OCS Study
MMS 2000-078

Northeastern Gulf of Mexico Chemical Oceanography and Hydrography Study

Annual Report: Year 3

U.S. Department of the Interior
Minerals Management Service
Gulf of Mexico OCS Region

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Editors

Ann E. Jochens
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Worth D. Nowlin, Jr.	TAMU	Program Manager, PI for Task 3
Ann E. Jochens	TAMU	Deputy Program Manager, PI for Program Management and Task 2
Douglas C. Biggs	TAMU	Co-PI for Task 1
Norman L. Guinasso, Jr.	GERG/TAMU	Co-PI for Task 1
Matthew K. Howard	TAMU	Co-PI for Task 2
M. C. Kennicutt II	GERG/TAMU	Co-PI for Tasks 1 and 3
Robert O. Reid	TAMU	Co-PI for Task 3

Additionally, Dr. Steven F. DiMarco and Ms. Christina Bernal contributed to the authorship of this report.

To all who participated on the four NEGOM-COH cruises (N6, N7, N8, and N9), both ship's crew and scientific teams, we extend our great appreciation. We also thank the voluntary contributions of the scientists and students at University of Colorado (CU), University of South Florida (USF), University of Southern Mississippi (USM), as well as Texas A&M University (TAMU) who participated in these cruises. The science members, affiliations, and cruises are listed below.

Leila Belabbassi (TAMU; N6)
Christina Bernal (TAMU; N6, N7, N8, N9)
Dr. Doug Biggs (TAMU; N6, N7, N8, N9)
Scott Birkhead (TAMU; N8)
Marty Bohn (TAMU; N9)
Ken Bottom (TAMU; N6, N7, N8, N9)
Amy Bratcher (TAMU; N8)
Greg Breed (TAMU; N9)
Bob Brown (retired; N8)
Yesim Buyukakis (TAMU; N6)
Dr. Piers Chapman (TAMU; N6)
Paul Clark (TAMU; N6, N7, N8, N9)
Roland Clark (TAMU; N7)
Robyn Conmy (USF; N7, N9)
Dr. Carlos del Castilla (USF; N6, N8)
Miranda Dettwyler (TAMU; N9)
Kristie Elston (TAMU; N8)
Yue Fang (TAMU; N8)
Will Fletcher (TAMU; N9)
Chad Fox (CU; N8)
Mike Fredericks (TAMU; N6, N7, N8, N9)
Bill Green (TAMU; N6, N7, N8)
Dwight Gledhill (TAMU; N6)
Dennis Guffy (TAMU; N6, N8, N9)
Dr. Norm Guinasso (TAMU; N6, N7, N8, N9)
Karie Holtermann (USM; N9)

Alexey Ivanov (TAMU; N6, N7)
Bill Kopesky (TAMU; N6)
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Rob Masserini (USF; N7)
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Jeff Morin (TAMU; N6)
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Ryan Thomas (TAMU; N7, N8)
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Elise Waltman (TAMU; N6)
Eddie Webb (TAMU; N6, N7, N8, N9)
Xiang-Dong Xia (TAMU; N7)

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Ann E. Jochens
Worth D. Nowlin, Jr.

ABSTRACT

The Northeastern Gulf of Mexico Physical Oceanography Program (NEGOM) is supported by the Minerals Management Service (MMS) of the U. S. Department of the Interior. Through a contract between MMS and the Texas A&M Research Foundation, several components of the Texas A&M University System are conducting the Chemical Oceanography and Hydrography study of NEGOM (NEGOM-COH). This report covers activities from July 1999 through August 2000. Data were collected from hydrographic and acoustic Doppler current profiler (ADCP) surveys conducted in the Gulf of Mexico over the continental shelf and upper slope between the Mississippi delta and Tampa Bay in water depths of 10 to 1000 m. Additionally, historical and concurrent data from other programs in this region were collected.

Four hydrographic/ADCP surveys, N6, N7, N8, and N9, were conducted with 98, 98, 101, and 98 hydrographic sampling stations and 89, 84, 78, and 75 expendable bathythermograph stations on respective cruises. Each survey also included continuous ADCP measurements along the cruise track. At each hydrographic sampling station continuous profiles were made of conductivity, temperature, pressure, downwelling irradiance, fluorescence, and light transmission. Up to twelve water samples were taken at each station and analyzed for dissolved oxygen and six nutrients: nitrate, nitrite, phosphate, silicate, ammonium, and urea. At approximately 60 stations on each cruise, water samples were filtered and analyzed for phytoplankton pigments at the surface, from the chlorophyll maximum determined from fluorescence, and from the low light regime immediately below the maximum. Pigments were determined using high performance liquid chromatography. At about 60 stations on each cruise, water samples were filtered and analyzed for particulate matter concentrations at surface, middle, and bottom water depths and for particulate organic carbon and particulate organic nitrogen concentrations at surface and bottom (N6) or chlorophyll maximum (N7-N9) water depths. Bottle salinity was measured routinely at the most inshore and offshore stations on each cross-shelf line. Surface bucket salinity samples were taken in regions expected to have river water influences. The instrumentation as well as calibration and sampling procedures are described in this report. The collected data were subjected to stringent quality assurance/quality control procedures, which also are described.

On each cruise there were a number of complementary research programs. N6 had seven programs, including coring, bio-optical sampling, color dissolved organic material (CDOM) measurements, and flow cytometry sampling. There were five programs on N7, consisting of drifter deployments for MMS, bio-optical sampling, CDOM measurements, flow cytometry, and experimental measurements using a 38 kHz ADCP. On N8, ten complementary programs were pursued; the major ones were coring, a NASA over-flight for concurrent airborne and sea water flow-through bio-optical measurements, standard bio-optical and CDOM sampling, flow cytometry, benthic trawl samples, and 38 kHz ADCP measurements. Five complementary research efforts were accommodated on cruise N9, including bio-optical sampling, CDOM measurements, benthic trawls, and 38 kHz ADCP measurements. Graduate student training and research was conducted on all cruises for various academic institutions.

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ACRONYMS AND ABBREVIATIONS

ADCP	acoustic Doppler current profiler
AVHRR	advanced very high resolution radiometer satellite
CCAR	Colorado Center for Astrodynamics Research
CTD	conductivity-temperature-depth
DGPS	differential global positioning system
GPS	global positioning system
HPLC	high performance liquid chromatography
NEGOM	Northeastern Gulf of Mexico Physical Oceanography Program
NEGOM-COH	NEGOM Chemical Oceanography and Hydrography Study
MMS	Minerals Management Service, U.S. Department of the Interior
NASA	National Aeronautics and Space Administration
OS	Ocean Surveyor
PAR	photosynthetically available radiation
PI	principal investigator
PM	particulate matter
POC	particulate organic carbon
PON	particulate organic nitrogen
QA/QC	quality assurance/quality control
RDI	RD Instruments, Inc.
R/V	research vessel
SAIL	Serial ASCII Interface Loop system
S/N	serial number
SSHA	sea surface height anomaly
TAMU	Texas A&M University
USF	University of South Florida
USM	University of Southern Mississippi
UTC	universal coordinated time
XBT	expendable bathythermograph probe

1 EXECUTIVE SUMMARY

1.1 Introduction

The Minerals Management Service (MMS) of the U.S. Department of the Interior supports the Northeastern Gulf of Mexico Physical Oceanography Program (NEGOM). NEGOM is divided into six study units, one of which is the Chemical Oceanography and Hydrography Study (NEGOM-COH). NEGOM-COH covers the east Louisiana-Mississippi-Alabama-west Florida continental shelf and upper slope from the Mississippi River delta to Tampa Bay in water depths of 10 to 1000 m. This report focuses on the third year of work of NEGOM-COH covering the period July 1999 through August 2000. It does not contain detailed syntheses or interpretation of data collected; those will be detailed in the Final Synthesis Report at the conclusion of the program.

The contract for NEGOM-COH was awarded to the Texas A&M Research Foundation on 30 September 1997. Through the contract, components of the Texas A&M University System, a combination of Texas institutions of higher learning and Texas state agencies dedicated to training, research, and extension, conduct the NEGOM-COH study. In addition to support from the MMS, financial backing for NEGOM-COH is provided by Texas A&M University (TAMU), a component of the System. TAMU is assisted in this program by a subcontract with Dr. Robert R. Leben of the University of Colorado.

The major objective of NEGOM-COH is to describe spatial and temporal distributions and variations of hydrographic variables, and the processes that contribute to them. It will be met through completion of a three-year field program of hydrographic/acoustic Doppler current profiler (ADCP) cruises in the spring, summer, and fall seasons, after which observations will be synthesized, interpreted, and reported to provide a more complete understanding of circulation and distribution of properties over the study area.

Program management is provided by Dr. Worth D. Nowlin, Jr., Program Manager, and Dr. Ann E. Jochens, Deputy Program Manager. Study tasks are:

- Task 1, Field Work and Data Collection
  - Dr. Douglas C. Biggs, Co-principal investigator (Co-PI)
  - Dr. Norman L, Guinasso, Jr., Co-PI
  - Dr. M. C. Kennicutt II, Co-PI
- Task 2, Data Reduction/Analysis and Synthesis
  - Dr. Ann E. Jochens, Principal Investigator (PI)
  - Dr. Matthew K. Howard, Co-PI
- Task 3, Information/Data Synthesis and Technical Reports
  - Dr. Worth D. Nowlin, Jr., PI
  - Professor Robert O. Reid, Co-PI
  - Dr. M. C. Kennicutt II, Co-PI

1.2 Field Data

Four hydrographic/ADCP survey cruises were conducted in the report period: cruise N6 during 15–28 August 1999; cruise N7 during 13–25 November 1999; cruise N8 during 15–26 April 2000, and cruise N9 during 28 July–8 August 2000. Conductivity-temperature-depth (CTD) and bottle sampling were completed at 98, 98, 101, and 98 stations and expendable bathythermographs (XBT) were launched successfully at 89, 84, 78, and 75 stations. ADCP data were recorded continuously along track. The standard pattern of station locations and line numbers, as well as bathymetry and geographic locations, are shown in Figure 1.2.1.

At each CTD/bottle station, continuous profiles were made of conductivity, temperature, dissolved oxygen, downwelling irradiance, backscatterance, fluorescence, and percent light transmission. Up to 12 water samples were taken at each station and analyzed for dissolved oxygen and six nutrients: nitrate, nitrite, phosphate, silicate, ammonium, and urea. Typically at 60 stations, water samples were analyzed for phytoplankton pigments, particulate matter, and particulate organic carbon/particulate organic nitrogen. Bottle salinities were measured at the innermost and seawardmost stations of each cross-shelf line, as well as at supplemental stations for problem solving associated with bottle sampling. Surface bucket salinity samples were taken in regions expected to be influenced by river water. XBT stations were taken between cross-shelf CTD stations to increase the resolution of the temperature data to ~10 km. Near-surface temperature, salinity, and fluorescence were logged every two minutes while the ship was underway or stopped at stations. To calibrate the underway fluorescence, 101, 99, 99, and 101 underway water samples were analyzed for chlorophyll content. After collection, the data sets were processed for compliance with quality assurance and quality control (QA/QC) criteria.

On each cruise there were a number of complementary research programs. For cruises N6, N7, N8, and N9, there were seven, five, ten, and five complementary programs, respectively. The type of programs included coring, bio-optical sampling, color dissolved organic material measurements, flow cytometry sampling, experimental measurements using a 38 kHz ADCP, drifter deployments for MMS, a NASA over-flight for concurrent airborne and sea water flow-through bio-optical measurements, and benthic trawl sampling. Graduate student training and research was conducted on all cruises for various academic institutions, including TAMU, University of South Florida, University of Southern Mississippi, and University of Colorado.

1.3 Third Annual Report

This third annual report focuses on the data collection and processing activities of NEGOM-COH. It contains no detailed analyses of the data. Examples of products can be found in the first and second annual reports (Jochens and Nowlin, 1998 and 1999, respectively).

The NEGOM-COH Synthesis Report, in preparation, will contain discussions of all data analyses carried out. The final synthesis report is expected to be available from MMS about September 2001.

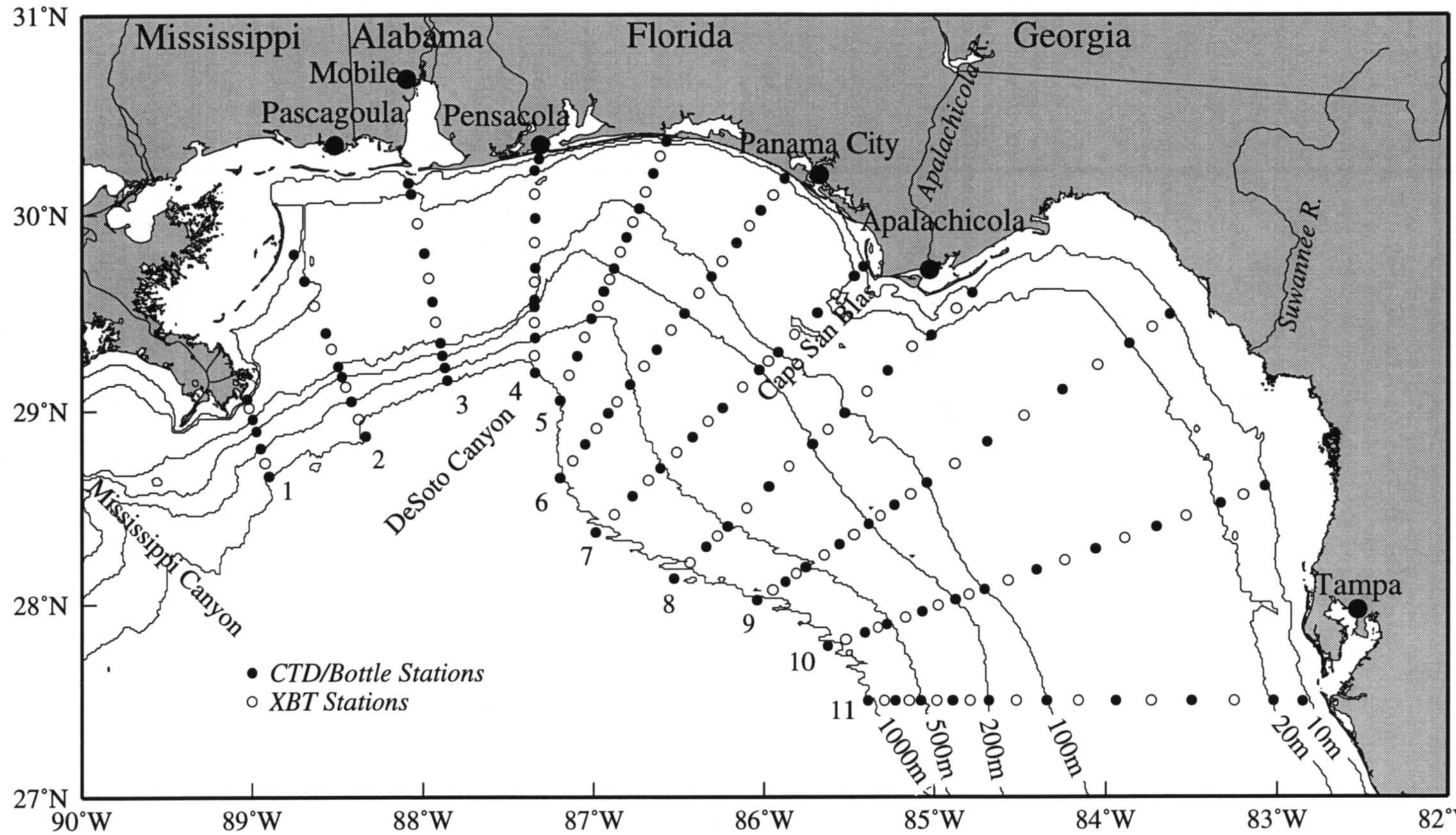

Figure 1.2.1. Station locations and cross-shelf line numbers for NEGOM hydrographic/ADCP cruises and geographic locations in the study area. Line numbers are given at the offshore end of the lines.

2 INTRODUCTION

The first annual report for NEGOM-COH detailed the program objectives, tasks, and participants, activities from October 1997 through June 1998, the data collection and processing for cruises N1 and N2, and the results of preliminary examination of the N1 data set (Jochens and Nowlin, 1998). The second annual report described the activities from July 1998 through June 1999 and included data acquisition on cruises N3, N4, and N5, and QA/QC and analysis for selected data from cruises N2, N3, and N4 (Jochens and Nowlin, 1999). This third annual report focuses on the period from July 1999 through August 2000 and includes information on data acquisition on cruises N6 through N9 and on QA/QC for data from cruises N5 through N9. Information on the NEGOM-COH program is provided on a publicly accessible web page on the internet at http://negom.tamu.edu/negom.

2.1 Overview of Cruise Schedule and Nomenclature

Four hydrographic/ADCP cruises were conducted aboard *R/V Gyre* during this report period. The cruises, their various designators, and their start and end dates are given in Table 2.1.1. The NEGOM ID is the shorthand identifier used in this report. The cruise ID number is the standard cruise identifier widely used in the U.S. oceanographic community. The first two characters are the year of the cruise, the third character is the ship identifier, G for *Gyre*, and the last two characters are the number of the ship's cruise for that year. Typical station locations and cross-shelf line numbers are shown in Figure 1.2.1.

Table 2.1.1. Cruise identifiers and dates.

Survey No.	Start Date	End Date	NEGOM ID	Cruise ID
6	15 August 1999	28 August 1999	N6	99-G-08
7	13 November 1999	25 November 1999	N7	99-G12
8	15 April 2000	26 April 2000	N8	00-G-04
9	28 July 2000	8 August 2000	N9	00-G-08

2.2 Programmatic Changes

For the first six cruises, particulate organic carbon samples were taken from the top and bottom Niskin bottles. There was little relationship found between particulate organic carbon values and the particulate matter concentrations or beam attenuation for the bottom samples. Therefore, for the final three cruises, samples were taken from the bottles at the surface and chlorophyll maximum.

Antheraxanthin was added to the suite of pigments determined by high performance liquid chromatography (HPLC) after equipment and an analytic standard became available for identification of this pigment. This occurred for N6 and subsequent cruises.

To better assess off-shelf currents and to make full use of the available ship time on cruise N8, line 2 was extended approximately 45 km offshore into a cyclonic eddy and an additional three CTD and three XBT stations were taken.

2.3 Report Organization

This is the third annual report of the NEGOM-COH study. It reports on: data-gathering efforts; equipment, measurement and analytical methodologies employed; and results of quality control procedures and results. Extensive results and syntheses of the information will be provided in the final Synthesis Report at the conclusion of the field work and analyses. Section 3 of the report details the acquisition of the chemical oceanography, hydrography, and ADCP measurements, as well as collateral data assembly. Section 4 discusses data processing efforts and data quality control methods and results. All times are reported in Universal Coordinated Time (UTC) unless stated otherwise.

3 DATA ACQUISITION

Data acquisition activities for cruises N6, N7, N8, and N9 described here include a discussion of *in situ* sampling efforts and the instrumentation, calibration, and sampling procedures. Summaries of field data collection and collateral data assembly are given.

3.1 General Description of Surveys

From July 1999 through August 2000, four hydrographic/ADCP surveys (N6 through N9) were conducted aboard the *R/V Gyre.* A Sea-Bird SBE-911*plus* CTD was used on each cruise. CTD-Rosette stations were occupied on each cruise at nearly identical station locations. Test stations, at which all bottles were tripped in the salinity minimum water at ~700-800 m, were made to test instrumentation and equipment. XBT probes were launched between CTD stations. ADCP data were collected along the track. Navigation data and station locations were determined using a differential Global Positioning System (DGPS).

The surveys consisted of eleven lines of CTD and XBT stations perpendicular to the bathymetry (cross-shelf lines). The lines are numbered from 1 to 11 going from west to east (Figure 1.2.1). The naming convention for cross-shelf lines is:

First and second characters:	NEGOM cruise number (N6, N7, N8, or N9)
Third character:	L = Line
Fourth and fifth characters:	Line number (1 through 11)
Sixth character:	S = Sequence
Seventh and eighth characters:	Sequence number of station on the line
Ninth character:	C = CTD station type; X = XBT station type

Stations on each cross-shelf line are numbered sequentially from innermost to outermost station regardless of station type. As an example, station N6L06S03C is the third station from the coast on line 6 and is a CTD station taken on cruise N6. On cruise N6, XBTs also were deployed between pairs of cross-shelf lines along portions of the 1000-m isobath. For these stations the third character is "X", denoting a segment between two cross-shelf lines; the fourth and fifth characters give the starting cross-shelf line number and the sixth and seventh give the ending cross-shelf line number. The eighth character is "M", denoting the station is midway between the two cross-shelf lines. In the tables below, where it is clear whether the station type is a CTD or an XBT, the ninth character is not included.

3.1.1 Cruise N6

The sixth NEGOM-COH hydrography cruise (N6) was conducted on the *R/V Gyre* during 15 - 28 August 1999. It was staged out of Galveston, TX, and returned to Panama City, FL. Dr. Douglas C. Biggs and Dr. Norman L. Guinasso, Jr., were co-chief scientists. One hundred CTD stations, including one test station (Station 000, N6TEST00) and one supplementary station (Station 00A, N6CORE00), were completed. The test station was located in deep water near Mississippi Canyon. The supplementary station was taken outside the NEGOM study area in about 35 m water depth west of the Mississippi River Delta. Eighty-nine successful XBT drops were made. The locations of the CTDs and XBTs and the cruise track are shown in Figure 3.1.1.

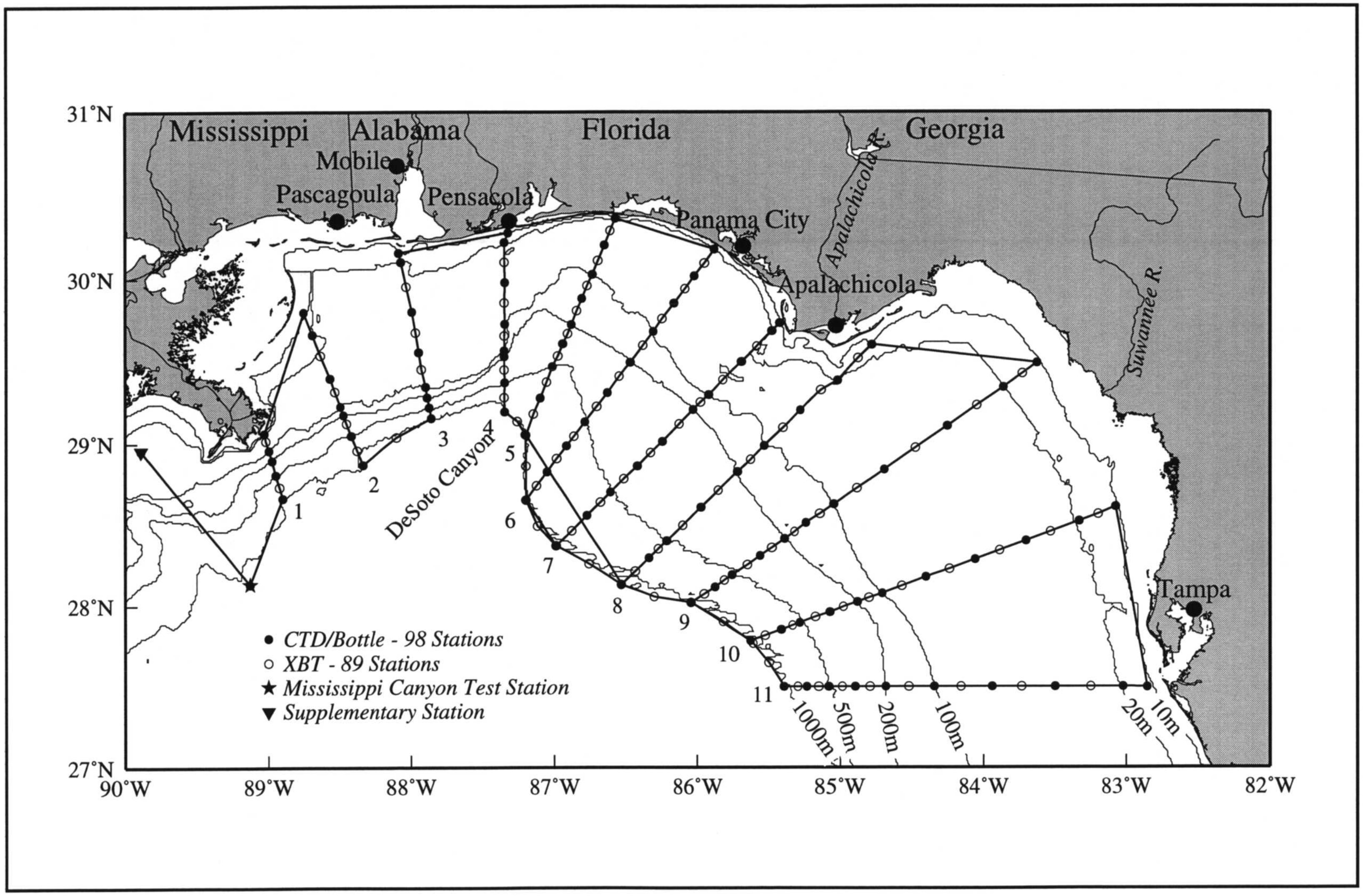

Figure 3.1.1. Station locations for cruise N6 conducted 15 - 28 August 1999. The cruise ran in order along lines 1, 2, 3, 4, 11, 10, 9, 8, 5, 6, and 7. The thick line shows the cruise track, which began at the location of the most seaward station on line 1.

The cruise started at the seaward end of line 1 and completed the CTD/XBT stations along lines 1, 2, 3, and 4. Collecting XBT data, it then ran along the 1000-m isobath to the most seaward station on line 11. The cross-shelf CTD/XBT station sampling then resumed and was completed for lines 11, 10, 9, and 8. Due to illness, the cruise diverted to complete line 5 and then to evacuate the ill person via water taxi to Destin, FL. Lines 6 and 7 then were run to complete the cruise. Station number, date, time, location, water depth, and number of bottles tripped at each CTD station are given in Table 3.1.1.

Stations at which bottle samples were taken are summarized in Table 3.1.2. Nutrients and oxygen were measured from every Niskin bottle sampled. Salinity was measured at the inner-most and 1000-m isobath stations on each cross-shelf line, the test station, the supplemental station, and station 86 for a total of 25 stations. Surface bucket salinity samples were taken at 58 of the CTD stations in regions expected to be influenced by river water. Pigment samples were taken at the top, in the chlorophyll-maximum as estimated from the downcast fluorescence trace, and in the low light regime immediately below the chlorophyll-maximum at 60 stations. Total particulate matter (PM), particulate organic carbon (POC), and particulate organic nitrogen (PON) were measured from the shallowest and deepest bottles and, for PM, from a middle, "clear water" bottle at 60 stations. Duplicate POC/PON samples were taken at station 35.

The location, date, time, total water depth, and probe type of the XBT drops are given in Table 3.1.3. A 150kHz broadband ADCP was operated continuously along the track (Section 3.2.3). Flow-through near-surface temperature, conductivity, and fluorescence were logged every 2 minutes (Section 3.2.5). Surface samples were filtered and analyzed at 101 locations for chlorophyll *a* content to calibrate the flow-through fluorometer.

Seven complementary research efforts were accommodated on summer cruise N6. With ship support provided by the state of Texas, Mr. Jeff Morin, TAMU, took gravity/box core samples at the supplementary station and Mr. Dwight Gledhill, TAMU, took piston core samples at the test station. Both then assisted with NEGOM sampling for the remainder of the cruise. Mr. Bisman Nababan, from the remote sensing group of Dr. Frank Muller-Karger at the University of South Florida (USF), conducted irradiance casts and collected dissolved organic carbon data for comparison with SeaWiFS data. Dr. Carlos del Castilla, working for Dr. Paula Coble of USF, operated an underway Safire system to collect dissolved organic material fluorescence and absorbance data. Mr. Bill Kopesky collected samples for the flow cytometry program of Dr. Lisa Campbell, TAMU. Ms. Yesim Buyukates, graduate student of Dr. Dan Roelke of TAMU, participated in the cruise for purposes of looking at NEGOM data for her study of red tides. Two salinity samples were taken at each of three stations for Dr. Donald Shive of Muhlenberg College, Allentown, PA, for use in training chemistry students. Further information on these complementary research programs can be obtained from the scientists involved.

Table 3.1.1. Times and locations for CTD stations on cruise N6.

