is presented in Hopkins et al. (1977) where no less than 8 species are reported for the first time from the northern Gulf of Mexico. In addition, 2 species were recorded from the Florida Middle Ground by Dardeau et al. (in press) as both bathymetric and northern range extensions. Indications are that a previously unrecognized tropical shrimp fauna exists in suitable habitats in the deeper water (> 100 ft.) of the continental shelf off Florida.

Forty-four species of carideans, including representatives of 9 families, have been identified so far. Only 27 species of carideans have been reported from the West Flower Garden Bank, a similar habitat in the western Gulf (Pequegnat and Ray, 1974). A similar comprehensive study, of a somewhat different habitat, in the western Atlantic yielded only 25 species (Gore et al., 1978). Several species from the Florida Middle Ground are new to science and at least 3 are new records for the northern Gulf of Mexico. Live color notes of 19 species have been made, many for the first time, as a result of this study.

Carideans were collected from 36 identified habitats ranging from surface plankton to living sponges and corals. Many of the species collected are either facultative or obligate commensals. Ten host species of hard coral, soft coral and sponge were collected often enough to determine the relative abundance of commensal shrimps. A total of 26 species have been taken from these hosts. Several are highly specific, while others occur on a variety of hosts. A comparison of fall and winter data reveals a decline in commensal populations, particularly those on the soft corals.

Stations do not differ qualitatively in species composition but a quantitative difference appears in comparisons of number of individuals per unit area of Synalpheus populations in Agelas dispar. A plot of number of individuals against wet volume of the sponge shows a virtually identical slope for both seasons at Stations 481, 491 and 151. Station 247, however, shows a slightly lower slope, indicating fewer individuals in the larger sponges than at the other stations.

Caridean shrimps from the artificial habitats have not yet been identified but preliminary perusal reveals a diverse fauna which differs qualitatively from that found in the natural reef. In other words, we are sampling species that are difficult or impossible to sample otherwise. Further study promises to elucidate a very diverse system in which competition for space (i.e. hosts) plays a major role in the community structure.

Isopods

The isopod story is quite intriguing in that an analysis of the FMG I Agelas and Madracis samples indicates that there are four taxa which are numerically dominant, but they are in directly inverse order with respect to host, as follows:

Agelas		Madracis	
1. Caspias bermudensis	≈ 65%	1. Steretrium occidentale	≈ 38%
2. Alcirona krebsii	≈ 15%	2. Jaesopsis ratbunae	≈ 28%
3. Jaesopsis ratbunae	≈ 12%	3. Alcirona krebsii	≈ 15%
4. Steretrium occidentale	≈ 5%	4. Carpias bermudensis	≈ 11%

Furthermore, two new genera and five or more undescribed species have been isolated.

Amphipods

Amphipods are the dominant representative of this group. Species diversity and abundance is not yet clearly established; however, the genus Leucothoe has a wide range of hosts. As might be expected because of the epifauna associated with it, Madracis will very likely show greater diversity.

Non Caridean Decapoda

Hermit crabs have been found in high number but low diversity (12 species).

We believe that we may have one new species of Pagurus. Two species of Upogebia have been encountered, one each from Agelas and Madracis. Host specificity is not ruled out.

Stomatopoda

Gonodactylus cf bredini is ubiquitous.

Pycnogonida

We have recorded 5 species to date; they are not abundant on Agelas or Madracis.

Echinoderms

The dominant cryptofaunal echinoderms are Ophiactis spp. and Ophiothrix spp. (Ophiuroidea). Ophiactis spp. is an obligate commensal of Agelas and usually found in relatively large numbers.

Fishes

Point Diversity Estimates

To date fifty-nine (59) point diversity counts (# individuals per species per eight cubic metres per five minute time interval) have been obtained. A majority of these counts have been taken at stations 151 and 247 within the 24 to 30 metre depth range. All counts have been processed with respect to species diversity and evenness parameters.

Results indicate that differences in ichthyofaunal composition are greater between biotopes (eg. reef slope vs. shallow reef flat) than between stations. Additional counts to be taken on the summer cruise in the 30 to 37 metre depth range are expected to confirm this pattern.

Diversity and evenness data reflect the numerical dominance of purple reeffish, *Chromis scotti*, in several reef biotopes. Type (hard coral, sponge, rubble, etc.) and amount of available cover in each biotope appear to have an important influence upon the distribution of Florida Middle Ground fishes.

Infaunal Fishes

For the approximately sixty *Madracis decactis* samples processed to date, four fish associates have been identified (*Lythrypnus nesiotes*, *L. elasson*, *Starksia ocellata*, *C. scotti*). For a similarly sized collection of *Agelas dispar*, only a single fish species, *Lythrypnus nesiotes*, has been found. Although several additional fish species have been taken in miscellaneous sponge samples, only *Gobiosoma xanthiprora*, an obligate sponge commensal, is represented by a high number of individuals. Data appear to indicate that Florida Middle Ground infaunal fishes show a high degree of habitat specificity.

Artificial habitat samples, however, have been typified by a higher diversity (fifteen fish species) than the "natural" habitat samples, with none of the species exhibiting a marked numerical dominance. At least two species, *Gobulus myersi* and *Psilotris celsus*, represent new Florida Middle Ground records, and *P. celsus* may be a new record for the Gulf of Mexico.

Additions to the Known Florida Middle Ground Ichthyofauna

In addition to *G. myersi* and *P. celsus*, a number of species visually sighted, photographed, and/or collected are new to the Florida Middle Ground. These include *Lythrypnus elasson*, *Emblemaria atlantica*, *Kyphosus sectatrix*, *Liopropoma eukrines*, *Mycteroperca tigris*, *Dasyatis americana*, *Ophichthus ocellatus*, and *Callechelys perryae*.

Algae

The algae species list for the program is not as extensive as it was in

1975-76. We presently attribute this to (a) the cold water regime of the past two years (responsible for the coral deaths); (b) the turbulent sea activity of October and January, and (c) lack of time on station devoted specifically to algae collecting.

Of positive note, however, is the continued occurrence of a new species of Codium (Chlorophyta) which we first encountered in 1975-76.

Physical Characterization

Hydrographic data taken during cruises to the Florida Middle Ground are summarized in Table X-A-1. The temperature and salinity data fall well within the range of previously reported data for this area of the West Florida Shelf (SUSIO Final BLM Report Contract No. 08550-CT5-30). Dissolved oxygen values ranged from 1.9 to 7.1 ppm (percent saturation levels ranged from 26% to 103%). The low dissolved oxygen observations were all made during the October sampling period at the bottom of the water column.

The performance records of the recording instrumentation are presented in Table X-A-2. The two current meters have returned 100% of the anticipated data. Progressive vector plots, speed and direction distributions, N-S and E-W component plots and energy spectra plots have all been produced from the current meter data. The two refractometer/thermograph units have returned approximately 39% of the data from Station 151 and 68% of the data from Station 247. The temperature and salinity data from these instruments cross check with the cruise hydrographic data very well with one exeption. The time series salinity data exhibit an interesting feature not seen on the cruise hydrographic data. The daily minimum observations in the time series data (there are 24 observations per day) frequently are < 30.0 ppt and have reached values as low as 24.8 ppt.

DEVIATIONS/PROBLEMS/ALTERNATIVES

The only major deviation and problem really encountered was the inability to accomplish all our objectives on FMG 04. As a result we are exercising the only available alternative. We have programmed three additional days and two extra divers into the June-July cruise. We hope that with good weather we will be able to secure good and thorough collections.

RECOMMENDATIONS

None at this time.

MANAGEMENT IMPLICATIONS

No new ones at this time.

[Program Manager's Note: The analytical formulae specified in Appendix A-I, pp. 14-20, require verification and must be referenced. The PIs will provide an update in the next PI Progress Report.]

Table X-A-1 Hydrographic Data Summary for the Florida Middle Ground

(Vertical Profiling with a Hydrolab Corp. Water Quality Surveyor Unit)

STATION	DATES	DEPTH (M)	TEMPERATURE (°C) min/$\bar{x}$/max	SALINITY (PPT) min/$\bar{x}$/max	DISSOLVED (PPM) min/$\bar{x}$/max	OXYGE (% SA min/m
151	Oct. 1-5,78	1.0	28.0/28.3/28.5	33.5/34.2/35.0	5.2/5.7/6.6	81/10
		27.0	24.5/25.2/26.0	35.8/36.1/36.2	3.1/3.8/4.2	46/64
247	Oct. 11-14, 78	1.0	26.5/26.6/26.7	34.2/34.5/34.6	5.5/5.8/6.1	83/92
		27.0	22.7/23.3/24.0	35.0/35.5/35.8	2.5/3.3/4.6	35/66
481	Oct. 6-8, 78	1.0	27.3/27.8/28.3	33.9/34.3/34.6	5.7/5.8/6.1	89/95
		27.0	21.5/23.7/25.0	35.0/35.4/35.8	1.9/3.0/3.4	26/50
491	Oct. 14-18, 78	1.0	24.9/25.5/26.7	34.2/34.5/34.6	5.4/5.7/5.9	81/89
		27.0	22.2/23.6/25.8	35.0/35.1/35.4	2.5/3.8/5.6	35/84
151	Jan. 16-19, 79	1.0	19.5/19.7/20.0	34.6/35.3/35.8	6.6/6.8/7.1	88/95
		25.0	19.3/19.6/20.0	34.6/35.3/35.8	6.4/6.7/7.0	85/93
247	Jan. 26&30, 79	1.0	16.5/17.1/17.6	34.6/34.8/35.0	7.1/7.1/7.1	89/90
		25.0	16.5/17.1/17.6	35.0/35.0/35.0	6.6/6.8/6.9	84/86
481	NO DATA					
491	Jan.30-31, 79	1.0	18.0/18.1/18.2	34.6/34.8/35.0	7.1/7.2/7.3	91/94
		25.0	18.0/18.1/18.2	35.0/35.0/35.0	7.1/7.1/7.1	91/91
151	Mar. 28&29, 79	1.0	17.8/18.0/18.2	35.4/35.8/36.2	6.7/6.7/6.8	103/10
		22.0	17.3/17.4/17.4	35.4/35.8/36.2	6.5	100
247	Mar. 27&28	1.0	17.2/17.4/17.6	35.0/35.4/35.8	6.6/6.6/6.7	101/10
		25.0	17.1/17.1/17.2	35.4/35.8/36.2	6.2/6.4/6.5	95/10
481	NO DATA					
491	NO DATA					

Table X-A-2 Performance of Recording Instruments

			1978			1979	
STATION	INSTRUMENT	OCT.	NOV.	DEC.	JAN.	FEB.	MAR.
151	Current Meter	—	—	—	—	—	—
151	Refract./Thermo.					—	—
247	Current Meter	—	—	—	—	—	—
247	Refract./Thermo.	—	—	—	—		

APPENDIX X-A-I

TECHNIQUES

COMPUTER CODING SHEET: FILES 30-32

COLUMN NUMBER	EXPLANATION
2-3	File code number
5-19	Sample ID code number
21-23	Station number
25	Year (8 = 1978, 9 = 1979)
26-27	Month (01 thru 12)
28-29	Day (01 thru 31)
31	Season (1 = fall, 2 = winter, 3 = spring, 4 = summer)
33	A = Diver cryptofauna
	B = Diver sediment
	C = Diver misc. invertebrates
	D = Diver Algae
	E = Diver Fish
	F = Dip Net
	G = SHIPEK
	H = Bucket Dredge
	I = Capetown Dredge
	J = Rod & Reel
	K = Trawl
	L = Submersible
	M = Other
35-36	AA = Sponge - *Agelas dispar*
	AB = Sponge - *Callyspongia vaginalis*
	AC = Sponge - *Callyspongia* A.
	AD = Sponge - *Callyspongia* B.
	AE = Sponge - *Geodia*
	AF = Sponge - *Ircinia campana*
	AG = Sponge - *Ircinia* ? *strobilina*
	AH = Sponge - *Haliclona* A
	AI = Sponge - *Haliclona/Halichondria*

(Files 30-32, Continued)

COLUMN NUMBER	EXPLANATION
35-36 (Continued)	AJ = Sponge - _Haliclona_ A
	AK = Sponge - _Haliclona_ B
	AL = Sponge - _Halichondria_ ?
	AM = Sponge - _Verongia fistularis_
	AN = Sponge - _Pseudoceratina crassa_
	AO = Sponge - _Placospongia_
	AP = Sponge - _Tethya_ ?
	AQ = Sponge - Axinillid sponge
	AR = Sponge - _Neofibularia nolitangere_
	AS = Sponge - Sponge like _Geodia_
	AT = Sponge - Sponge A
	AU = Sponge - Sponge B
	AV = Sponge - Sponge C
	AW = Sponge - Sponge D
	AX = Sponge - Sponge E
	AY = Sponge - Dead Sponge
	BA = Soft Coral - _Muricia laxa_
	BB = Soft Coral - _Muricia elongata_
	BC = Soft Coral - _Eunicia calyculata_
	BD = Soft Coral - _Plexaurella fusifera_
	BE = Soft Coral - _Lophogorgia cardinalis_
	BF = Soft Coral - _Lophogorgia hebes_
	BG = _Pseudoterogorgia acerosa_
	CA = Hard Coral - _Oculina diffusa_
	CB = Hard Coral - _Manicina areolata_
	CC = Hard Coral - _Meandrina meandrites_
	CD = Hard Coral - _Scolymia_ sp.
	CE = Hard Coral - _Scolymia lacera_
	CF = Hard Coral - _Dichocoenia stellaris_
	CG = Hard Coral - _Dichocoenia stokesii_
	CH = Hard Coral - _Stephanocoenia michelini_
	CI = Hard Coral - _Agaricia_ sp.
	CJ = Hard Coral - _Agaricia fragilis_

COLUMN NUMBER	EXPLANATION
35-36 (Continued)	CK = Hard Coral - *Agaricia agaricites*
	CL = Hard Coral - *Cladocora arbuscula*
	CM = Hard Coral - *Isophyllia sinuosa*
	CN = Hard Coral - *Millepora alcicornis* (hydrozoan)
	CO = Hard Coral - *Madracis decactis*
	DA = Habitats - Fall 20 day
	DB = Habitats - Fall-Winter 90 day
	DC = Habitats - Winter 20 day
	DD = Habitats - Winter-March 90 day
	DE = Habitats - Winter-March 90 day
	DF = Habitats - Winter-Summer 120 day
	DG = Habitats - March-Summer 90 day
	DH = Habitats - Summer 20 day
	DI = Habitats - Fall-Summer 247
	DJ = Habitats - Fall-Summer 481
	DK = Habitats - Fall-Summer 491
	DL = Habitats - Other
	EA = Algae - General
	EB = Algae - ¼ Metre
	EC = Algae - Surface (Sargassum)
	FA = Misc. Host - *Astrophyton*
	FB = Misc. Host - Bryzoa
	FC = Misc. Host - Hydrozoa
	FD = Misc. Host - Worms
	FE = Misc. Host - Ascidian
	GA = Sediment - Dredge
	GB = Sediment - Diver
	GC = Sediment - Submersible
	HA = Old BLM Stations - 151
	HB = Old BLM Stations - 247
	IA = Misc. Animals - Shrimp
	IB = Misc. Animals - Crabs
	IC = Misc. Animals - Mollusks
	ID = Misc. Animals - Worms

(Files 30-32, Continued)

COLUMN NUMBER	EXPLANATION
35-36 (Continued)	IE = Misc. Animals - Rubble
	IF = Misc. Animals - Fish Trap
	IG = Misc. Animals - Fish Slurp
	IH = Misc. Animals - Surface
	II = Misc. Animals - Echinoderms
	JA = Other Collections
38	0 = No 1 = Yes (Decalcified)
40-43	Military Time
45-46	Depth in Metres
48	L = Light D = Dark
50-52	Salinity, column 52 = tenths
54-56	Temp., Column 56 = tenths
58-62	Volume, Column 62 = tenths
64-68	Calcium Dry wt., Column 68 = tenths
70-74	Sponge Dry wt., Column 74 = tenths
76-80	Sediment Dry wt., Column 80 = tenths

File 30: Cryptofaunal Data File

- File Code Number
- Sample ID Number
- Station
- Date
- Season
- Collection Method
- Sample Category
- Decalcification
- Time
- Depth (M)
- Light/Dark
- Salinity $^{o}/oo$
- Temperature ^{o}C
- Volume (ml)
- Calcium Dry Weight (g)
- Sponge Dry Weight (g)
- Habitat Sediment Dry Weight (g)

File 31: Cryptofaunal Data Archive

File Code Number

Sample ID Number

NOAA Code Number

Number of Individuals

NOAA Code Number

Number of Individuals

NOAA Code Number

Number of Individuals

File 32: Ichthyofaunal Diversity Archive

File Code Number

Count ID Number

NOAA Code Number

Number of Individuals

NOAA Code Number

Number of Individuals

NOAA Code Number

Number of Individuals

NOAA Code Number

Number of Individuals

COMPUTER CODING SHEET: FILE 33

COLUMN NUMBER	EXPLANATION
2-3	File code number
5-9	Count I.D. number
11-13	Station number
15-19	Date (year; 8=78, 9=79)
21	Season (1=fall, 2=winter, 3=spring, 4=summer)
23	D = Diver
	S = Submarine
25	1 = Shallowreef flat
	2 = Shallow ridge crest
	3 = Reef face
	4 = Reef slope
	5 = Deep ridge
	6 = Deep sand flat
	7 = Patch reef
27-28	Depth in Metres
30-33	Military time
35-37	Percent sand substrate cover
39-41	Percent rubble substrate cover
43-45	Percent soft coral substrate cover
47-49	Percent sponge substrate cover
51-53	Percent hard coral substrate cover
55-57	Percent outcrop substrate cover

File 33: Ichthyofaunal Diversity File

File Code Number

Count ID Number

Station

Date

Season

Count Method

Biotope

Depth(m)

Time

Percent Sand

Percent Rubble

Percent Soft Coral

Percent Sponge

Percent Hard Coral

Percent Outcrop

ABUNDANCE DATA DISPLAY - NO. 1

PHYLOGENETIC LISTING OF SPECIES BY STATION SEASONALLY AND OVERALL

A CODE	SCIENTIFIC NAME	STATION 151 F W S T	STATION 247 F W S T	STATION 481 F W S T	STATION 491 F W S T	FMG OVERA F W S

ABUNDANCE DATA DISPLAY - NO. 2. PHYLOGENETIC LISTING OF SPECIES BY HOST, TYPE, AND VOLI

EXAMPLE:

Agelas dispar

SEASON	SAMPLE NO.	VOLUME	SCIENTIFIC NAME	ABUNDANCE	NO./UNIT VOLUME

DATA ANALYSIS NO. 1 - Dominance Index

Where combined relative abundance of the two most common species is used to calculate DI,

$$DI = A + B$$ (A and B are the relative abundance of the two most common species.)

we would emphasize data for the following taxa:

a) Decapoda (Caridea)

b) Isopoda

c) Polychaeta (Syllidae)

d) Mollusca

e) Total

and compare:

a) Sample

b) Stations
   1) Seasonally
   2) Overall

c) Habitat
   1) Seasonally
   2) Overall

DATA ANALYSIS NO. 2 - Shannon-Wiener Index of Diversity

Where $H' = -\sum_{i=1}^{N} P_i$ and $P_i = p_i \log_{10} p_i$

or $= p_i \log_2 p_i$

or $= p_i \ln p_i$

where N = Total N species

p_i = proportion of the community belonging to the i^{th} species (n_i/N)

we would emphasize data for the following taxa

a) Decapoda (Caridea)

b) Isopoda

c) Polychaeta (Syllidae)

d) Mollusca

e) Total

and compare:

a) Sample

b) Stations
   1) Seasonally
   2) Overall

c) Habitat
   1) Seasonally
   2) Overall

DATA ANALYSIS NO. 3 - Pielou's Evenness

Where $J' = \frac{H'}{H'\ max}$ and $H'\ max = \log_{10} S$ and S = the number of species.

or $= \log_2 S$

or $= \ln S$

we would emphasize data for the following taxa:

a) Decapoda (Caridea)

b) Isopoda

c) Polychaeta (Syllidae)

d) Mollusca

e) Total

and compare:

a) Sample

b) Stations
   1) Seasonally
   2) Overall

c) Habitat
   1) Seasonally
   2) Overall

DATA ANALYSIS NO. 4 - Hurburt's Expected Number of Species

Where $E(S_n)$ is the estimated number of species

and $E(S_n) = \sum_{1}^{S} \left(1 - \left(\binom{N-N_i}{n} / \binom{N}{n}\right)\right)$

S = No. of species in original sample

N = No. of individuals in original sample

N_i = No. of individuals in the ith species

n = Sample size

we would emphasize data for the following taxa:

a) Decapoda (Caridea)

b) Isopoda

c) Polychaeta (Syllidae)

d) Mollusca

e) Total

and compare:

a) Sample

b) Stations
   1) Seasonally
   2) Overall

c) Habitat
   1) Seasonally
   2) Overall

DATA ANALYSIS NO. 5 - Margelef's Species Richness

Where $SR = \frac{(S-1)}{\ln N}$

and S = the number of species

N = number of individuals

we would emphasize data for the following taxa:

a) Decapoda (Caridea)

b) Isopoda

c) Polychaeta (Syllidae)

d) Mollusca

e) Total

and compare:

a) Sample

b) Stations
   1) Seasonally
   2) Overall

c) Habitat
   1) Seasonally
   2) Overall

DATA ANALYSIS NO. 6. Sanders Minimal Faunal Abundance for Station Similarity

Where $MFA = \sum_{i=1} c_i$ and $c_i = \begin{cases} a_i, & a_i \le b_i \\ b_i, & b_i \le c_i \end{cases}$, $0 \le a, b, c \le 1$

and the value may be presented as a % by x 100

This method examines two S species assemblages A and B with proportionate abundances of the ith species a_i and b_i respectively.

We would use selective taxa and compare

a) Decapoda (Caridea)

b) Isopoda

c) Polychaeta (Syllidae)

d) Mollusca

e) Total

and compare:

a) Sample

b) Stations
   1) Seasonally
   2) Overall

c) Habitat
   1) Seasonally
   2) Overall

DATA ANALYSIS NO. 7 - Morisita's Coefficient of Interspecific Association and Similarity

Where $C\lambda = \frac{Z\sum_{1}^{\infty} n_{1i} n_{2i}}{N_1 N_2 (\lambda_{1j} + \lambda_{2j})}$

and n_{1i} and n_{2i} are numbers of specimens of the ith species in samples 1 & 2, and

N_1 and N_2 are total numbers of specimens in the two samples and

$$\lambda_{1j} = \sum_{1}^{\infty} \frac{n_i (n_i - 1)}{N (N-1)} \qquad \lambda_{2j} = \sum_{1}^{\infty} \frac{n_i (n_i - 1)}{N (N-1)}$$

for each sample.

We would examine:

a) Decapoda: Caridea

b) Polychaetes: Syllidae

c) Molluscs

d) Isopods

e) Total

By:

a) Samples - (Dendrogram as well as print out of values)

b) Station - (Trellis Diagram and print out values)

c) Season - (Trellis Diagram and print out of values)

d) Station and Season (Trellis Diagram)

e) Host Type - Dendrogram & Print out

f) Habitat - Dendrogram & Print out

DATA ANALYSIS NO. 8 - Bray Curtis Similarity Index

Where $\% S = \frac{2A}{B + C} \times 100$

and A = No. of species common to both sites, and B and C are the total number of species at each site.

This analysis should be performed for the following taxa:

a) Decapoda: Caridea

b) Isopoda

c) Polychaeta: Syllidae

d) Mollusca

e) Total of Above

and should be applied to

Madracis Samples

Agelas Samples

Artificial Habitats 30 day

Artificial Habitats 30, 60, 90 day.

Display as trellis diagram with numbers.

DATA ANALYSIS NO. 9 - Examination of Species/Volume Using Linear Regression.

See: Ricker, W.E. 1973. Linear regressions in fishery research.
J. Fish. Res. Board Can. 30: 409-434.
(Abstract attached.)

Use Nair Bartlett Model II Regression Method and the following taxa:

a) Decapoda; Caridea

b) Polychaeta; Syllidae

c) Molluscs

d) Isopods

e) Total

Please examine:

a) Species Number vs. Sample Volume

b) Species Number vs. Sample Dry Weight

c) Individual Number vs. Sample Volume

d) Individual Number vs. Sample Dry Weight

To include correlation coefficients and F distribution values with associated probabilities of error.

Abstract from: Journal Fisheries Research Board of Canada, Vol. 30, No. 3, 1973.

Linear Regressions in Fishery Research

W. E. RICKER

Fisheries Research Board of Canada
Biological Station, Nanaimo, B.C.

RICKER, W. E. 1973. Linear regressions in fishery research. J. Fish. Res. Board Can. 30: 409–434.

A number of regression situations in fish and fishery biology are examined, in which both of the variates are subject to error of measurement, or inherent variability, or both. For most of these situations a functional regression line is more suitable than the ordinary predictive regressions that have usually been employed, so that many estimates now in use are in some degree biased. Examples are (1) estimation of the exponent in the weight:length relationship, where almost all published values are somewhat too small; and (2) estimating the regression of logarithm of metabolic rate on log body weight of fish, where the best average figure proves to be 0.85 rather than 0.80. In the very common situation where the distribution of the variates is non-normal and open-ended, a functional regression is the most appropriate one even for purposes of prediction. Two ways of estimating the functional regression are (1) from arithmetic means of segments of the distribution, when computed symmetrically; and (2) from the geometric mean of one predictive regression and the reciprocal of the other. The GM regression gives a more accurate estimate when it is applicable; it is appropriate in all situations where the variability is mainly inherent in the material (little of it due to errors of measurement), or where the measurement variances are approximately proportional to the total variance of each variate; and it is the best estimate available for short series with moderate or large variability even when neither of these conditions applies. When error in X results solely from the measuring process the predictive regression of Y on X is also the functional regression if observations of X are not taken at random but rather have pre-established values, as is usual in experimental work. The uses of the various regressions are summarized in Table 8.

RICKER, W. E. 1973. Linear regressions in fishery research. J. Fish. Res. Board Can. 30: 409–434.

L'auteur examine un certain nombre de régressions rencontrées en biologie des poissons et des pêches, dans des situations où les deux variables aléatoires sont sujettes à des erreurs de mesure, à une variabilité inhérente, ou aux deux. Dans la plupart de ces situations, une droite de régression fonctionnelle est plus appropriée que les régressions prédictrices ordinaires généralement employées, et qui font que plusieurs estimations présentement en usage sont biaisées jusqu'à un certain point. Comme exemples, on peut citer (1) l'estimation de l'exposant dans la relation poids-longueur, dont presque toutes les valeurs publiées sont un peu trop faibles; et (2) l'estimation de la régression du logarithme du taux métabolique en fonction du logarithme du poids du corps du poisson, dont la meilleure moyenne s'avère 0.85 plutôt que 0.80. Dans le cas très fréquent où la distribution des variables aléatoires est non normale et à extrémités ouvertes, une régression fonctionnelle est plus appropriée, même pour faire des prévisions. Deux façons d'estimer la régression fonctionnelle sont: (1) à partir de moyennes arithmétiques de segments de la distribution, calculées symétriquement, et (2) à partir de la moyenne géométrique d'une régression prédictrice et de la réciproque de l'autre. La régression basée sur cette dernière méthode, lorsque applicable, donne un estimé plus précis; elle peut s'appliquer à toutes les situations dans lesquelles la variabilité est inhérente surtout au matériel (et très peu aux erreurs de mesure), ou dans lesquelles les variances de mesure sont à peu près proportionnelles à la variance totale de chaque variable aléatoire; c'est de plus le meilleur estimé à notre portée pour de courtes séries à variabilité modérée ou grande, même si ni l'une ni l'autre de ces conditions ne sont applicables. Lorsque l'erreur en X est le résultat du seul processus de mesure, la régression prédictrice de Y en X est aussi la régression fonctionnelle si les observations de X ne sont pas prises au hasard, mais ont plutôt des valeurs préalablement établies, comme c'est ordinairement le cas dans des travaux expérimentaux. Le tableau 8 résume les usages des diverses régressions.

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APPENDIX X-A-II

SAMPLE INVENTORY

UPDATE

FMG IV
26 March - 30 March 1979

247768290328A	4	POC
	5	Nutrient
	6	Nutrient
	7	Nutrient
	8	Nutrient
247998190328A	1	beast from bag lost FMG III
	2	1 live _Scyllarides_ nodifer
247998190328B	1	beast off instruments
247998090328D	1	general algae
247998190328D	1	beast from algae sample
247998190328E	1	3 dorids
247998190328F	1	starfish from fish trap
	2	_Ircinia_ ? _stobilina_
	3	_Verongia_ _fistularis_
	4	_Pseudoceratina crassa_
	5	Sponge A
	6	_Ircinia_ ? _canoana_
	7	mollusks
151768290328B	4	POC
	5	Nutrient
	6	Nutrient
	7	Nutrient
	8	Nutrient
151747490328A	1	dip net
151768290329A	4	POC
	5	Nutrient
	6	Nutrient
	7	Nutrient
	8	Nutrient
151992690329E	1	Habitat 1
	2	Habitat 2
	3	Habitat 3
	4	Habitat 4
	5	Habitat 5
	6	Habitat 6
	7	Habitat 7
	8	Habitat 8
	9	Habitat 9
	10	Habitat 10
151998190329B	1	beast from off instruments
151747490329A	1	plastic sheet on surface

FLORIDA MIDDLE GROUND

PART B: GEOLOGICAL MICROENVIRONMENTS

L. Doyle, J. Steinmetz

INTRODUCTION

This third quarter involved continuation of sedimentologic and micropaleontologic analyses of sediments from the Florida Middle Ground.

RESULTS

Table X-B-1 lists the inventory of samples to date. Tables X-B-2 to X-B-4 list the samples and the status of their analyses to date. We received the "Chancey Charts" of the Florida Middle Ground area and also a set of computer-derived perspective views of the four Florida Middle Ground stations. We have begun to plot and interpret data using these charts.

DEVIATIONS/PROBLEMS/ALTERNATIVES

Processing of the samples is proceeding on schedule.

No data management plan has been forwarded to us. As soon as our laboratory analyses are completed, we will be ready for the synthesis and interpretation of the data. Appendix X-B-I lists the computer analyses we plan to run. Since no funding was provided to us for data analysis, we expect TAMRF and management to provide us with a means to meet this obligation.

RECOMMENDATIONS

A data management and computer analysis plan are needed immediately.

MANAGEMENT IMPLICATIONS

It will be impossible for us to meet the 1 December 79 deadline for the Final Report if a Data Management and Computer Analysis Plan are not received in the upcoming fourth quarter.

TABLE X-B-1

SAMPLE INVENTORY

Inventory Controls (Quantities)

1.	Contracted to be collected	200
2.	Actually collected	140
3.	Deficit (collection)	60
4.	Contracted to be analyzed	200
5.	Actually analyzed	104
6.	Deficit (analysis)	36
7.	Being analyzed	16
8.	Stored for analysis	20
9.	Archived	140
10.	Expended	0

TABLES X-B-2 to X-B-4

STATUS OF ANALYSES

Key to Tables 2, 3, and 4

A - Size frequency analysis

B - Particle constituent analysis

C - Total organic carbon

D - Weight per cent carbonate

E - Foraminifera staining

F - Micropaleontologic analysis

Sample Archive Identification

151199018004D-1

xxx	(1) station number
xx	(2) method of collection*
xx	(3) type of science**
x	(4) year
xx	(5) month
xx	(6) day
x-xx	(7) sample number

* 99 - Diver collected
18 - Bucket Dredge
21 - Shipek Dredge
 - Smith McIntyre

** 01 - Geological
 - Biological

TABLE X-B-2

GEOLOGICAL SEDIMENT SAMPLES

F M G (FALL SEASON)

50 Samples

Lab. No.	Archive Number	Depth, m	A	B	C	D	E	F
JS 1	151990181004D-1	26.2	X	X		X	X	X
2	4D-2		X	X	X	X	X	X
3	4D-3		X	X	X	X	X	X
4	4D-4		X	X	X	X	X	X
5	5D-1		X	X	X	X	X	X
6	5F-1		X	X	X	X	X	X
7	5F-2		X	X	X	X	X	X
8	5F-3		X	X	X	X	X	X
9	5F-4		X	X	X	X	X	
10	5F-5		X	X	X	X	X	
42	19D-1		X	X	X	X	X	
43	19D-2		X	X		X	X	
44	19D-3		X	X		X	X	
45	19D-4		X	X		X	X	
46	19D-5		X	X	X	X	X	
47	19D-6		X	X	X	X	X	
48	19D-7		X	X		X	X	
49	19D-8		X	X		X	X	
50	19D-9		X	X		X		
51	19D-10	↓	X	X	X	X		
JS 11	481990181007A-1	29.0	X	X		X	X	
12	7A-2		X	X	X	X	X	
13	7A-3		X	X		X	X	
14	7A-4		X	X		X	X	
15	7A-5	↓	X	X		X	X	
16	7A-6	29.9	X	X		X	X	
17	7A-7		X			X	X	
18	7A-8		X			X	X	
19	7A-9		X		X	X	X	
20	7A-10	↓	X			X	X	
JS 31	491990181016 -1	30.5	X		X	X		
32	16 -2		X		X	X		
33	16 -3		X		X	X		
34	16 -4		X			X		
35	16 -5		X			X		
36	16 -6		X			X		X
37	16 -7		X			X		
38	16 -8		X			X		
39	16 -9		X		X	X		
40	16 -10	↓	X		X	X		

TABLE X-B-2 Continued

Lab. No.	Archive Number	Depth, m	A	B	C	D	E	F
JS 21	247990181012G-1	25.9	X	X	x	X	X	
22	12G-2		X		x	X	X	
23	12G-3		X		x	X	X	
24	12G-4		X		x	X	X	
25	12G-5	↓	X		x	X	X	
26	13B-1	30.5	X			X	X	
27	13B-2		X			X	X	
28	13B-3		X			X	X	
29	13B-4		X		X	X	X	
30	13B-5	↓	X		X	X	X	

TABLE X-B-3

GEOLOGICAL SEDIMENT SAMPLES

F M G (SUBMERSIBLE CRUISE)

49 Samples

Lab. No.	Archive Number	Depth, m	A	B	C	D	E	F
JS 68	151210181107 -1	32.0	X	X	X	X		
69	7 -2	34.1	X		X	X		
70	7 -3	38.1	X			X		
71	7 -4	36.6	X		X	X		
72	151180181107 -1	--	X		X	X		
73	151210181108 -1	34.7	X		X	X		
74	8 -2	25.6	X			X		
75	8 -3	36.6	X		X	X		
76	8 -4	36.6	X			X		
77	8 - 5	36.6	X			X		
JS 78	481210181108 -1	37.5	X		X			
79	8 -2	37.5	X		X			
80	8 -3	37.5	X		X			
81	8 -4	35.6			X			
82	8 -5	33.8			X			
83	8 -6	34.3			X			
84	8 -7	33.8			X			
85	8 -8	35.6			X			
JS 86	491210181109 -1	40.2	X	X	X			
94	9 -2	36.6	X		X			
89	9 -3	26.5			X			
88	9 -4	40.2			X			
87	9 -5	41.1						
90	9 -6	--						
95	9 -7	36.6						
97	491210181111 -1	32.9			X			
98	11 -2	43.9	X		X			
99	11 -3	43.9	X		X			
100	11 -4	30.2			X			
101	11 -5	43.9	X		X			
102	11 -6	28.3						
103	11 -7	41.1						
104	11 -8	43.5						
JS 52	247210181105 -1	36.0		X	X		X	
53	5 -2	37.5			X		X	
54	5 -3	39.0			X		X	
56	5 -4	37.5						
--	5 -5	27.4						
59	5 -6	27.4						
61	5 -7	28.3			X			

TABLE X-B-3 Continued

Lab. No.	Archive Number	Depth, m	A	B	C	D	E	F
JS 63	247210181105 -8	30.0						
64	5 -9	30.0			X			
66	5 -10	31.0			X			
55	247180181105 -1	39.8			X			
57	5 -2	35.6			X		X	
60	5 -3	27.4			X			
62	5 -4	28.8						
65	5 -5	30.0			X			
67	5 -6	31.0			X			

TABLE X-B-4

GEOLOGICAL SEDIMENT SAMPLES

F M G (WINTER SEASON)

40 Samples

Lab. No.	Archive Number	Depth, m	A	B	C	D	E	F
JS110	151990190118D-1	25.0	X	X				
111	18D-2	↓	X	X				
112	18D-3		X					
113	18D-4		X					
114	18D-5		X					
115	18D-6		X					
116	18D-7		X					
117	18D-8		X					
118	18D-9		X					
119	18D-10	↓	X					
JS130	151990190203A-1	25.0	X	X				
131	3A-2	↓	X	X				
132	3A-3		X					
133	3A-4		X					
134	3A-5		X					
135	3A-6		X					
136	3A-7		X					
137	3A-8		X					
138	3A-9		X					
139	3A-10	↓	X					
JS120	247990190130A-1	31.1						
121	30A-2	↓						
122	30A-3							
123	30A-4							
124	30A-5							
125	30A-6							
126	30A-7							
127	30A-8							
128	30A-9							
129	30A-10	↓						
JS160	247210190130A-1	37.0						
161	30A-2	39.0						
162	30A-3	39.0						
163	30A-4	39.0						
164	30A-5	40.0						
165	30A-6	35.0						
166	30A-7	30.0						
167	30A-8	26.0						
168	30A-9	28.0						
169	30A-10	24.0						

APPENDIX X-B-I

PROPOSED COMPUTER ANALYSES OF

FMG GEOLOGICAL DATA

PROPOSED COMPUTER ANALYSES OF FMG GEOLOGICAL DATA

I. Sediments

A. Plots and contouring of sedimentary parameters on base map

1. Size analyses

2. Sedimentary moments

3. Carbonate constituents

4. Clay mineralogy

5. Total organic carbon

B. Cluster analyses

C. Regression analyses

II. Benthonic Foraminifera

A. Species present (%)

B. Species dominance

C. Species diversity

D. Species evenness

E. Cluster analyses

CHAPTER XI

CHARACTERIZATION OF BANKS/AREAS

R. Rezak

INTRODUCTION

Bank characterization involves the synthesis of submersible observations, bathymetry, sub-bottom profiling, biology, and sediment distribution. It includes physiography, structure, and sediment distribution around the banks. The physiography of the banks has been reported in an earlier Quarterly Summary Report (Feb 79, pp. C-1 through 5). The structure of the banks is basically that of salt plug intrusions into Tertiary and Holocene sediments. Fine details of structure are currently being worked out by the sub-sea floor mapping team. Sediment samples from the banks were taken on Cruise 79-BS-2, which took place during the last two weeks of the quarter (June 1979), and the samples will be analysed during the next quarter. Bathymetric maps and three-dimensional perspective views of the banks are contained in Appendix B.

RESULTS

To date, 32 of 75 tapes have been reviewed for geological observations. The reviewed tapes were made at Coffee Lump, Geyer, Fishnet, and Alderdice Banks. Banks remaining to be reviewed are Diaphus, Sidner, Jakkula, Rezak, Elvers, and East Flower Garden. (See Table XI-1.)

Since most of the analytical work on the banks is still in progress, no characterization of specific banks will be given in this report. However, submersible observations during the past few years have led me to a hypothesis concerning the relative ages of the banks. Actually, the dive on the bedrock ridge at Alderdice Bank crystallized my ideas on the subject.

Looking at all the banks we have studied in the northwestern Gulf of Mexico, we see all stages of reef bank development, from extremes such as the Flower Garden Banks, where both living and drowned reefs are present, to slightly encrusted bare rock ridges such as we find at Stetson, Claypile, Sonnier and Alderdice Banks. I am convinced that the banks are very dynamic features that exhibit the results of two opposing processes. Uplift of the banks is an ongoing process that tends to increase their relief above the sea floor. When the crest of the salt plug reaches a few hundred feet below the bank, dissolution of the salt begins, and this continues as the salt comes closer to the surface. A void is created beneath the caprock, and this void increases in size until the caprock collapses into it. If the collapse is of sufficient magnitude, it will also involve the overlying lithified sediments which have already been fractured in a radial pattern at the crest of the dome due to the upthrusting of the salt. The collapse may result in crestal basins such as occur at the West Flower Garden and Claypile Banks, or a series of wedge-shaped fault blocks as at Sonnier Banks, or a series of ridges as at Alderdice Bank.