Station Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Depth (m)	No. of Bottles
00A	N6CORE00	17-AUG-1999	16:33:44	28.953063	-89.889853	37.	12
000	N6TEST00	18-AUG-1999	00:23:46	28.132920	-89.130395	1061.	11
001	N6L01S07	18-AUG-1999	09:03:07	28.662875	-88.900053	1004.	12
002	N6L01S05	18-AUG-1999	11:08:50	28.805220	-88.948680	500.	12
003	N6L01S04	18-AUG-1999	12:38:36	28.894520	-88.973960	205.	12
004	N6L01S03	18-AUG-1999	13:45:27	28.956055	-88.997812	97.	12
005	N6L01S01	18-AUG-1999	14:55:59	29.059043	-89.030423	19.	4
006	N6L02S00	18-AUG-1999	20:27:49	29.800647	-88.753902	15.	4
007	N6L02S01	18-AUG-1999	21:41:14	29.662818	-88.692392	19.	4
008	N6L02S03	18-AUG-1999	23:52:49	29.397653	-88.570245	58.	4
009	N6L02S05	19-AUG-1999	01:28:51	29.224697	-88.497543	111.	12
010	N6L02S06	19-AUG-1999	02:24:06	29.173675	-88.473805	189.	12
011	N6L02S08	19-AUG-1999	03:51:49	29.047793	-88.416757	493.	12
012	N6L02S10	19-AUG-1999	05:37:00	28.869780	-88.336602	999.	12
013	N6L03S10	19-AUG-1999	09:47:40	29.153288	-87.859850	999.	12
014	N6L03S09	19-AUG-1999	11:23:46	29.218220	-87.875755	459.	12
015	N6L03S08	19-AUG-1999	12:43:51	29.281913	-87.888493	207.	12
016	N6L03S07	19-AUG-1999	13:48:59	29.345993	-87.900927	98.	12
017	N6L03S05	19-AUG-1999	15:50:14	29.558238	-87.948152	42.	5
018	N6L03S03	19-AUG-1999	18:04:09	29.804197	-87.997625	36.	5
019	N6L03S01	19-AUG-1999	20:22:56	30.103062	-88.074298	21.	4
020	N6L03S00	19-AUG-1999	21:06:58	30.156823	-88.088667	12.	4
021	N6L04S00	20-AUG-1999	01:52:39	30.279632	-87.324707	13.	4
022	N6L04S01	20-AUG-1999	02:35:43	30.221458	-87.351032	19.	5
023	N6L04S03	20-AUG-1999	04:29:04	29.979590	-87.349012	29.	5
024	N6L04S05	20-AUG-1999	06:25:26	29.729037	-87.348882	80.	12
025	N6L04S07	20-AUG-1999	08:01:36	29.567942	-87.350190	110.	12
026	N6L04S08	20-AUG-1999	08:55:40	29.531815	-87.350138	213.	12
027	N6L04S10	20-AUG-1999	10:33:17	29.371678	-87.346672	511.	12
028	N6L04S12	20-AUG-1999	12:34:44	29.194363	-87.348157	987.	12
029	N6L11S18	21-AUG-1999	05:57:26	27.499055	-85.395352	996.	12
030	N6L11S16	21-AUG-1999	07:57:09	27.498827	-85.225350	755.	12
031	N6L11S14	21-AUG-1999	09:48:13	27.499177	-85.076073	496.	12
032	N6L11S12	21-AUG-1999	11:36:57	27.499573	-84.890750	300.	12
033	N6L11S10	21-AUG-1999	13:32:58	27.499237	-84.681222	201.	12
034	N6L11S08	21-AUG-1999	16:07:08	27.500280	-84.342913	100.	12
035	N6L11S06	21-AUG-1999	18:52:14	27.500453	-83.940733	58.	9
036	N6L11S04	21-AUG-1999	21:35:42	27.499728	-83.496557	43.	4
037	N6L11S02	22-AUG-1999	00:33:00	27.501252	-83.022510	22.	5
038	N6L11S01	22-AUG-1999	01:46:45	27.497312	-82.853122	13.	4
039	N6L10S01	22-AUG-1999	10:10:17	28.608993	-83.074212	12.	4
040	N6L10S03	22-AUG-1999	12:03:18	28.521138	-83.329595	20.	4
041	N6L10S05	22-AUG-1999	14:40:40	28.400475	-83.702083	32.	6
042	N6L10S07	22-AUG-1999	17:23:59	28.286815	-84.059065	39.	4
043	N6L10S09	22-AUG-1999	19:57:47	28.177022	-84.404055	60.	5
044	N6L10S11	22-AUG-1999	22:24:27	28.076480	-84.706150	102.	12
045	N6L10S13	23-AUG-1999	00:02:08	28.022188	-84.876767	200.	11
046	N6L10S15	23-AUG-1999	01:49:15	27.959797	-85.069868	313.	12
047	N6L10S17	23-AUG-1999	03:46:30	27.895870	-85.276100	495.	12
048	N6L10S19	23-AUG-1999	05:07:35	27.852303	-85.412990	655.	12
049	N6L10S21	23-AUG-1999	07:27:31	27.782912	-85.631008	994.	12

Table 3.1.1. Times and locations for CTD stations on cruise N6 (continued).

Station Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Depth (m)	No. of Bottles
050	N6L09S21	23-AUG-1999	11:31:56	28.019132	-86.042420	979.	11
051	N6L09S19	23-AUG-1999	13:43:12	28.115022	-85.876547	682.	12
052	N6L09S17	23-AUG-1999	15:37:31	28.190858	-85.753908	502.	12
053	N6L09S15	23-AUG-1999	17:49:33	28.310348	-85.560443	304.	12
054	N6L09S13	23-AUG-1999	19:36:00	28.412758	-85.393618	200.	12
055	N6L09S11	23-AUG-1999	21:12:34	28.510907	-85.234182	162.	11
056	N6L09S09	23-AUG-1999	22:53:21	28.627353	-85.043788	98.	12
057	N6L09S07	24-AUG-1999	01:35:40	28.839780	-84.693920	46.	6
058	N6L09S05	24-AUG-1999	04:43:46	29.105440	-84.256075	27.	5
059	N6L09S03	24-AUG-1999	07:42:56	29.342655	-83.861285	20.	5
060	N6L09S01	24-AUG-1999	09:41:40	29.491292	-83.625663	12.	4
061	N6L08S01	24-AUG-1999	16:47:47	29.602123	-84.780017	14.	4
062	N6L08S03	24-AUG-1999	19:01:52	29.386823	-85.019942	25.	4
063	N6L08S05	24-AUG-1999	21:05:22	29.203973	-85.274593	40.	4
064	N6L08S07	24-AUG-1999	23:29:45	28.986182	-85.528882	121.	12
065	N6L08S09	25-AUG-1999	01:17:41	28.825528	-85.719160	199.	12
066	N6L08S11	25-AUG-1999	04:00:50	28.605627	-85.973177	308.	12
067	N6L08S13	25-AUG-1999	06:21:25	28.402348	-86.215092	496.	12
068	N6L08S15	25-AUG-1999	08:06:21	28.295305	-86.339145	672.	12
069	N6L08S17	25-AUG-1999	10:41:51	28.132228	-86.530562	998.	12
070	N6L05S17	25-AUG-1999	20:30:46	29.050862	-87.200947	995.	12
071	N6L05S15	25-AUG-1999	23:00:40	29.277745	-87.101618	708.	12
072	N6L05S13	26-AUG-1999	00:59:02	29.470788	-87.016340	480.	12
073	N6L05S11	26-AUG-1999	02:43:02	29.608477	-86.945093	263.	12
074	N6L05S09	26-AUG-1999	03:59:41	29.725840	-86.885920	199.	12
075	N6L05S07	26-AUG-1999	05:25:35	29.882902	-86.811590	147.	12
076	N6L05S05	26-AUG-1999	06:53:27	30.027678	-86.737165	99.	12
077	N6L05S03	26-AUG-1999	08:34:00	30.204820	-86.655707	27.	5
078	N6L05S01	26-AUG-1999	10:02:41	30.365935	-86.578790	19.	4
079	N6L06S01	26-AUG-1999	15:10:19	30.178808	-85.883368	21.	4
080	N6L06S03	26-AUG-1999	16:46:53	30.018252	-86.021422	32.	5
081	N6L06S05	26-AUG-1999	18:25:37	29.853597	-86.166260	47.	5
082	N6L06S07	26-AUG-1999	20:09:10	29.682588	-86.310030	100.	12
083	N6L06S09	26-AUG-1999	22:01:55	29.496432	-86.470868	204.	12
084	N6L06S11	26-AUG-1999	23:59:34	29.310330	-86.632468	384.	12
085	N6L06S13	27-AUG-1999	01:59:54	29.133015	-86.789645	498.	12
086	N6L06S15	27-AUG-1999	04:01:05	28.984517	-86.917517	610.	12
087	N6L06S17	27-AUG-1999	05:46:09	28.827078	-87.052560	767.	12
088	N6L06S19	27-AUG-1999	08:08:21	28.653437	-87.201165	994.	12
089	N6L07S17	27-AUG-1999	11:17:56	28.370637	-86.987340	1009.	12
090	N6L07S15	27-AUG-1999	13:54:31	28.557317	-86.772570	668.	12
091	N6L07S13	27-AUG-1999	15:53:00	28.701253	-86.612705	499.	12
092	N6L07S11	27-AUG-1999	18:11:05	28.861955	-86.422038	382.	12
093	N6L07S09	27-AUG-1999	20:29:49	29.010635	-86.245705	317.	12
094	N6L07S07	27-AUG-1999	22:48:16	29.207753	-86.029408	200.	12
095	N6L07S05	28-AUG-1999	00:13:38	29.298890	-85.921008	94.	12
096	N6L07S03	28-AUG-1999	02:29:56	29.499793	-85.693047	31.	5
097	N6L07S01	28-AUG-1999	04:27:12	29.686492	-85.478688	20.	4
098	N6L07S00	28-AUG-1999	05:09:25	29.735563	-85.427490	11.	3

Table 3.1.2 Number of bottles sampled by variable on cruise N6. Blank = no sample.

Station No.	Station Name	Nutrient	Oxygen	Salinity	Bucket Salinity	Pigment	PM*	POC & PON*
00A	N6CORE00	12	12	3	1			
000	N6TEST00	11	11	11				
001	N6L01S07	12	12	12	1	3	3	2
002	N6L01S05	12	12		1	3	3	2
003	N6L01S04	12	12		1	4	3	2
004	N6L01S03	12	12		1	4	3	2
005	N6L01S01	4	4	4	1	3	3	2
006	N6L02S00	4	4	4	1			
007	N6L02S01	4	4		1	3	3	2
008	N6L02S03	4	4		1			
009	N6L02S05	12	12		1	3	3	2
010	N6L02S06	12	12		1	4	3	2
011	N6L02S08	12	12		1	4	3	2
012	N6L02S10	12	12	12	1	3	3	2
013	N6L03S10	12	12	12	1	3	3	2
014	N6L03S09	12	12		1	3	3	2
015	N6L03S08	12	12		1	3	3	2
016	N6L03S07	12	12		1	3	3	2
017	N6L03S05	5	5		1			
018	N6L03S03	5	5		1			
019	N6L03S01	4	4		1	3	3	2
020	N6L03S00	4	4	4	1			
021	N6L04S00	4	4	4	1			
022	N6L04S01	5	5		1	2	3	2
023	N6L04S03	5	5		1			
024	N6L04S05	12	12		1			
025	N6L04S07	12	12			3	3	2
026	N6L04S08	12	12			3	3	2
027	N6L04S10	12	12			2	3	2
028	N6L04S12	12	12	12		3	3	2
029	N6L11S18	12	12	12		3	3	2
030	N6L11S16	12	12					
031	N6L11S14	12	12			3	3	2
032	N6L11S12	12	12					
033	N6L11S10	12	12			3	3	2
034	N6L11S08	12	12		1	4	3	2
035	N6L11S06	9	9		1			6
036	N6L11S04	4	4		1	3	3	2
037	N6L11S02	5	5		1	2	3	2
038	N6L11S01	4	4	4	1			
039	N6L10S01	4	4	4	1			
040	N6L10S03	4	4		1	2	3	2
041	N6L10S05	6	6		1	2	3	2
042	N6L10S07	4	4		1	2	3	2
043	N6L10S09	5	5		1			
044	N6L10S11	12	12		1	3	3	2
045	N6L10S13	11	11			3	3	2
046	N6L10S15	12	12					
047	N6L10S17	12	12			3	3	2
048	N6L10S19	12	12					
049	N6L10S21	12	12	12		3	3	2

Table 3.1.2 Number of bottles sampled by variable on cruise N6 (continued).

Station No.	Station Name	Nutrient	Oxygen	Salinity	Bucket Salinity	Pigment	PM*	POC & PON*
050	N6L09S21	11	11	11		3	3	2
051	N6L09S19	12	12					
052	N6L09S17	12	12			3	3	2
053	N6L09S15	12	12					
054	N6L09S13	12	12			3	3	2
055	N6L09S11	11	11					
056	N6L09S09	12	12		1	3	3	2
057	N6L09S07	6	6		1	2	3	2
058	N6L09S05	5	5		1	2	3	2
059	N6L09S03	5	5		1	2	3	2
060	N6L09S01	4	4	4	1			
061	N6L08S01	4	4	4	1			
062	N6L08S03	4	4		1	2	3	2
063	N6L08S05	4	4		1			
064	N6L08S07	12	12		1	3	3	2
065	N6L08S09	12	12			3	3	2
066	N6L08S11	12	12					
067	N6L08S13	12	12			3	3	2
068	N6L08S15	12	12					
069	N6L08S17	12	12	12		3	3	2
070	N6L05S17	12	12	12		3	3	2
071	N6L05S15	12	12					
072	N6L05S13	12	12			3	3	2
073	N6L05S11	12	12					
074	N6L05S09	12	12		1	3	3	2
075	N6L05S07	12	12		1			
076	N6L05S05	12	12		1	3	3	2
077	N6L05S03	5	5		1			
078	N6L05S01	4	4	4	1	2	3	2
079	N6L06S01	4	4	4	1	4	3	2
080	N6L06S03	5	5		1			
081	N6L06S05	5	5		1			
082	N6L06S07	12	12		1	3	3	2
083	N6L06S09	12	12			3	3	2
084	N6L06S11	12	12					
085	N6L06S13	12	12			3	3	2
086	N6L06S15	12	12	1				
087	N6L06S17	12	12					
088	N6L06S19	12	12	12		3	3	2
089	N6L07S17	12	12	12		3	3	2
090	N6L07S15	12	12					
091	N6L07S13	12	12			4	3	2
092	N6L07S11	12	12					
093	N6L07S09	12	12					
094	N6L07S07	12	12			3	3	2
095	N6L07S05	12	12		1	3	3	2
096	N6L07S03	5	5		1			
097	N6L07S01	4	4		1	2	3	2
098	N6L07S00	3	3	3	1			
	Total	936	936	189	58	175	180	126

* POC = particulate organic carbon; PON = particulate organic nitrogen; PM = total particulate material

Table 3.1.3 Launch times and locations for XBT drops on cruise N6.

Sequence Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Water Depth (m)	Probe Type
001	N6L01S06	18-AUG-1999	10:32:15	28.730737	-88.923875	775.	T7
002	N6L01S02	18-AUG-1999	14:31:44	29.015817	-89.016952	54.	T10
003	N6L02S02	18-AUG-1999	22:43:40	29.538170	-88.635763	30.	T10
004	N6L02S04	19-AUG-1999	00:41:30	29.316070	-88.538018	64.	T10
005	N6L02S07	19-AUG-1999	03:02:09	29.122648	-88.452140	286.	T7
006	N6L02S09	19-AUG-1999	04:53:37	28.955443	-88.376955	764.	T7
007	N6X0203M	19-AUG-1999	08:12:13	29.036410	-88.104570	1112.	T7
008	N6L03S06	19-AUG-1999	15:00:33	29.453058	-87.927990	62.	T10
009	N6L03S04	19-AUG-1999	17:01:08	29.677448	-87.971885	40.	T10
010	N6L03S02	19-AUG-1999	19:18:24	29.953342	-88.038065	25.	T10
011	N6L04S02	20-AUG-1999	03:32:37	30.102882	-87.350898	30.	T10
012	N6L04S04	20-AUG-1999	05:28:54	29.856562	-87.350963	46.	T10
013	N6L04S06	20-AUG-1999	07:20:16	29.656693	-87.351025	80.	T10
014	N6L04S09	20-AUG-1999	09:55:35	29.449695	-87.351757	356.	T10
015	N6L04S11	20-AUG-1999	11:53:16	29.282025	-87.350887	814.	T7
016	N6X0405M	20-AUG-1999	14:05:10	29.135822	-87.261080	1011.	T7
017	N6L05S17	20-AUG-1999	14:42:52	29.054725	-87.205087	999.	T7
019	N6X0506M	20-AUG-1999	15:57:27	28.860145	-87.198792	970.	T7
020	N6L06S19	20-AUG-1999	17:16:54	28.653150	-87.201557	1004.	T7
021	N6X0607M	20-AUG-1999	18:22:44	28.491198	-87.117947	1004.	T7
022	N6L07S17	20-AUG-1999	19:21:17	28.371050	-86.988298	1004.	T7
023	N6X0708M	20-AUG-1999	20:39:34	28.260988	-86.759383	1004.	T7
024	N6L08S17	20-AUG-1999	21:59:10	28.132252	-86.532263	1004.	T7
025	N6X0809M	20-AUG-1999	23:19:08	28.057017	-86.304250	1004.	T7
026	N6L09S21	21-AUG-1999	00:49:00	28.018963	-86.042978	976.	T7
027	N6X0910M	21-AUG-1999	02:15:59	27.902095	-85.819495	992.	T7
031	N6L10S21	21-AUG-1999	03:43:45	27.768318	-85.610183	1154.	T7
033	N6X1011M	21-AUG-1999	04:43:51	27.648197	-85.495332	1008.	T7
035	N6L11S17	21-AUG-1999	07:27:55	27.499743	-85.294338	836.	T7
036	N6L11S15	21-AUG-1999	09:13:21	27.500162	-85.145767	624.	T7
037	N6L11S13	21-AUG-1999	10:55:40	27.500100	-84.986097	391.	T7
038	N6L11S11	21-AUG-1999	12:45:21	27.498930	-84.791440	236.	T7
039	N6L11S09	21-AUG-1999	14:57:08	27.500353	-84.523513	140.	T10
040	N6L11S07	21-AUG-1999	17:31:03	27.499980	-84.159887	74.	T10
041	N6L11S05	21-AUG-1999	20:10:47	27.498963	-83.732930	50.	T10
042	N6L11S03	21-AUG-1999	23:06:33	27.500055	-83.249920	34.	T10
043	N6L10S02	22-AUG-1999	11:06:51	28.564000	-83.195000	17.	T10
044	N6L10S04	22-AUG-1998	13:28:14	28.456167	-83.528000	30.	T10
045	N6L10S06	22-AUG-1999	16:06:53	28.343208	-83.887577	40.	T10
046	N6L10S08	22-AUG-1999	18:51:35	28.228363	-84.240790	48.	T10
047	N6L10S10	22-AUG-1999	21:20:24	28.122778	-84.569115	74.	T10
048	N6L10S12	22-AUG-1999	23:18:02	28.048992	-84.799125	150.	T10
049	N6L10S14	23-AUG-1999	00:57:41	27.992635	-84.976133	248.	T7
050	N6L10S16	23-AUG-1999	02:47:34	27.930763	-85.167107	374.	T7
051	N6L10S18	23-AUG-1999	04:30:48	27.877480	-85.333083	586.	T7
052	N6L10S20	23-AUG-1999	06:32:34	27.817543	-85.522470	791.	T7
053	N6L09S20	23-AUG-1999	13:04:42	28.071937	-85.950745	804.	T7
055	N6L09S18	23-AUG-1999	15:06:50	28.157765	-85.811520	588.	T7
056	N6L09S16	23-AUG-1999	16:58:31	28.253977	-85.652872	380.	T7
057	N6L09S14	23-AUG-1999	18:51:16	28.360028	-85.478887	246.	T7
058	N6L09S12	23-AUG-1999	20:29:49	28.457780	-85.318993	180.	T10

Table 3.1.3 Launch times and locations for XBT drops on cruise N6 (continued).

Sequence Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Water Depth (m)	Probe Type
059	N6L09S10	23-AUG-1999	22:04:50	28.567043	-85.138688	130.	T10
060	N6L09S08	24-AUG-1999	00:10:54	28.724622	-84.882418	52.	T10
061	N6L09S06	24-AUG-1999	03:09:55	28.971995	-84.476187	34.	T10
063	N6L09S04	24-AUG-1999	06:20:13	29.232880	-84.048080	26.	T10
064	N6L09S02	24-AUG-1999	08:49:53	29.427677	-83.728733	16.	T10
065	N6L08S02	24-AUG-1999	17:46:46	29.522655	-84.872518	16.	T10
066	N6L08S04	24-AUG-1999	19:55:25	29.327688	-85.128325	28.	T10
067	N6L08S06	24-AUG-1999	22:20:53	29.094632	-85.403573	50.	T10
068	N6L08S08	25-AUG-1999	00:29:48	28.902450	-85.628025	170.	T10
069	N6L08S10	25-AUG-1999	02:46:58	28.710045	-85.853997	254.	T7
070	N6L08S12	25-AUG-1999	05:21:44	28.496532	-86.104515	374.	T7
071	N6L08S14	25-AUG-1999	07:27:35	28.352118	-86.274125	568.	T7
072	N6L08S16	25-AUG-1999	09:48:25	28.214348	-86.436180	833.	T7
073	N6L05S16	25-AUG-1999	21:59:29	29.181382	-87.149327	826.	T7
074	N6L05S14	26-AUG-1999	00:01:34	29.374463	-87.056307	694.	T7
075	N6L05S12	26-AUG-1999	01:46:21	29.534427	-86.978903	348.	T7
076	N6L05S10	26-AUG-1999	03:25:41	29.670997	-86.912642	224.	T7
077	N6L05S08	26-AUG-1999	04:48:18	29.808423	-86.847217	170.	T10
078	N6L05S06	26-AUG-1999	06:18:13	29.959827	-86.773887	124.	T10
079	N6L05S04	26-AUG-1999	07:49:14	30.112803	-86.700062	47.	T10
080	N6L05S02	26-AUG-1999	09:24:26	30.292765	-86.613012	28.	T10
081	N6L06S02	26-AUG-1999	15:57:57	30.097510	-85.952788	28.	T10
082	N6L06S04	26-AUG-1999	17:35:43	29.942333	-86.090112	40.	T10
083	N6L06S06	26-AUG-1999	19:22:11	29.760362	-86.247053	68.	T10
084	N6L06S08	26-AUG-1999	21:03:48	29.600773	-86.385437	134.	T10
085	N6L06S10	26-AUG-1999	22:57:05	29.410407	-86.549257	290.	T7
086	N6L06S12	27-AUG-1999	00:58:28	29.226358	-86.708507	442.	T7
088	N6L06S14	27-AUG-1999	03:04:43	29.043020	-86.866280	554.	T7
090	N6L06S16	27-AUG-1999	05:03:11	28.906617	-86.983492	698.	T7
091	N6L06S18	27-AUG-1999	07:15:57	28.741793	-87.125132	906.	T7
092	N6L07S16	27-AUG-1999	13:01:05	28.464108	-86.880533	716.	T7
093	N6L07S14	27-AUG-1999	15:15:46	28.638195	-86.682493	574.	T7
094	N6L07S12	27-AUG-1999	17:13:13	28.784548	-86.513858	420.	T7
095	N6L07S10	27-AUG-1999	19:18:43	28.944783	-86.329412	338.	T7
096	N6L07S08	27-AUG-1999	21:53:19	29.120413	-86.127943	258.	T7
097	N6L07S06	27-AUG-1999	23:36:29	29.251550	-85.979040	158.	T10
098	N6L07S04	28-AUG-1999	01:19:32	29.387523	-85.822905	50.	T10
099	N6L07S02	28-AUG-1999	03:30:17	29.593492	-85.586598	28.	T10

Launches at missing sequence numbers were failures or deemed bad data during QA/QC or were where the counter erroneously advanced.

3.1.2 Cruise N7

The seventh NEGOM-COH hydrography cruise (N7) was conducted aboard the *R/V Gyre* during 12-25 November 1999 on two legs. Leg one, with an 18-member science party, was from Gulfport, MS, to St. Petersburg, FL, and consisted of the hydrographic sampling program for lines 1 through 11. Leg two, with a 4-member science party, consisted of an ADCP run along the 1000-m isobath. Dr. Douglas C. Biggs and Dr. Norman L. Guinasso, Jr., were co-chief scientists. Ninety-nine CTD stations, including one test station, were completed and 84 successful XBT drops were launched. CTD and XBT locations and cruise track are shown in Figure 3.1.2. Station number, date, time, location, water depth, and number of bottles tripped at each CTD station are shown in Table 3.1.4.

The test station was taken approximately at the location of the most seaward CTD station on line 1. The cruise track started at this location and ran along the cross-shelf lines 1 through 11 in order. Due to weather-related time constraints, the 10-m isobath station on line 8 (station 58, N7LA8S01C) was moved to the 10-m isobath between line 7 and 8 and the innermost XBT station on line 8 was eliminated. The water sampling contingent of the science crew disembarked at St. Petersburg on 22 November 2000. Leg two began in St. Petersburg, FL, ran seaward along line 11 and then along the 1000-m isobath to line 1. The cruise ended at the completion of the 1000-m isobath ADCP run. XBTs were dropped along the 1000-m isobath at the ends of each cross-shelf line.

Stations at which bottle samples were taken are summarized in Table 3.1.5. Nutrient and oxygen concentrations were measured from every Niskin bottle depth sampled. Salinity was measured at all bottles only at the most shoreward and most offshore stations and at the test station for a total of 23 stations. Surface bucket salinity samples were taken at 81 stations with possible influence by river water. Pigment measurements were collected at the top bottle, the chlorophyll-maximum as determined by the downcast fluorescence trace, and the low light regime immediately below the chlorophyll-maximum at 59 stations. PM samples were taken from the top, mid-depth "clear water", and bottom bottles at 52 stations. POC and PON were measured from the top and chlorophyll-maximum bottles at 52 stations.

The location, date, time, total water depth, and probe type of the 84 successful XBT drops are listed in Table 3.1.6. ADCP data were collected continuously along the survey track (Section 3.2.3). Two ADCPs were operated. A 38 kHz ADCP was operated throughout the N7 cruise in water depths greater than ~40 m. A broadband 150 kHz ADCP was operated continuously from the beginning of the cruise to the shoreward end of line 10. The broadband ADCP then was replaced with a narrowband 150 kHz ADCP as part of a scheduled comparison between the narrowband and 38 kHz instruments. The broadband ADCP was reinstalled after the ship put into port prior to the final run on line 11 and the 1000-m isobath. Flow-through, near-surface temperature, conductivity, and fluorescence were logged every 2 minutes (Section 3.2.5) during Leg 1. Surface samples were filtered and analyzed for chlorophyll *a* content to calibrate the flow-through fluorometer at 99 locations.

Five complementary research efforts were accommodated on autumn cruise N7. Thirty ARGOS-tracked drifters were launched for Dr. James M. Price of MMS. Mr. Bisman Nababan, graduate student of Dr. Frank Muller-Karger at USF, and Ms. Robyn Conmy, graduate student of Dr. Paula Coble of USF, conducted irradiance casts and collected dissolved organic carbon data for comparison with SeaWiFS data and operated an underway Safire system to collect dissolved organic material fluorescence and absorbance data. Samples were collected for the flow cytometry program of Dr. Lisa Campbell, TAMU. A 38kHz ADCP, which samples to 500-1000 m, was operated by Dr. Guinasso in cooperation with RD Instruments (RDI) for a comparison with a 150 kHz ADCP, which samples to 100-200m. Further information on these complementary research programs can be obtained from the scientists involved.