The existence of these opposing processes has been documented at Damon Mound, a salt dome near Freeport, Texas, where a large open pit mine has removed much of the caprock. At the southeast margin of the mine is a large tilted fault block of Miocene Reef and associated sediments that has been downfaulted into the caprock of the dome. The facies of the reef are almost exact counterparts of the sedimentary facies at the West Flower Garden Bank and must have formed when Damon Mound was at a depth comparable to that at the West Flower Garden Bank.

DEVIATIONS/PROBLEMS/ALTERNATIVES

There are no deviations or problems to date in the bank characterization studies.

RECOMMENDATIONS

None.

MANAGEMENT IMPLICATIONS

The proposed hypothesis on the dynamic nature of the geologic structures should be of concern to BLM, particularly if the process of collapse proves to be catastrophic in nature. The nearly bare, bedrock outcrop at Alderdice Bank conceivably could have been emplaced within the past year. If such is the case, this is a geological hazard that has not been considered in the past. I do not recommend any hasty management decisions based upon the evidence we have at this time. However, I strongly recommend that a series of "on the bottom seismographs" be emplaced on selected banks to determine the amount of seismicity present on the banks over a period of one year. This should give a reliable assessment of the mobility of the banks and would either prove or disprove my hypothesis.

[Program Manager's Note: During the quarterly meeting, a question was raised about further analysis of certain geological and bathymetric data. Dr. Rezak explained that the data in question had never been required or collected under the present or previous contracts.]

TABLE XI-1

SUBMERSIBLE DIVES AND DATA COLLECTION

BANK OR STATION	DIVE					FILM		
	No.	Date	Duration	Pilot	Observer	16 mm	35 mm	Video
Coffee Lump	103	27 Sep	5 + 49	Green	Bright	0	2	5
	113	11 Oct	4 + 17	Green	Rezak	0	1	4
	114	11 Oct	1 + 45	Smith	Green	0	Check-out Dive	
East Flower Garden	104	28 Sep	2 + 40	Cooke	Lavar	0	---	---
	105	29 Sep	---	Cooke	Ambler	0	---	---
	106	29 Sep	3 + 48	Cooke	Perry-Plake	0	1	4
	107	30 Sep	6 + 20	Green	Bright	0	4	6
	108	1 Oct	5 + 30	Cooke	Norse	0	2	6
	109	2 Oct	---	Cooke	Bright	0	2	5
	110	5 Oct	4 + 20	Green	McGrail	2	1	3
	111	6 Oct	3 + 40	Cooke	McGrail	2	1	2
	112	6 Oct	2 + 15	Bottom	Jenkins	1	1	2
	129	22 Oct	5 + 15	Green	Perry-Plake	0	3	4
	130	22 Oct	1 + 59	Cooke	Warsi	0	0	2
	131	23 Oct	4 + 40	Smith	Cooke	0	0	0
	132	23 Oct	1 + 48	Green	Bright	0	0	2
	133	24 Oct	5 + 00	Green	Rezak	0	2	7
	134	24 Oct	3 + 16	Smith	Cooke	0	Check-out Dive	
Geyer	115	12 Oct	9 + 05	Cooke	Bright	0	4	8
	127	21 Oct	2 + 51	Cooke	Titgen	0	1	3
	128	21 Oct	2 + 32	Green	Cooper	0	0	1
Fishnet	116	13 Oct	2 + 25	Green	Rezak	0	1	3
	117	13 Oct	4 + 18	Green	Titgen	0	2	4
Diaphus	118	16 Oct	3 + 01	Cooke	Wong	0	1	3
	119	16 Oct	4 + 12	Green	Bright	0	1	4

BANK OR STATION	DIVE					FILM		
	No.	Date	Duration	Pilot	Observer	16 mm	35 mm	Video
Sidner	120	17 Oct	5 + 40	Cooke	Bright	0	3	3
Alderdice	121	18 Oct	4 + 48	Green	Rezak	0	1	5
	122	18 Oct	4 + 15	Cooke	Bright	0	1	4
	123	19 Oct	2 + 42	Green	Rezak	0	2	4
Jakkula	124	19 Oct	3 + 02	Cooke	Bright	0	3	6
Rezak	125	20 Oct	3 + 30	Cooke	Rezak	0	1	3
Elvers	126	20 Oct	5 + 55	Green	Bright	0	3	6
Florida Middle Ground								
Station 151	137	7 Nov	3 + 23	Smith	Steinmetz	0	1	3
	138	7 Nov	2 + 0	Cooke	Shapiro	0	0	2
	144	11 Nov	4 + 20	Bright	Clark	0	2	3
Station 247	135	6 Nov	3 + 42	Green	Hopkins	0	1	4
	136	6 Nov	3 + 24	Bright	Steinmetz	0	1	5
	145	12 Nov	3 + 45	Green	Hopkins	0	0	5
	146	12 Nov	1 + 30	Green	Hudgins	0	0	2
Station 481	139	9 Nov	1 + 55	Smith	Meyer	0	1/2	3
	140	9 Nov	4 + 15	Bright	Lutz	0	0	3
Station 491	141	10 Nov	3 + 10	Cooke	Steinmetz	0	1/2	4
	142	10 Nov	3 + 51	Green	Dardeau	0	0	2
Station 493	143	11 Nov	3 + 40	Cooke	Adkinson	0	1	3

CHAPTER XII

SUMMARY AND RECOMMENDATIONS

J. LeBlanc

INTRODUCTION

This chapter will summarize problems or concerns, solutions, alternatives and/or recommendations. Findings and performance will also be assessed.

POINTS OF INTEREST

1. Florida Middle Ground diving cruises.
   a. Status. Dr. T. Hopkins has completed the data collection and is proceeding with the analysis/reduction. The data collected exceeded expectations and the reduction, analysis, integration and synthesis may not be completed by the contractual date.
   b. Recommendations:
      1. Dr. Hopkins prepare an impact statement with cost and time estimates.
      2. TAMRF and TAMU review the potential impact on the TAMRF-BLM Contract AA551-CT8-35.
2. Seasonal/Summer Cruise.
   a. Status. Cruise was completed in latter part of quarter after funding by BLM. Data has been inventoried and transported to appropriate researchers.

3. BLM requirement for additional work at Flower Gardens.

   a. Status. Requirements are being evaluated. Cost/technical proposals will define impact on contract.

   b. Recommendations:

      1. BLM expeditiously approve the proposed Modification #3.

      2. BLM expeditiously release the next RFP.

4. Data management functions.

   a. Status. Agreement was reached as to responsibilities.

   b. Recommendations:

      1. Future RFPs and SOWs be evaluated for data and information requirements by professional or certified data processors.

      2. The TAMRF-TAMU BLM Program Office attempt to help USF and UA solve their data problems.

      3. BLM provide for USF a data set containing the requested MAFLA data.

      4. Each researcher and associate provide a description and statement of analytical techniques/tools to be used, i.e., mathematical/statistical formulae or model and whether manual or automated analysis will be required.

      5. Each researcher and associate review and select the appropriate NODC exchange format for their respective data. Furthermore, working formats need to be documented as a data management function, e.g., the format for use by Dr. Steinmetz.

5. Trace metal sediment analysis delays.

   a. Status. All samples will be delivered by 1 Aug 79 for analysis. The draft report will be available on schedule.

6. HMW hydrocarbon analyses in Spondylus.

   a. Status. Analysis continues on schedule.

7. HMW hydrocarbons/Delta C-13 analysis in sediments.

   a. Status. Samples have been transported for analysis.

   b. Recommendations:

      1. Stainless steel jars be used in future data collection to prevent sample contamination.

8. Long term suspended sediment dispersal.

   a. Status. At or ahead of schedule.

   b. Recommendations:

      1. Research be initiated to find a more likely cause for the anomalous distribution of sediment transport.

      2. Dr. S. Gartner investigate the possibliities of integrating his coccolith study with the hydrographic study at EFG (Re Taylor Column).

9. Characterization of banks.

   a. Status. Diaphus Bank was selected as a model for presenting results of bank characterization.

   b. Recommendations:

      1. BLM provide written feedback on the approach and method.

      2. Bathymetric and sub-bottom mapping be accomplished well ahead of other investigations.

10. Sea bottom sampling.

a. Status. All sampling will be completed by the end of the 3rd Seasonal/Summer Cruise.

b. Recommendations:

1. BLM not specify a Smith-McIntyre Sampler in future SOWs, but the Gray-O'Hara sampler instead.

2. Stainless steel jars be used to prevent breakage and contamination during transportation from the ship to the laboratory.

11. Geohazards.

a. Status. Dr. R. Rezak proposed a hypothesis on the relative ages and mobility of the banks.

b. Recommendations:

1. Emplace at selected banks "on the bottom seismographs" over a period of at least one year to determine and verify seismicity.

12. 4th Quarterly Meeting.

a. Status. Meeting is scheduled for 10-11 Oct 79 at TAMU.

b. Recommendations:

1. List of attendees be available not later than 15 Sep 79.

2. Attendees confirm attendance not later than 1 Oct 79.

3. Attendees act with haste as rooms are at a premium and may not be available (football weekend on 13 Oct 79).

FINDINGS AND PERFORMANCE ASSESSMENT

Brief statements to assess performace include:

1. Dr. R. Rezak et al. are analyzing data and samples and have started to characterize some banks. Dr. Rezak has proposed a hypothesis based on observations. He is on schedule except the time and cost will be impacted by the proposed additional work (Contract Modification #3).
2. Dr. T. Bright et al. are analyzing data and samples and have started to characterize banks. Biological findings may be significant. Dr. Bright is on schedule except time and cost will be impacted by the proposed additional work at the Flower Gardens (Mod #3).
3. Dr. S. Gartner et al. are analyzing data and samples, are ahead of schedule, and anticipate no cost overrun.
4. Dr. D. McGrail et al. are analyzing data and samples and have started the characterization process. Dr. McGrail is now on schedule but will be impacted by the proposed additional work (Mod #3).
5. Dr. T. Hilde et al. are analyzing bathymetric and seismic records and anticipate no time or cost overruns.
6. Dr. B. Presley et al. have analyzed Spondylus, started the sediment trace metal analysis, and anticipate no further time delays.
7. Dr. J. Brooks et al. have received all samples for analysis and anticipate no delays or additional costs.
8. Dr. C. Giam et al. are analyzing HMW Hydrocarbons and anticipate no delays.
9. Dr. P. Parker et al. are analyzing all samples delivered and anticipate no further delays.
10. Dr. J. Steinmetz et al. are analyzing data, started the characterizing process, and anticipate a time impact at no cost.

11. Dr. T. Hopkins et al. are analyzing samples and data, started the characterizing process, and anticipate a time impact at no cost.

12. Mr. J. LeBlanc et al. are preparing or modifying subcontracts, editing and delivering reports and plans, monitoring and controlling funds and schedules, and managing the program to satisfy the contract. There is an anticipated cost and time overrun to perform the additional work (Mod #3). (See Table XII-1 for present delivery dates.)

TABLE XII-1

SCHEDULE FOR FINAL REPORT

(as of 30 Jun 79)

ABBREVIATED CHAPTER & TITLE		RESEARCHERS	DRAFT DATES	
			TAMU	BLM
PART ONE				
I.	Introduction	LeBlanc	Dec 79	Jan 80
II.	Methods	All PIs	Oct 79	Nov 79
IIIA.	Project Management	LeBlanc	Jan 80	Jan 80
IIIB.	Data Management	LeBlanc/Sharman	Dec 79	Jan 80
PART TWO				
IVA.	Trace Metals	Presley/Boothe	Dec 79	Jan 80
IVB.	HMWH (Organisms)	Giam/Neff	Dec 79	Jan 80
IVC.	HMWH (Sediments)	Parker/Scalan/Winters	Dec 79	Jan 80
V.	Long Term Dispersals	Gartner	Nov 79	Dec 79
VI.	Hydrography	McGrail	Mar 80	Apr 80
VII.	Mapping	Hilde/Rezak	Dec 79	Jan 80
PART THREE				
VIII.	Introduction	Rezak	Dec 79	Jan 80
IX.	EFG	Rezak/Bright/McGrail	Jan 80	Jan 80
X.	COF	Rezak/Bright/McGrail	Jan 80	Jan 80
XI.	FIS	Rezak/Bright/McGrail	Dec 79	Jan 80
XII.	DIA	Rezak/Bright/McGrail	Oct 79	Nov 79
XIII.	JAK	Rezak/Bright/McGrail	Jan 80	Jan 80
XIV.	ELV	Rezak/Bright/McGrail	Oct 79	Nov 79
XV.	GEY	Rezak/Bright/McGrail	Dec 79	Jan 80
XVIA.	REZ	Rezak/Bright/McGrail	Nov 79	Dec 79
XVIB.	SID	Rezak/Bright/McGrail	Nov 79	Dec 79

TABLE XII-1 (Continued)

ABBREVIATED CHAPTER & TITLE		RESEARCHERS	DRAFT DATES	
			TAMU	BLM
XVII.	ALD	Rezak/Bright/McGrail	Nov 79	Dec 79
XVIII.	32F	Rezak/Bright/McGrail	Oct 79	Nov 79
XIX.	LSI	Rezak/Bright/McGrail	Nov 79	Dec 79
PART FOUR				
XXA.	Introduction	Hopkins/Steinmetz/Doyle	Oct 79	Dec 79
XXB.	Geology	Doyle	Dec 79	Jan 80
XXC.	Sedimentology	Steinmetz	Dec 79	Jan 80
XXD.	Biology and Chemistry	Hopkins/Schroeder	Dec 79	Jan 80
XXE.	Conclusions	Hopkins/Steinmetz/Doyle	Dec 79	Jan 80
XXF.	Management Implications	Hopkins/Steinmetz/Doyle	Dec 79	Jan 80
XXG.	Recommendations	Hopkins/Steinmetz/Doyle	Dec 79	Jan 80
PART FIVE				
XXI.	Summary	LeBlanc/Rezak/Bright	Jan 80	Feb 80
XXII.	Recommendations	LeBlanc/Rezak/Bright	Jan 80	Feb 80

APPENDIX A

3rd
QUARTERLY MEETING

17-18 Jul 79

A G E N D A

BLM Quarterly Meeting
TAMRF-BLM Contract AA551-CT8-35
17-18 July 1979

302 Rudder Tower
Texas A&M University
College Station, Texas

<u>TUESDAY, JULY 17</u>

I. GENERAL

8:00 Norman - Registration (coffee and donuts available)
9:00 LeBlanc - Introduction
9:15 Vice President Prescott - Welcoming
9:20 LeBlanc - Ground Rules
9:25 BLM - Action Items

II. FLORIDA MIDDLE GROUND

9:30 Rezak - Mapping

10:00 BREAK

10:15 Hopkins - Experimental Design & Environmental Monitoring
10:45 Steinmetz - Progress of Geological Studies
11:15 BLM - Action Items

11:30 LUNCH

(coffee and iced tea available for afternoon session)

III. SPECIAL STUDIES

1:00 Gartner - Long Term Suspended Sediment Dispersal (Fossil Coccoliths)
1:10 Boatwright - Petroleum-like Hydrocarbon in TOPO-HI Sediment
1:20 Boothe - Status of Trace Metals in <u>Spondylus</u> Analyses
1:30 BLM - Action Items

IV. TOPOGRAPHIC FEATURES OF INTEREST

1:45 Rezak - Bathymetric and Sub-sea Mapping

Feeley - Fishnet, Coffee Lump, and Rezak-Sidner Banks
Chen - Alderdice and Geyer Banks
Warsi - Elvers and Jakkula Banks

2:45 BREAK

3:00 Rezak - Geological and Chemical Sampling
3:30 Rezak/Bright/McGrail - Characterization of Diaphus Bank
4:30 BLM - Action Items

6:00 to 8:00 - Cocktail party at Jose's Mexican Restaurant
(one-half mile past east by-pass on Highway 30)

<u>WEDNESDAY, JULY 18</u>

V. EAST FLOWER GARDEN MONITORING

8:00 Coffee and donuts available
8:30 McGrail/Horne - Currents, Temperatures, and Heartaches from Moored Arrays
9:15 Bright - Coral Populations
9:30 Pequegnat - Systematics, Epifauna of Fishing Banks
9:45 Perry-Plake - Leafy Algae Populations
10:00 Denoux/Combs - Coral Reproduction, Recruitment
10:15 BLM - Action Items

10:30 BREAK

VI. PROJECT MANAGEMENT

10:40 LeBlanc - Reports
10:50 Sharman - Data Management
11:00 LeBlanc - Performance
11:15 BLM - Action Items

11:30 LUNCH

(coffee and iced tea available for afternoon session)

VII. INFORMATION NEEDS

1:00 Pugh/Burke - Interagency Report
2:00 LeBlanc - Open Forum; Summary and Recommendations
3:00 BLM - Action Items
3:15 Individual Conferences

ATTENDEES

BLM Quarterly Meeting
TAMRF-BLM Contract AA551-CT8-35
17-18 July 1979

302 Rudder Tower
Texas A&M University
College Station, TX 77843

I. Bureau of Land Management
   1. Mr. Charles Hill; 500 Camp St., Suite 841, New Orleans LA 70130
   2. Dr. Robert Rogers; 500 Camp St., Suite 841, New Orleans LA 70130
   3. Mr. Thomas Burke; Environmental Studies, 18th & C St. NW, Washington, D.C. 20240

II. NOAA
   1. Mr. Ed Lindelof; Office of Coastal Zone Management, 200 Wisconsin Ave., Washington, D.C. 20235
   2. Mr. Lawrence Pugh; Dept. of Commerce, 6010 Executive Blvd., Rockville, MD 20852

III. U.S. Fish & Wildlife Service
   1. Mr. Jim Barkuloo; P.O. Box 4696, Panama City, FA 32401
   2. Mr. Russ Peterson; 601 Rosenberg, Galveston, TX 77550

IV. Coastal and Marine Council
   1. Mr. Howard T. Lee; P.O. Box 13407, Austin, TX 78711

V. U.S. Environmental Protection Agency
   1. Dr. Norman Richards; Sabine Island, Gulf Breeza, FA 32561

VI. U.S. Geological Survey
   1. Dr. William E. Sweet; P.O. Box 7944, Metairie, LA 70011

VII. Ter Eco
   1. Mr. E.A. Kennedy; College Station, TX 77840

VIII. University of Alabama
   1. Dr. Thomas Hopkins; Marine Science Program, Box 386, Dauphin Island, Alabama 36528

IX. University of South Florida
   1. Dr. John Steinmetz; Marine Science Institute, 830 First St., St. Petersburg, FA 33701

X. University of Texas
   1. Dr. Dan Boatwright; UT Marine Science Institute, Port Aransas Marine Laboratory, Port Aransas, TX 78373

XI. Texas A&M University
- A. Office of University Research
  - Dr. Robert Berg
- B. Department of Oceanography
  - Dr. Paul Boothe
  - Dr. Tom Bright
  - Mr. Yu-Hsin Chen
  - Mr. Chris Combs
  - Mr. Guy Denoux
  - Ms. Mary Feeley
  - Dr. Stefan Gartner
  - Ms. Jean Hagerbaumer
  - Mr. Frank Irwin
  - Mr. Jim Kendall
  - Mr. Joseph U. LeBlanc
  - Dr. David McGrail
  - Dr. William Merrell
  - Dr. Rose Norman
  - Dr. Linda Pequegnat
  - Dr. B.J. Presley
  - Dr. Richard Rezak
  - Dr. George Sharman
  - Mr. Waris Warsi
- C. Department of Chemistry
  - Dr. C.S. Giam
  - Dr. Grace Neff

MINUTES

BLM QUARTERLY MEETING

TAMRF-BLM Contract AA551-CT8-35

17-18 July 1979

INTRODUCTION

The third quarterly meeting under Contract AA551-CT8-35 was held at Texas A&M University, College Station, Texas, on 17-18 July 1979. The purpose of the meeting was to discuss, report, and evaluate the status of work efforts and to arrive at alternatives for problems.

CALL TO ORDER

1. The meeting was called to order by Mr. Joe LeBlanc, Program Manager, at 9 a.m., 17 July 1979.

2. Dr. Richard Rezak introduced Dr. Robert Berg, of the Texas A&M Office of University Research, who welcomed the attendees to A&M.

3. Mr. LeBlanc restated the project objectives: "To collect, analyze, synthesize, and quantify data and to deliver quality information, products, and services ahead of schedule and below cost to BLM."

4. The meeting objectives were defined as: "To discuss, report, and evaluate the status of work and to arrive at alternatives for problems."

5. The attendees were asked to introduce themselves (see attached list of attendees).

6. Ground rules were reviewed as follows:

   a. stay within allocated time limit and agenda (Dr. Rose Norman appointed time keeper);

   b. make presentations;

      1. present work efforts and status

      2. identify open items and status

3. identify problems and recommend actions
4. assess performance (time, cost)
5. correct previous reports

c. identify action items:

1. what?
2. when?
3. where?
4. who?
5. how?

FLORIDA MIDDLE GROUND

1. Dr. Richard Rezak (substituting for Dr. Tom Hilde, who was on leave) reported on the status of the mapping effort at the Florida Middle Ground. Nine charts at a scale of 1:12,000 have now been reduced and consolidated in a single 30" x 40" map, at a scale of 1:40,000. Contouring and profiling of subbottom data is now in progress.

2. Dr. Tom Hopkins reported on the overall Florida Middle Ground biological/geological research effort and on the recent (June/July) diving cruise. He noted that the experiment with artificial habitats has been very successful, generating a great deal of data, but that this data (which was not specifically contracted for) cannot be inventoried and analysed within current contractual time and budget limitations. He intends to seek funding elsewhere, but agreed to provide a time/cost estimate for the effort within 30 days.

Dr. Hopkins also reported continuing problems with the Endeco 101 refractometer (now off the market). However, the only deviation from schedule was time lost on the March cruise, but this was made up on the June/July cruise.

3. Dr. John Steinmetz reported on the status of Florida Middle Ground geological studies, providing a chart showing the kinds of analyses underway. He stated two current needs: (a) a data management and data analysis program; and (b) copies of the reduced Florida Middle Ground maps for plotting purposes. Mr. LeBlanc agreed to see that copies of these maps are sent to both Steinmetz and Hopkins within two weeks of the meeting, if the A&M cartographic unit can meet this schedule.

SPECIAL STUDIES

1. Dr. Dan Boatwright reported on the status of HMW hydrocarbon analyses by the Marine Science Institute at Port Aransas. Of the 24 samples to be delivered, 16 arrived on 4 May 1979, and of the 16 jars, 11 were broken. The breakage is apparently a result of expansion when frozen, rather than impact, so he recommends using another type of jar. Of the 16 samples, 11 have been extracted and 8 have been analysed. Results show no inputs from petroleum, virtually unchanged from last year. However, GC-MS analyses have not yet been run.

2. Dr. Stefan Gartner described the nature of his study and various phases of his research on long term suspended sediment dispersal as revealed through fossil coccoliths. Phase 1 of the project is well along, with all data collection completed, and interpretation underway. Dr. Gartner also showed slides displaying distribution along the northwestern Gulf of Mexico.

3. Dr. Paul Boothe introduced the trace metal study of Spondylus, comparing results from 1976 through 1978 studies. Analysis technique this year varies from previous years in that only half of the sample is homogenized. The other half is divided into head, mantle, digestive gland, and adductor muscle, so that location of trace metal concentrations can be pinpointed. Dr. Boothe recommends that this technique be continued rather

than the whole organism analysis of past years. Dr. Hopkins suggested sending trace metal data from the MAFLA Spondylus project to Dr. Boothe for comparison.

TOPOGRAPHIC FEATURES OF INTEREST

1. Dr. Richard Rezak gave an overview of the mapping effort. Since 1974, 38 banks have been mapped, some of which (East, 4 Rocks, e.g.) had no topographic expression. Three of Dr. Rezak's graduate students gave a slide presentation describing the seismic records and bathymetric maps of 7 of the 8 banks mapped under the current contract. Mary Feeley presented Fishnet, Coffee Lump and Rezak-Sidner Banks, Yu-Hsin Chen presented Alderdice and Geyer Banks, and Waris Warsi presented Elvers and Jakkula Banks.

2. Dr. Tom Bright showed several diver-taken photos that indicate that some of the banks (e.g. Bright, Geyer) peak much higher than our bathymetric records have shown. Dr. Rezak reported a similar pinnacle on Diaphus Bank, not shown on bathymetric maps. Rezak indicated that the 500' spacing in the bathymetry work would account for missing features that fell between the spacing. The one on Diaphus, e.g., was about 300 feet long.

3. Dr. Robert Rogers asked whether the naming of the banks had been made official. Dr. Rezak reported that the names have been submitted to U.S. D.O.I. Board on Geographic Names. Dr. Rogers requested an inquiry about the turnaround time for this process.

4. Drs. Rezak, McGrail, and Bright illustrated the method being used for characterization of banks, using Diaphus Bank as the sample bank.

a. Dr. Rezak discussed a theory he has formulated about potentially catastrophic geological activity on some of the banks. He showed slides of banks with so little biota that the implication is that the features were formed within the last twenty years or so. More time and data are needed to confirm the theory.

b. Dr. David McGrail reported on hydrographic data obtained in a recent cruise to Diaphus Bank. There is evidence for presence of a Taylor column at the bank. Mr. Tom Burke questioned whether the Taylor column can be verified at the East Flower Garden Bank (EFG) by Dr. Gartner's coccolith method. Dr. Gartner offered to take a close look at the data.

c. Dr. Tom Bright provided a description of biota at Diaphus Bank, through a slide presentation.

EAST FLOWER GARDEN BANK MONITORING

1. Dr. David McGrail gave a slide presentation on hydrographic data from the East Flower Garden Bank.

2. Dr. Linda Pequegnat summarized the identification of various biological samples gathered at the East Flower Garden Bank. She will provide a list of specialists for inclusion in the Quarterly Summary Report. Early reports indicate one possible new coral species and 10 different starfishes. Specialists at the Smithsonian have asked to keep several samples for their collection, an indication that the sampling technique is superior. Dr. Pequegnat herself has made advances in determining that a shrimp she has been studying is identical to one common to an eastern Atlantic shrimp. Submersible diving has provided the first color notes and *in situ* photography of this shrimp.

3. Dr. Bright summarized the monitoring of coral populations at the East Flower Garden, with emphasis on ahermatypic corals.

4. Mr. Guy Denoux described the coral reproduction studies at the

East Flower Garden.

5. Mr. Chris Combs described the coral recruitment experiment underway at the East Flower Garden.

INFORMATION NEEDS

1. Mr. Tom Burke opened a discussion of EPA's current interest in the East and West Flower Garden Banks, interest stemming from several issues: (a) the proposed Marine Sanctuary designation; (b) the pending NPDES permit for drilling by Mobil; and (c) the imminence of the second five-year EPA pass-through funding program, scheduled to begin in 1980. Several issues are involved in the present controversy over the DEIS concerning sanctuary designation: size of the sanctuary; barging requirement; shunting to 6 instead of 10 m above bottom; and the five-year ban on leasing within the East Flower Garden area.

2. Mr. Ed Lindeloff reported on the current status of the DEIS. His office anticipates that the FEIS should go to the printer by the middle of August. Meeting participants expressed distress at the short time allowed and indicated doubt that the problems identified in the DEIS could be corrected in time to make a mid-August FEIS convincing or accurate. Another DEIS should be in order.

3. Mr. Larry Pugh introduced the new EPA pass-through program, which will provide the first EPA money for work at the Flower Garden. He emphasized that the work is intended to complement, not duplicate, current work by other agencies. The emphasis will be on the effect of drilling mud plumes and other effluents.

4. Dr. Norman Richards reported on the status of NPDES permits. The Mobil permits have been roughed out and sent to Washington for review. They will then be returned for comments. Issuance appears imminent, within the next 60 days, before the Mobil platform can go up.

PROJECT MANAGEMENT

1. Mr. LeBlanc reported on a potential problem in reduction of Dr. Hopkin's data. Additional time may be needed for analysis.

2. All PIs reported that they were on schedule.

3. Dr. George Sharman reported on potential data management problems. Two kinds of formats are needed. A single data exchange format for reporting all projects to BLM for archiving must be selected. Meanwhile, each PI must assist in designing working formats to fit individual data requirements. PIs will work out their own individual working formats, and then a single exchange format will be selected or designed. The choices among NODC, MAFLA, and South Texas data formats were discussed. BLM indicated no preference.

4. To solve Dr. Steinmetz' data reduction problems, all his data will be sent to Texas A&M University for computer reduction.

5. Dr. Hopkins is to transfer his current meter data from cards to tape and send it to Texas A&M University for reduction in the Texas A&M University format.

6. Mr. LeBlanc is to provide a checklist of who is where in digitizing/reducing data, and to monitor the data management through a progress chart.

7. Drs. Bright and Pequegnat will take steps toward providing a working format for their biological data.

8. Dr. R. Norman will prepare a list of references about the Flower Garden.

9. To make corrections on the 2nd Quarterly Summary Report, a list of insertions will be included in the 3rd Quarterly Summary Report. (See Attachment 1.)

MEETING ADJOURNED

CORRECTIONS TO QUARTERLY SUMMARY REPORT, 2nd REPORT, (1 DEC 78 - 28 Feb 79)

Page	Description
iii	Re: Chapter IX, change Hilde to Bright.
iv	Re: Figure XI-2, eliminate 45° azimuth.
4	Add: NOTE: CT ≡ contract.
26-27	Update or replace.
80	Label 1st set of ($\bar{x}$,N,R) DOC, 2nd set POC.
85	Change 1 (4) to $708, total $8185.
85	Change 3 (1), (2), (3) to $0, Total $0.
85	Add: Total $11,290.
99-100	Include in Appendix B .
100	Change bottom picture azimuth to 315°.
100	Eliminate 45° azimuth.
101	Re: 1.b.2, funds made available are $11,290.
102	Change $80,000 to $139,198.

APPENDIX B

BATHYMETRIC MAPS

AND

PERSPECTIVE VIEWS OF THE BANKS

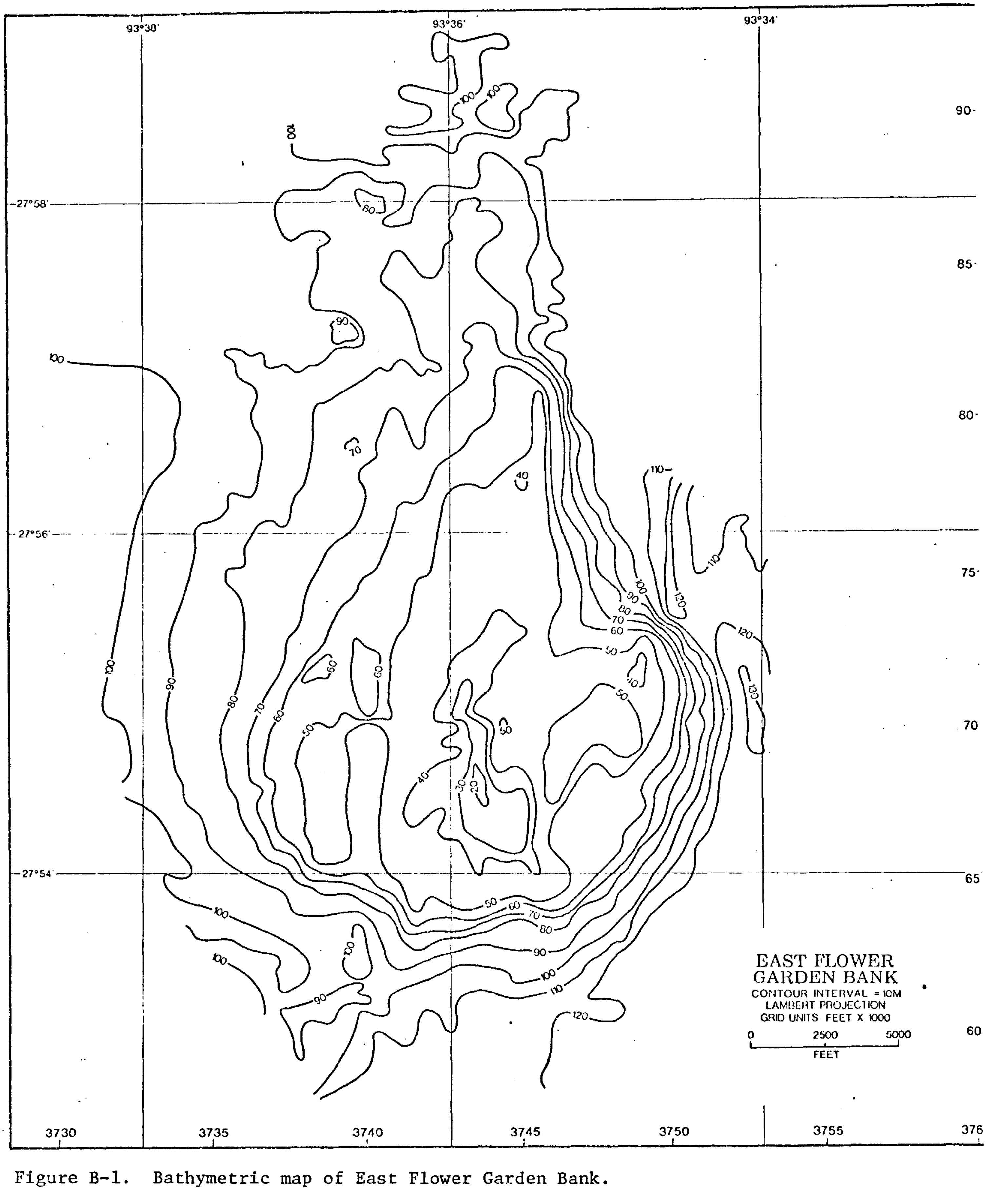
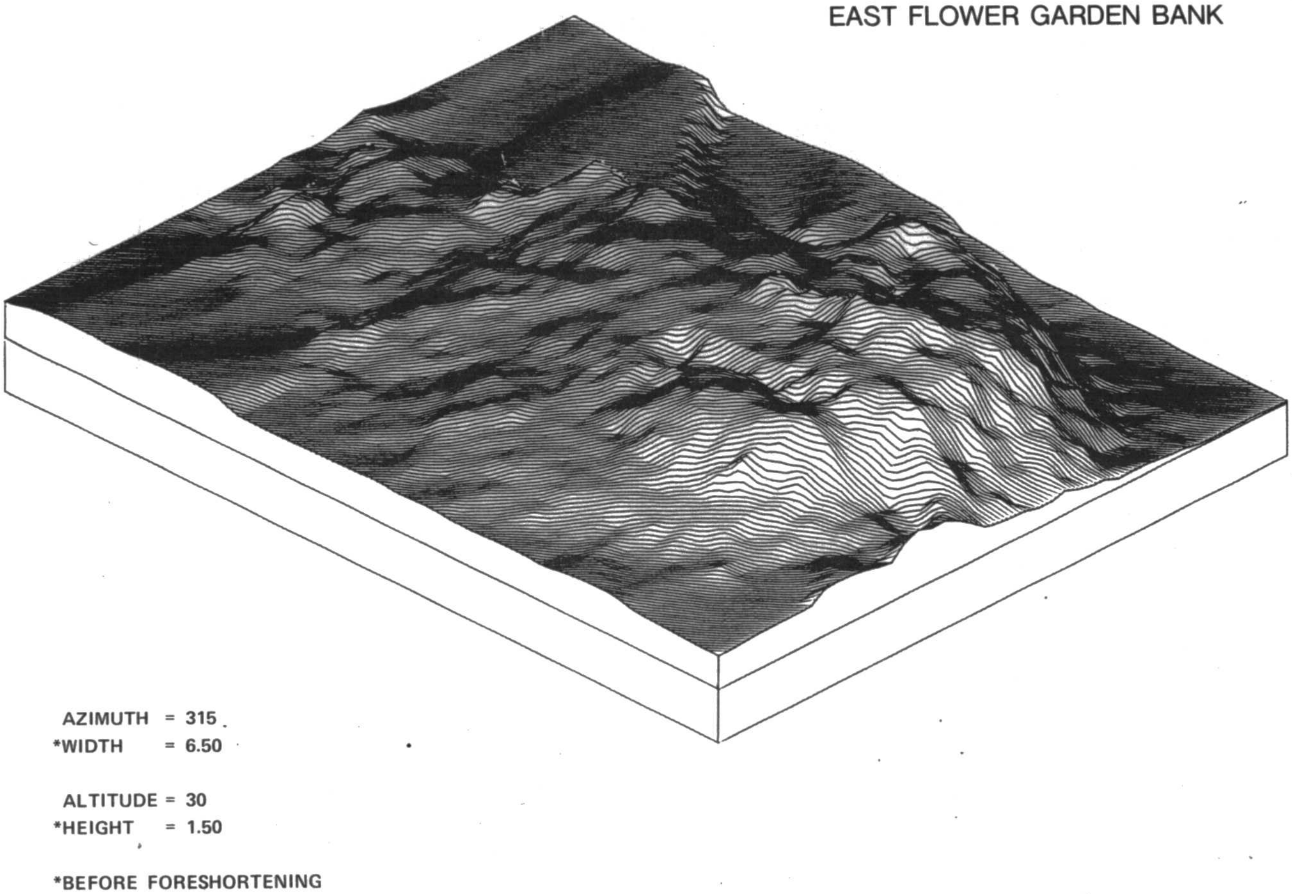


Figure B-1. Bathymetric map of East Flower Garden Bank.