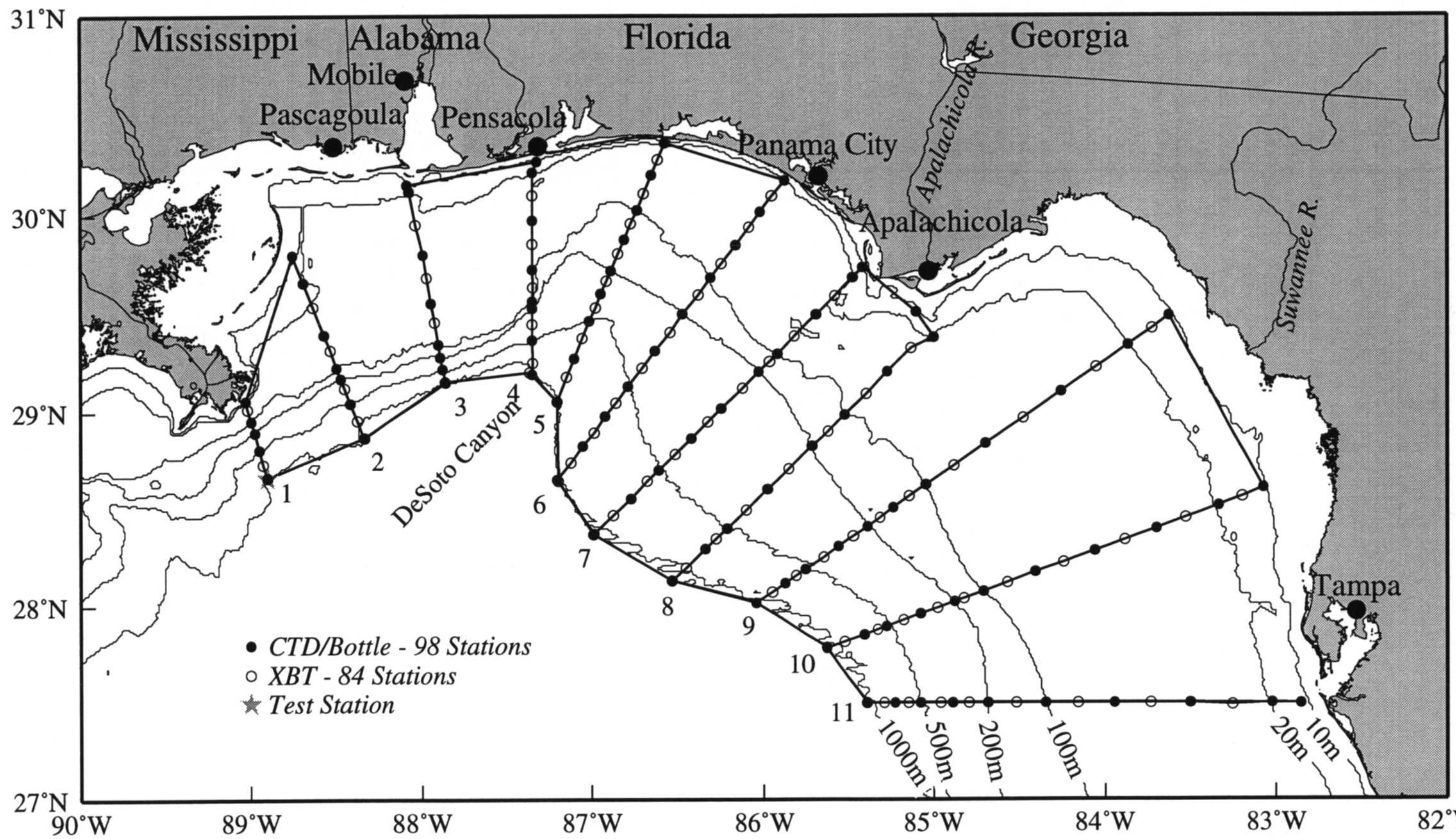

Figure 3.1.2. Station locations for cruise N7 conducted 12 - 25 November 1999. The cruise ran along lines 1 through 11 in order. The thick line shows the cruise track, which began with at test station near the most seaward station on line 1. XBTs were deployed at the offshore ends of the lines at cruise end.

Table 3.1.4. Times and locations for CTD stations on cruise N7.

Station No.	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Depth (m)	No. of Bottles
000	N7TEST00	13-NOV-1999	16:27:47	28.662690	-88.899048	1000.	12
001	N7L01S07	13-NOV-1999	18:28:53	28.662892	-88.900270	1002.	12
002	N7L01S05	13-NOV-1999	20:59:55	28.805990	-88.949197	504.	12
003	N7L01S04	13-NOV-1999	22:24:06	28.893882	-88.973517	207.	12
004	N7L01S03	13-NOV-1999	23:26:04	28.952613	-88.996395	106.	12
005	N7L01S01	14-NOV-1999	00:43:43	29.057675	-89.028092	21.	4
006	N7L02S00	14-NOV-1999	06:23:07	29.800955	-88.754447	15.	4
007	N7L02S01	14-NOV-1999	07:33:18	29.661690	-88.691905	19.	4
008	N7L02S03	14-NOV-1999	09:43:05	29.393505	-88.573053	58.	6
009	N7L02S05	14-NOV-1999	11:13:32	29.225252	-88.498328	110.	12
010	N7L02S06	14-NOV-1999	12:13:09	29.172503	-88.473820	190.	12
011	N7L02S08	14-NOV-1999	13:34:44	29.045738	-88.417888	493.	12
012	N7L02S10	14-NOV-1999	15:37:46	28.867812	-88.339902	950.	12
013	N7L03S10	14-NOV-1999	20:26:42	29.149988	-87.860715	1032.	12
014	N7L03S09	14-NOV-1999	22:09:07	29.218975	-87.879465	453.	12
015	N7L03S08	14-NOV-1999	23:16:06	29.282748	-87.891930	201.	12
016	N7L03S07	15-NOV-1999	00:13:08	29.347867	-87.902533	95.	12
017	N7L03S05	15-NOV-1999	01:59:40	29.558600	-87.947050	43.	5
018	N7L03S03	15-NOV-1999	03:50:56	29.804268	-87.995943	35.	5
019	N7L03S01	15-NOV-1999	06:26:20	30.123222	-88.076577	19.	5
020	N7L03S00	15-NOV-1999	07:13:26	30.154995	-88.087455	11.	4
021	N7L04S00	15-NOV-1999	11:49:56	30.273440	-87.327028	11.	4
022	N7L04S01	15-NOV-1999	12:23:37	30.219653	-87.352223	22.	5
023	N7L04S03	15-NOV-1999	14:10:52	29.978493	-87.352708	30.	5
024	N7L04S05	15-NOV-1999	16:03:13	29.728818	-87.352553	75.	6
025	N7L04S07	15-NOV-1999	17:31:13	29.567372	-87.353410	104.	12
026	N7L04S08	15-NOV-1999	18:26:00	29.530210	-87.352177	177.	12
027	N7L04S10	15-NOV-1999	20:12:59	29.369450	-87.351455	508.	12
028	N7L04S12	15-NOV-1999	22:01:52	29.192213	-87.351393	1014.	12
029	N7L05S17	16-NOV-1999	00:15:35	29.054842	-87.204893	996.	12
030	N7L05S15	16-NOV-1999	03:10:45	29.273787	-87.104755	710.	12
031	N7L05S13	16-NOV-1999	05:49:12	29.465822	-87.013115	485.	12
032	N7L05S11	16-NOV-1999	07:58:38	29.605508	-86.946357	264.	12
033	N7L05S09	16-NOV-1999	09:52:18	29.721987	-86.888860	201.	11
034	N7L05S07	16-NOV-1999	11:51:12	29.879738	-86.812887	148.	11
035	N7L05S05	16-NOV-1999	13:33:11	30.028668	-86.738750	100.	8
036	N7L05S03	16-NOV-1999	15:15:05	30.205975	-86.655687	28.	5
037	N7L05S01	16-NOV-1999	16:35:59	30.366022	-86.579042	19.	4
038	N7L06S01	16-NOV-1999	20:48:08	30.177853	-85.881745	20.	4
039	N7L06S03	16-NOV-1999	22:29:30	30.019093	-86.024020	32.	5
040	N7L06S05	17-NOV-1999	00:01:10	29.852153	-86.168018	47.	6
041	N7L06S07	17-NOV-1999	01:31:46	29.685480	-86.312593	100.	12
042	N7L06S09	17-NOV-1999	03:24:35	29.500403	-86.474382	202.	12
043	N7L06S11	17-NOV-1999	05:26:05	29.314737	-86.633180	384.	11
044	N7L06S13	17-NOV-1999	07:36:32	29.133575	-86.789858	498.	12
045	N7L06S15	17-NOV-1999	09:34:22	28.979363	-86.923813	618.	12
046	N7L06S17	17-NOV-1999	11:37:47	28.826920	-87.053660	768.	12
047	N7L06S19	17-NOV-1999	13:53:40	28.652945	-87.202738	993.	12
048	N7L07S17	17-NOV-1999	17:21:39	28.373960	-86.985653	994.	12
049	N7L07S15	17-NOV-1999	20:04:10	28.556108	-86.769557	663.	12
050	N7L07S13	17-NOV-1999	22:10:06	28.702852	-86.611245	495.	12
051	N7L07S11	18-NOV-1999	00:09:55	28.864117	-86.422472	381.	12

Table 3.1.4. Times and locations for CTD stations on cruise N7 (continued).

Station No.	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Depth (m)	No. of Bottles
052	N7L07S09	18-NOV-1999	02:04:14	29.017605	-86.247480	315.	12
053	N7L07S07	18-NOV-1999	04:13:07	29.207778	-86.029015	199.	12
054	N7L07S05	18-NOV-1999	05:28:46	29.298820	-85.922390	94.	12
055	N7L07S03	18-NOV-1999	07:40:54	29.499633	-85.695953	31.	4
056	N7L07S01	18-NOV-1999	09:52:44	29.686902	-85.479673	21.	4
057	N7L07S00	18-NOV-1999	10:36:47	29.736817	-85.426638	11.	4
058	N7LA8S01*	18-NOV-1999	15:20:25	29.510475	-85.101652	14.	4
059	N7L08S03	18-NOV-1999	16:44:26	29.381810	-85.000883	25.	5
060	N7L08S05	18-NOV-1999	18:56:47	29.206452	-85.273090	37.	4
061	N7L08S07	18-NOV-1999	21:07:20	28.986720	-85.526430	96.	11
062	N7L08S09	18-NOV-1999	22:58:56	28.824778	-85.719092	198.	12
063	N7L08S11	19-NOV-1999	01:24:35	28.604627	-85.977277	308.	12
064	N7L08S13	19-NOV-1999	03:46:31	28.400655	-86.216298	498.	12
065	N7L08S15	19-NOV-1999	05:20:29	28.294923	-86.340587	675.	12
066	N7L08S17	19-NOV-1999	07:33:34	28.131185	-86.532438	1003.	12
067	N7L09S21	19-NOV-1999	11:39:46	28.018270	-86.044197	978.	12
068	N7L09S19	19-NOV-1999	14:09:02	28.118267	-85.879067	674.	12
069	N7L09S17	19-NOV-1999	16:01:32	28.192272	-85.753760	496.	12
070	N7L09S15	19-NOV-1999	18:15:23	28.309668	-85.563302	303.	12
071	N7L09S13	19-NOV-1999	19:55:53	28.411183	-85.396510	199.	12
072	N7L09S11	19-NOV-1999	21:38:51	28.508007	-85.235188	161.	12
073	N7L09S09	19-NOV-1999	23:20:50	28.627435	-85.045478	98.	12
074	N7L09S07	20-NOV-1999	02:06:28	28.839893	-84.695093	46.	5
075	N7L09S05	20-NOV-1999	05:08:13	29.105590	-84.256910	27.	4
076	N7L09S03	20-NOV-1999	08:14:55	29.341962	-83.861582	19.	4
077	N7L09S01	20-NOV-1999	10:03:39	29.492247	-83.626153	11.	4
078	N7L10S01	20-NOV-1999	16:52:21	28.610233	-83.073583	11.	4
079	N7L10S03	20-NOV-1999	18:37:31	28.518478	-83.332417	19.	4
080	N7L10S05	20-NOV-1999	20:56:26	28.400387	-83.701760	30.	4
081	N7L10S07	20-NOV-1999	23:16:58	28.284727	-84.059953	39.	5
082	N7L10S09	21-NOV-1999	01:35:22	28.176533	-84.403280	59.	6
083	N7L10S11	21-NOV-1999	03:37:03	28.077852	-84.708583	102.	12
084	N7L10S13	21-NOV-1999	04:52:35	28.023395	-84.879220	201.	12
085	N7L10S15	21-NOV-1999	06:26:51	27.961443	-85.074738	314.	12
086	N7L10S17	21-NOV-1999	08:12:22	27.897020	-85.278182	493.	12
087	N7L10S19	21-NOV-1999	09:47:59	27.853492	-85.413820	653.	12
088	N7L10S21	21-NOV-1999	11:51:28	27.783585	-85.632173	986.	12
089	N7L11S18	21-NOV-1999	15:02:43	27.499818	-85.394512	997.	12
090	N7L11S16	21-NOV-1999	16:48:04	27.500225	-85.225898	751.	12
091	N7L11S14	21-NOV-1999	18:40:35	27.500603	-85.075908	496.	12
092	N7L11S12	21-NOV-1999	20:17:46	27.500210	-84.888698	296.	12
093	N7L11S10	21-NOV-1999	21:55:30	27.501265	-84.681113	200.	12
094	N7L11S08	22-NOV-1999	00:12:53	27.500410	-84.342758	100.	12
095	N7L11S06	22-NOV-1999	02:46:09	27.499500	-83.943988	58.	5
096	N7L11S04	22-NOV-1999	05:40:45	27.500968	-83.498420	42.	4
097	N7L11S02	22-NOV-1999	08:49:47	27.500712	-83.022935	21.	4
098	N7L11S01	22-NOV-1999	10:09:04	27.497340	-82.854247	13.	4

* N7LA8S01C (station 58) is on the 10-m isobath between lines 7 and 8, not on line 8 as usual for N7L08S01C.

Table 3.1.5 Number of bottles sampled by variable on cruise N7. Blank = no sample.

Station No.	Station Name	Nutrient	Oxygen	Salinity	Bucket Salinity	Pigment	PM	POC & PON
000	N7TEST00	12	12	12				
001	N7L01S07	12	12	12		3	3	2
002	N7L01S05	12	12		1	3	3	2
003	N7L01S04	12	12		1	3	3	2
004	N7L01S03	12	12		1	3	3	1
005	N7L01S01	4	4	4	1	2		
006	N7L02S00	4	4	4	1			
007	N7L02S01	4	4		1	3	3	2
008	N7L02S03	6	6		1			
009	N7L02S05	12	12		1			
010	N7L02S06	12	12		1	3		
011	N7L02S08	12	12		1	3	3	2
012	N7L02S10	12	12	12	1	3	3	2
013	N7L03S10	12	12	12	1	3	3	2
014	N7L03S09	12	12		1	3	3	2
015	N7L03S08	12	12		1	3	3	2
016	N7L03S07	12	12		1	3	3	2
017	N7L03S05	5	5		1			
018	N7L03S03	5	5		1			
019	N7L03S01	5	5		1	3	3	2
020	N7L03S00	4	4	4	1			
021	N7L04S00	4	4	4	1			
022	N7L04S01	5	5		1	3	3	2
023	N7L04S03	5	5		1			
024	N7L04S05	6	6		1			
025	N7L04S07	12	12		1	5	3	2
026	N7L04S08	12	12		1	3	3	2
027	N7L04S10	12	12		1	3	3	2
028	N7L04S12	12	12	12	1	3	3	2
029	N7L05S17	12	12	12	1	3	3	2
030	N7L05S15	12	12		1			
031	N7L05S13	12	12			4	3	2
032	N7L05S11	12	12					
033	N7L05S09	11	12		1	3		
034	N7L05S07	11	11		1			
035	N7L05S05	8	8		1	3		
036	N7L05S03	5	5		1			
037	N7L05S01	4	4	4	1	2	3	2
038	N7L06S01	4	4	4	1	1	3	1
039	N7L06S03	5	5		1			
040	N7L06S05	6	6		1			
041	N7L06S07	12	12		1	1	3	1
042	N7L06S09	12	12		1	3	3	2
043	N7L06S11	11	11		1			
044	N7L06S13	12	12			3	3	2
045	N7L06S15	12	12					
046	N7L06S17	12	12					
047	N7L06S19	12	12	12		3	3	2
048	N7L07S17	12	12	12	1	3	3	2
049	N7L07S15	12	12		1			
050	N7L07S13	12	12		1	3	3	2
051	N7L07S11	12	12		1			

Table 3.1.5 Number of bottles sampled by variable on cruise N7 (continued).

Station No.	Station Name	Nutrient	Oxygen	Salinity	Bucket Salinity	Pigment	PM	POC & PON
052	N7L07S09	12	12		1			
053	N7L07S07	12	12		1	3	3	2
054	N7L07S05	12	12		1	3	3	2
055	N7L07S03	4	4		1			
056	N7L07S01	4	4		1	3		
057	N7L07S00	4	4	4	1			
058	N7L08S01	4	4	4	1			
059	N7L08S03	5	5		1	3	3	2
060	N7L08S05	4	4		1			
061	N7L08S07	11	12		1	3	3	2
062	N7L08S09	12	12		1	3	3	2
063	N7L08S11	12	12		1			
064	N7L08S13	12	12		1	3	3	2
065	N7L08S15	12	12		1			
066	N7L08S17	12	12	12		3	3	2
067	N7L09S21	12	12	12		3	3	2
068	N7L09S19	12	12					
069	N7L09S17	12	12			3	3	2
070	N7L09S15	12	12		1			
071	N7L09S13	12	12		1	3	3	2
072	N7L09S11	12	12		1			
073	N7L09S09	12	12		1	3	3	2
074	N7L09S07	5	5		1	2	3	2
075	N7L09S05	4	4		1	1	3	1
076	N7L09S03	4	4		1	3	3	2
077	N7L09S01	4	4	4	1			
078	N7L10S01	4	4	4	1			
079	N7L10S03	4	4		1	2	3	2
080	N7L10S05	4	4		1	2	3	2
081	N7L10S07	5	5		1	2	3	2
082	N7L10S09	6	6		1			
083	N7L10S11	12	12		1	3	3	2
084	N7L10S13	12	12		1	3	3	2
085	N7L10S15	12	12					
086	N7L10S17	12	12			3	3	2
087	N7L10S19	12	12					
088	N7L10S21	12	12	12		3	3	2
089	N7L11S18	12	12	12		3	3	2
090	N7L11S16	12	12					
091	N7L11S14	12	12		1	3	3	2
092	N7L11S12	12	12		1			
093	N7L11S10	12	12		1	3	3	2
094	N7L11S08	12	12		1	3	3	2
095	N7L11S06	5	5		1			
096	N7L11S04	4	4		1	3		
097	N7L11S02	4	4		1	3		
098	N7L11S01	4	4	4	1			
	Total	911	913	188	81	168	156	100

Table 3.1.6 Launch times and locations for XBT drops on cruise N7.

Sequence Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Water Depth (m)	Probe Type
001	N7L01S06	13-NOV-1999	20:19:17	28.732722	-88.926232	734.	T7
002	N7L01S02	14-NOV-1999	00:19:27	29.015290	-89.018363	55.	T10
003	N7L02S02	14-NOV-1999	08:30:46	29.538745	-88.635680	32.	T10
004	N7L02S04	14-NOV-1999	10:30:24	29.316217	-88.537800	64.	T10
005	N7L02S07	14-NOV-1999	12:56:21	29.122958	-88.450952	294.	T7
006	N7L02S09	14-NOV-1999	14:53:56	28.955520	-88.376845	764.	T7
007	N7L03S06	15-NOV-1999	01:17:10	29.459065	-87.927525	60.	T10
008	N7L03S04	15-NOV-1999	03:00:10	29.685475	-87.974040	40.	T10
009	N7L03S02	15-NOV-1999	05:08:13	29.954318	-88.038960	34.	T10
010	N7L04S02	15-NOV-1999	13:16:16	30.102538	-87.350375	30.	T10
011	N7L04S04	15-NOV-1999	15:07:30	29.856785	-87.350797	46.	T10
013	N7L04S06	15-NOV-1999	16:55:05	29.637500	-87.349833	82.	T10
014	N7L04S09	15-NOV-1999	19:37:18	29.449278	-87.350915	361.	T7
015	N7L04S11	15-NOV-1999	21:35:00	29.253795	-87.349912	838.	T7
016	N7L05S16	16-NOV-1999	02:18:48	29.181378	-87.148928	826.	T7
017	N7L05S14	16-NOV-1999	04:58:19	29.377815	-87.056148	694.	T7
018	N7L05S12	16-NOV-1999	07:14:28	29.534165	-86.978822	345.	T7
019	N7L05S10	16-NOV-1999	09:13:08	29.671335	-86.913023	220.	T10
020	N7L05S08	16-NOV-1999	11:10:08	29.808158	-86.846675	166.	T10
021	N7L05S06	16-NOV-1999	12:55:38	29.960223	-86.774277	124.	T10
022	N7L05S04	16-NOV-1999	14:30:16	30.111228	-86.700307	48.	T10
023	N7L05S02	16-NOV-1999	15:57:07	30.283368	-86.617747	28.	T10
024	N7L06S02	16-NOV-1999	21:47:28	30.098900	-85.954642	30.	T10
025	N7L06S04	16-NOV-1999	23:14:22	29.941690	-86.089383	40.	T10
026	N7L06S06	17-NOV-1999	00:54:08	29.758407	-86.247870	68.	T10
027	N7L06S08	17-NOV-1999	02:30:55	29.598487	-86.381692	134.	T10
028	N7L06S10	17-NOV-1999	04:35:30	29.407623	-86.544470	284.	T7
029	N7L06S12	17-NOV-1999	06:45:49	29.225935	-86.708222	436.	T7
030	N7L06S14	17-NOV-1999	08:54:56	29.047407	-86.859042	560.	T7
033	N7L06S16	17-NOV-1999	10:57:35	28.892910	-86.986937	694.	T7
034	N7L06S18	17-NOV-1999	13:04:45	28.740768	-87.120828	835.	T7
036	N7L07S16	17-NOV-1999	19:04:42	28.469790	-86.873387	716.	T7
039	N7L07S14	17-NOV-1999	21:37:31	28.645062	-86.676505	584.	T7
040	N7L07S12	17-NOV-1999	23:24:02	28.784732	-86.514657	428.	T7
042	N7L07S10	18-NOV-1999	01:25:20	28.949132	-86.326033	346.	T7
044	N7L07S08	18-NOV-1999	03:25:17	29.122703	-86.125283	258.	T7
045	N7L07S06	18-NOV-1999	05:03:16	29.259515	-85.966938	146.	T7
046	N7L07S04	18-NOV-1999	06:32:07	29.387545	-85.822733	49.	T10
047	N7L07S02	18-NOV-1999	08:46:58	29.591703	-85.585798	28.	T10
048	N7L08S04	18-NOV-1999	17:37:25	29.327398	-85.128333	26.	T10
049	N7L08S06	18-NOV-1999	20:05:15	29.093402	-85.402383	50.	T10
050	N7L08S08	18-NOV-1999	22:12:31	28.901622	-85.626098	170.	T10
051	N7L08S10	19-NOV-1999	00:24:55	28.707173	-85.856067	258.	T7
052	N7L08S12	19-NOV-1999	02:48:54	28.497252	-86.103677	375.	T7
053	N7L08S14	19-NOV-1999	04:47:39	28.349655	-86.277893	579.	T7
056	N7L08S16	19-NOV-1999	06:50:53	28.197165	-86.453415	819.	T7
057	N7L09S20	19-NOV-1999	13:27:00	28.073352	-85.950960	808.	T7
059	N7L09S18	19-NOV-1999	15:29:01	28.157055	-85.809555	578.	T7
060	N7L09S16	19-NOV-1999	17:31:29	28.253847	-85.652530	332.	T7
061	N7L09S14	19-NOV-1999	19:16:55	28.360322	-85.478943	246.	T7
062	N7L09S12	19-NOV-1999	20:58:57	28.458023	-85.319400	178.	T10

Table 3.1.6 Launch times and locations for XBT drops on cruise N7 (continued).

Sequence Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Water Depth (m)	Probe Type
063	N7L09S10	19-NOV-1999	22:37:43	28.567215	-85.139172	129.	T10
064	N7L09S08	20-NOV-1999	00:40:07	28.723627	-84.882417	103.	T10
065	N7L09S06	20-NOV-1999	03:34:40	28.969807	-84.475163	36.	T10
066	N7L09S04	20-NOV-1999	06:49:31	29.230257	-84.051957	26.	T10
067	N7L09S02	20-NOV-1999	09:16:16	29.426018	-83.727403	17.	T10
068	N7L10S02	20-NOV-1999	17:41:30	28.563987	-83.195318	17.	T10
069	N7L10S04	20-NOV-1999	19:52:39	28.456228	-83.527585	26.	T10
070	N7L10S06	20-NOV-1999	22:08:34	28.342570	-83.881702	36.	T10
071	N7L10S08	21-NOV-1999	00:32:07	28.227327	-84.239238	50.	T10
072	N7L10S10	21-NOV-1999	02:44:52	28.122608	-84.568510	74.	T10
073	N7L10S12	21-NOV-1999	04:29:15	28.040252	-84.823017	164.	T10
074	N7L10S14	21-NOV-1999	05:45:48	27.992237	-84.976698	248.	T7
076	N7L10S16	21-NOV-1999	07:30:01	27.927988	-85.174098	402.	T7
077	N7L10S18	21-NOV-1999	09:09:12	27.877543	-85.333142	552.	T7
078	N7L10S20	21-NOV-1999	11:08:02	27.816452	-85.524130	794.	T7
079	N7L11S17	21-NOV-1999	16:20:31	27.500395	-85.294075	835.	T7
080	N7L11S15	21-NOV-1999	18:05:46	27.500225	-85.146202	634.	T7
081	N7L11S13	21-NOV-1999	19:50:43	27.498678	-84.957468	394.	T7
082	N7L11S11	21-NOV-1999	21:13:39	27.499958	-84.792195	236.	T7
084	N7L11S09	21-NOV-1999	23:12:08	27.500340	-84.516025	140.	T10
086	N7L11S07	22-NOV-1999	01:30:39	27.499808	-84.156487	72.	T10
087	N7L11S05	22-NOV-1999	04:12:06	27.500337	-83.733435	50.	T10
088	N7L11S03	22-NOV-1999	07:21:59	27.490553	-83.251368	34.	T10
089	N7L11S18	24-NOV-1999	21:48:45	27.499648	-85.398903	996.	T7
090	N7L10S21	25-NOV-1999	00:07:57	27.786322	-85.634550	1000.	T7
096	N7L08S17	25-NOV-1999	05:38:29	28.131430	-86.532773	1005.	T7
097	N7L07S17	25-NOV-1999	08:40:06	28.371037	-86.988458	1004.	T7
098	N7L06S19	25-NOV-1999	10:56:49	28.647342	-87.195407	1000.	T7
099	N7L05S17	25-NOV-1999	13:35:45	29.054165	-87.205153	997.	T7
100	N7L04S12	25-NOV-1999	14:51:48	29.202367	-87.365348	1037.	T7
101	N7L03S10	25-NOV-1999	17:29:45	29.153342	-87.861518	998.	T7
102	N7L02S10	25-NOV-1999	20:31:55	28.869717	-88.337332	997.	T7
103	N7L01S07	25-NOV-1999	23:54:26	28.663202	-88.899552	997.	T7

Launches at missing sequence numbers were failures or deemed bad data during QA/QC or were where the counter erroneously advanced.

3.1.3 Cruise N8

The eighth NEGOM-COH hydrography cruise (N8) was conducted aboard the *R/V Gyre* during 15 - 26 April 2000. It was staged out of St. Petersburg, FL, and returned to Pascagoula, MS. Dr. Douglas C. Biggs and Dr. Norman L. Guinasso, Jr., were co-chief scientists. There were 102 CTD stations, including a test station, and 78 successful XBT launches. CTD and XBT locations and the cruise track are shown in Figure 3.1.3.

The cruise track began with the innermost station on line 11 and ran along lines 11 through 3, then 1, and 2. The test station was made after sampling on the most seaward

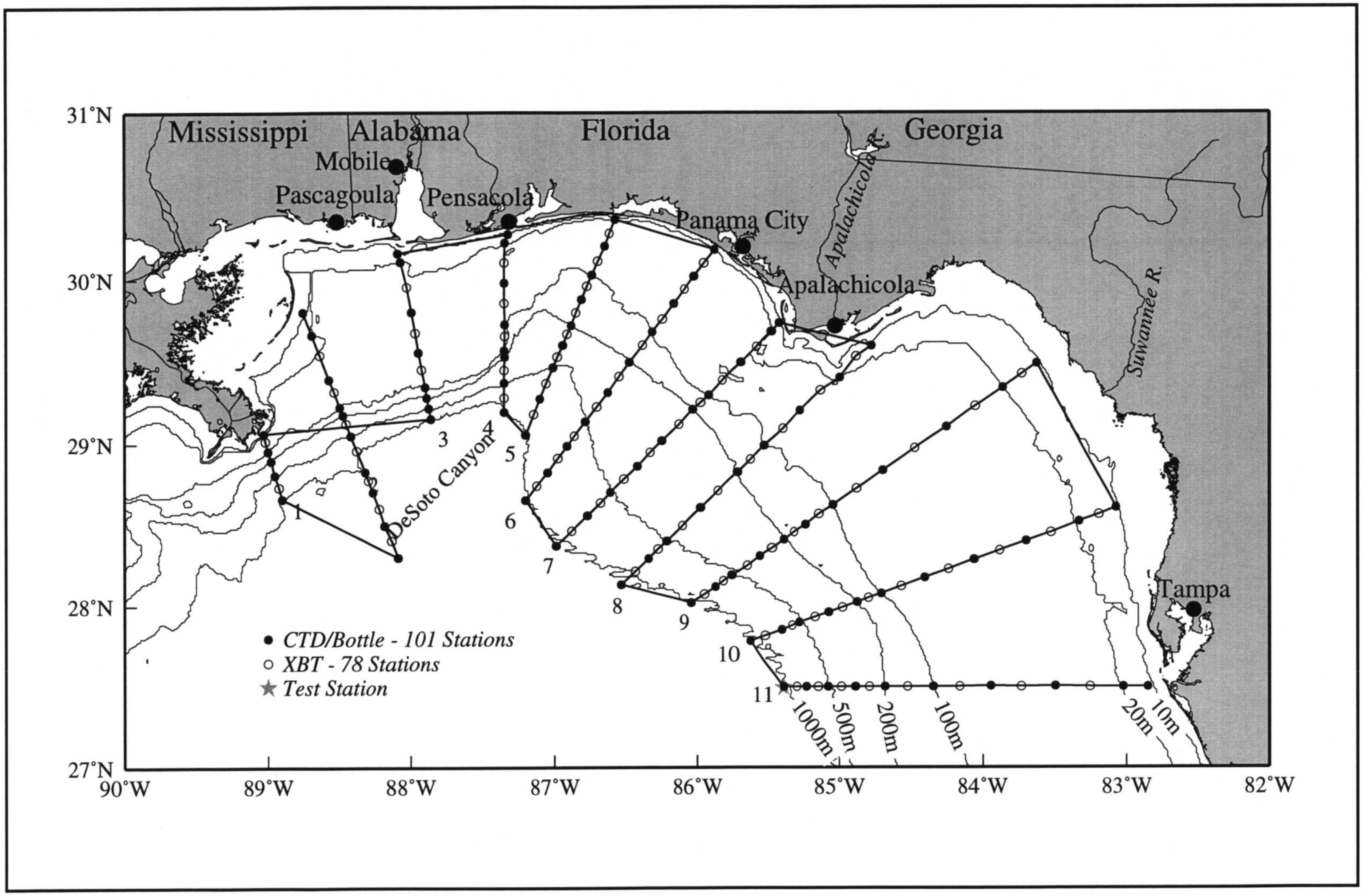

Figure 3.1.3. Station locations for cruise N8 conducted 15 - 26 April 2000. The cruise ran in order along lines 11, 10, 9, 8, 7, 6, 5, 4, 3, 1, and 2. The thick line shows the cruise track, which began at the location of the innermost station on line 11.

station on line 11 was completed. Three non-standard CTD and three non-standard XBT stations were added to extend line 2 approximately 45 km through a cold core eddy located over the upper slope. The station number, date, time, location, water depth, and number of bottles tripped at each CTD station are shown in Table 3.1.7.

Stations at which bottle samples were taken are summarized in Table 3.1.8. Nutrients and oxygen were measured from every Niskin bottle depth sampled. Duplicate sets of nutrient samples were taken and frozen at stations 32 and 33. Salinity was measured from all bottles at the most shoreward, most offshore, and test stations and from selected bottles at five diagnostic stations for a total of 28 stations. Pigment measurements were collected from the top bottle, the chlorophyll-maximum as determined by the downcast fluorescence trace, and the low light regime immediately below the chlorophyll-maximum at 60 stations. PM samples were taken from the top, mid-depth "clear water", and bottom bottles at 59 stations. POC and PON were measured from the top and chlorophyll-maximum bottles at 60 stations. Surface bucket salinity samples were taken at 68 CTD/XBT stations over the inner shelf to better define the freshwater gradients that might be associated with spring river discharge.

The location, date, time, total water depth, and probe type of the 78 successful XBT drops are listed in Table 3.1.9. Two ADCPs (38 kHz and 150 kHz) ran continuously along the track. Flow-through, near-surface temperature, conductivity, and fluorescence were logged every 2 minutes. Surface samples were filtered and analyzed at 99 locations for chlorophyll *a* content to calibrate the flow-through fluorescence.

Ten complementary research efforts were accommodated on spring cruise N8. Ryan Thomas, graduate student in geological oceanography at TAMU, and Scott Birkhead, geology undergraduate student at TAMU, took 32 gravity cores and 40 shipek-type grab samples (shallow water/sandy bottom) at selected stations after completion of CTD work. NASA conducted over-flights during the cruise to make airborne bio-optical measurements using Lidar and other instrumentation for Dr. Bob Swift (NASA) and Dr. Greg Mitchell (University of California-San Diego). As part of this effort, Lisa Vanderbloemen, graduate student of Dr. Frank Muller-Karger (USF), operated a Shipboard Laser Fluorometer and a Chelsea Fast Repetition Rate Fluorometer, which both sampled the flow-through surface water stream. She and Bisman Nababan, another USF graduate student of Dr. Muller-Karger, and Dr. Carlos del Castillo and Antoya Stovall-Leonard, post-doc and graduate student of Dr. Paula Coble (USF), conducted irradiance casts and collected dissolved organic carbon data for comparison with SeaWiFS data and operated an underway Safire system to collect dissolved organic material fluorescence and absorbance data. Samples were collected for the flow cytometry program of Dr. Lisa Campbell, TAMU. Surface whole phytoplankton samples were collected at daytime stations for Yesim Buyukates, graduate student of Dr. Daniel L. Roelke of TAMU, for her study of trigger mechanisms for blooms of possible harmful algae species. An otter trawl was pulled in three different locations on the west Florida shelf in water depths of 20 m, 25 m, and 55 m for Dr. Gil Rowe, TAMU, to provide shallow-water collections for comparison with deep water samples being collected as part of the MMS-sponsored Deep Gulf of Mexico Benthic study. Secchi disk depth readings were taken at stations during daylight. The 38kHz ADCP again was operated by Dr. Guinasso in cooperation with RDI for a comparison with the 150 kHz ADCP. Dr. Chad Fox, postdoc of Dr. Robert Leben of the Colorado Center for Astrodynamics Research, University of Colorado, participated as part of TAMU-CCAR cooperative analyses of ship and satellite altimeter data. Further information on these complementary research programs can be obtained from the scientists involved.

Table 3.1.7. Times and locations for CTD stations on cruise N8.

Station No.	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Depth (m)	No. of Bottles
001	N8L11S01	15-APR-2000	15:22:36	27.498613	-82.852110	11.	4
002	N8L11S02	15-APR-2000	16:40:21	27.501405	-83.022138	20.	4
003	N8L11S04	15-APR-2000	19:45:46	27.501668	-83.496660	42.	5
004	N8L11S06	15-APR-2000	22:46:43	27.501687	-83.944585	56.	5
005	N8L11S08	16-APR-2000	01:22:53	27.499530	-84.344237	101.	12
006	N8L11S10	16-APR-2000	04:03:33	27.500972	-84.682873	200.	12
007	N8L11S12	16-APR-2000	06:09:13	27.500233	-84.890083	297.	12
008	N8L11S14	16-APR-2000	08:18:54	27.500590	-85.076398	493.	12
009	N8L11S16	16-APR-2000	10:06:41	27.501248	-85.225688	479.	11
010	N8L11S18	16-APR-2000	12:46:53	27.498620	-85.397088	1006.	12
000	N8TEST18	16-APR-2000	14:45:21	27.491665	-85.401368	1137.	12
011	N8L10S21	16-APR-2000	18:25:05	27.783828	-85.630590	979.	12
012	N8L10S19	16-APR-2000	21:41:33	27.851758	-85.412593	654.	12
013	N8L10S17	16-APR-2000	23:49:12	27.897527	-85.276540	489.	10
014	N8L10S15	17-APR-2000	02:25:10	27.960522	-85.073483	314.	11
015	N8L10S13	17-APR-2000	04:35:33	28.023657	-84.878132	198.	12
016	N8L10S11	17-APR-2000	06:33:19	28.077020	-84.708455	102.	12
017	N8L10S09	17-APR-2000	09:10:54	28.175070	-84.402160	58.	6
018	N8L10S07	17-APR-2000	11:37:24	28.286365	-84.057472	37.	4
019	N8L10S05	17-APR-2000	13:54:46	28.400088	-83.700188	30.	4
020	N8L10S03	17-APR-2000	16:16:12	28.522132	-83.330668	19.	4
021	N8L10S01	17-APR-2000	18:09:56	28.608013	-83.072348	10.	4
022	N8L09S01	17-APR-2000	01:19:21	29.491948	-83.625337	10.	4
023	N8L09S03	18-APR-2000	03:19:22	29.343265	-83.859850	18.	4
024	N8L09S05	18-APR-2000	07:36:35	29.103283	-84.254505	27.	4
025	N8L09S07	18-APR-2000	11:05:28	28.835675	-84.695327	45.	5
026	N8L09S09	18-APR-2000	14:06:40	28.623618	-85.045740	98.	12
027	N8L09S11	18-APR-2000	16:29:54	28.502810	-85.234925	164.	12
028	N8L09S13	18-APR-2000	18:28:00	28.410238	-85.395443	199.	12
029	N8L09S15	18-APR-2000	20:29:44	28.308412	-85.560697	304.	12
030	N8L09S17	18-APR-2000	22:47:14	28.191940	-85.754313	495.	12
031	N8L09S19	19-APR-2000	00:51:03	28.118712	-85.875748	666.	12
032	N8L09S21	19-APR-2000	03:36:04	28.019367	-86.041962	971.	12
033	N8L08S17	19-APR-2000	08:31:14	28.132555	-86.532390	1003.	12
034	N8L08S15	19-APR-2000	12:00:17	28.293995	-86.341747	678.	12
035	N8L08S13	19-APR-2000	14:32:20	28.401742	-86.216342	497.	12
036	N8L08S11	19-APR-2000	17:58:17	28.608558	-85.977438	306.	12
037	N8L08S09	19-APR-2000	21:00:51	28.825823	-85.719617	197.	12
038	N8L08S07	19-APR-2000	23:19:46	28.987452	-85.528048	104.	12
039	N8L08S05	20-APR-2000	02:32:00	29.204387	-85.272990	37.	4
040	N8L08S03	20-APR-2000	04:43:20	29.403162	-84.995498	21.	4
041	N8L08S01	20-APR-2000	06:48:53	29.600187	-84.777725	12.	4
042	N8L07S00	20-APR-2000	12:48:41	29.738027	-85.428767	11.	4
043	N8L07S01	20-APR-2000	13:27:24	29.687317	-85.479662	19.	4
044	N8L07S03	20-APR-2000	17:12:22	29.500362	-85.694900	30.	4
045	N8L07S05	20-APR-2000	19:20:45	29.297947	-85.921085	94.	12
046	N8L07S07	20-APR-2000	20:45:14	29.208422	-86.028608	198.	12
047	N8L07S09	20-APR-2000	23:18:42	29.017553	-86.246555	313.	12
048	N8L07S11	21-APR-2000	01:38:34	28.862890	-86.423432	378.	11
049	N8L07S13	21-APR-2000	04:19:12	28.701672	-86.611742	495.	12
050	N8L07S15	21-APR-2000	07:05:32	28.558112	-86.770803	662.	12
051	N8L07S17	21-APR-2000	10:37:49	28.371175	-86.987520	1008.	12

Table 3.1.7. Times and locations for CTD stations on cruise N8 (continued).

Station No.	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Depth (m)	No. of Bottles
052	N8L06S19	21-APR-2000	14:52:14	28.651430	-87.203368	999.	12
053	N8L06S17	21-APR-2000	18:41:18	28.823227	-87.049807	766.	12
054	N8L06S15	21-APR-2000	21:30:07	28.983963	-86.914385	605.	12
055	N8L06S13	21-APR-2000	23:52:43	29.134413	-86.786252	493.	12
056	N8L06S11	22-APR-2000	02:30:55	29.313750	-86.631267	380.	12
057	N8L06S09	22-APR-2000	05:17:36	29.499603	-86.476150	204.	12
058	N8L06S07	22-APR-2000	08:13:12	29.684088	-86.315612	99.	12
059	N8L06S05	22-APR-2000	10:33:17	29.853705	-86.167353	46.	6
060	N8L06S03	22-APR-2000	12:21:23	30.019445	-86.023692	30.	4
061	N8L06S01	22-APR-2000	13:56:38	30.179972	-85.882888	19.	4
062	N8L05S01	22-APR-2000	18:27:43	30.364127	-86.576278	18.	4
063	N8L05S03	22-APR-2000	19:54:05	30.201700	-86.650568	27.	4
064	N8L05S05	22-APR-2000	21:27:13	30.027203	-86.739188	97.	12
065	N8L05S07	22-APR-2000	23:05:27	29.880793	-86.811628	147.	12
066	N8L05S09	23-APR-2000	00:49:12	29.722933	-86.885463	197.	12
067	N8L05S11	23-APR-2000	02:20:52	29.603747	-86.943705	266.	12
068	N8L05S13	23-APR-2000	04:04:07	29.465820	-87.012897	497.	12
069	N8L05S15	23-APR-2000	06:29:05	29.273863	-87.102320	713.	12
070	N8L05S17	23-APR-2000	09:06:12	29.053720	-87.203862	995.	12
071	N8L04S12	23-APR-2000	12:11:16	29.193778	-87.353577	1021.	12
072	N8L04S10	23-APR-2000	15:05:29	29.371743	-87.351477	497.	11
073	N8L04S08	23-APR-2000	17:13:06	29.532667	-87.349963	211.	12
074	N8L04S07	23-APR-2000	18:15:42	29.569273	-87.350700	108.	12
075	N8L04S05	23-APR-2000	20:14:26	29.730082	-87.349865	77.	12
076	N8L04S03	23-APR-2000	22:18:19	29.980355	-87.350057	26.	4
077	N8L04S01	23-APR-2000	23:59:38	30.222798	-87.349028	18.	4
078	N8L04S00	24-APR-2000	00:34:09	30.272813	-87.325970	9.	4
079	N8L03S00	24-APR-2000	05:55:28	30.156275	-88.091010	11.	4
080	N8L03S01	24-APR-2000	06:53:14	30.106373	-88.075713	19.	5
081	N8L03S03	24-APR-2000	09:32:13	29.803070	-87.996015	34.	5
082	N8L03S05	24-APR-2000	11:35:21	29.557057	-87.946453	42.	5
083	N8L03S07	24-APR-2000	13:29:01	29.346312	-87.900237	95.	12
084	N8L03S08	24-APR-2000	14:27:13	29.281675	-87.888892	211.	12
085	N8L03S09	24-APR-2000	15:47:43	29.217805	-87.875533	499.	12
086	N8L03S10	24-APR-2000	17:24:24	29.151123	-87.858395	1034.	12
087	N8L01S01	25-APR-2000	02:43:34	29.060142	-89.029900	15.	4
088	N8L01S03	25-APR-2000	04:02:15	28.951987	-88.998362	101.	12
089	N8L01S04	25-APR-2000	05:07:12	28.894297	-88.977922	205.	12
090	N8L01S05	25-APR-2000	06:31:34	28.805352	-88.951353	515.	12
091	N8L01S07	25-APR-2000	08:53:14	28.660592	-88.901180	992.	12
092	N8L02S16	25-APR-2000	16:44:50	28.299803	-88.088913	2306.	12
093	N8L02S14	25-APR-2000	19:35:06	28.497407	-88.181165	989.	12
094	N8L02S12	25-APR-2000	22:10:33	28.702412	-88.262810	989.	12
095	N8L02S10	25-APR-2000	23:59:58	28.824593	-88.317540	924.	22
096	N8L02S08	26-APR-2000	03:12:02	29.047250	-88.417458	486.	12
097	N8L02S06	26-APR-2000	05:11:30	29.173472	-88.474350	187.	12
098	N8L02S05	26-APR-2000	06:34:10	29.224315	-88.497520	110.	12
099	N8L02S03	26-APR-2000	08:28:02	29.392788	-88.572327	57.	5
100	N8L02S01	26-APR-2000	10:41:31	29.662327	-88.693227	17.	4
101	N8L02S00	26-APR-2000	11:50:31	29.802500	-88.755347	13.	4

Table 3.1.8 Number of bottles sampled by variable on cruise N8. Blank = no sample.

Station No.	Station Name	Nutrient	Oxygen	Salinity	Bucket Salinity	Pigment	PM	POC & PON
001	N8L11S01	4	4	4	1			
002	N8L11S02	4	4		1	2	3	2
003	N8L11S04	5	5		1	2	3	2
004	N8L11S06	5	5		1			
005	N8L11S08	12	12		1	3	3	2
006	N8L11S10	12	12			3	3	2
007	N8L11S12	12	12					
008	N8L11S14	12	12			3	3	2
009	N8L11S16	11	11					
010	N8L11S18	12	12	12		3	3	2
000	N8TEST18	12	12	12				
011	N8L10S21	12	12	12		3	3	2
012	N8L10S19	12	12					
013	N8L10S17	10	10	10		3	1	1
014	N8L10S15	11	11					
015	N8L10S13	12	12			3	3	2
016	N8L10S11	12	12		1	3	3	2
017	N8L10S09	6	6		1			
018	N8L10S07	4	4		1	2	3	2
019	N8L10S05	4	4		1	2	3	2
020	N8L10S03	4	4		1	2	3	2
021	N8L10S01	4	4	4	1			
022	N8L09S01	4	4	4	1			
023	N8L09S03	4	4		1	2	3	1
024	N8L09S05	4	4		1	3	3	2
025	N8L09S07	5	5		1	3	1	2
026	N8L09S09	12	12		1	3	3	2
027	N8L09S11	12	12					
028	N8L09S13	12	12			3	3	2
029	N8L09S15	12	12					
030	N8L09S17	12	12			3	3	2
031	N8L09S19	12	12					
032	N8L09S21	24	12	12		3	3	2
033	N8L08S17	24	12	12		3	3	2
034	N8L08S15	12	12					
035	N8L08S13	12	12			3	3	2
036	N8L08S11	12	12	2				
037	N8L08S09	12	12			3	3	2
038	N8L08S07	12	12		1	3	3	2
039	N8L08S05	4	4		1			
040	N8L08S03	4	4		1	2	3	2
041	N8L08S01	4	5	6	1			
042	N8L07S00	4	4	4	1			
043	N8L07S01	4	4		1	2	3	2
044	N8L07S03	4	4		1			
045	N8L07S05	12	12		1		3	2
046	N8L07S07	12	12		1	3	3	2
047	N8L07S09	12	12					
048	N8L07S11	11	11					
049	N8L07S13	12	12			3	3	2
050	N8L07S15	12	12					
051	N8L07S17	12	12	12		3		2

Table 3.1.8 Number of bottles sampled by variable on cruise N8 (continued).

Station No.	Station Name	Nutrient	Oxygen	Salinity	Bucket Salinity	Pigment	PM	POC & PON
052	N8L06S19	12	12	12		3	3	2
053	N8L06S17	12	12					
054	N8L06S15	12	12					
055	N8L06S13	12	12		1	3	3	2
056	N8L06S11	12	12		1			
057	N8L06S09	12	12		1	3	4	2
058	N8L06S07	12	12		1	3	4	2
059	N8L06S05	6	6		1			
060	N8L06S03	4	4		1			
061	N8L06S01	4	4	4	1	2	3	2
062	N8L05S01	4	4	4	1	2	3	2
063	N8L05S03	4	4		1			
064	N8L05S05	12	12		1	3	3	2
065	N8L05S07	12	12		1			
066	N8L05S09	12	12		1	3	3	2
067	N8L05S11	12	12		1			
068	N8L05S13	12	12		1	3	3	2
069	N8L05S15	12	12		1			
070	N8L05S17	12	12	12	1	3	3	2
071	N8L04S12	12	12	12	1	3	3	2
072	N8L04S10	11	11		1	3	3	2
073	N8L04S08	12	12		1	3	3	2
074	N8L04S07	12	12		1	3	3	2
075	N8L04S05	12	12		1			
076	N8L04S03	4	4		1			
077	N8L04S01	4	4		1	2	3	2
078	N8L04S00	4	4	4	1			
079	N8L03S00	4	4	4	1			
080	N8L03S01	5	5		1	2	3	2
081	N8L03S03	5	5					
082	N8L03S05	5	5		1			
083	N8L03S07	12	12		1	3	3	2
084	N8L03S08	12	12		1	3	3	2
085	N8L03S09	12	12		1	3	3	2
086	N8L03S10	12	12	12	1	3	3	2
087	N8L01S01	4	4	4	1	2	3	2
088	N8L01S03	12	12		1	3	3	2
089	N8L01S04	12	12		1	3	3	2
090	N8L01S05	12	12		1	3	3	2
091	N8L01S07	12	12	12	1	3	3	2
092	N8L02S16	12	12	2				
093	N8L02S14	12	12	2				
094	N8L02S12	12	12	2				
095	N8L02S10	11	11	11	1	3	2	2
096	N8L02S08	12	12		1	3	3	2
097	N8L02S06	12	12		1	3	3	2
098	N8L02S05	12	12		1	3	3	2
099	N8L02S03	5	5		1			
100	N8L02S01	4	4		1	2	3	2
101	N8L02S00	4	4	4	1			
	Total	972	949	207	68	163	174	118

Table 3.1.9 Launch times and locations for XBT drops on cruise N8.

Sequence Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Water Depth (m)	Probe Type
001	N8L11S03	15-APR-2000	18:06:22	27.500043	-83.250137	28.	T10
002	N8L11S05	15-APR-2000	21:29:51	27.498655	-83.733028	46.	T10
003	N8L11S07	16-APR-2000	00:16:49	27.499582	-84.159795	67.	T10
004	N8L11S09	16-APR-2000	02:58:05	27.500583	-84.526968	136.	T10
005	N8L11S11	16-APR-2000	05:23:11	27.500065	-84.792275	227.	T7
006	N8L11S13	16-APR-2000	07:37:36	27.500398	-84.986430	381.	T7
007	N8L11S15	16-APR-2000	09:28:54	27.500013	-85.146188	606.	T7
008	N8L11S17	16-APR-2000	11:58:25	27.500232	-85.295007	815.	T7
009	N8L10S20	16-APR-2000	20:52:06	27.817333	-85.522750	791.	T7
010	N8L10S18	16-APR-2000	23:21:58	27.877490	-85.332907	586.	T7
011	N8L10S16	17-APR-2000	01:39:31	27.930895	-85.167003	401.	T7
012	N8L10S14	17-APR-2000	03:51:40	27.992205	-84.976165	262.	T10
013	N8L10S12	17-APR-2000	05:48:15	28.048842	-84.798845	144.	T10
014	N8L10S10	17-APR-2000	07:58:53	28.122340	-84.568752	70.	T10
015	N8L10S08	17-APR-2000	10:29:04	28.228300	-84.239902	45.	T10
016	N8L10S06	17-APR-2000	12:48:31	28.343113	-83.881952	32.	T10
017	N8L10S04	17-APR-2000	15:03:37	28.454860	-83.526827	21.	T10
018	N8L10S02	17-APR-2000	17:17:59	28.564300	-83.194052	12.	T10
019	N8L09S02	18-APR-2000	02:13:20	29.426017	-83.729467	13.	T10
020	N8L09S04	18-APR-2000	06:00:37	29.230162	-84.052062	22.	T10
021	N8L09S06	18-APR-2000	09:25:44	28.971020	-84.475747	31.	T10
022	N8L09S08	18-APR-2000	12:43:56	28.724955	-84.882792	48.	T10
023	N8L09S10	18-APR-2000	15:23:45	28.567443	-85.139260	129.	T10
024	N8L09S12	18-APR-2000	17:45:57	28.456313	-85.318972	175.	T10
025	N8L09S14	18-APR-2000	19:44:22	28.359738	-85.478803	240.	T7
026	N8L09S16	18-APR-2000	21:55:08	28.250392	-85.652907	378.	T7
027	N8L09S18	19-APR-2000	00:14:29	28.153643	-85.815750	577.	T7
028	N8L09S20	19-APR-2000	02:49:10	28.071435	-85.950790	795.	T7
029	N8L08S16	19-APR-2000	11:01:15	28.214712	-86.435825	833.	T7
030	N8L08S14	19-APR-2000	13:55:25	28.352558	-86.274295	570.	T7
031	N8L08S12	19-APR-2000	16:41:33	28.496905	-86.104092	372.	T7
032	N8L08S10	19-APR-2000	19:43:38	28.710235	-85.853915	252.	T7
033	N8L08S08	19-APR-2000	22:23:55	28.902703	-85.627845	165.	T10
034	N8L08S06	20-APR-2000	00:41:56	29.094282	-85.402743	45.	T10
035	N8L08S04	20-APR-2000	03:47:08	29.327933	-85.128093	22.	T10
036	N8L08S02	20-APR-2000	05:57:18	29.533560	-84.887002	10.	T10
037	N8L07S02	20-APR-2000	14:24:09	29.593310	-85.587012	23.	T10
038	N8L07S04	20-APR-2000	18:21:07	29.387345	-85.823247	47.	T10
039	N8L07S06	20-APR-2000	20:14:49	29.251327	-85.979182	155.	T10
040	N8L07S08	20-APR-2000	22:11:54	29.119188	-86.130648	258.	T10
041	N8L07S10	21-APR-2000	00:44:50	28.944983	-86.330267	334.	T7
042	N8L07S12	21-APR-2000	03:20:48	28.784158	-86.514233	415.	T7
043	N8L07S14	21-APR-2000	06:09:17	28.635573	-86.682833	560.	T7
044	N8L07S16	21-APR-2000	09:33:22	28.464230	-86.881345	807.	T7
045	N8L06S18	21-APR-2000	17:38:14	28.742460	-87.124993	845.	T7
046	N8L06S16	21-APR-2000	20:48:23	28.911705	-86.978795	673.	T7
047	N8L06S14	21-APR-2000	23:03:39	29.048837	-86.861460	548.	T7
048	N8L06S12	22-APR-2000	01:38:24	29.226153	-86.707753	425.	T7
049	N8L06S10	22-APR-2000	04:17:01	29.409780	-86.546575	284.	T7
050	N8L06S08	22-APR-2000	07:11:24	29.600795	-86.385448	129.	T10
051	N8L06S06	22-APR-2000	09:35:45	29.760275	-86.246170	62.	T10

Table 3.1.9 Launch times and locations for XBT drops on cruise N8 (continued).

Sequence Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Water Depth (m)	Probe Type
052	N8L06S04	22-APR-2000	11:37:50	29.942445	-86.089875	35.	T10
053	N8L06S02	22-APR-2000	13:12:36	30.099042	-85.954870	24.	T10
054	N8L05S02	22-APR-2000	19:12:05	30.278782	-86.618752	22.	T10
055	N8L05S04	22-APR-2000	20:44:28	30.110895	-86.700923	44.	T10
056	N8L05S06	22-APR-2000	22:22:02	29.959608	-86.774202	120.	T10
058	N8L05S08	23-APR-2000	00:11:23	29.798412	-86.851632	170.	T10
059	N8L05S10	23-APR-2000	01:47:00	29.670798	-86.913160	216.	T10
060	N8L05S12	23-APR-2000	03:30:07	29.530722	-86.980952	340.	T7
062	N8L05S14	23-APR-2000	05:40:40	29.369457	-87.059068	604.	T10
063	N8L05S16	23-APR-2000	07:59:20	29.181425	-87.147605	850.	T7
067	N8L04S11	23-APR-2000	14:23:22	29.282232	-87.350963	814.	T7
065	N8L04S09	23-APR-2000	16:33:57	29.450105	-87.351028	351.	T7
066	N8L04S06	23-APR-2000	19:38:58	29.657093	-87.349987	76.	T7
067	N8L04S04	23-APR-2000	21:27:21	29.857167	-87.351065	40.	T10
068	N8L04S02	23-APR-2000	23:13:10	30.103115	-87.350908	26.	T10
069	N8L03S02	24-APR-2000	08:15:13	29.954877	-88.030585	30.	T10
070	N8L03S04	24-APR-2000	10:40:16	29.678003	-87.971988	37.	T10
071	N8L03S06	24-APR-2000	12:34:47	29.452928	-87.927208	58.	T10
072	N8L01S02	25-APR-2000	03:14:34	29.015493	-89.016728	53.	T10
073	N8L01S06	25-APR-2000	08:13:36	28.730370	-88.923632	780.	T7
075	N8L02S15	25-APR-2000	18:37:57	28.402917	-88.133520	2178.	T7
076	N8L02S13	25-APR-2000	21:21:19	28.600458	-88.220243	1942.	T7
077	N8L02S11	25-APR-2000	23:38:18	28.773873	-88.295727	1352.	T7
078	N8L02S09	26-APR-2000	02:28:16	28.955883	-88.376738	764.	T7
079	N8L02S07	26-APR-2000	04:40:07	29.123293	-88.451200	277.	T10
080	N8L02S04	26-APR-2000	07:46:09	29.316283	-88.537733	58.	T10
081	N8L02S02	26-APR-2000	09:46:02	29.540152	-88.636140	24.	T10

Launches at missing sequence numbers were failures or deemed bad data during QA/QC, or had no XBT launch although the counter advanced.