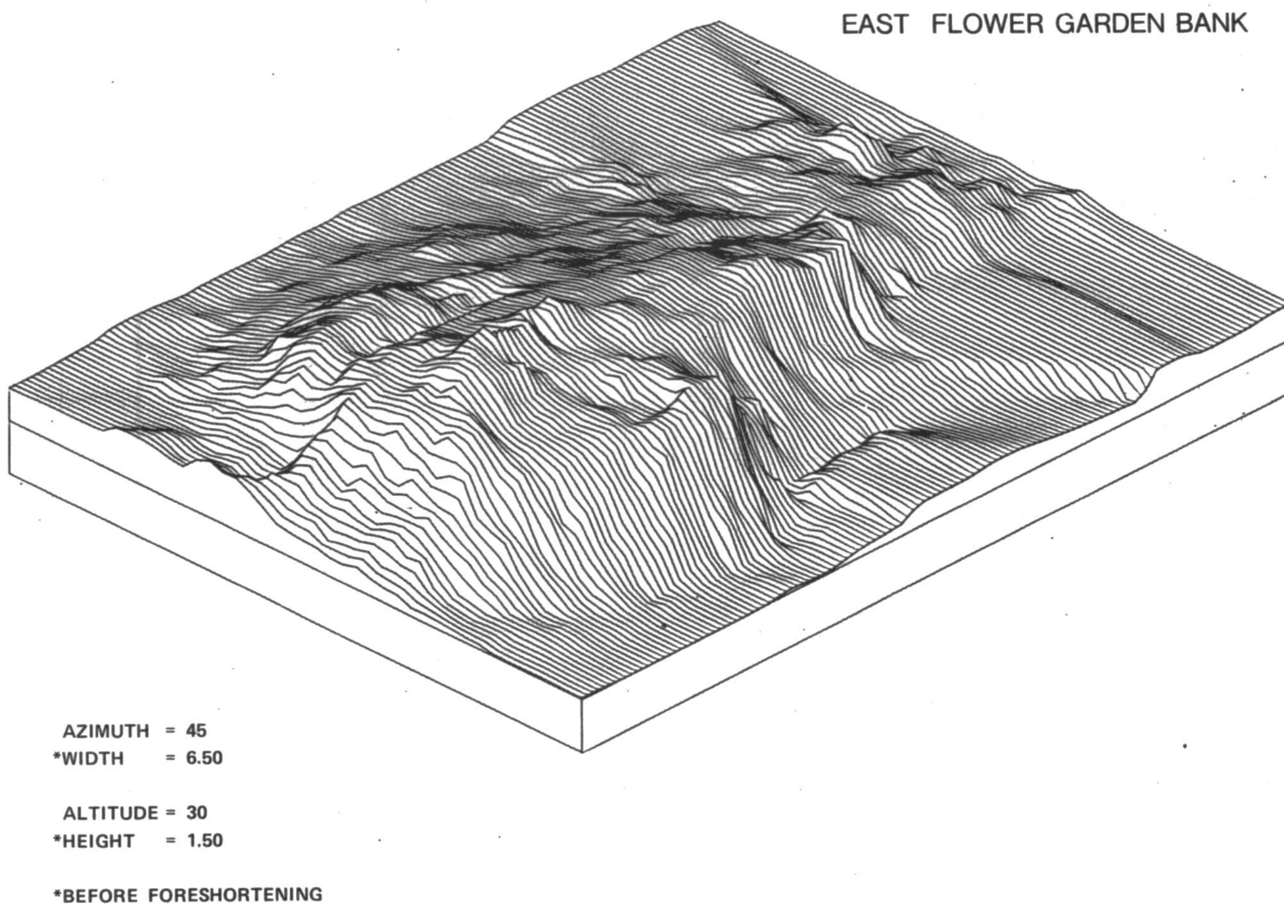
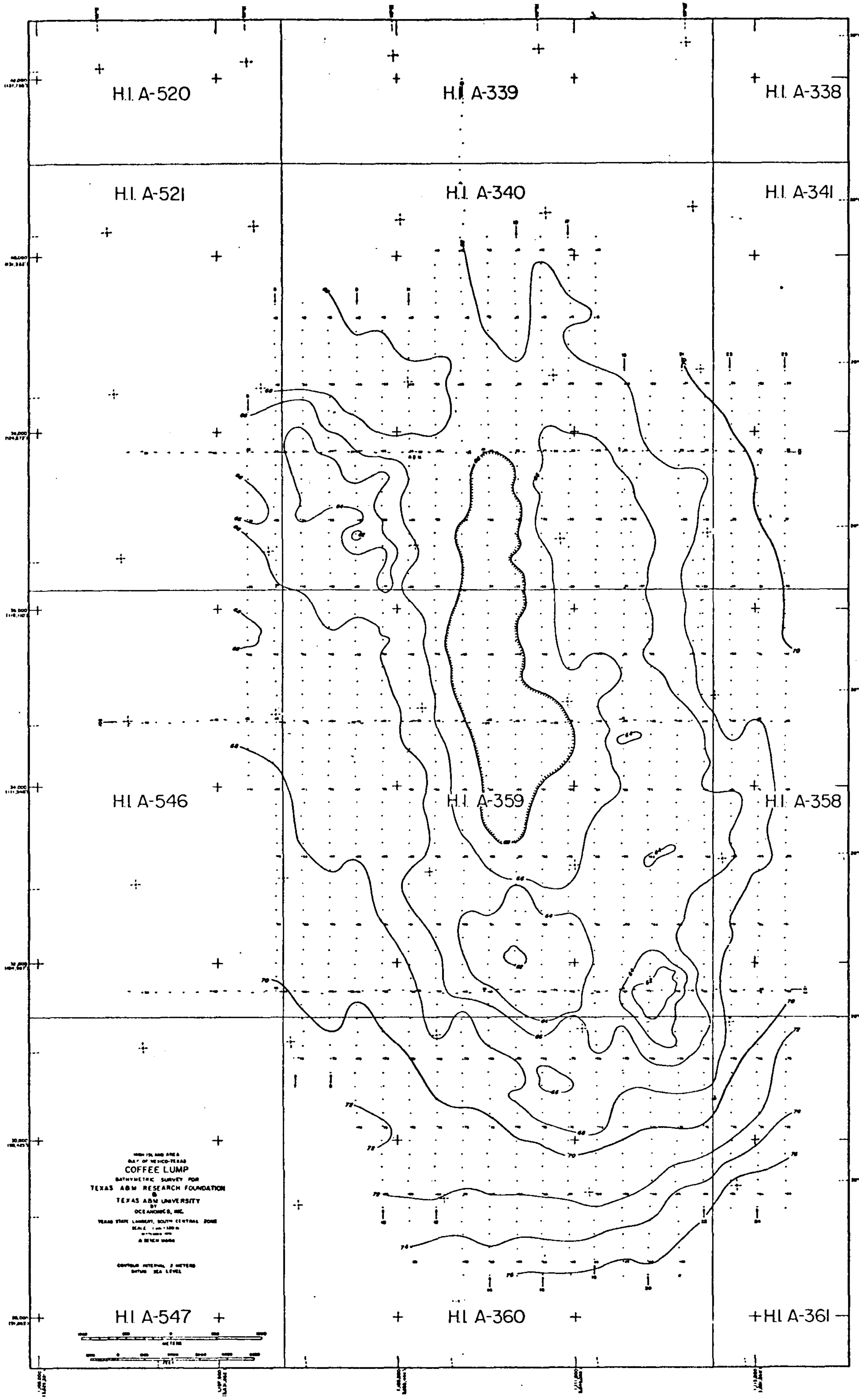


Figure B-2. Three-dimensional perspective views, East Flower Garden Bank; 315° and 45° azimuth


H.I. A-520
H.I. A-339
H.I. A-338
H.I. A-521
H.I. A-340
H.I. A-341
H.I. A-546
H.I. A-359
H.I. A-358
H.I. A-547
H.I. A-360
H.I. A-361
COFFEE LUMP
BATHYMETRIC SURVEY FOR
TEXAS A&M RESEARCH FOUNDATION
&
TEXAS A&M UNIVERSITY
BY
OCEANONICS, INC.
DATUM SEA LEVEL

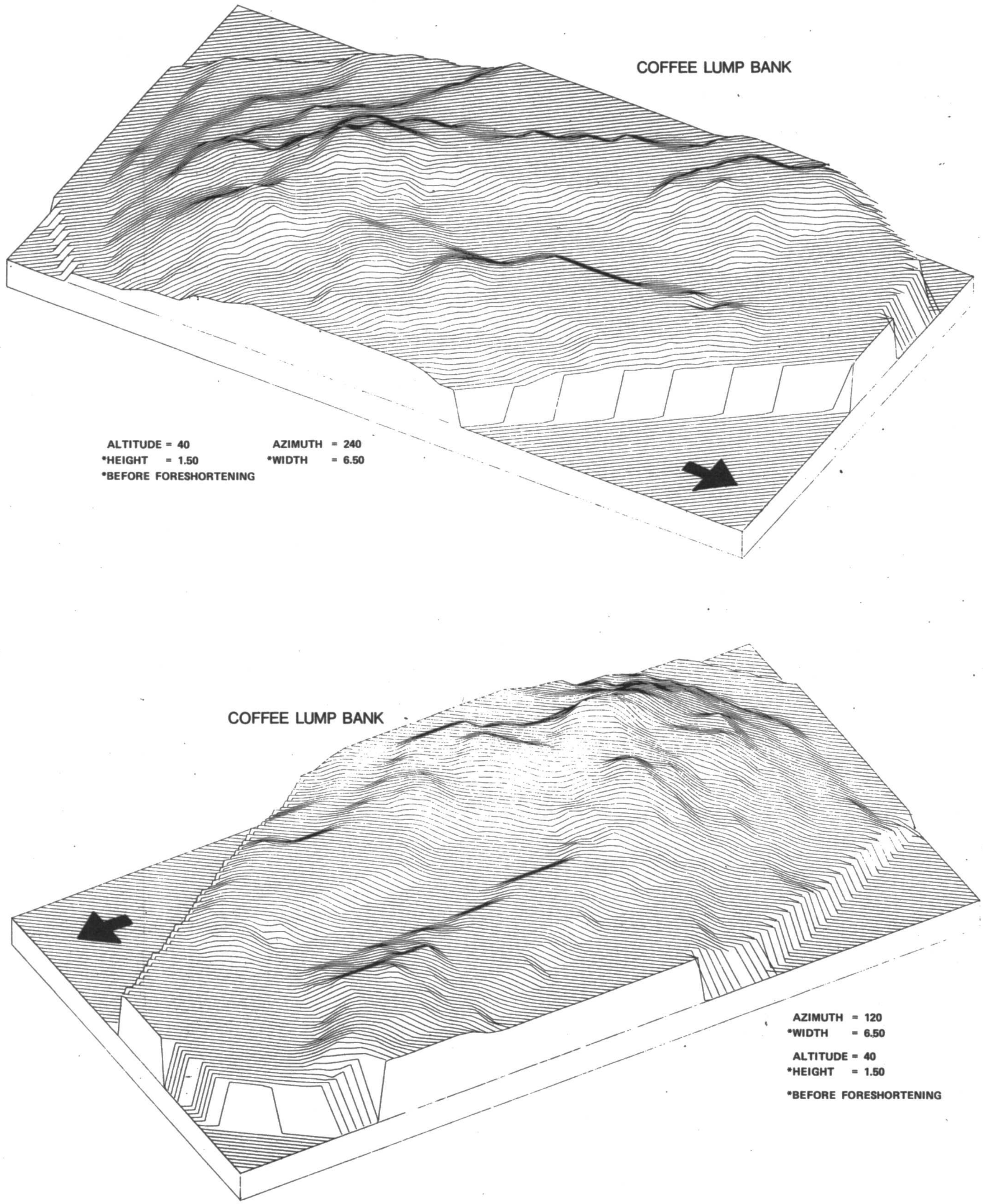


Figure B-4. Three-dimensional perspective views, Coffee Lump Bank; 240° and 120° azimuth.

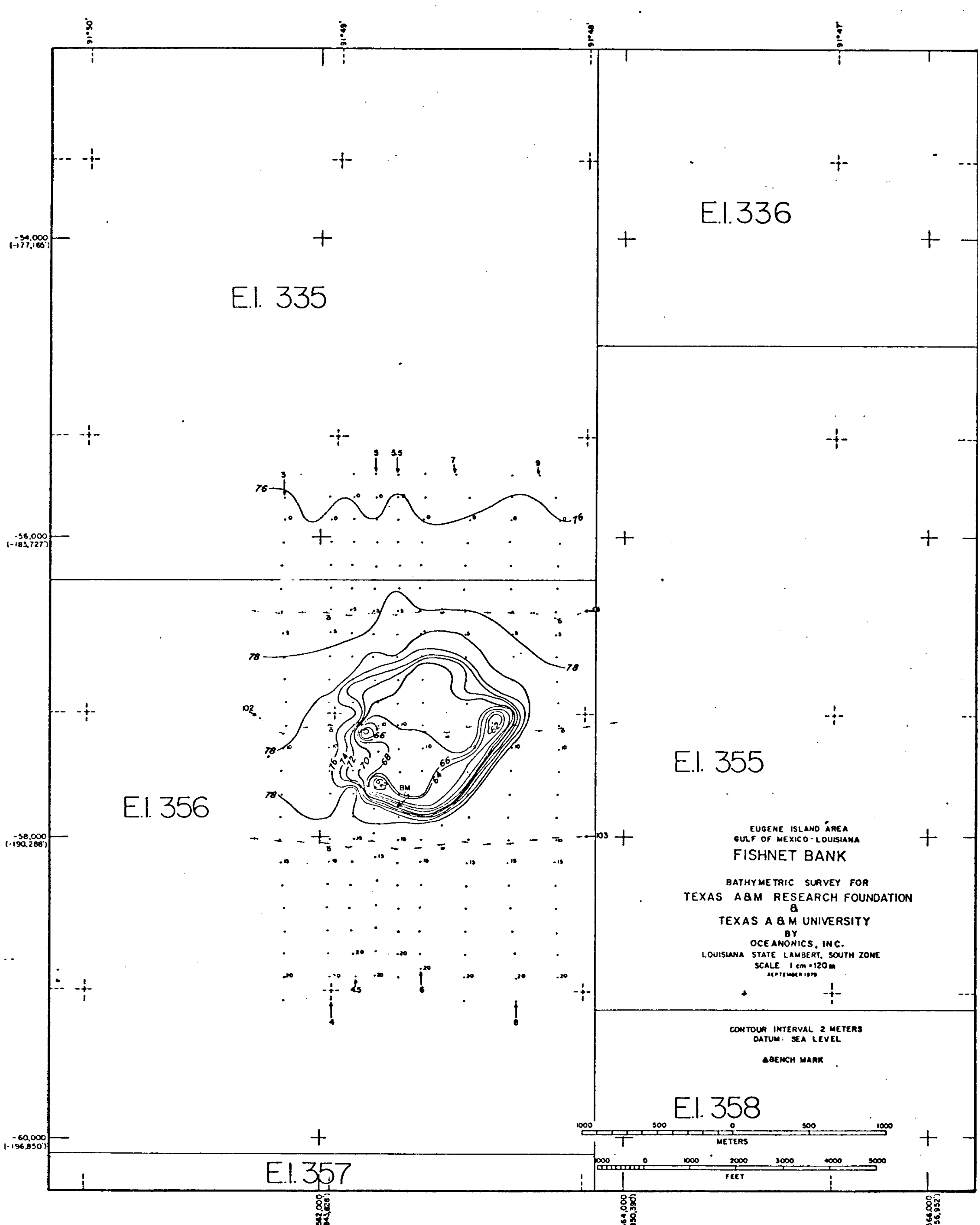
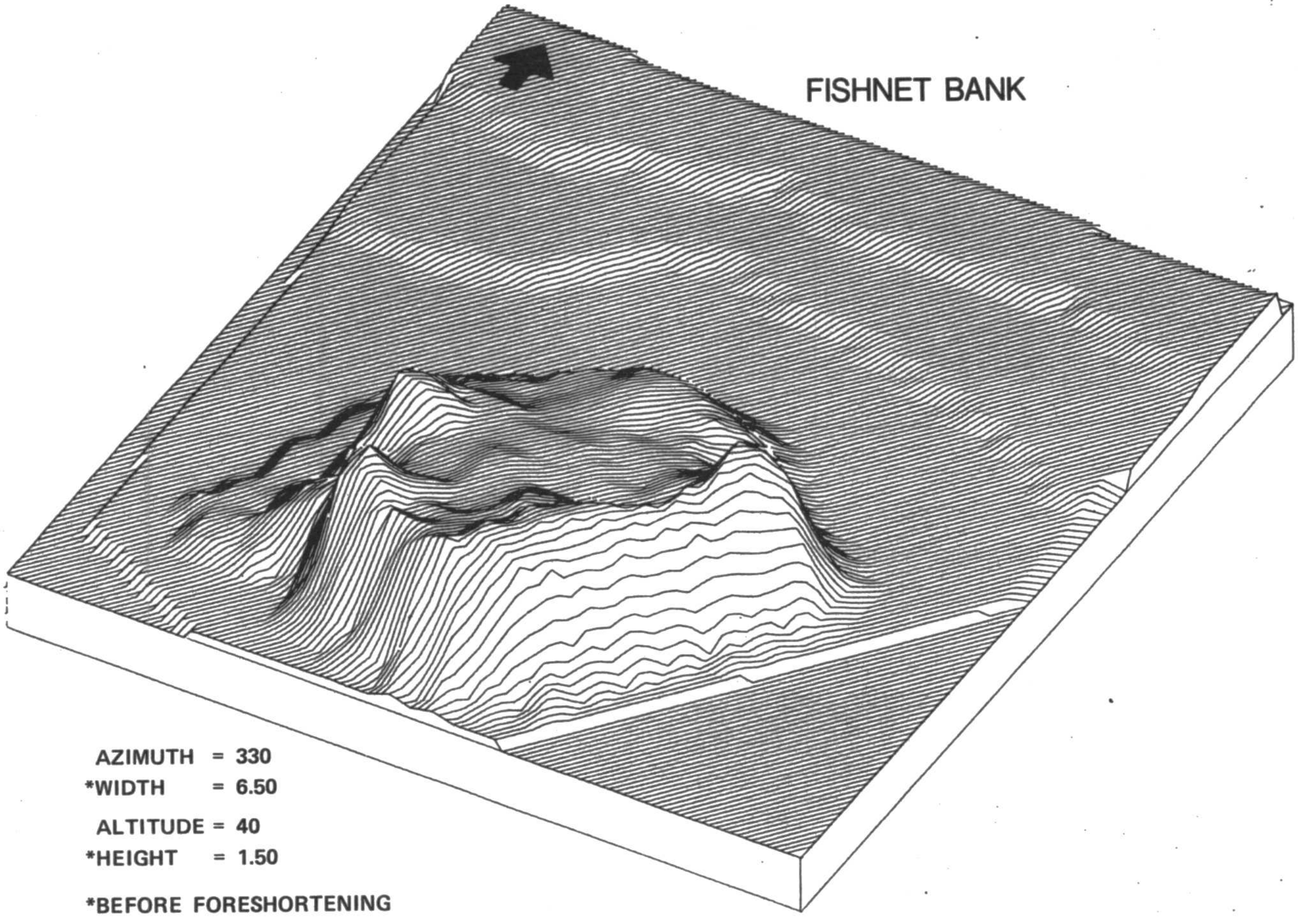


Figure B-5. Bathymetric map of Fishnet Bank.



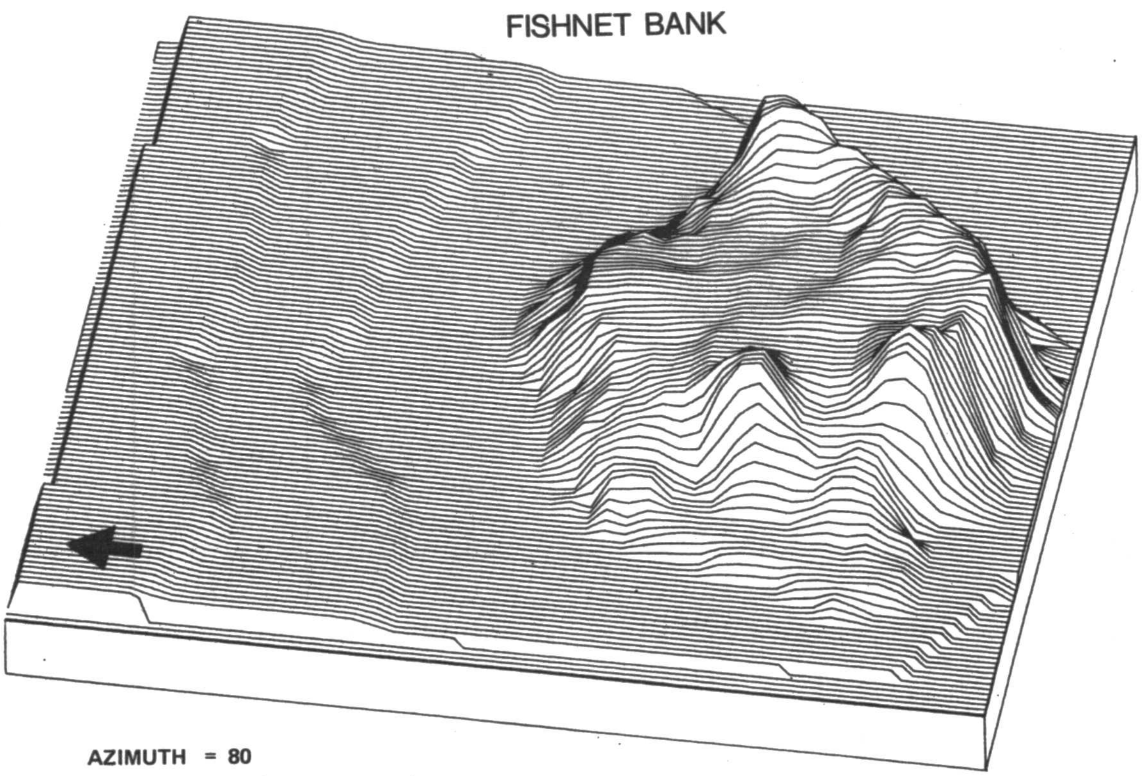


Figure B-6. Three dimensional perspective views, Fishnet Bank: 330° and 80° azimuth.