3.1.4 Cruise N9

The ninth NEGOM-COH hydrography cruise (N9) was conducted aboard the *R/V Gyre* during 28 July - 8 August 2000. It was staged out of Pascagoula, MS, and returned to Panama City, FL. Dr. Douglas C. Biggs and Dr. Norman L. Guinasso, Jr., were co-chief scientists. Ninety-nine CTD stations, including one test station, were completed and 75 successful XBT drops were made. CTD and XBT locations and the cruise track are shown in Figure 3.1.4.

The cruise track began with innermost station on line 1 and ran along lines 1 through 11 in order. The test station was made along the 1000-m isobath between lines 1 and 2. The station number, date, time, location, water depth, and number of bottles tripped at each CTD station are shown in Table 3.1.10.

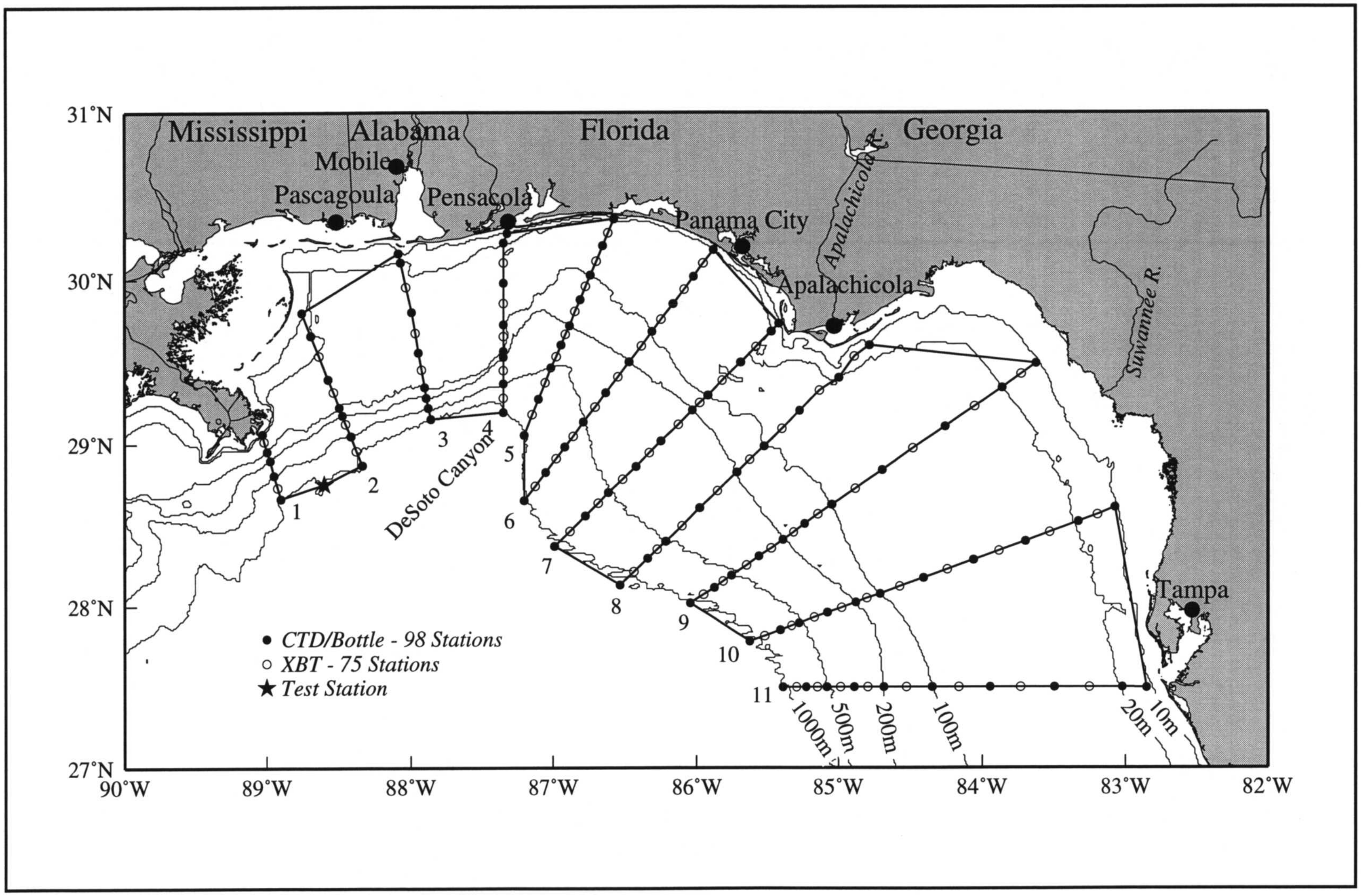

Figure 3.1.4. Station locations for cruise N9 conducted 28 July - 8 August 2000. The cruise ran in order along lines 1 through 11. Station 6 was the test station. The thick line shows the cruise track, which began at the location of the most shoreward station on line 1.

Stations at which bottle samples were taken are summarized in Table 3.1.11. Nutrients and oxygen were measured from every Niskin bottle depth sampled. Salinity was measured at all bottles at the most shoreward and most offshore stations, the test station, and one station for diagnostic purposes for at total of 24 bottle salinity stations. Pigment measurements were collected from the top bottle, the chlorophyll-maximum as determined by the downcast fluorescence trace, and the low light regime immediately below the chlorophyll-maximum at 60 stations. PM samples were taken from the top, mid-depth "clear water", and bottom bottles at 60 stations. POC and PON were measured from the top and chlorophyll-maximum bottles at 60 stations. Surface bucket salinity samples were taken at 95 CTD stations to better define the freshwater gradients that might be associated with summer river discharge.

The location, date, time, total water depth, and probe type of the 75 successful XBT drops are listed in Table 3.1.12. Two ADCPs (38 kHz and 150 kHz) ran continuously along the track. Flow-through, near-surface temperature, conductivity, and fluorescence were logged every 2 minutes. Surface samples were filtered and analyzed at 101 locations for chlorophyll *a* content to calibrate the flow-through fluorescence.

Four complementary research efforts were accommodated on cruise N9. Mr. Bisman Nababan and Ms. Lucia Odriozola, graduate students of Dr. Frank Muller-Karger at USF, and Ms. Robyn Conmy and Ms. Antoya Stovall-Leonard, respectively, research assistant and graduate student of Dr. Paula Coble of USF, made bio-optic measurements and characterized the colored dissolved organic material (CDOM). They used a flow-through AC-9 fluorometer, tandem chlorophyll and CDOM fluorometry, and irradiance casts for the bio-optical measurements, and scanning spectrophometers and an underway Safire system to collect CDOM data. Four benthic trawls were conducted by Dr. Doug Biggs of TAMU over the outer continental shelf to provide shallow-water collections for comparison with deep water samples being collected as part of the MMS-sponsored Deep Gulf of Mexico Benthic study. The 38 kHz ADCP again was operated by Dr. Norman Guinasso and Mr. John Walpert of TAMU in cooperation with RDI for a comparison with the 150 kHz ADCP. Graduate student training and research was provided to Ms. Karie Holtermann, graduate student of Dr. Denis Wiesenburg of the University of Southern Mississippi, and to Ms. Emma Roscow, graduate student of Dr. Marcus Horning of TAMU-Galveston. Entering OCNG graduate students Laurie Sindlinger, Will Fletcher, Greg Breed, and Jennifer Wagonner also participated. Further information on these complementary research programs can be obtained from the scientists involved.

Table 3.1.10. Times and locations for CTD stations on cruise N9.

Station No.	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Depth (m)	No. of Bottles
001	N9L01S01	29-Jul-2000	10:30:08	29.060208	-89.030430	16.	4
002	N9L01S03	29-Jul-2000	11:36:56	28.953500	-88.995500	101.	12
003	N9L01S04	29-Jul-2000	12:48:10	28.886000	-88.969333	209.	12
004	N9L01S05	29-Jul-2000	14:00:20	28.805833	-88.949333	499.	12
005	N9L01S07	29-Jul-2000	16:13:04	28.662000	-88.900333	1005.	12
006	N9TEST00	29-Jul-2000	20:02:00	28.746578	-88.600357	952.	12
007	N9L02S10	29-Jul-2000	22:38:08	28.869579	-88.336197	992.	12
008	N9L02S08	30-Jul-2000	00:57:47	29.047422	-88.416603	494.	12
009	N9L02S06	30-Jul-2000	02:34:59	29.176256	-88.471214	185.	12
010	N9L02S05	30-Jul-2000	03:30:12	29.224691	-88.496910	111.	12
011	N9L02S03	30-Jul-2000	06:01:08	29.393732	-88.569641	58.	7
012	N9L02S01	30-Jul-2000	08:15:01	29.661352	-88.690895	19.	5
013	N9L02S00	30-Jul-2000	09:31:31	29.800344	-88.750160	16.	4
014	N9L03S00	30-Jul-2000	13:51:52	30.153910	-88.091370	12.	4
015	N9L03S01	30-Jul-2000	14:28:47	30.099512	-88.074333	22.	6
016	N9L03S03	30-Jul-2000	16:39:03	29.800547	-87.995934	37.	6
017	N9L03S05	30-Jul-2000	18:26:47	29.555363	-87.946251	41.	5
018	N9L03S07	30-Jul-2000	20:47:42	29.342562	-87.903191	102.	12
019	N9L03S08	30-Jul-2000	21:42:43	29.280462	-87.891701	212.	12
020	N9L03S09	30-Jul-2000	22:43:57	29.217682	-87.878990	466.	12
021	N9L03S10	30-Jul-2000	23:59:10	29.150761	-87.862999	1026.	12
022	N9L04S12	31-Jul-2000	03:54:17	29.195425	-87.350655	988.	12
023	N9L04S10	31-Jul-2000	05:56:30	29.371964	-87.350861	501.	12
024	N9L04S08	31-Jul-2000	07:38:28	29.532328	-87.348839	220.	12
025	N9L04S07	31-Jul-2000	08:35:56	29.568691	-87.349312	108.	12
026	N9L04S05	31-Jul-2000	10:04:48	29.729511	-87.350334	78.	8
027	N9L04S03	31-Jul-2000	12:06:33	29.978764	-87.352249	31.	5
028	N9L04S01	31-Jul-2000	14:00:58	30.225126	-87.350876	18.	4
029	N9L04S00	31-Jul-2000	14:41:51	30.279581	-87.324982	13.	4
030	N9L05S01	31-Jul-2000	19:03:28	30.365459	-86.577888	18.	4
031	N9L05S03	31-Jul-2000	20:22:54	30.204845	-86.655907	26.	5
032	N9L05S05	31-Jul-2000	21:50:18	30.028484	-86.736832	97.	11
033	N9L05S07	31-Jul-2000	23:23:12	29.881388	-86.809906	147.	12
034	N9L05S09	01-Aug-2000	01:02:00	29.721792	-86.886116	199.	12
035	N9L05S11	01-Aug-2000	04:06:50	29.606558	-86.943741	263.	12
036	N9L05S13	01-Aug-2000	05:42:31	29.466742	-87.009552	491.	12
037	N9L05S15	01-Aug-2000	07:56:02	29.275093	-87.102364	707.	12
038	N9L05S17	01-Aug-2000	10:31:50	29.055418	-87.202850	990.	12
039	N9L06S19	01-Aug-2000	14:10:36	28.651148	-87.197968	985.	12
040	N9L06S17	01-Aug-2000	16:32:23	28.827702	-87.051094	763.	12
041	N9L06S15	01-Aug-2000	18:31:22	28.983727	-86.916710	611.	12
042	N9L06S13	01-Aug-2000	20:32:27	29.134928	-86.788551	497.	12
043	N9L06S11	01-Aug-2000	22:39:56	29.314922	-86.631371	381.	12
044	N9L06S09	02-Aug-2000	00:39:36	29.503145	-86.471359	199.	12
045	N9L06S07	02-Aug-2000	02:23:13	29.687574	-86.309998	98.	12
046	N9L06S05	02-Aug-2000	04:53:46	29.854334	-86.166595	46.	5
047	N9L06S03	02-Aug-2000	06:34:50	30.019148	-86.023186	32.	5
048	N9L06S01	02-Aug-2000	08:09:17	30.178259	-85.885010	21.	4
049	N9L07S00	02-Aug-2000	12:12:33	29.738285	-85.427216	12.	4
050	N9L07S01	02-Aug-2000	12:53:08	29.686943	-85.479340	20.	4
051	N9L07S03	02-Aug-2000	14:53:52	29.499537	-85.695427	32.	4
052	N9L07S05	02-Aug-2000	16:50:33	29.298428	-85.920540	92.	12

Table 3.1.10. Times and locations for CTD stations on cruise N9 (continued).

Station No.	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Depth (m)	No. of Bottles
053	N9L07S07	02-Aug-2000	18:13:39	29.206642	-86.027199	199.	12
054	N9L07S09	02-Aug-2000	20:26:44	29.016293	-86.247269	316.	12
055	N9L07S11	02-Aug-2000	22:24:15	28.862019	-86.423119	381.	12
056	N9L07S13	03-Aug-2000	00:28:00	28.700300	-86.611366	498.	12
057	N9L07S15	03-Aug-2000	02:23:23	28.556828	-86.774529	668.	12
058	N9L07S17	03-Aug-2000	04:45:49	28.370237	-86.987480	1007.	12
059	N9L08S17	03-Aug-2000	08:45:26	28.132650	-86.529839	995.	12
060	N9L08S15	03-Aug-2000	11:08:32	28.296984	-86.338554	671.	12
061	N9L08S13	03-Aug-2000	12:58:27	28.402109	-86.214615	496.	12
062	N9L08S11	03-Aug-2000	15:25:27	28.605288	-85.974167	308.	12
063	N9L08S09	03-Aug-2000	18:51:16	28.824873	-85.717896	197.	12
064	N9L08S07	03-Aug-2000	20:50:08	28.985283	-85.526047	112.	12
065	N9L08S05	03-Aug-2000	23:57:49	29.204578	-85.274460	42.	5
066	N9L08S03	04-Aug-2000	02:53:29	29.403296	-84.996284	21.	4
067	N9L08S01	04-Aug-2000	04:49:22	29.602659	-84.779228	13.	4
068	N9L09S01	04-Aug-2000	11:10:00	29.490488	-83.623428	11.	4
069	N9L09S03	04-Aug-2000	12:55:00	29.341192	-83.860985	19.	4
070	N9L09S05	04-Aug-2000	15:45:00	29.103357	-84.257545	27.	5
071	N9L09S07	04-Aug-2000	21:02:20	28.838102	-84.694618	46.	5
072	N9L09S09	04-Aug-2000	23:29:53	28.625866	-85.046471	99.	12
073	N9L09S11	05-Aug-2000	01:03:13	28.506580	-85.236557	164.	12
074	N9L09S13	05-Aug-2000	02:25:36	28.409250	-85.397507	202.	12
075	N9L09S15	05-Aug-2000	03:49:38	28.309015	-85.563095	306.	12
076	N9L09S17	05-Aug-2000	05:36:00	28.189022	-85.754547	506.	12
077	N9L09S19	05-Aug-2000	07:01:35	28.116503	-85.879028	677.	12
078	N9L09S21	05-Aug-2000	08:53:27	28.017967	-86.042618	988.	12
079	N9L10S21	05-Aug-2000	12:48:04	27.783567	-85.631584	992.	12
080	N9L10S19	05-Aug-2000	16:03:34	27.854818	-85.415482	655.	12
081	N9L10S17	05-Aug-2000	17:49:46	27.894672	-85.272484	491.	12
082	N9L10S15	05-Aug-2000	19:50:07	27.958378	-85.070610	314.	12
083	N9L10S13	05-Aug-2000	21:29:40	28.022945	-84.877510	199.	12
084	N9L10S11	05-Aug-2000	22:50:33	28.077909	-84.708313	101.	12
085	N9L10S09	06-Aug-2000	01:42:53	28.175903	-84.403267	59.	6
086	N9L10S07	06-Aug-2000	04:08:36	28.288713	-84.059280	38.	4
087	N9L10S05	06-Aug-2000	06:24:26	28.401600	-83.699265	31.	4
088	N9L10S03	06-Aug-2000	08:41:41	28.521595	-83.330879	20.	4
089	N9L10S01	06-Aug-2000	10:22:16	28.610165	-83.072899	12.	4
090	N9L11S01	06-Aug-2000	19:21:35	27.497105	-82.851501	12.	4
091	N9L11S02	06-Aug-2000	20:40:12	27.503393	-83.024452	22.	4
092	N9L11S04	06-Aug-2000	23:26:39	27.499905	-83.497421	42.	5
093	N9L11S06	07-Aug-2000	02:12:57	27.500595	-83.943855	57.	8
094	N9L11S08	07-Aug-2000	04:54:11	27.498529	-84.343376	101.	12
095	N9L11S10	07-Aug-2000	07:16:51	27.499632	-84.680130	200.	12
096	N9L11S12	07-Aug-2000	09:04:48	27.499872	-84.889435	297.	12
097	N9L11S14	07-Aug-2000	10:44:18	27.500814	-85.075706	494.	12
098	N9L11S16	07-Aug-2000	12:20:40	27.499393	-85.226158	755.	12
099	N9L11S18	07-Aug-2000	14:08:20	27.499550	-85.395569	1003.	12

Table 3.1.11. Number of bottles sampled by variable on cruise N9.

Station No.	Station Name	Nutrient	Oxygen	Salinity	Bucket Salinity	Pigment	PM	POC & PON
001	N9L01S01	4	4	4		2	3	1
002	N9L01S03	12	12			3	3	2
003	N9L01S04	12	12		1	3	3	2
004	N9L01S05	12	12		1	3	3	2
005	N9L01S07	12	12	12		3	3	2
006	N9TEST00	12	12	12				
007	N9L02S10	12	12	12	1	3	3	2
008	N9L02S08	12	12		1	2	3	1
009	N9L02S06	12	12		1	2	3	1
010	N9L02S05	12	12		1	2	3	1
011	N9L02S03	7	7		1			
012	N9L02S01	5	5		1	2	3	2
013	N9L02S00	4	4	4	1			
014	N9L03S00	4	4	4	1			
015	N9L03S01	6	6		1	2	3	2
016	N9L03S03	6	6		1			
017	N9L03S05	5	5		1			
018	N9L03S07	12	12		1	2	3	1
019	N9L03S08	12	12		1	2	3	1
020	N9L03S09	12	12		1	2	3	1
021	N9L03S10	12	12	12	1	2	3	1
022	N9L04S12	12	12	12	1	2	3	1
023	N9L04S10	12	12		1	2	3	1
024	N9L04S08	12	12		1	3	3	2
025	N9L04S07	12	12		1	3	3	2
026	N9L04S05	8	8		1			
027	N9L04S03	5	5		1			
028	N9L04S01	4	4		1	3	3	2
029	N9L04S00	4	4	4	1			
030	N9L05S01	4	4	4	1	2	3	1
031	N9L05S03	5	5		1			
032	N9L05S05	11	11		1	3	3	2
033	N9L05S07	12	12		1			
034	N9L05S09	12	12		1	3	3	2
035	N9L05S11	11	11		1			
036	N9L05S13	12	12		1	3	3	2
037	N9L05S15	12	12		1			
038	N9L05S17	12	12	12	1	3	3	2
039	N9L06S19	12	12	12	1	3	3	2
040	N9L06S17	12	12		1			
041	N9L06S15	12	12		1			
042	N9L06S13	12	12		1	3	3	2
043	N9L06S11	12	12		1			
044	N9L06S09	12	12		1	2	3	1
045	N9L06S07	12	12		1	3	3	2
046	N9L06S05	5	5		1			
047	N9L06S03	5	5		1			
048	N9L06S01	4	4	4	1	2	3	2
049	N9L07S00	4	4	4	1			
050	N9L07S01	4	4		1	3	3	2
051	N9L07S03	4	4		1			
052	N9L07S05	12	12		1	3	3	2

Table 3.1.11. Number of bottles sampled by variable on cruise N9 (continued).

Station No.	Station Name	Nutrient	Oxygen	Salinity	Bucket Salinity	Pigment	PM	POC & PON
053	N9L07S07	12	12		1	3	3	2
054	N9L07S09	12	12		1			
055	N9L07S11	12	12		1			
056	N9L07S13	12	12		1	2	3	1
057	N9L07S15	12	12		1			
058	N9L07S17	12	12	12	1	3	3	2
059	N9L08S17	12	12	12	1	3	3	2
060	N9L08S15	12	12		1			
061	N9L08S13	12	12		1	3	3	2
062	N9L08S11	12	12		1			
063	N9L08S09	12	12		1	3	3	2
064	N9L08S07	12	12		1	3	3	2
065	N9L08S05	5	5		1			
066	N9L08S03	4	4		1	1	3	1
067	N9L08S01	4	4	4	1			
068	N9L09S01	4	4	4	1			
069	N9L09S03	4	4		1	3	3	2
070	N9L09S05	5	5		1	3	3	2
071	N9L09S07	5	5		1	3	3	2
072	N9L09S09	12	12		1	3	3	2
073	N9L09S11	12	12		1			
074	N9L09S13	12	12		1	3	3	2
075	N9L09S15	12	12		1			
076	N9L09S17	12	12		1	3	3	2
077	N9L09S19	12	12		1			
078	N9L09S21	12	12	12	1	3	3	2
079	N9L10S21	12	12	12	1	3	3	2
080	N9L10S19	12	12		1			
081	N9L10S17	12	12		1	3	3	2
082	N9L10S15	12	12	12	1			
083	N9L10S13	12	12		1	3	3	2
084	N9L10S11	12	12		1	3	3	2
085	N9L10S09	6	6		1			
086	N9L10S07	4	4		1	2	3	2
087	N9L10S05	4	4		1	2	3	2
088	N9L10S03	4	4		1	2	3	2
089	N9L10S01	4	4	4	1			
090	N9L11S01	4	4	4	1			
091	N9L11S02	4	4		1	2	3	2
092	N9L11S04	5	5		1	3	3	2
093	N9L11S06	8	8		1			
094	N9L11S08	12	12		1	3	3	2
095	N9L11S10	12	12		1	3	3	2
096	N9L11S12	12	12		1			
097	N9L11S14	12	12		1	3	3	2
098	N9L11S16	12	12		1			
099	N9L11S18	12	12	12	1	3	3	2
	Total	925	925	200	95	158	180	106

Table 3.1.12 Launch times and locations for XBT drops on cruise N9.

Sequence Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Water Depth (m)	Probe Type
001	N9L01S02	29-Jul-2000	10:49:29	29.053000	-89.025833	22.	T-10
002	N9L01S06	29-Jul-2000	15:11:48	28.730230	-88.923890	685.	T-10
003	N9L02S09	30-Jul-2000	00:06:01	28.956303	-88.376106	764.	T-7
004	N9L02S07	30-Jul-2000	02:05:51	29.121590	-88.451164	285.	T-7
005	N9L02S04	30-Jul-2000	05:07:12	29.316860	-88.538124	63.	T-10
006	N9L02S02	30-Jul-2000	07:17:50	29.541777	-88.631409	25.	T-10
007	N9L03S02	30-Jul-2000	15:32:38	29.952791	-88.039505	29.	T-10
008	N9L03S04	30-Jul-2000	17:34:44	29.678053	-87.971725	37.	T-10
009	N9L03S06	30-Jul-2000	20:00:11	29.452667	-87.927238	60.	T-10
010	N9L04S11	31-Jul-2000	05:16:59	29.282431	-87.350838	760.	T-7
011	N9L04S09	31-Jul-2000	07:00:37	29.450132	-87.350548	355.	T-7
012	N9L04S06	31-Jul-2000	09:31:29	29.657099	-87.351418	75.	T-10
013	N9L04S04	31-Jul-2000	11:08:26	29.857082	-87.351509	40.	T-10
014	N9L04S02	31-Jul-2000	13:05:36	30.103098	-87.352203	26.	T-10
015	N9L05S02	31-Jul-2000	19:46:22	30.283710	-86.620110	22.	T-10
016	N9L05S04	31-Jul-2000	21:11:08	30.111828	-86.700737	43.	T-10
017	N9L05S06	31-Jul-2000	22:43:11	29.960014	-86.773056	118.	T-10
018	N9L05S08	01-Aug-2000	00:18:57	29.808308	-86.846764	162.	T-10
019	N9L05S10	01-Aug-2000	03:33:09	29.670635	-86.911133	218.	T-7
020	N9L05S12	01-Aug-2000	05:03:52	29.533445	-86.977081	345.	T-7
021	N9L05S14	01-Aug-2000	07:03:34	29.374163	-87.055260	610.	T-7
022	N9L05S16	01-Aug-2000	09:29:56	29.181023	-87.148331	826.	T-7
023	N9L06S18	01-Aug-2000	15:47:16	28.742859	-87.125427	860.	T-7
024	N9L06S16	01-Aug-2000	17:59:28	28.926500	-86.964333	675.	T-7
026	N9L06S14	01-Aug-2000	19:09:06	28.979321	-86.921303	550.	T-7
028	N9L06S12	01-Aug-2000	21:54:06	29.227182	-86.707001	430.	T-7
029	N9L06S10	01-Aug-2000	23:52:23	29.410807	-86.549522	283.	T-7
030	N9L06S08	02-Aug-2000	01:41:28	29.600485	-86.383972	128.	T-10
031	N9L06S06	02-Aug-2000	03:11:12	29.759678	-86.245232	62.	T-10
032	N9L06S04	02-Aug-2000	05:49:24	29.943398	-86.092522	35.	T-10
033	N9L06S02	02-Aug-2000	07:28:52	30.104774	-85.950233	25.	T-10
034	N9L07S02	02-Aug-2000	13:57:48	29.593307	-85.587715	23.	T-10
035	N9L07S04	02-Aug-2000	16:01:38	29.387260	-85.823051	46.	T-10
036	N9L07S06	02-Aug-2000	17:42:49	29.249521	-85.976570	158.	T-10
037	N9L07S08	02-Aug-2000	19:24:41	29.120893	-86.129761	260.	T-10
038	N9L07S10	02-Aug-2000	21:36:19	28.944637	-86.329948	337.	T-7
039	N9L07S12	02-Aug-2000	23:36:36	28.784597	-86.512451	425.	T-7
040	N9L07S14	03-Aug-2000	01:38:47	28.634785	-86.686287	568.	T-7
041	N9L07S16	03-Aug-2000	03:49:45	28.463589	-86.880440	780.	T-7
042	N9L08S16	03-Aug-2000	10:20:16	28.214539	-86.435028	745.	T-7
043	N9L08S14	03-Aug-2000	12:25:46	28.352448	-86.273903	566.	T-7
044	N9L08S12	03-Aug-2000	14:22:02	28.496943	-86.103432	370.	T-7
045	N9L08S10	03-Aug-2000	16:47:27	28.710327	-85.853790	250.	T-7
046	N9L08S08	03-Aug-2000	19:55:38	28.908333	-85.633500	164.	T-10
047	N9L08S06	03-Aug-2000	22:52:51	29.094513	-85.403000	45.	T-10
048	N9L08S04	04-Aug-2000	01:15:26	29.328314	-85.130066	22.	T-10
049	N9L08S02	04-Aug-2000	03:59:58	29.533381	-84.886749	10.	T-10
050	N9L09S02	04-Aug-2000	11:58:07	29.426888	-83.728714	12.	T-10
051	N9L09S04	04-Aug-2000	14:15:04	29.230286	-84.052322	21.	T-10
052	N9L09S06	04-Aug-2000	19:29:42	28.970110	-84.474701	32.	T-10
053	N9L09S08	04-Aug-2000	22:23:06	28.722008	-84.876007	47.	T-10
054	N9L09S10	05-Aug-2000	00:22:53	28.567778	-85.138489	128.	T-10
055	N9L09S12	05-Aug-2000	01:52:34	28.457289	-85.319191	175.	T-10
056	N9L09S14	05-Aug-2000	03:13:56	28.359823	-85.478706	228.	T-10
057	N9L09S16	05-Aug-2000	04:54:49	28.239167	-85.678833	400.	T-7
058	N9L09S18	05-Aug-2000	06:30:44	28.152674	-85.814011	575.	T-7

Table 3.1.12 Launch times and locations for XBT drops on cruise N9 (continued).

Sequence Number	Station Name	Date (UTC)	Time (UTC)	Latitude (°N)	Longitude (°W)	Water Depth (m)	Probe Type
060	N9L09S20	05-Aug-2000	08:15:42	28.066885	-85.956367	790.	T-7
061	N9L10S20	05-Aug-2000	14:41:27	27.815557	-85.523293	749.	T-7
062	N9L10S18	05-Aug-2000	17:14:04	27.877342	-85.332687	575.	T-7
063	N9L10S16	05-Aug-2000	19:00:06	27.928167	-85.165604	385.	T-7
064	N9L10S14	05-Aug-2000	20:51:47	27.993065	-84.977722	243.	T-7
065	N9L10S12	05-Aug-2000	22:15:50	28.048607	-84.800026	144.	T-7
066	N9L10S10	05-Aug-2000	23:56:08	28.122587	-84.569199	70.	T-10
067	N9L10S08	06-Aug-2000	02:53:22	28.227797	-84.239891	44.	T-10
068	N9L10S06	06-Aug-2000	05:17:50	28.342657	-83.881805	38.	T-10
069	N9L10S04	06-Aug-2000	07:30:13	28.456329	-83.527473	27.	T-10
070	N9L10S02	06-Aug-2000	09:34:25	28.564222	-83.194969	13.	T-10
071	N9L11S03	06-Aug-2000	22:10:07	27.499140	-83.269096	29.	T-10
072	N9L11S05	07-Aug-2000	00:56:43	27.499735	-83.732750	46.	T-10
073	N9L11S07	07-Aug-2000	03:40:11	27.499660	-84.159904	66.	T-10
074	N9L11S09	07-Aug-2000	06:15:42	27.499928	-84.524269	140.	T-10
075	N9L11S11	07-Aug-2000	08:25:29	27.500196	-84.791840	233.	T-7
076	N9L11S13	07-Aug-2000	10:07:51	27.500076	-84.985954	391.	T-7
077	N9L11S15	07-Aug-2000	11:47:39	27.499878	-85.146027	590.	T-7
078	N9L11S17	07-Aug-2000	13:28:02	27.499960	-85.295410	839.	T-7

Launches at missing sequence numbers were failures or deemed bad data during QA/QC (59), or had no XBT launch although the counter advanced (25 & 27).

3.2 Instrumentation, Calibration, and Sampling Procedures

Standard oceanographic instrumentation and sampling procedures were used to collect measurements on the NEGOM-COH cruises. Data taken at each station consist of five types—continuous profiles, discrete measurements, ADCP measurements, XBT profiles, and supplementary underway measurements. The equipment and data collection procedures for each were summarized in previous NEGOM-COH reports (Jochens and Nowlin, 1998, 1999). Below are given changes in methods or procedures and additional information on data collection. At the time of this report, processing of data from cruises N6, N7, and N8 was completed, but data processing for cruise N9 was in progress.

3.2.1 Continuous Profiles

Continuous profiles versus pressure were made of temperature, conductivity, downwelling irradiance (with a photosynthetically available radiation (PAR) sensor), transmissivity, fluorometry, optical backscatter, and, although not contractually required, dissolved oxygen. Instruments were mounted on the Rosette frame below the Niskin water bottles and Rosette system to provide unperturbed, obstruction-free flow of water to all instruments during the downcast. The various instruments were interfaced with the CTD, which transmitted data to the Sea-Bird SBE-11 deck unit for data logging and storage. The altimeter allowed the CTD package to be lowered to within 1-5 meters of the sea floor. Typically two sets of instruments were taken on each cruise to provide back-up instrumentation. This redundancy helped assure collection of complete data sets for each parameter. No major CTD equipment failure occurred on these cruises. The hydrographic equipment used on the cruises is listed in Table 3.2.1. Sensor specifications and methods were detailed in Jochens and Nowlin (1998).

Table 3.2.1 Hydrographic equipment available on cruises N6, N7, N8, and N9.

Instrument	**Manufacturer**	**Quantity**			
		N6	**N7**	**N8**	**N9**
CTD system	Sea-Bird SBE-911*plus*	2	2	2	2
CTD deck unit	Sea-Bird SBE-11	2	2	2	2
Rosette system	General Oceanics 12 place	2	2	1	1
Carousel system	Seabird Carousel 24 place			1	1
Rosette frame	TAMU fabrication	2	2	1	1
Carousel frame	Seabird			1	1
Niskin bottles	GO Lever Action, 10 liter	14	14	14	14
Niskin bottles	GO Standard, 10-12 liter	10	10	10	8
Transmissometer	25-cm SeaTech 2000 m	2	2	1	1
Transmissometer	Wetlabs 6000m CStar			1	1
Fluorometer	Chelsea Instruments	2	2	2	1
Optical backscatter	SeaTech light scattering sensor	2	2	2	2
PAR sensor	Biospherical QSP-200L	2	2	2	2
Altimeter	Datasonics PSA-900	2	2	1	2
Altimeter	Datasonics PSA-916 2500m			1	1
Oxygen sensor	Sea-Bird SBE 13, Beckman polarographic	2	2	2	2

3.2.2 Discrete Measurements

Water samples for discrete measurements were collected from 10-liter Niskin bottles mounted on a General Oceanics Rosette sampler. Typically, four to 12 bottles per station were used. Bottles were tripped at the maximum CTD depth, the sea surface (~3 m), and the chlorophyll maximum as determined from the fluorescence profile by the CTD operator. Other bottles were tripped at the sigma-theta surfaces, when present, specified in Table 3.2.2. Some of these surfaces are associated with specific water masses brought into the Gulf by the Loop Current. The CTD operator had discretion to trip unused bottles to fill gaps in bottle spacing or to sample in interesting features in temperature, salinity, fluorescence, or percent transmission profiles. Extra bottles, when available, were taken at 20-m and 50-m depths for flow cytometry sampling. Generally, in water depths of 100 m or more, all 12 bottles were tripped regardless of availability of surfaces.

Discrete water samples were taken for nutrients (phosphate, silicate, nitrate, nitrite, ammonium, and urea) and dissolved oxygen at all stations and for PM, POC/PON, and phytoplankton pigments at approximately 60 stations on each cruise. The PM/POC/PON and pigment samples usually were taken from the same stations to facilitate integration and interpretation of data. For salinity, samples were measured at bottles from the inshore-most and offshore-most stations, from leaking bottles, and for stations with unplanned bottle trips. Salinity also was measured from surface bucket samples taken at each station located in regions under possible influence of river water.

Water samples were drawn and processed as soon as the CTD-Rosette system was brought on board. Analyses of dissolved oxygen, nutrients, and salinity were performed at sea. Samples for PM, POC/PON, and phytoplankton pigments were filtered at sea, and the filters returned for final processing onshore. Methods and analysis specifications are provided in previous NEGOM-COH annual reports (Jochens and Nowlin, 1998, 1999).

Table 3.2.2 Bottle tripping locations.

Trip Location	Comments
Top	generally about 3-m depth
Chlorophyll maximum	as indicated by downcast fluorescence maximum
Bottom	generally 1 to 5 m above sea floor
Available σ_θ surfaces:	
24.6	
25.4	salinity maximum in Subtropical Underwater
25.9	
26.2	
26.5	oxygen maximum in 18°C Sargasso Sea Water
26.8	
27.0	
27.15 or 27.10	oxygen minimum in Tropical Atlantic Central Water
27.45	salinity minimum in Antarctic Intermediate Water
Other bottles if available	interesting features in downcast profiles or for spacing

PON measurements were made on all NEGOM-COH cruises. Although not required by the contract, PON data are included in the master bottle data sets for each cruise. Methods of sample collection and analysis for the POC/PON filters are described in Jochens and Nowlin (1998, 1999). POC/PON filter samples for N6 through N9 were analyzed at the Virginia Institute of Marine Science.

3.2.3 Acoustic Doppler Current Profiler Measurements

ADCP measurements were made along track on cruises N6, N7, N8, and N9. Data were collected using a 150-kHz broadband ADCP (S/N 1183) for N6 through N8. A 150-kHz narrowband ADCP (S/N 355) was used on cruise N7 along lines 10 and 11 and on cruise N9. Also, an experimental Ocean Surveyor 38 kHz (OS-38) ADCP (S/N 8) was operated simultaneously with the 150 kHz ADCPs on N7, N8, and N9. All three ADCP instruments were manufactured by RD Instruments (RDI) of San Diego, CA. The OS-38 was on loan to the NEGOM-COH program by RDI for the purposes of side-by-side comparison with the 150 kHz instruments, beta-testing of data acquisition software, and instrument development. Figure 3.2.1 shows locations with data from the 150 kHz instruments, giving the general cruise tracks for collection of ADCP data. Dates of data collection and quantity of raw ADCP and navigation data are summarized in Table 3.2.3.

Accurate ship position data are crucial for useful shipboard ADCP data. Differential global positioning system (DGPS) position fixes were used when available. ADCP data processing, recording, and instrument control were done using the DOS-based RDI TRANSECT program during cruises N6, N8, and N9. The Windows-based RDI VMDAS program was the data acquisition software used on N7. Details on instrument specifications, mounting on the vessel, data processing, and associated navigation data are provided in Jochens and Nowlin (1998).

A Sperry gyrocompass was used to provide ship heading to the ADCP during cruise N6. The gyrocompass historically has provided a source of error when determining current velocity because of lag and directional sticking, thus leading to directional biases that have to be systematically corrected. Therefore, an AshTech ADU2 3DF positioning antenna array (S/N AD00251), installed on the *R/V Gyre* and capable of more accurate ship heading by utilizing DGPS fixes, was configured to provide ship heading directly to

Table 3.2.3. Dates and quantity of 150 kHz ADCP data.

Cruise	ADCP Start (UTC)	ADCP Stop (UTC)	Acquisition Program	Quantity of Data (Mbyte)	OS-38
N6	15 August 1999 19:33	28 August 1999 04:42	TRANSECT	401	no
N7	13 November 1999 03:30	24 November 1999 23:55	VMDAS	1007	yes
N8	15 April 2000 14:57	25 April 2000 12:56	TRANSECT	620	yes
N9	29 July 2000 02:56	08 August 2000 11:41	TRANSECT	586	yes

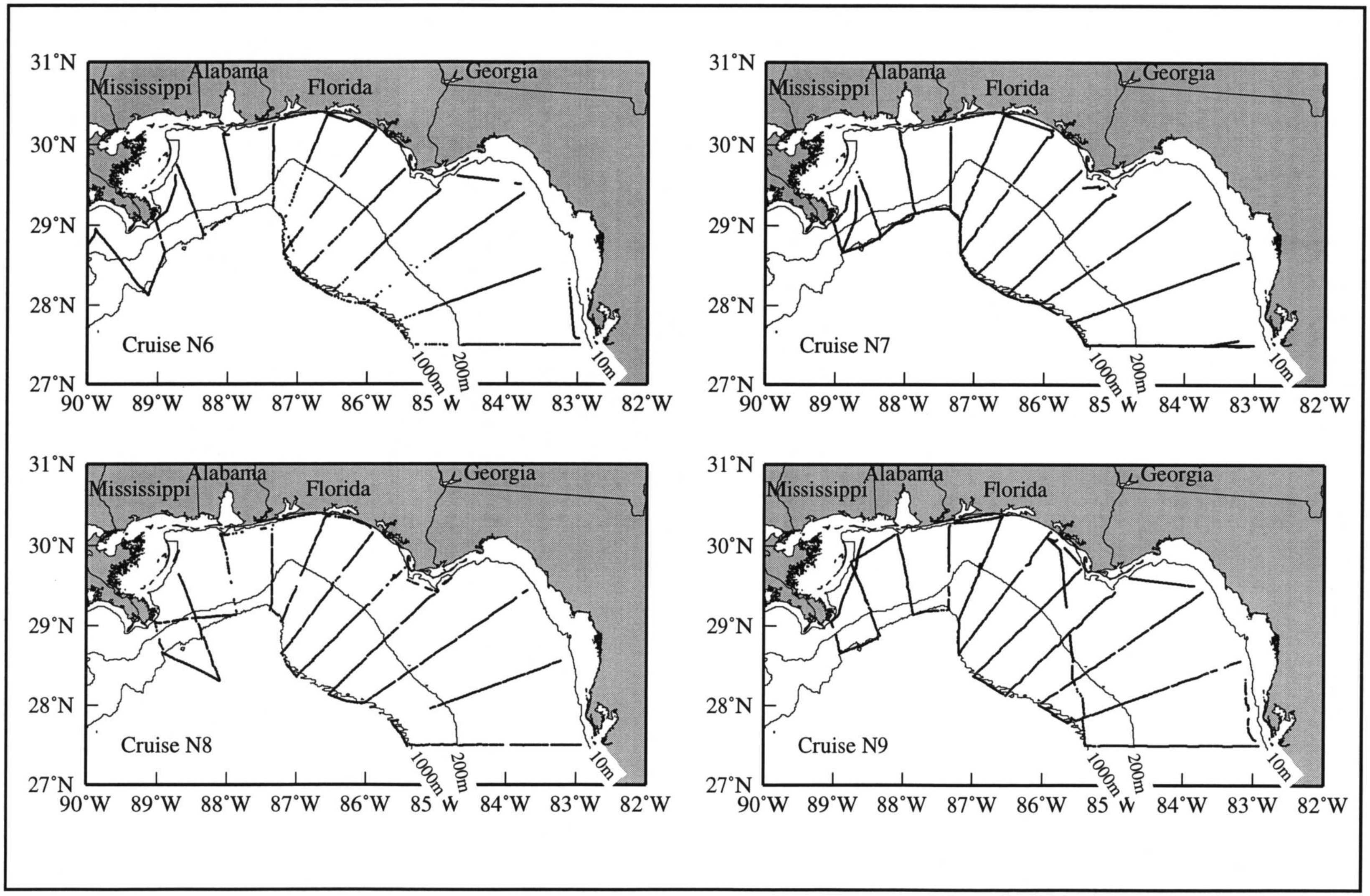

Figure 3.2.1. Locations of ADCP data for cruises N6, N7, N8, and N9.

the ADCP during cruises N7, N8, and N9. For N6, ship heading determined using the AshTech was saved in a separate file for post-cruise integration into the ADCP processing. The AshTech heading allows processing and QA/QC of data collected while on-station, accelerating/decelerating, and turning; these data were discarded on past cruises due to the unreliability of the gyro heading during these times.

The configurations recorded for the ADCP during each cruise are shown in Table 3.2.4. Configurations are basically identical for each cruise, except that bin sizes for the OS-38 are 40 m. This enhances continuity among the different cruises and simplifies analysis and interpretation. The number of velocity pings per ensemble was changed from 2 to 1 on N7 and subsequent cruises to enhance the ensemble processing procedures.

3.2.4 XBT Measurements

Expendable bathythermograph (XBT) profiles were obtained using Sippican, Inc., T7 and T10 probes. T10s operate to 200 m and were used at stations in water depths of 200 m or shallower. T7s operate to depths of 760 m and were used at other stations. The probe type for each XBT deployment which produced usable data, as well as the drop locations, are given in Tables 3.1.3 (N6), 3.1.6 (N7), 3.1.9 (N8), and 3.1.12 (N9). XBT deployment locations are shown in Figures 3.1.1 (N6), 3.1.2 (N7), 3.1.3 (N8), and 3.1.4 (N9). On N6, there were 89 successful XBTs out of 99 launches. On N7, there were 103 XBT launches of which 84 produced data. On N8, 81 XBTs were released, 78 returned good data. On N9, there were 75 successful XBTs out of 76 launches. Methods for deployment were detailed in Jochens and Nowlin (1998).

Table 3.2.4. ADCP configuration summary.

Parameter	**Cruise**			
	N6	**N7**	**N8**	**N9**
Instrument type	broadband	broadband	broadband	narrowband
Frequency (kHz)	153.6	153.6	153.6	153.6
Transducer pattern	convex	convex	convex	concave
Depth cell length (m)	4	4	4	4
Number of depth cells	90	90	90	60
Segment time (minutes)	5	5	5	5
Time between pings (sec)	1	1	1	1
Velocity pings per ensemble	2	1	1	1
First bin depth (m)	14	14	14	14
Transmit pulse length (m)	4	4	4	4
Blank after transmit (m)	4	4	4	4
Navigation type	DGPS	DGPS	DGPS	DGPS
Data recorded	raw, navigation, averaged	raw, navigation, averaged	raw, navigation, averaged	raw, navigation, averaged

3.2.5 Underway Measurements

Near-surface (~3 m) temperature, conductivity, and fluorescence were logged every 2 minutes throughout cruises N6 through N9 using the Serial ASCII Interface Loop (SAIL) system on the *R/V Gyre*. These measurements continued and extended similar data logging during cruises N1 through N5 in the first and second field years. The fluorescence was calibrated to chlorophyll concentration by correlation with chlorophyll samples obtained from the flow through stream. The underway measurements are supplemental to the contractually required data discussed in Sections 3.2.1 through 3.2.4. However, these underway data are useful in fixing the location of river plumes and other confluence and frontal regimes. Details on sensors, logging procedures, calibration procedures, and QA/QC of underway measurements were given in the first annual report (Jochens and Nowlin, 1998). During the third year, data usually were logged from port of departure to port of return.

Raw data from each cruise generally are better than 95% complete along the cruise track. Locations of 2-minute data are shown in Figure 3.2.2. Breaks in the SAIL data logging are seen as gaps in the tracks in the figure. The causes of the longer hiatus periods were lock-up of computer systems and/or pump problems resulting in no flow to the main lab or sensors. Other down time during the four cruises was approximately 2 to 4 minutes per day when the SAIL data computer was backed up. Locations of discrete samples that were filtered and analyzed for chlorophyll for calibration of the flow-through fluorometer data are given in Figure 3.2.3.

3.3 Summary of Field Data Collected

A summary of the data collected and scientific participation on the three cruises conducted in this reporting period is given in Table 3.3.1. Samples taken at test or supplementary stations are not included in this tabulation. In addition, visiting researchers on each cruise collected complementary data for use in their individual research programs. Information relative to these complementary programs is given in Table 3.3.2 and described in section 3.1.

3.4 Summary of Collateral Data Assembly

To provide comparative information, historical data and physical oceanographic and ancillary data collected concurrently with the NEGOM-COH field program have been assembled. Historical data sets include hydrography and current measurements. These were summarized in Jochens and Nowlin (1998). Concurrent data sets were identified and assembled, including sea surface height anomaly (SSHA) from satellite altimeter, sea surface temperature from satellite Advanced Very High Resolution Radiometer (AVHRR) sensors, and ocean color from the SeaWiFS satellite. Ancillary data were acquired, including river discharge, surface wind speed and direction, air temperature, surface barometric pressure, frontal passages, and sea level. Using the surface meteorological observations and objective analysis, surface wind and wind stress fields were produced at one-hour intervals using objective analysis (see Figure 5.1.1 in Jochens and Nowlin, 1999, for an example). Table 3.4.1 shows the major concurrent and ancillary data sets assembled.

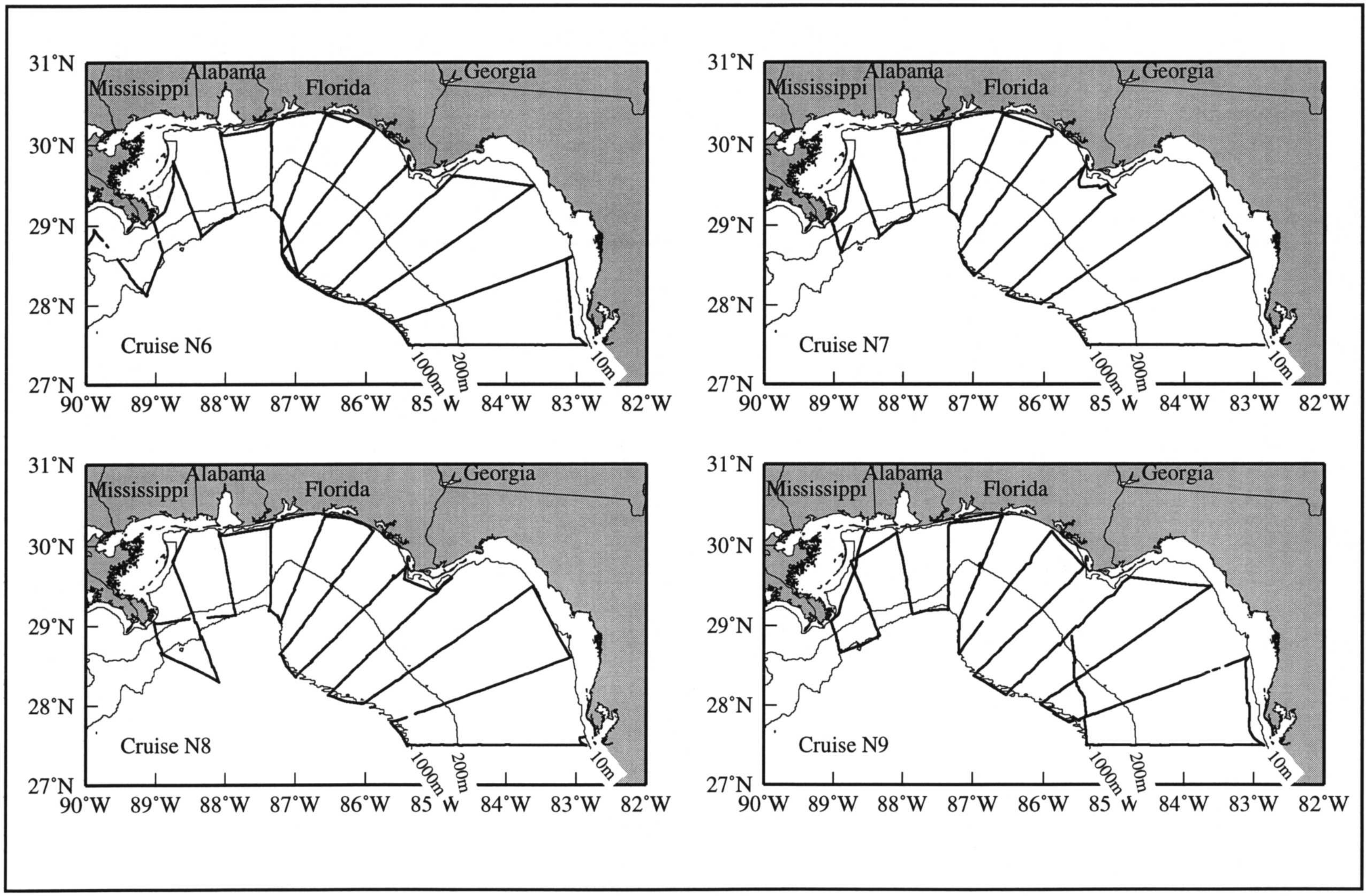

Figure 3.2.2. Locations of near-surface, flow-through temperature, salinity, and fluorescence data logged every 2 minutes on cruises N6, N7, N8, and N9.

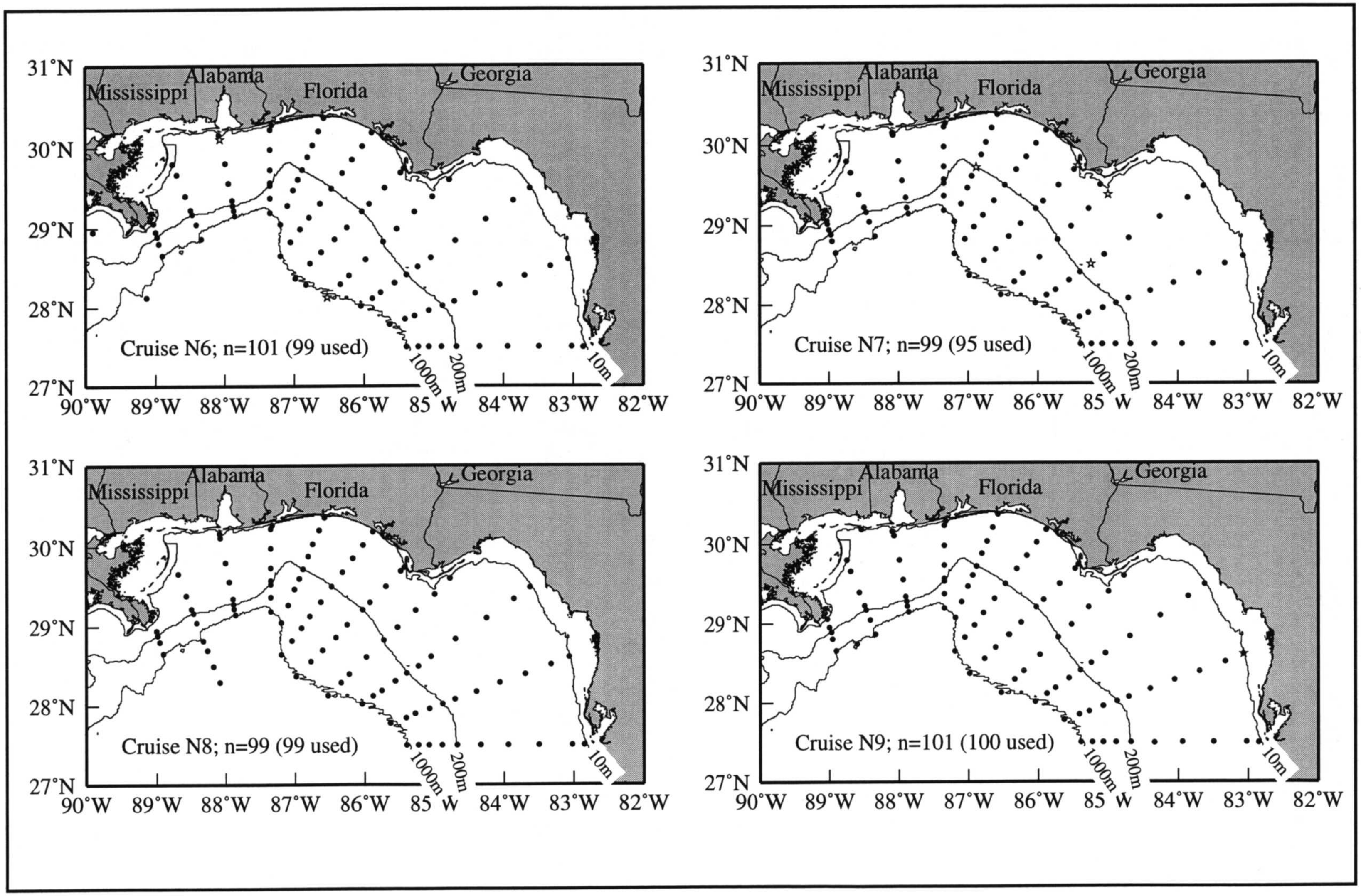

Figure 3.2.3. Locations of discrete samples filtered for calibration at sea of near-surface, flow-through fluorometer data on cruises N6, N7, N8, and N9. Stars denote outlier points not used in the calibration.

Table 3.3.1. Summary of data collection and scientific participation on NEGOM-COH cruises. Cruise duration and track length represent port-to-port values; the cross-shelf track is approximately 2742 km. Numbers from test/supplemental stations are excluded.

Description	N6 August 1999	N7 November 1999	N8 April 2000	N9 August 2000
Cruise duration (days)	13	13	12	11
Cruise track (km)	3743[a]	3659[b]	2825[c]	3195[d]
Total hydrographic stations	100	99	102	99
CTD stations	98	98	101	98
Nutrient stations	98	98	101	98
Oxygen stations	98	98	101	98
Salinity stations	23	22	27	24
Pigment stations	60	59	60	60
Particulate matter stations	60	52	59	60
Particulate organic carbon stations	61	52	60	60
XBT drops (successful/total)	89/99	84/103	78/81	75/76
Nutrient samples	913	899	960	913
Oxygen samples	913	901	937	913
Salinity samples	175	176	195	188
Pigment samples	175	170	163	158
Particulate matter samples	180	156	174	180
Particulate organic carbon samples	126	100	118	106
Surface bucket salinity samples	58	81	68	95
Surface chlorophyll samples	101	99	99	101
Underway surface temperature and conductivity logging	2 min	2 min	2 min	2 min
Underway surface fluorescence logging	2 min	2 min	2 min	2 min
Total scientific party	23	18	24	23
NEGOM-COH scientists	13	14	13	15
Guest investigators on board	6	3	7	5
Students	10	7	12	11
Complementary studies	7	5	10	4

[a] Galveston, TX, to Panama City, FL

[b] Gulfport, MS, to St. Petersburg, FL; excludes ADCP run

[c] St. Petersburg, FL, to Pascagoula, MS

[d] Pascagoula, MS, to Panama City, FL

Table 3.3.2 Complementary programs on NEGOM-COH hydrography surveys.

Description	N6	N7	N8	N9
Drifter launches		30		
Flow cytometry sampling	yes	yes	yes	
Bio-optical stations	~2 per day	~2 per day	~2 per day	~2 per day
Safire system sampling	yes	yes	yes	yes
Shipek-type grab cores			40	
Gravity/box cores	4/2		32	
Piston cores	4			
38 kHz ADCP testing		yes	yes	yes
Altimeter-*in situ* data observers			1	
Red tide observer	1			
Phytoplankton sampling			yes	
Salinity water samples for teaching	6			
Otter or benthic trawls			3	4
Secchi depth readings			yes	
NASA bio-optical over-flights			yes	

Table 3.4.1. Gulf of Mexico collateral data assembled in support of NEGOM-COH.