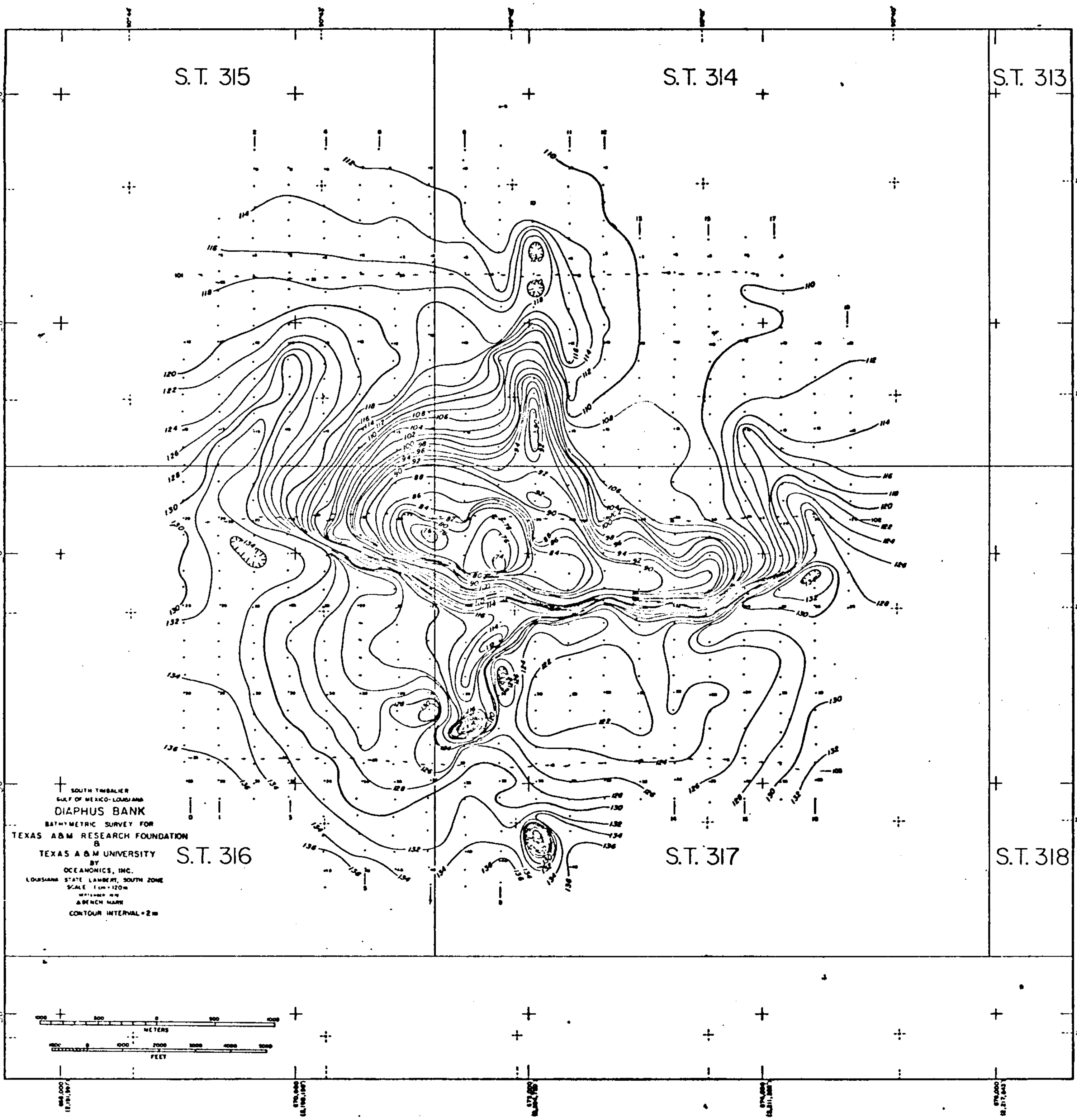
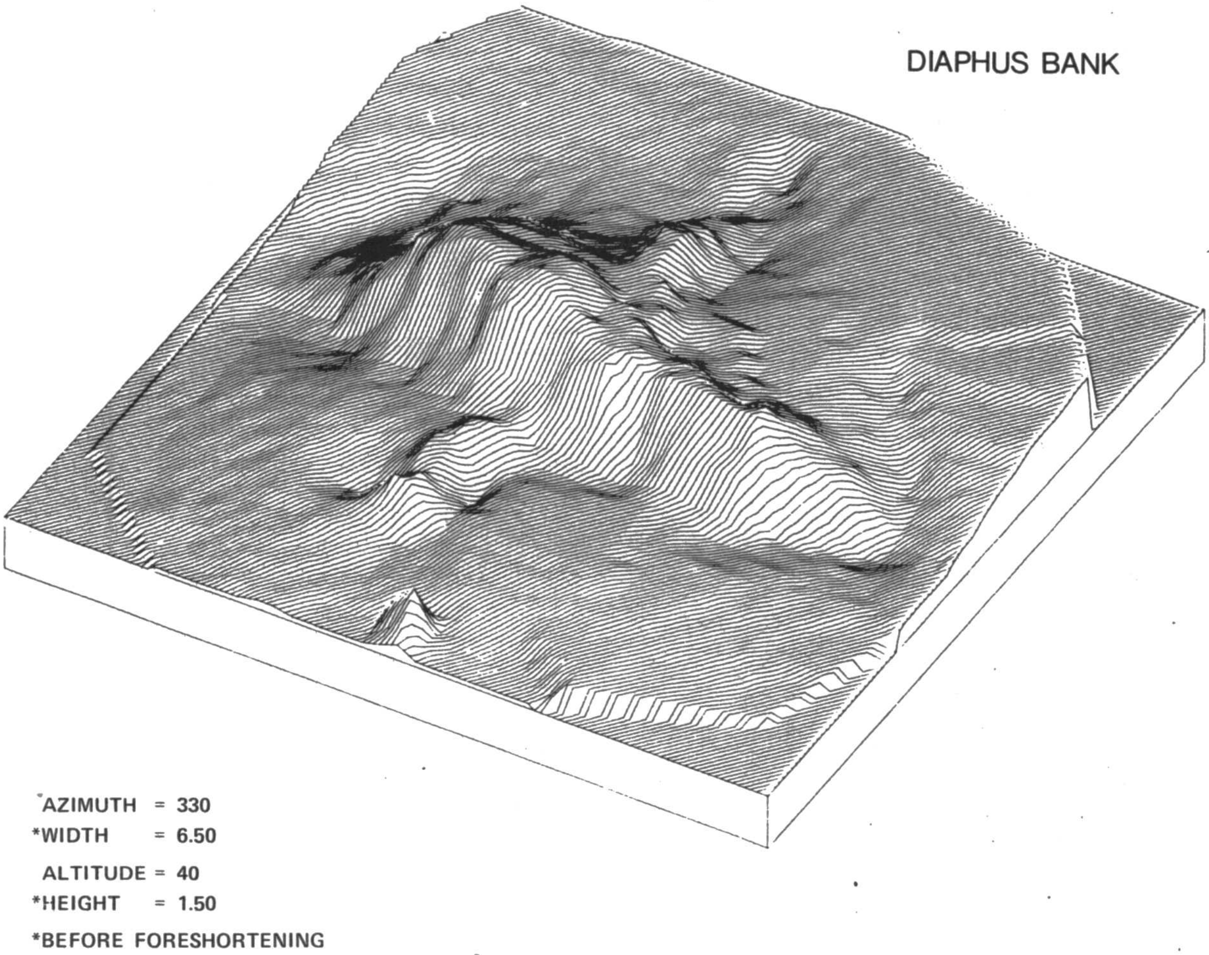


Figure B-7. Bathymetric map of Diaphus Bank.



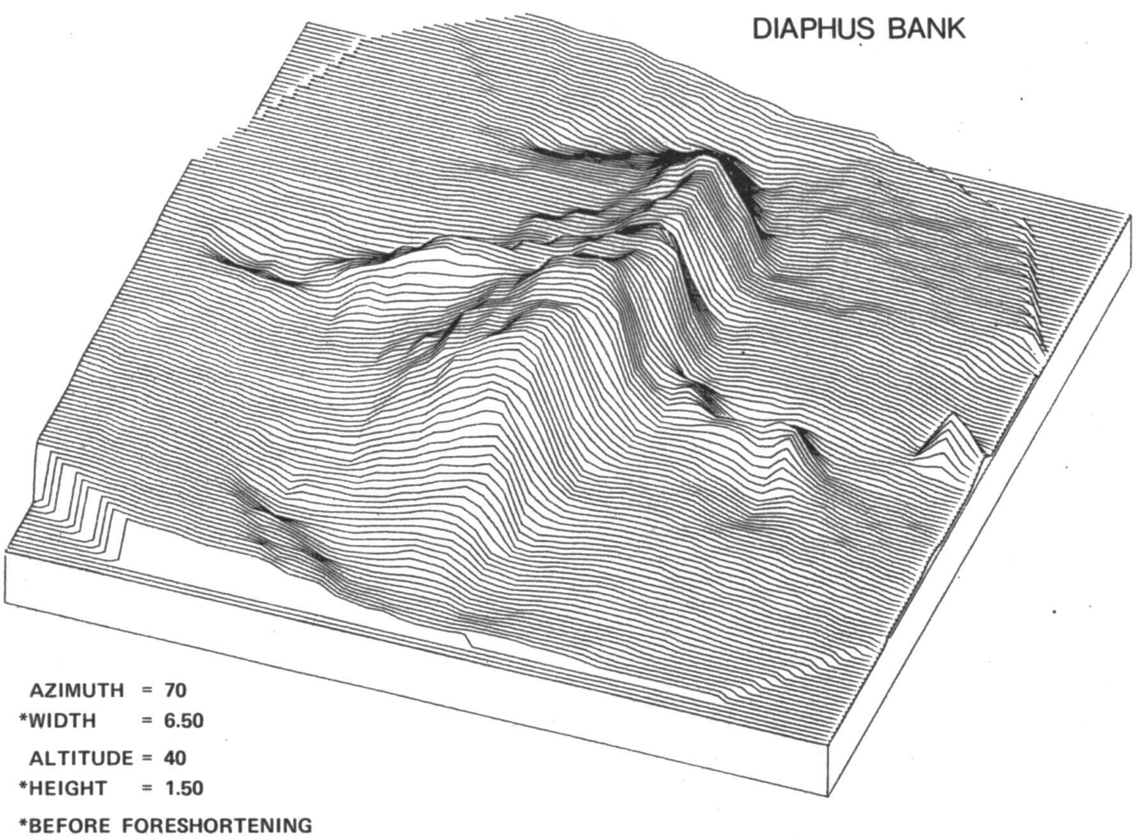


Figure B-8. Three-dimensional perspective views, Diaphus Bank; 330° and 70° azimuth.

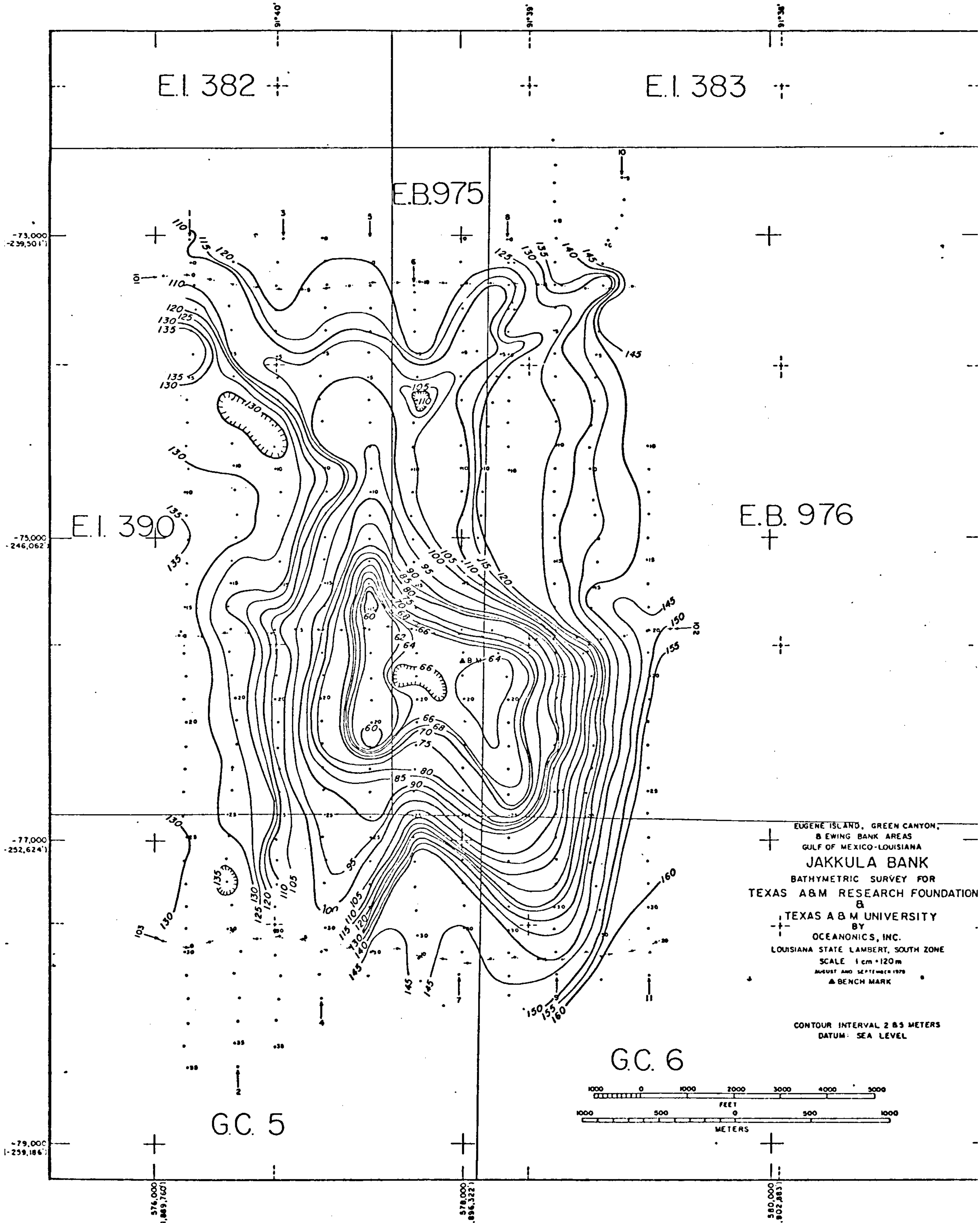


Figure B-9. Bathymetric map of Jakkula Bank.

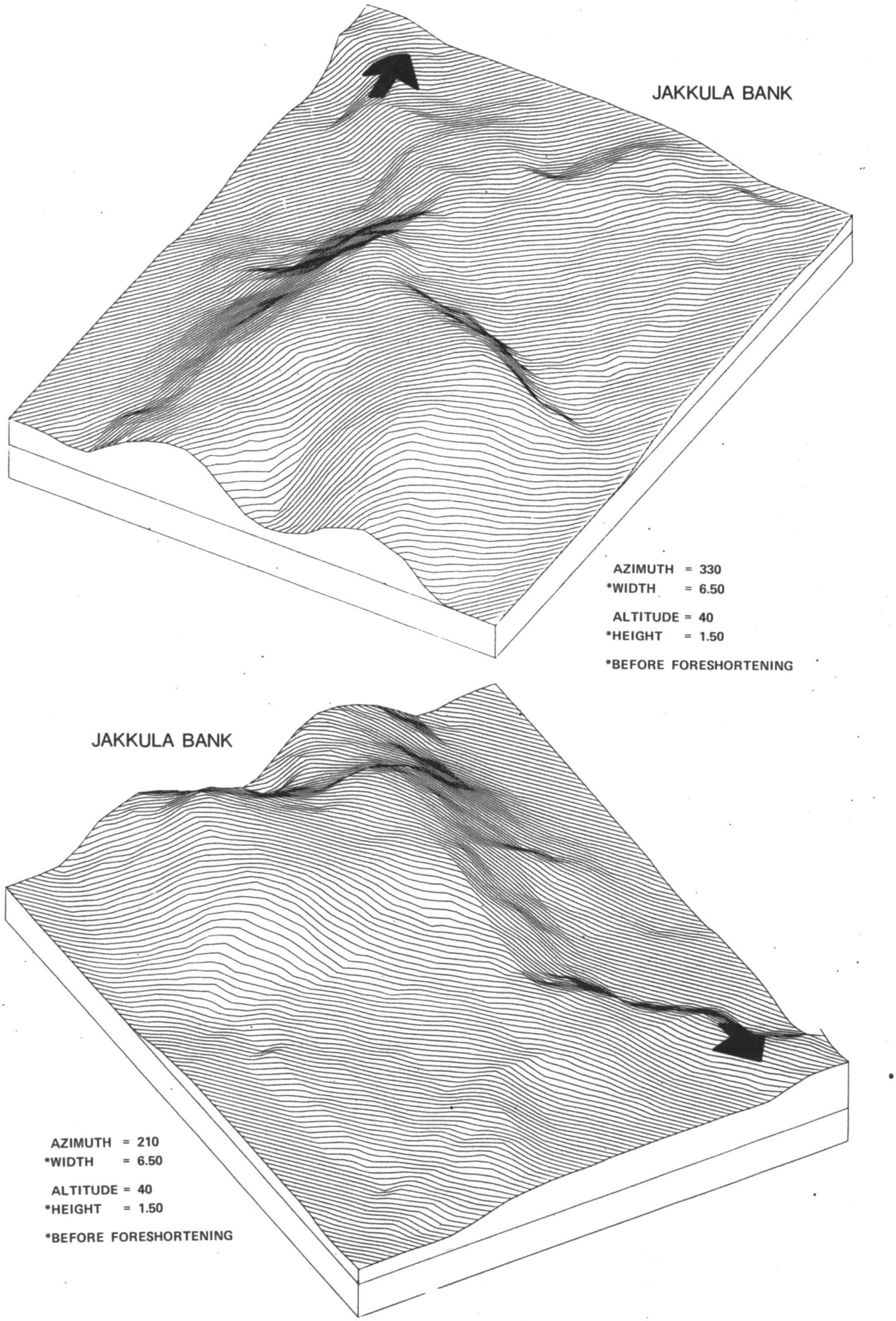


Figure B-10. Three-dimensional perspective views, Jakkula Bank; 330° and 210° azimuth.