Data Type	Dates	Major Sources
Sea surface height anomaly fields (blended TOPEX/Poseidon and ERS-2 satellite altimeter product)	November 1997–August 2000; Daily	Dr. Robert L. Leben, Colorado Center for Astrodynamics Research, University of Colorado
Sea surface temperature fields (satellite AVHRR)	November 1997–August 2000; 7-day composites	Johns-Hopkins University, Applied Physics Laboratory
Sea surface ocean color fields (SeaWiFS)	Composites for periods of 9 NEGOM cruises	Dr. Frank Muller-Karger, University of South Florida
River discharge: Mississippi and rivers discharging into the northeast Gulf	1998 and 1999 water years; available data for 2000	U.S. Geological Survey
Meteorological: wind speed and direction, barometric pressure, air and sea surface temperature, relative humidity, dew point	November 1997–August 2000	National Data Buoy Center, various airports
Currents: current meter and moored ADCP	March 1997 through March 1999	Science Applications International Corp., NEGOM DeSoto Canyon Eddy Intrusion Study
Sea level	various	Conrad Blutcher Institute; NOAA National Ocean Service

4 DATA QUALITY ASSURANCE AND CONTROL

A summary of the results of data processing and quality assurance/quality control (QA/QC) processing for cruises N5 through N8 and preliminary results for cruise N9 are discussed in this section. The data processing and QA/QC methods for each type of data, together with results of QA/QC processing for November 1997 through June 1998, were presented in the first annual report (Jochens and Nowlin, 1998). Changes to those methods and a summary of the results of QA/QC processing for July 1998 through June 1999 were given in the second annual report (Jochens and Nowlin, 1999).

4.1 Continuous Profile Data

The composite plots of CTD temperature versus salinity for cruises N5 (spring 1999), N6 (summer 1999), N7 (fall 1999), N8 (spring 2000), and N9 (summer 2000; preliminary data) show good quality results for the continuous sensors (Figures 4.1.1 through 4.1.5). Note the seasonal differences for temperatures higher than 18°C and the lack of scatter and the tight fit below 18°C.

4.2 Discrete Measurements

4.2.1 Nutrients, Oxygen, and Salinity

Nitrate versus phosphate concentrations for cruises N5 – N7 (1999) and N8 – N9 (2000) are shown in Figures 4.2.1 and 4.2.2, respectively. The Redfield ratio of 16:1 for N:P is indicated by the line. Note that nitrate values are generally high relative to this ratio. The data pairs near phosphate of 1.45 μM and nitrate of 13 μM are from station N6CORE00C (station A on cruise N6), located west of the Mississippi River Delta at a depth of 32.4 m in a hypoxic region. Several nutrient data points are still under investigation, but many of the unusual points are from areas directly influenced by river discharge. Extremely high values of nitrate (>>33 μM) and other nutrients occurred in association with river discharge on cruise N5; such data are not shown.

On cruise N8, duplicate nutrient samples were taken at stations 32, 33, and 95. One set was analyzed at sea, the duplicate was frozen and analyzed at a later time. The frozen samples from station 95 were bad, so the results were discarded. Comparisons of frozen and fresh sample analyses for the other two stations are shown in Figures 4.2.3 and 4.2.4.

The composite plot of bottle salinity versus CTD salinity for cruises N5 through N9 is shown in Figure 4.2.5. The overall agreement is good, as shown by the r^2 values of 0.94 or better for each cruise. Differences occurred mainly in regions with significant vertical gradients of salinity over the depth difference between the bottle sample and the deeper CTD sample, suggesting the same waters were not sampled. These were mainly at near-shore, shallow, river-influenced stations. Several points are still under investigation.

Dissolved oxygen concentration versus sigma-theta for cruises N5 – N7 (1999) and N8 – N9 (2000) are shown in Figures 4.2.6 and 4.2.7, respectively. The dissolved oxygen concentrations behaved as expected, with more variability in the less dense upper water than in the denser deep water. Note the oxygen minimum at about σ_θ = 27.15 or 27.10 $kg \cdot m^{-3}$; this is associated with the Tropical Atlantic Central water mass. Note further the group of data at $\sigma_\theta \sim 25$ $kg \cdot m^{-3}$ and dissolved oxygen <1.4 $mL \cdot L^{-1}$; these are in the hypoxic zone west of the Mississippi River Delta on N6 (N6CORE00C).

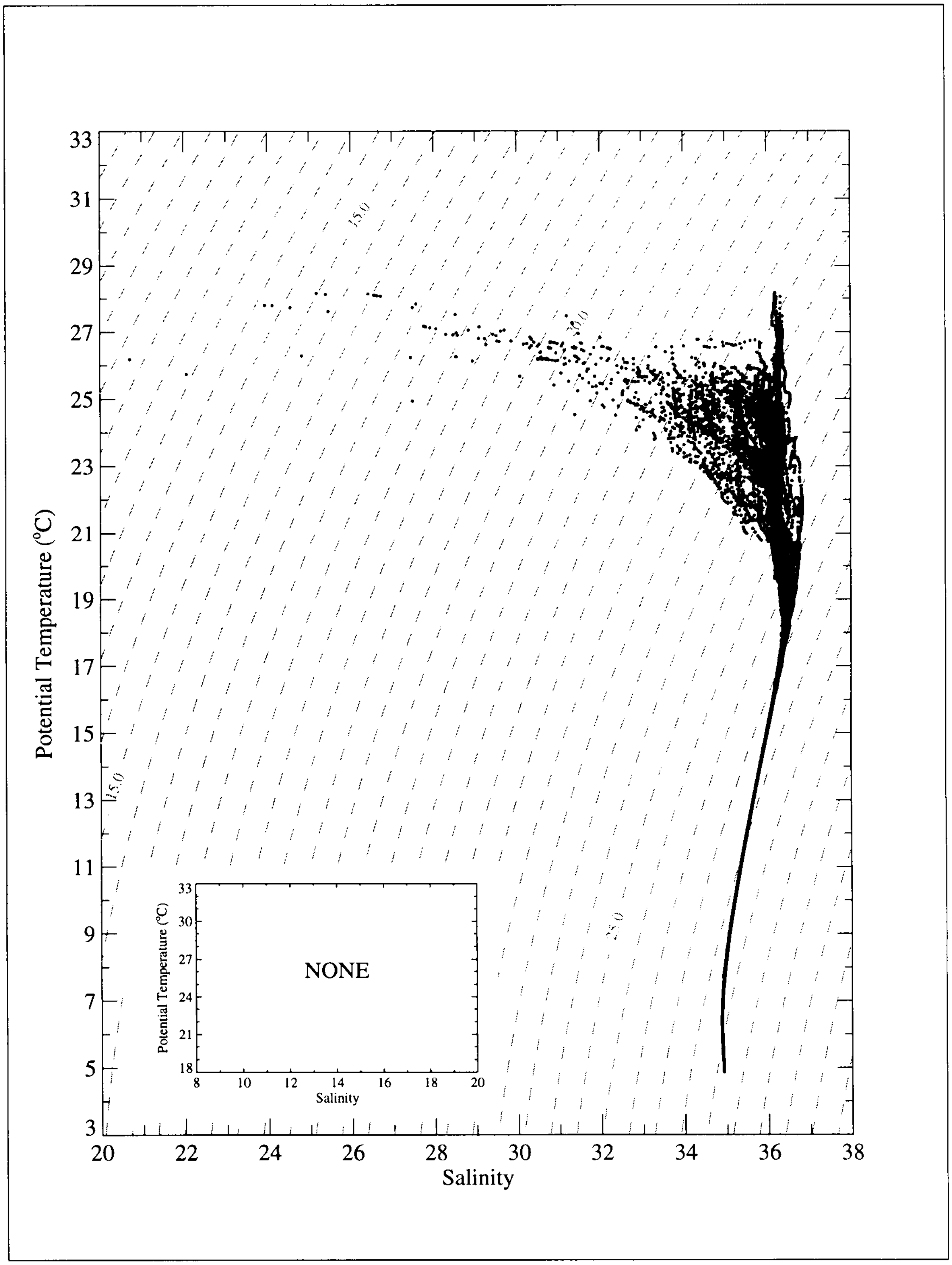

Figure 4.1.1. Composite potential temperature–salinity diagram for stations from cruise N5 (May 1999). Inset shows points with salinity less than 20.

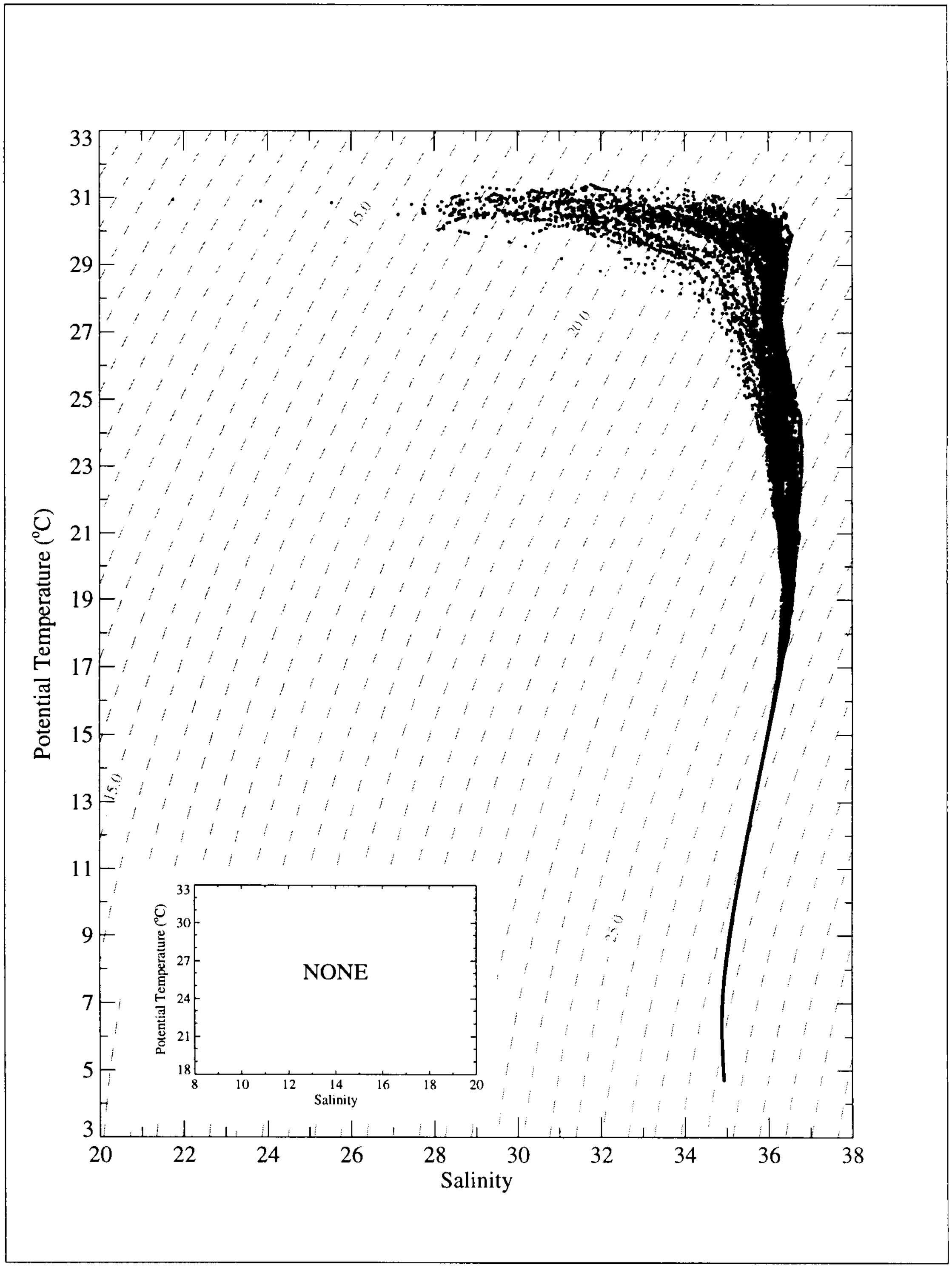

Figure 4.1.2. Composite potential temperature–salinity diagram for stations from cruise N6 (August 1999). Inset shows points with salinity less than 20.

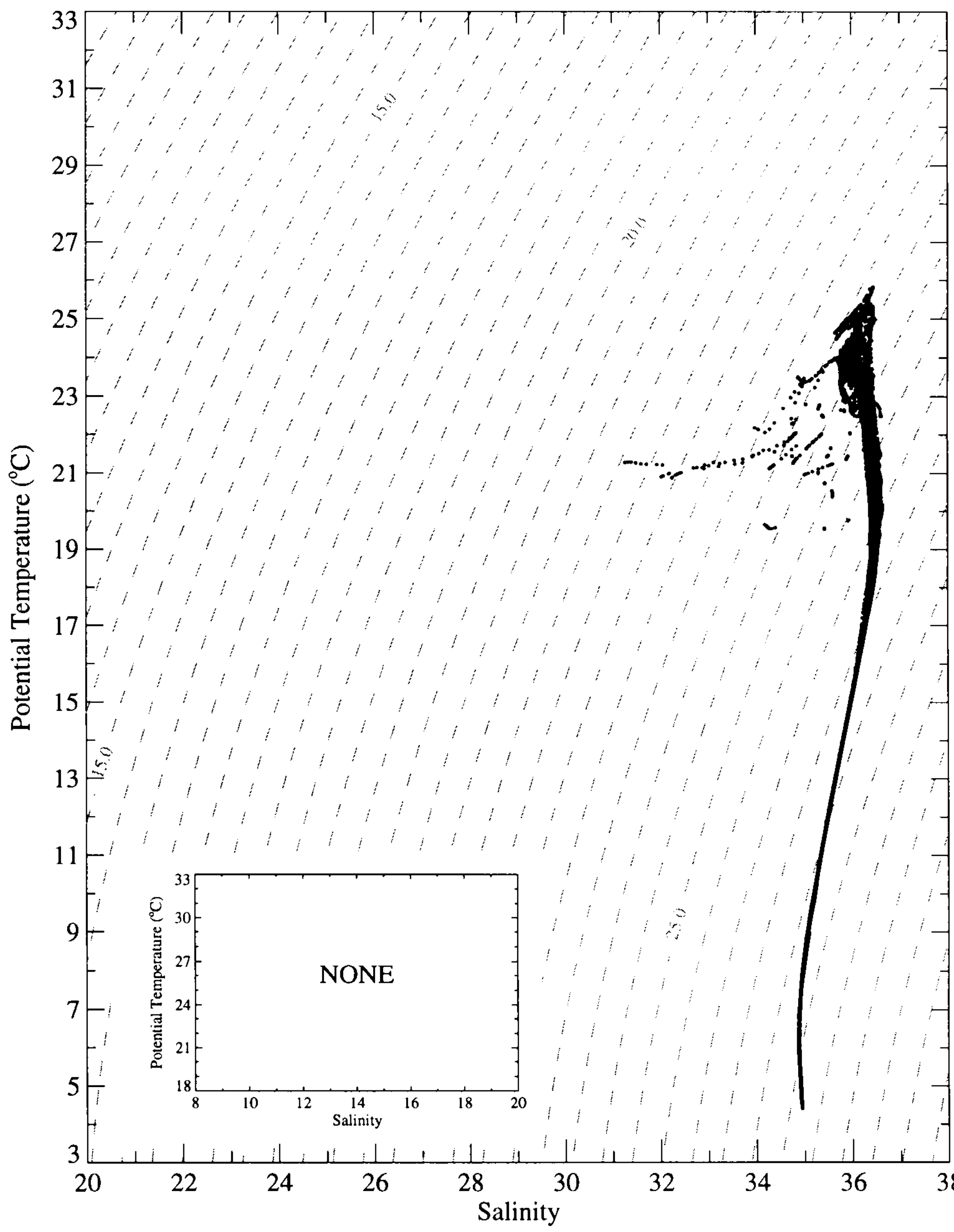

Figure 4.1.3. Composite potential temperature–salinity diagram for stations from cruise N7 (November 1999). Inset shows points with salinity less than 20.

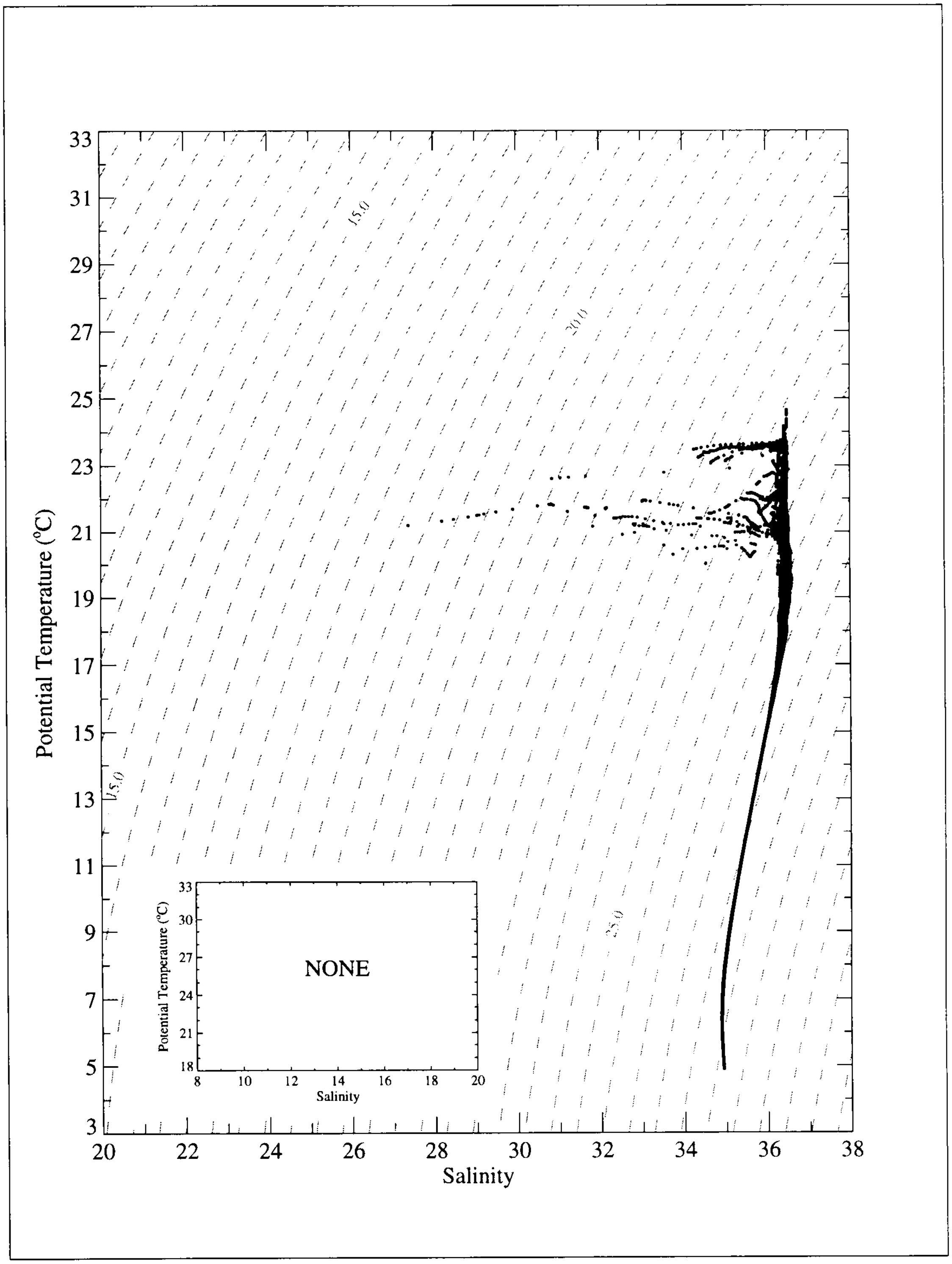

Figure 4.1.4. Composite potential temperature–salinity diagram for stations from cruise N8 (April 2000). Inset shows points with salinity less than 20.

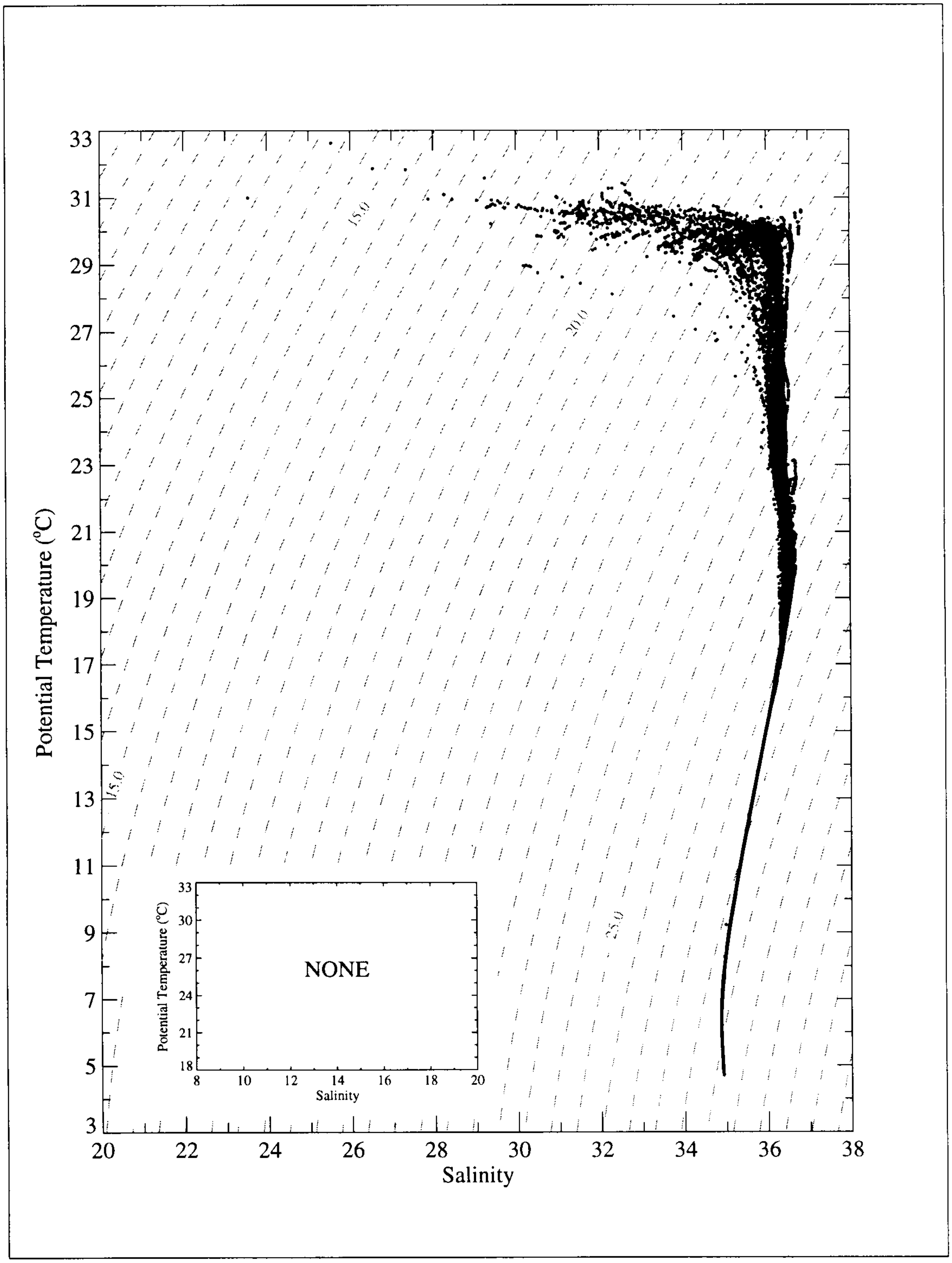

Figure 4.1.5. Composite potential temperature–salinity diagram, using preliminary data, for stations from cruise N9 (July/August 2000). Inset shows points with salinity less than 20.

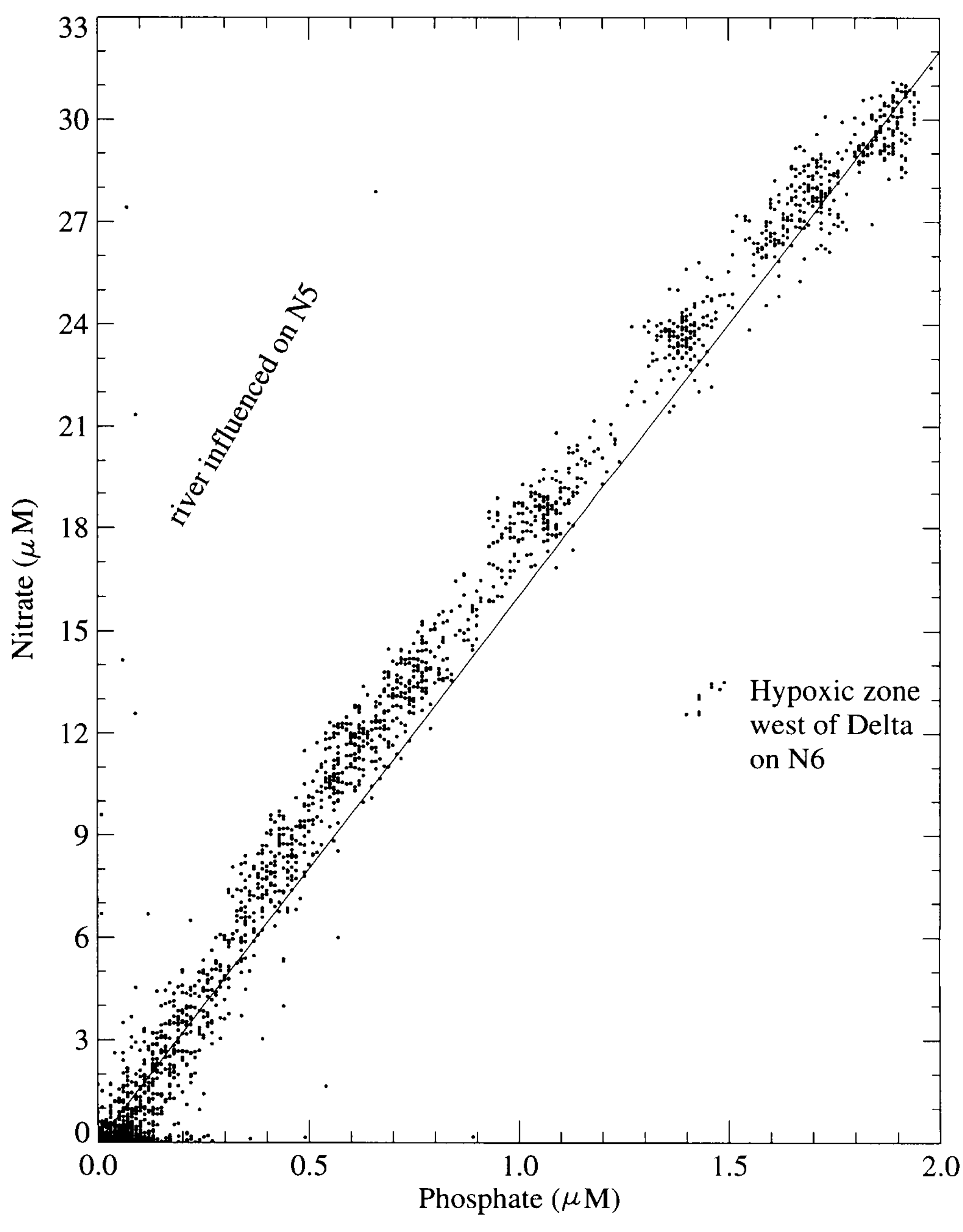

Figure 4.2.1. Phosphate versus nitrate for 1999 cruises N5 (spring), N6 (summer), and N7 (fall). The line represents the Redfield ratio of N:P (16:1).