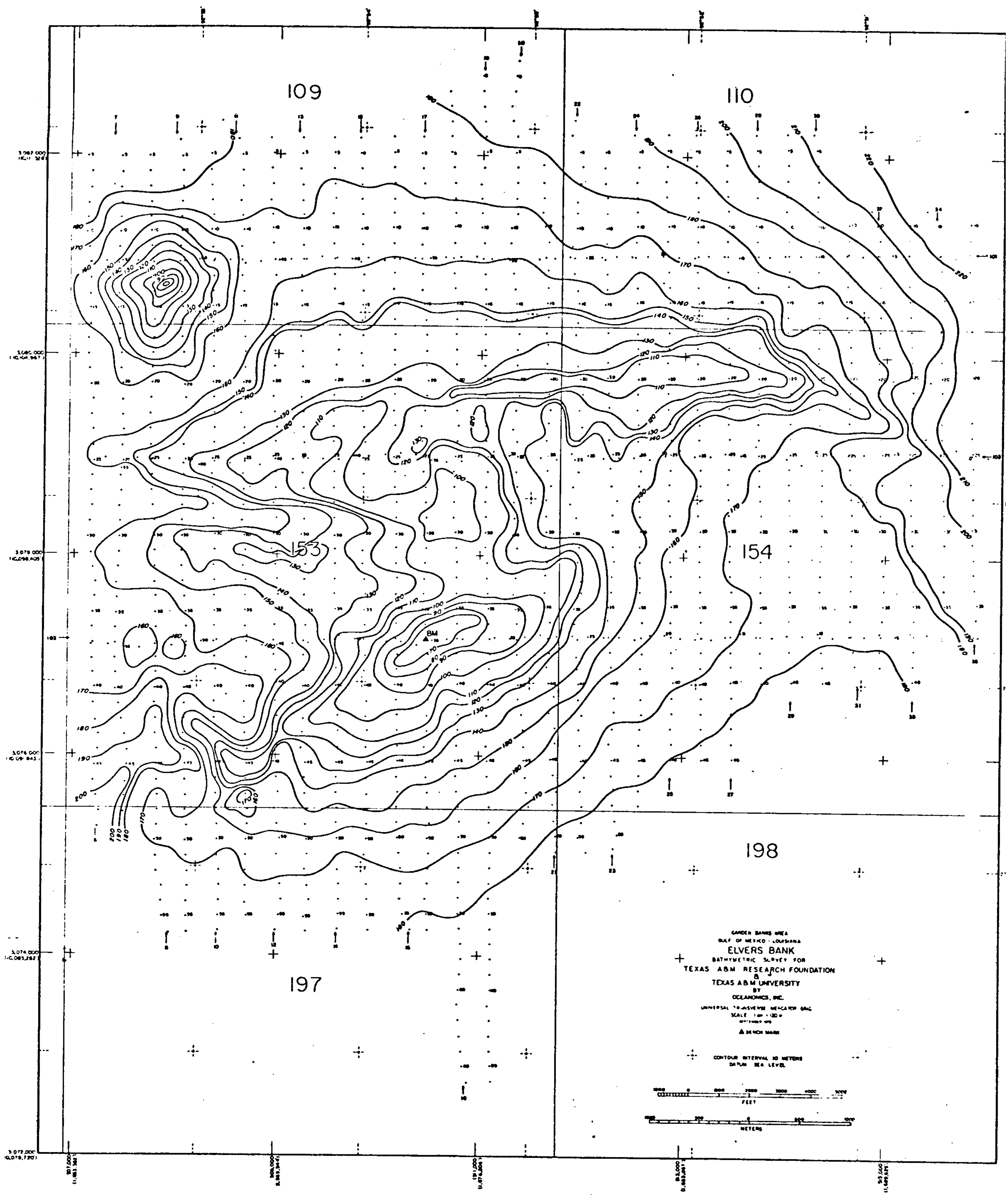
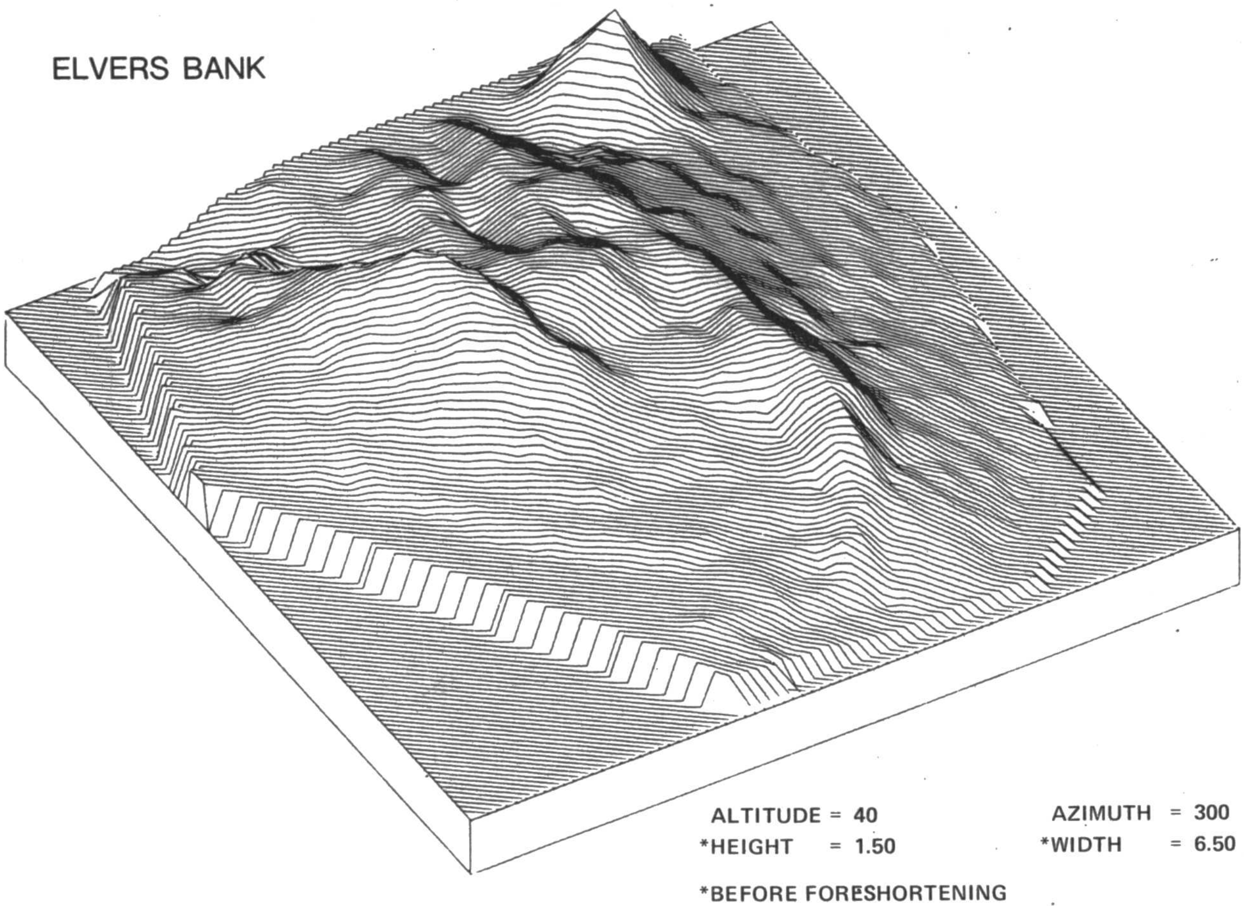


Figure B-11. Bathymetric map of Elvers Bank.



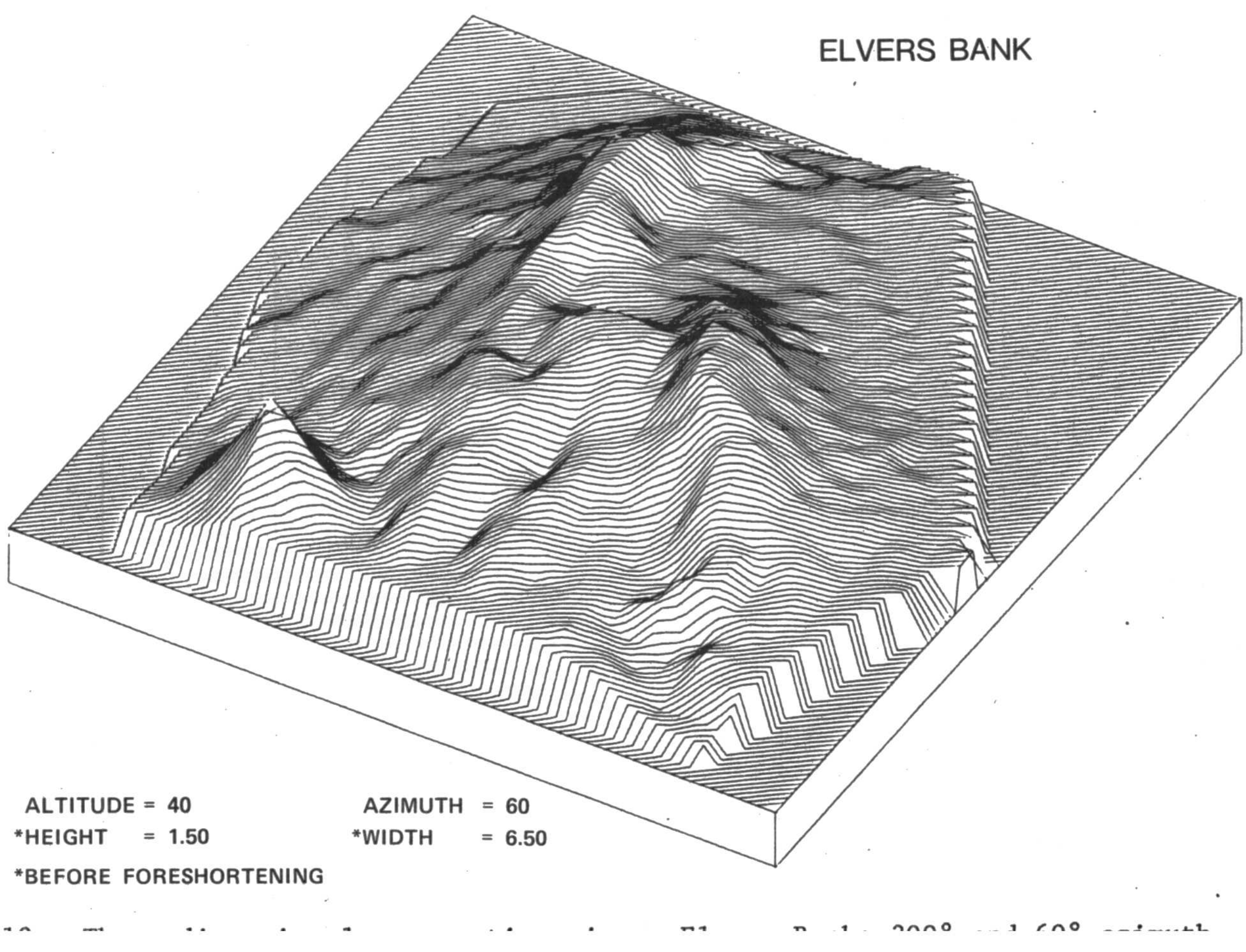


Figure B-10. Three-dimensional perspective views Elvers Bank, 300° and 60° azimuth

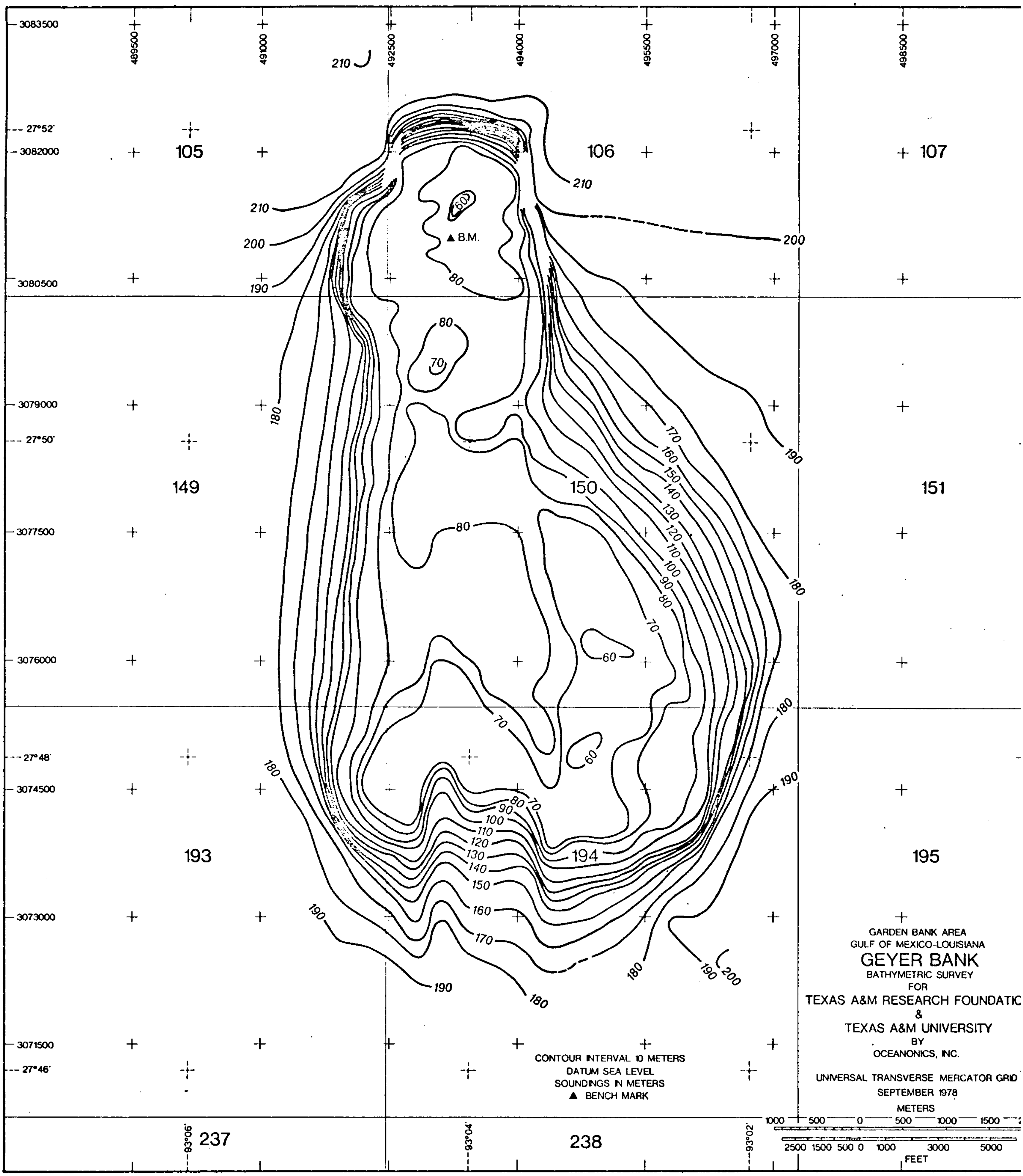


Figure B-13. Bathymetric map of Geyer Bank.

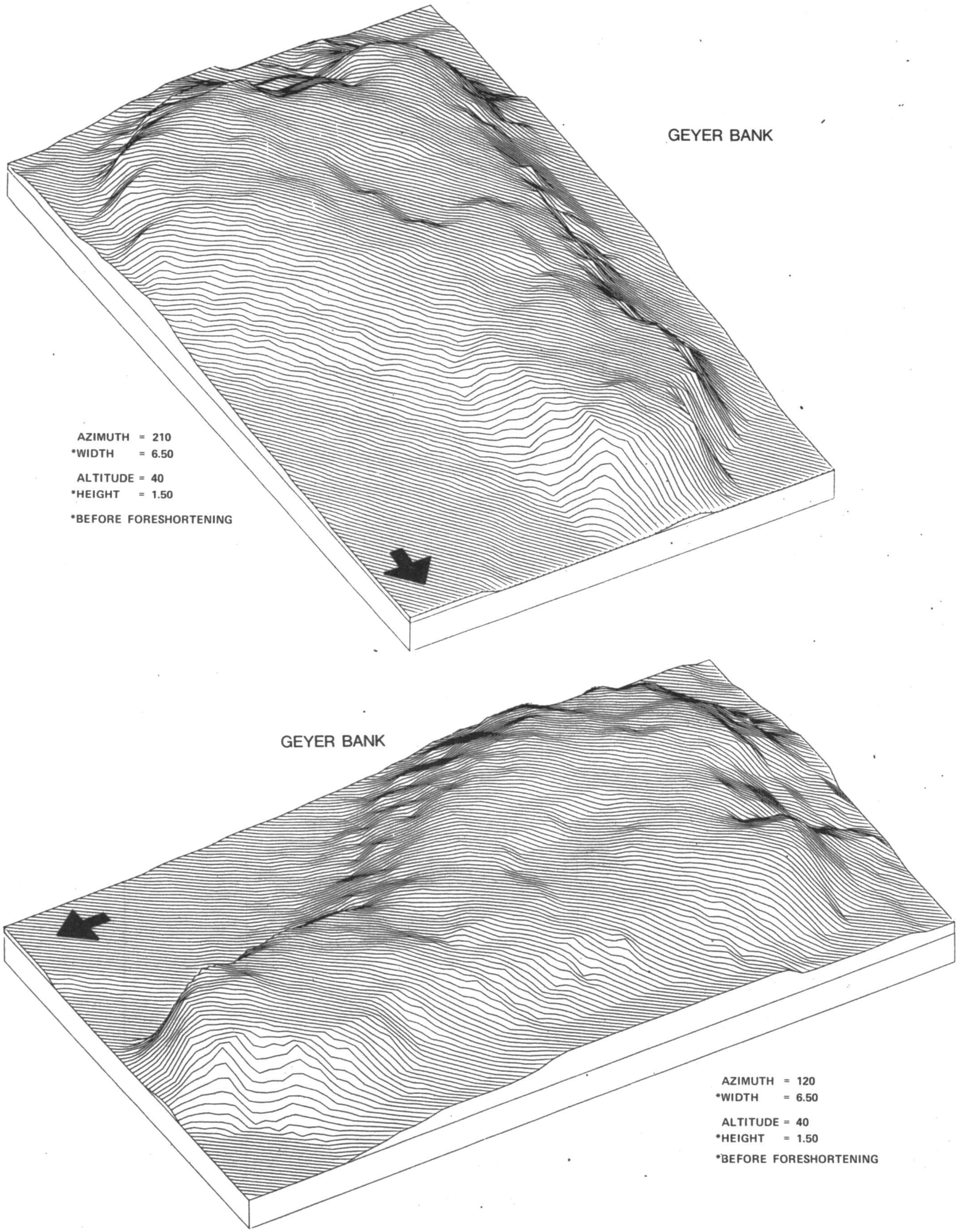
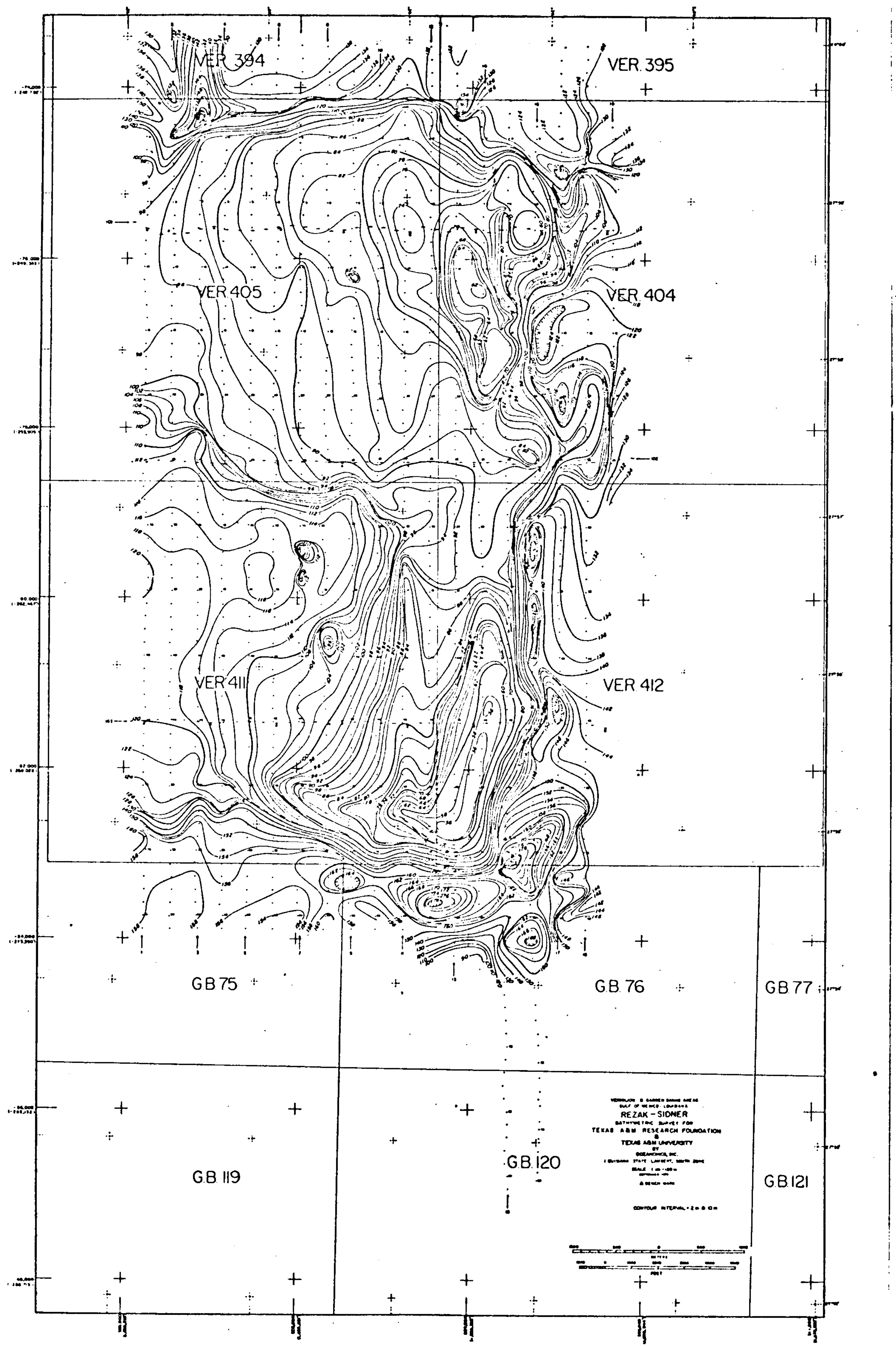
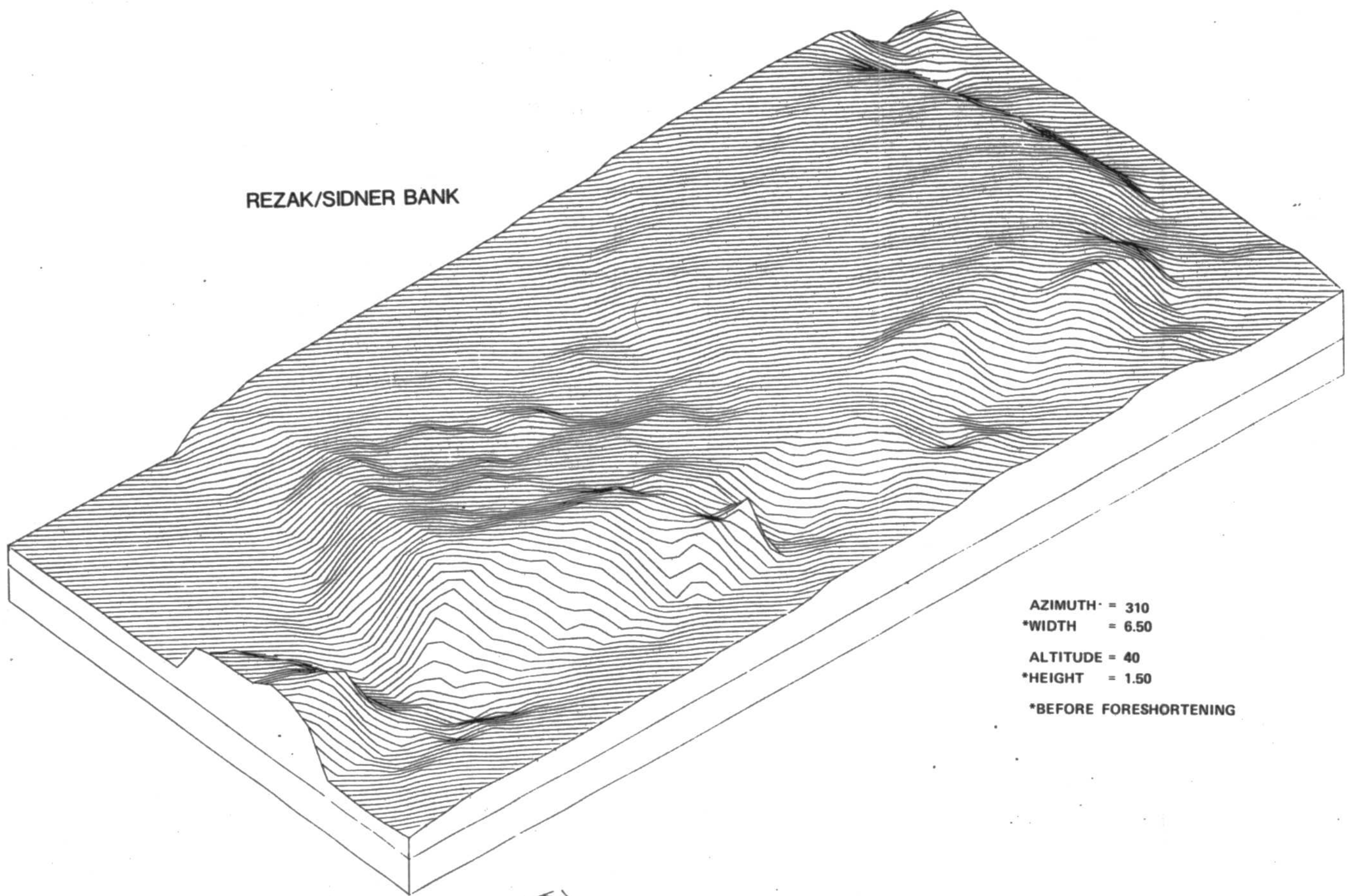


Figure B-14. Three-dimensional perspective views, Geyer Bank; 210° and 120° azimuth.


VER 394
VER 395
VER 405
VER 404
VER 411
VER 412
GB 75
G.B. 76
GB 77
G.B. 119
G.B. 120
G.B. 121
REZAK – SIDNER
TEXAS A&M RESEARCH FOUNDATION
&
TEXAS A&M UNIVERSITY



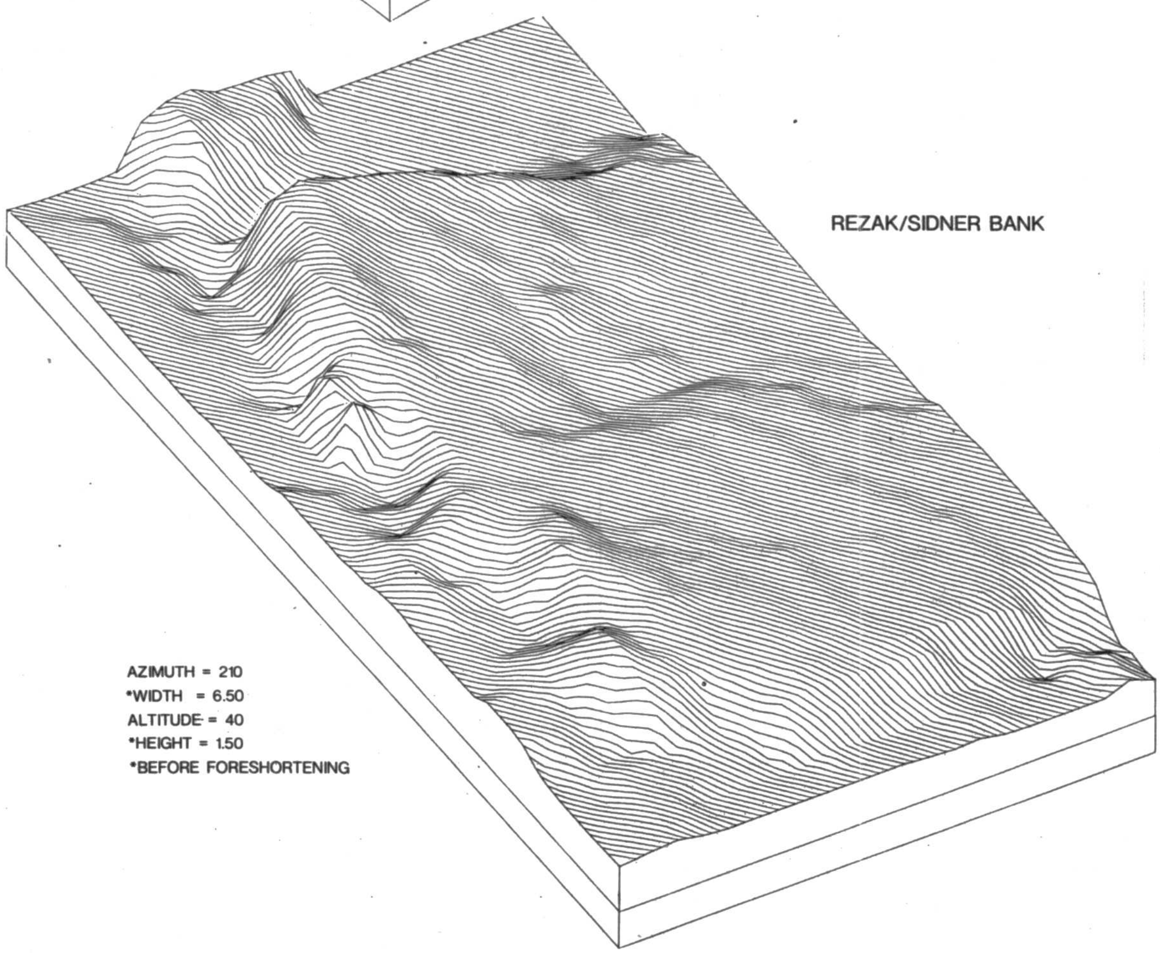


Figure B-16. Three-dimensional perspective views, Rezak/Sidner Bank; 310° and 210° azimuth.

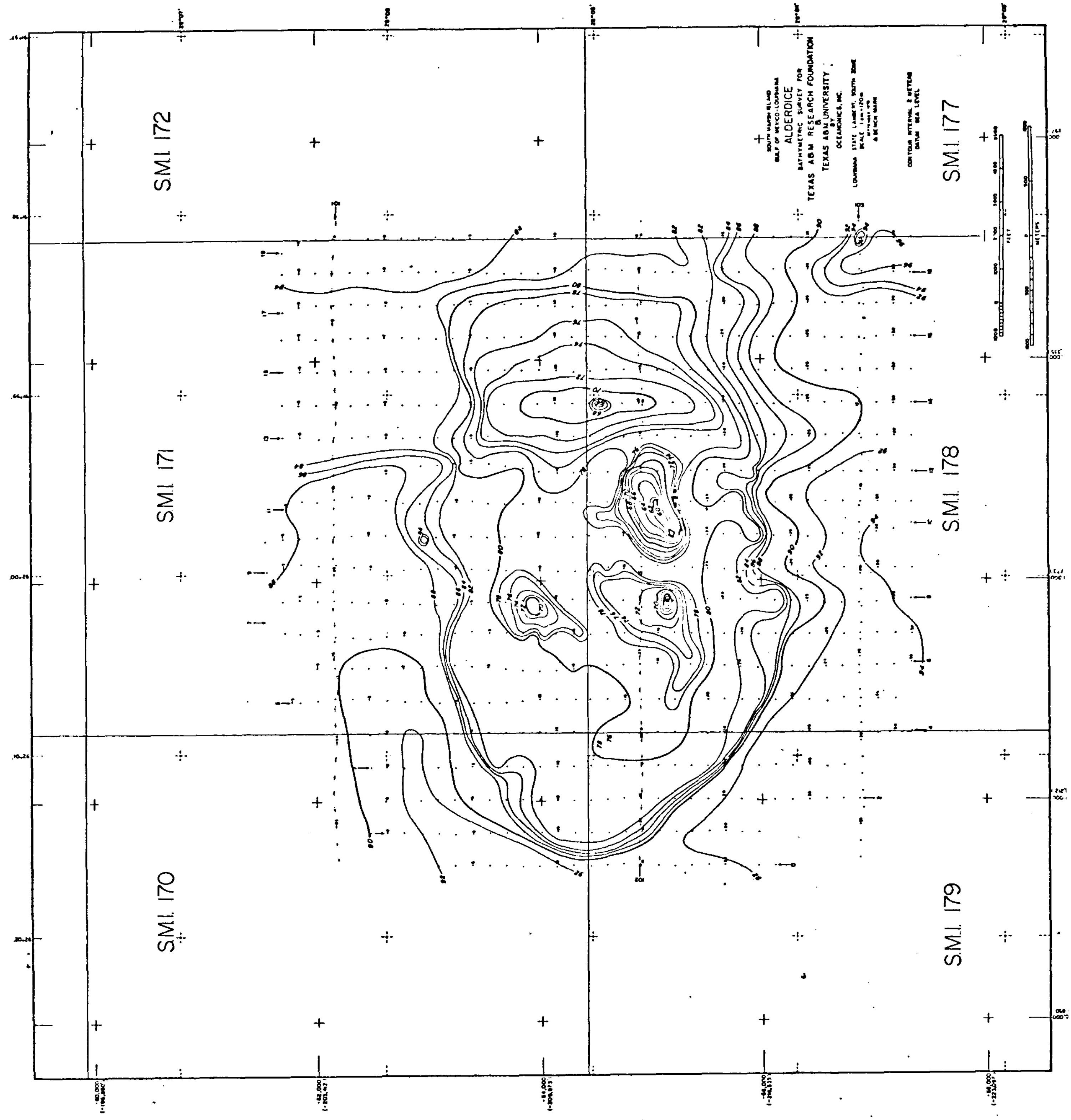
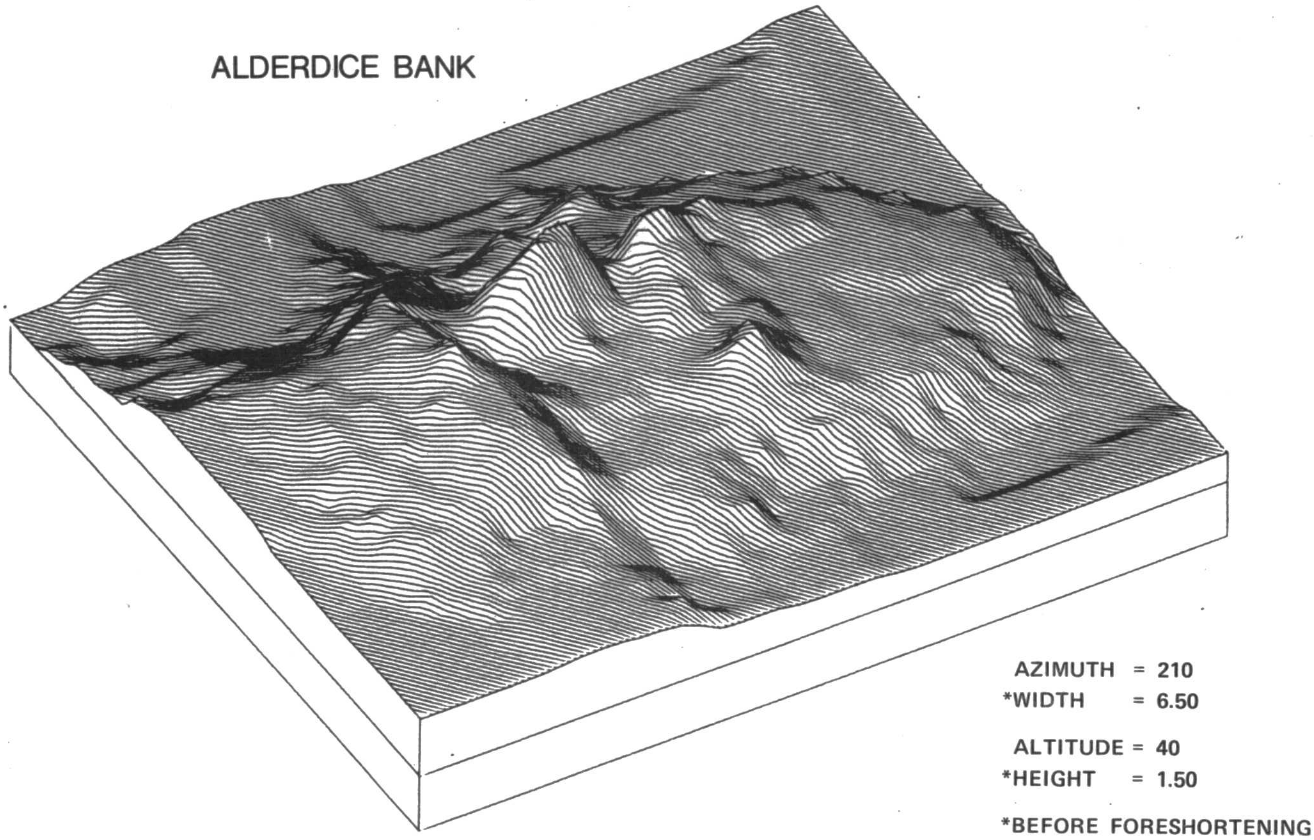
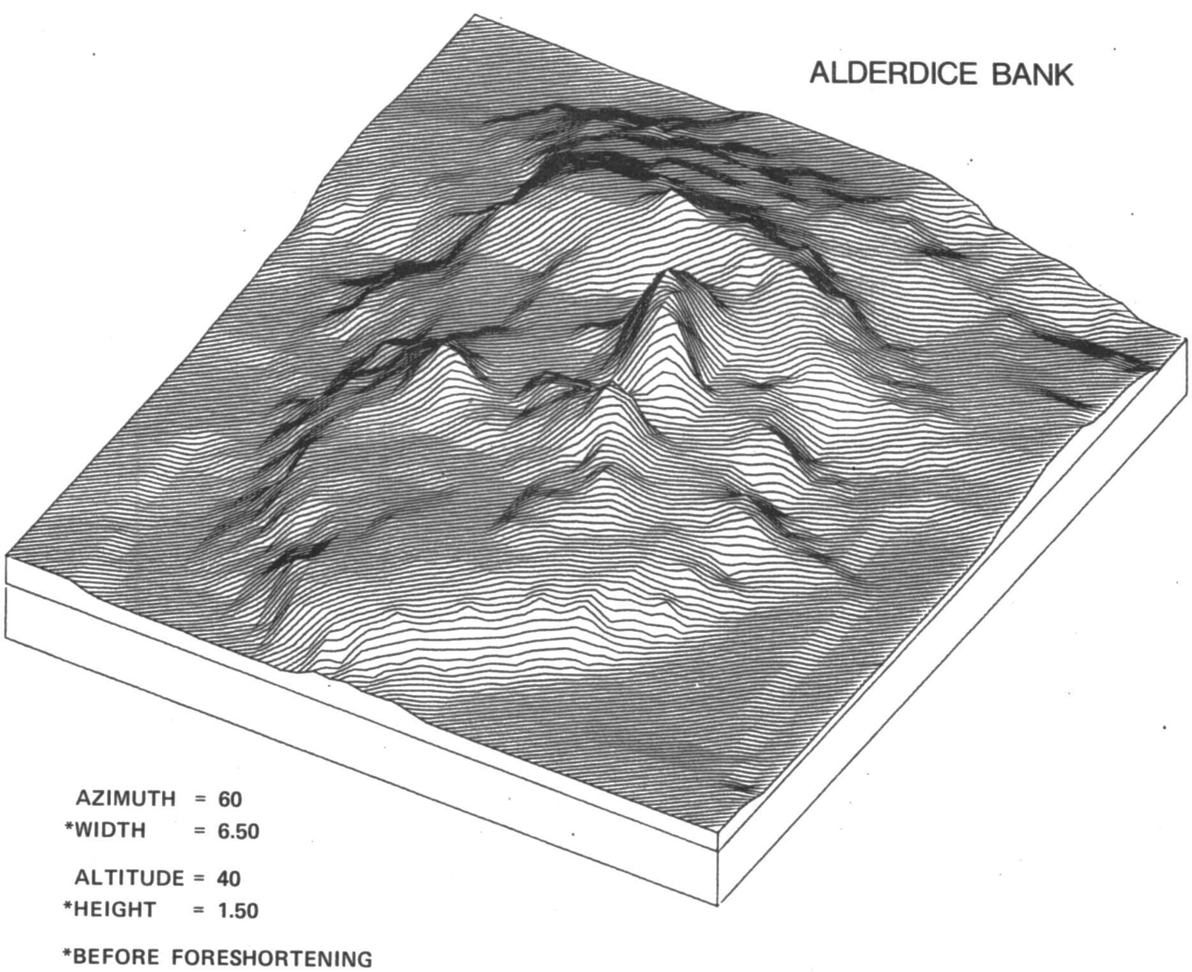


Figure B-17. Bathymetric map of Alderdice Bank.


ALDERDICE BANK
AZIMUTH = 210
*WIDTH = 6.50
ALTITUDE = 40
*HEIGHT = 1.50
*BEFORE FORESHORTENING


ALDERDICE BANK
AZIMUTH = 60
*WIDTH = 6.50
ALTITUDE = 40
*HEIGHT = 1.50
*BEFORE FORESHORTENING

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Minerals Revenue Management** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.