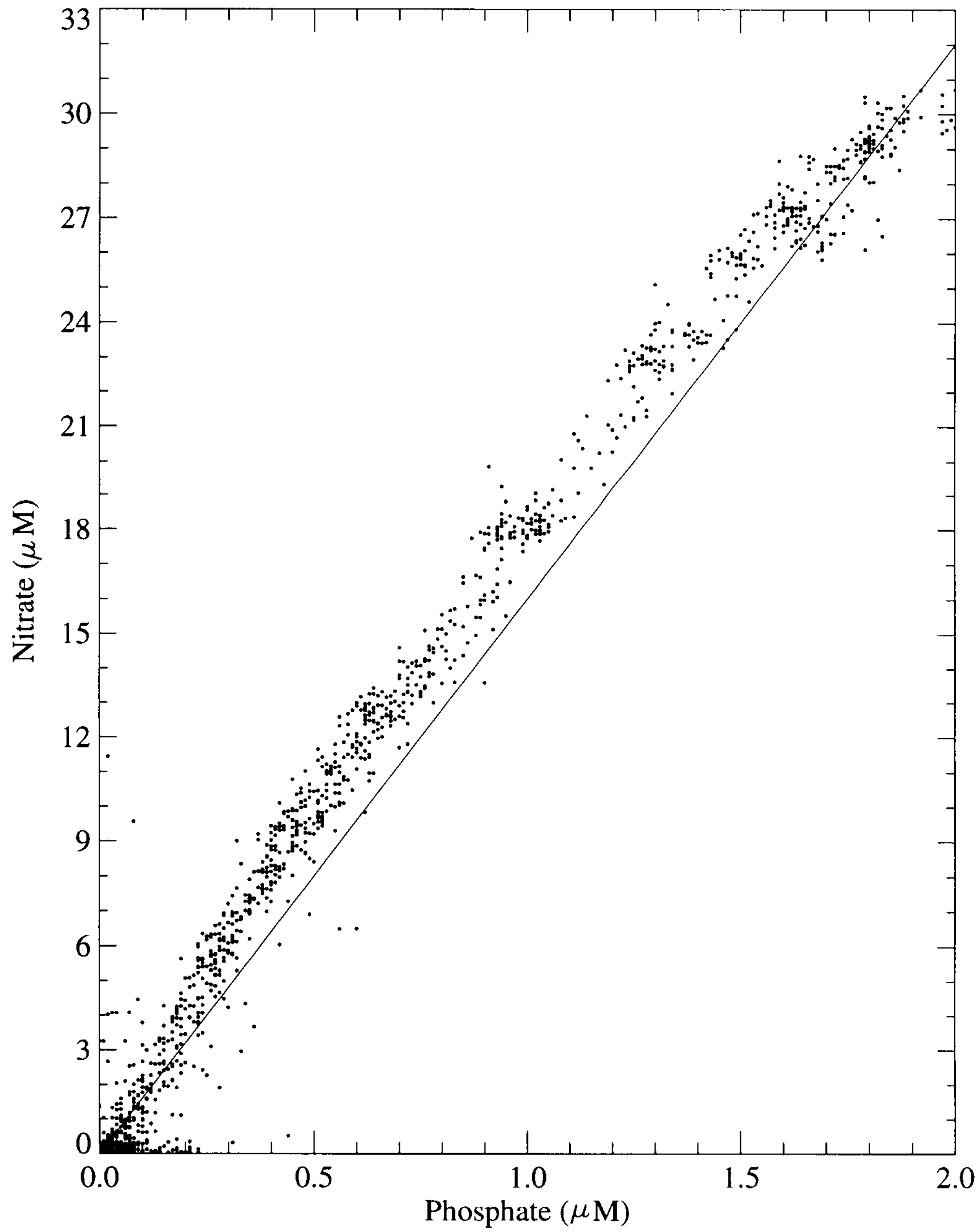

Figure 4.2.2. Phosphate versus nitrate for 2000 cruises N8 (spring) and N9 (summer). The line represents the Redfield ratio of N:P (16:1). N9 data are preliminary.

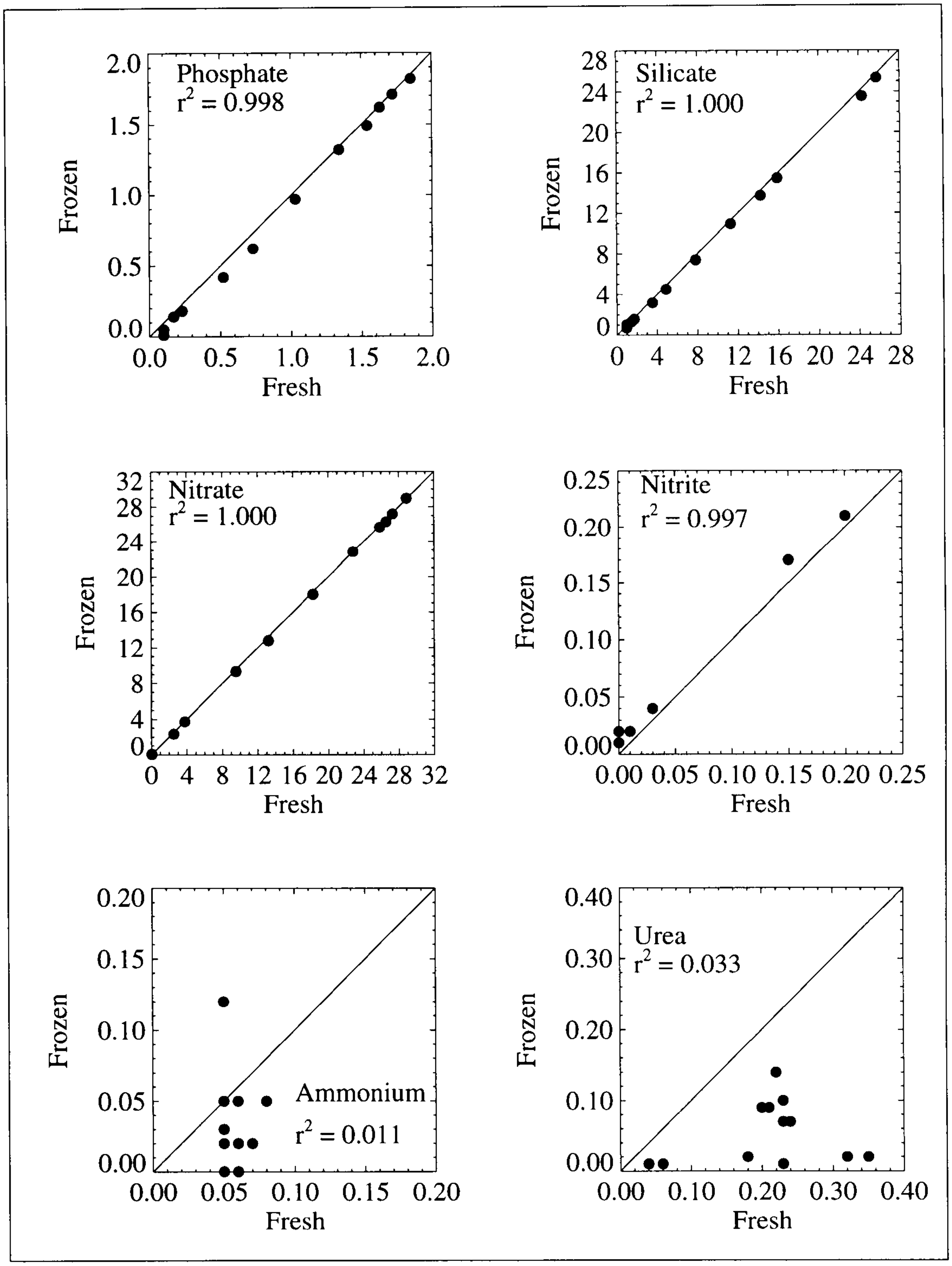

Figure 4.2.3. Frozen versus fresh nutrient concentrations (μM) from station 32 on NEGOM cruise N8 (April 2000). There are 12 pairs each.

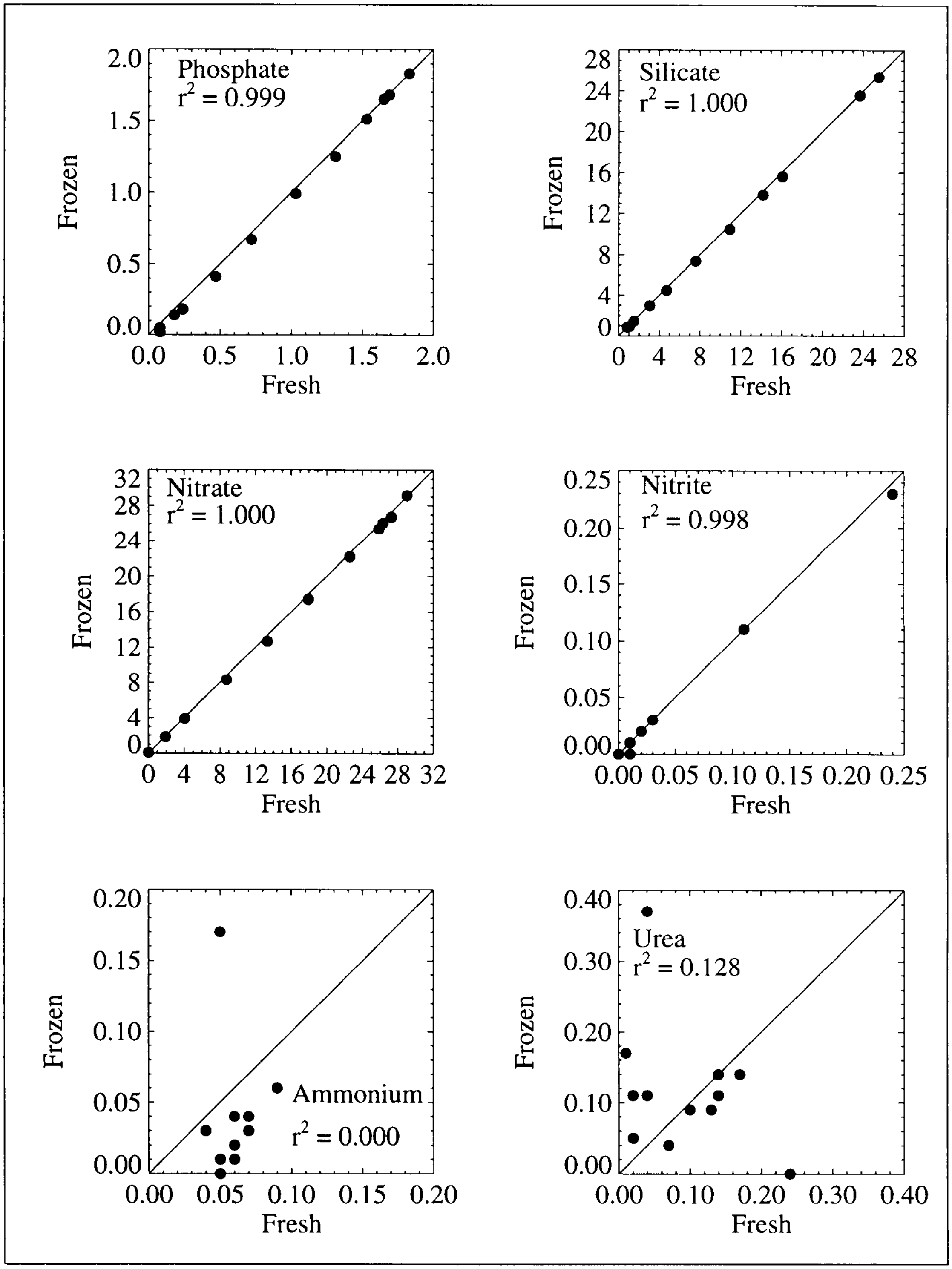

Figure 4.2.4. Frozen versus fresh nutrient concentrations (μM) from station 33 on NEGOM cruise N8 (April 2000). There are 12 pairs each.

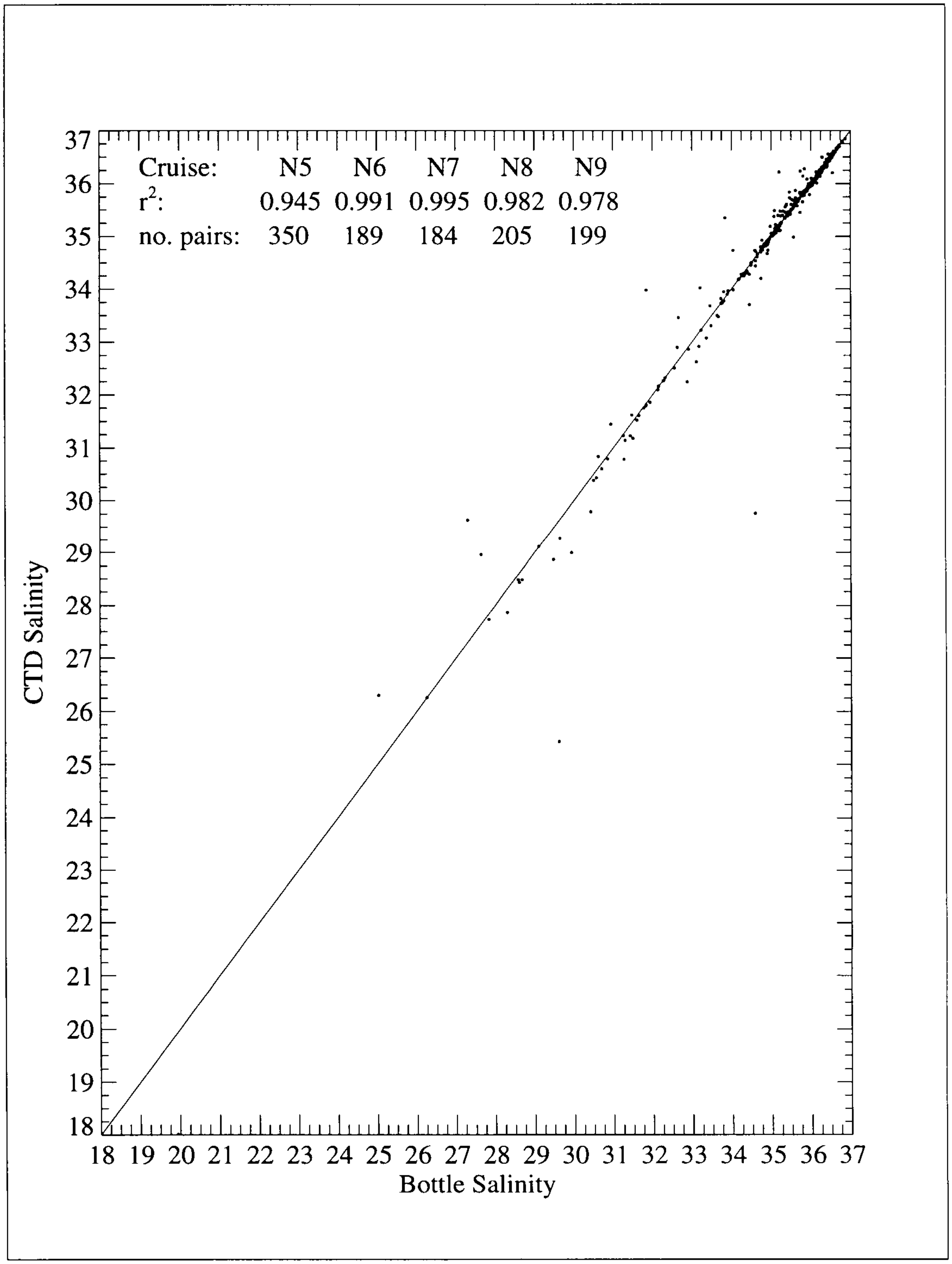

Figure 4.2.5. Ensemble upcast CTD salinity versus bottle salinity for cruises N5 through N9. Outliers generally are from stations with strong stratification caused by the influence of river discharge. N9 data are preliminary.

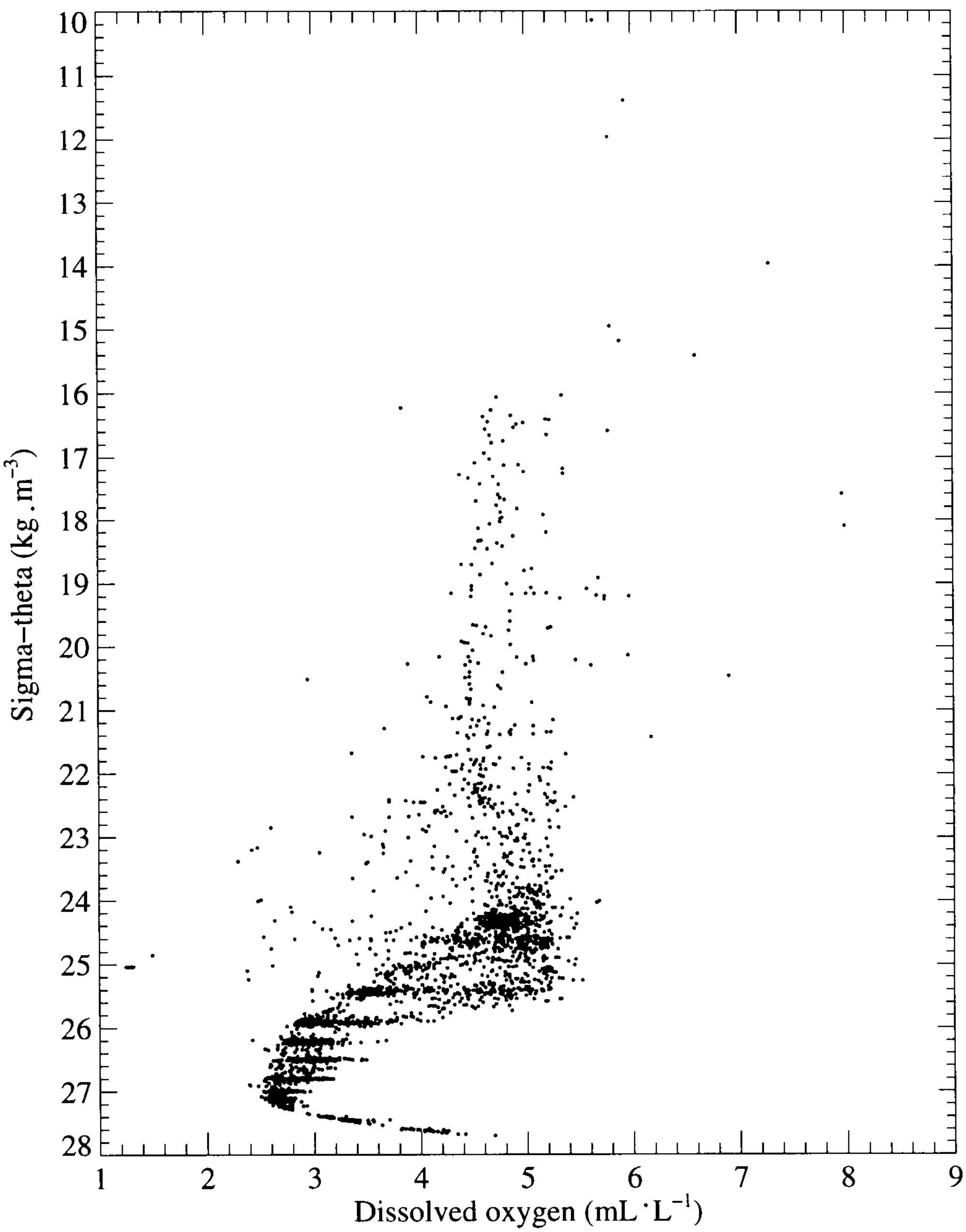

Figure 4.2.6. Dissolved oxygen versus upcast sigma–theta for 1999 cruises N5 (spring), N6 (summer), and N7 (fall).

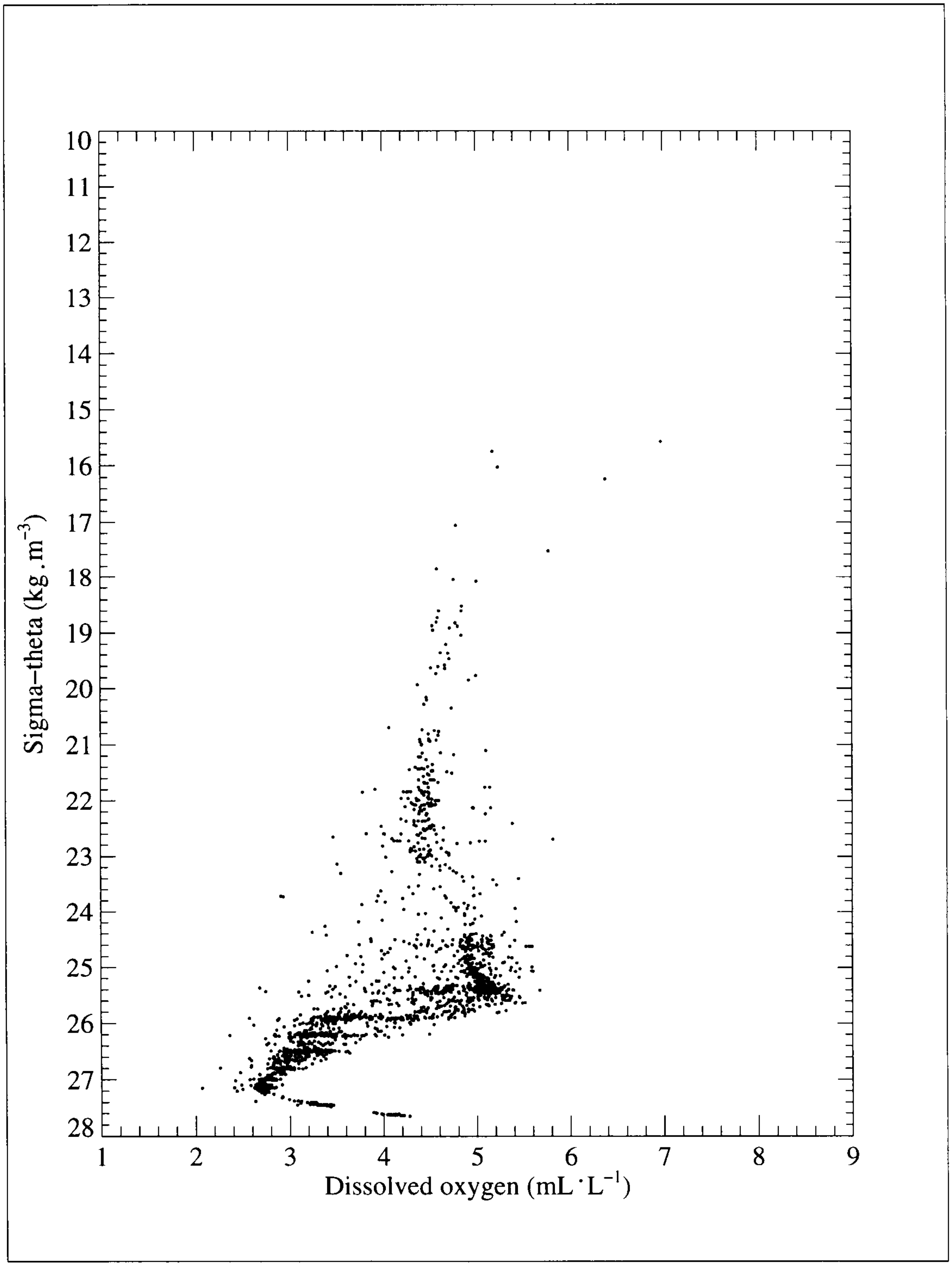

Figure 4.2.7. Dissolved oxygen versus upcast sigma–theta for 2000 cruises N8 (spring) and N9 (summer). N9 data are preliminary.

4.2.2 Particulates

Examination of N2 PM data revealed a systematic error in the processing of blanks by one shift on the cruise. The 11 suspect blanks were deleted from the data set and PM concentrations were re-determined with the remaining 19 blanks. This correction ensures a more accurate estimate of PM from beam c_p derived from transmissometer data. Three bottles each were tripped at depths of ~1.5 m and ~54.6 m at station 35 on cruise N6 and analyzed for POC and PON. Results are shown in Table 4.2.1.

Table 4.2.1. POC and PON from two depths at station 35 on NEGOM cruise N6.

Pressure (db)	**Depth (m)**	**POC ($\mu g \cdot L^{-1}$)**	**PON ($\mu g \cdot L^{-1}$)**	**Trans-missometer (V)**
2.571	1.6	32.20	4.36	4.414
2.630	1.6	39.60	5.89	4.421
2.479	1.5	36.57	5.54	4.422
56.017	54.6	32.96	6.60	4.377
55.967	54.6	22.45	5.65	4.379
55.953	54.6	32.96	6.95	4.380

For the NEGOM cruises, ratios of POC to PON usually ranged from about 4 to 8. For cruise N5, however, the ratios were unusually large, going from 2 to 14. The variability of the POC and PON concentrations for different depths were not out of the ordinary. The filter processing and analysis procedures used for N5 were the same as for all other cruises, and no analytical or processing errors were found.

4.2.3 Pigments

Because of availability of new detector equipment and an authentic standard to verify its presence, antheraxanthin was added to pigments measured by HPLC for cruises N6 through N9. HPLC analysis methods were described in Jochens and Nowlin (1998).

4.3 Acoustic Doppler Current Profiler Measurements

QA/QC processing of ADCP data was described in detail in Section 4 of Jochens and Nowlin (1998, 1999). A brief summary is given here, together with processing modifications and results for cruises N5 through N9.

ADCP and DGPS navigation data are recorded using one of two data acquisition programs, TRANSECT or VMDAS. TRANSECT records binary ADCP data, converts the data to engineering units, averages the data into five-minute or other user-defined segments, and converts the averaged data into ASCII format. The averaged data then are merged with the navigation data supplied by either the ship gyroscope or the AshTech DGPS antenna array. Standard processing was performed on TRANSECT-recorded data and was used on N5, N6, N8, and N9. VMDAS is an MS-Windows based program that allows for more advanced averaging, merging, and visualization schemes than available with TRANSECT. As with TRANSECT, VMDAS records binary ADCP data and converts the data to engineering units. Ensemble processing was used on VMDAS-recorded data and merged ensembles, consisting of 4-6 seconds of data, with the navigation data from the AshTech antenna to produce current velocities. The velocities then are averaged to produce the five-minute data, which are output in ASCII format. Ensemble processing was used on N7. It also could be used on the raw TRANSECT data, but this was not done on the other NEGOM data.

4.3.1 Standard ADCP Processing

Current velocity is estimated by subtracting ship speed from the 5-minute averaged ADCP transducer velocities. Poor estimates of ship velocity will seriously degrade data quality. Therefore, good, reliable DGPS data are crucial for a quality shipboard ADCP data set. Ship velocity estimated by the ADCP bottom-tracking mode is used when good bottom track fixes are available, usually in water depths of less than 300 m. Calculated DGPS ship velocity is used when the ship is in deeper water. The subset of data with both bottom-track and navigation velocities is used to perform a directional calibration of the ADCP after the procedure of Joyce (1989). Complex regression statistics for bottom-track versus DGPS navigation velocities and average DGPS ship speed for cruises N6 through N9 are summarized in Table 4.3.1. These show the regression angle and modulus fall within typical values of mean alignment error (1-2 degrees) and sensitivity error (1.00 to 1.04) for the *R/V Gyre*. After navigation data are merged with ADCP data, current data are inspected for additional problems and bad data segments are removed or flagged. Results of this step are summarized in Table 4.3.2. In standard processing, data collected while the ship is on-station, accelerating, decelerating, or turning sharply are discarded. These data are eliminated because ship velocity in these situations is not constant during the five-minute average and, therefore, when a constant velocity is assumed and removed, the resulting current velocity can have significantly large error.

4.3.2 Ensemble Processing Procedure

Ensemble processing begins with the raw ensemble data, which typically consist of 1-2 velocity pings and 1-2 bottom-track pings. Each ping is 2 seconds; the time for each

Table 4.3.1. Complex regression statistics for GPS velocity versus bottom-track velocity from 150 kHz ADCP data on cruises N5 through N9.

Description	N5	N6	N7	N8	N9
Stations for misalignment angle	1897	NA	1918	1615	2121
Sample size used	958	NA	1651	3380	10090
Clockwise regression angle (α)	-1.485678°	-0.4627°	2.246100°	-1.9792186°	-1.361789°
Regression modulus (b_m)	1.002232	1.00278	1.013704	0.9853648	1.010795
Coherence parameter (ρ^2)	0.9190487	0.98127	0.9674937	0.9853648	0.9998852
Average GPS ship speed ($cm \cdot s^{-1}$)	443.44	NA	467.49	443.16	449.61

NA = Not Available

Table 4.3.2. Results of evaluation of 150 kHz ADCP data for external factors on cruises N5 through N9 and number of data segments rejected.

Description	N5	N6	N7	N8	N9
Total number of segments	3696	NA	96512	3040	2917
Segments rejected for no navigation data	28	NA	415	85	53
Segments rejected for insufficient beams	12	NA	4174	0	20
Segments rejected for bottom-track depth too shallow	270	NA	2448	235	85
Segments rejected for slow ship speed (< 100 $cm \cdot s^{-1}$)	468	NA	0	873	627
Segments rejected for fast ship speed (> 650 $cm \cdot s^{-1}$)	0	NA	0	0	0
Segments rejected for % of good pings in first bin < 30	0	NA	481	0	3
Preliminary number of usable segments	2918	NA	88994	1847	2129
Segments rejected for bad navigation data	281	NA	0	0	0
Segments rejected for outliers	0	NA	0	0	157
Final number of usable segments	2637	NA	88994	1847	1972

NA = Not Available

ensemble is, therefore, typically 8 seconds. Aside from the duration of the data used (8 seconds versus five minute averages), ensemble processing is similar to standard processing. The input data are merged with the navigation data by removing an accurate estimate for the ship velocity, and the current velocity is estimated. The ensemble processing procedure also uses bottom-track and DGPS velocities to estimate the Joyce parameters described in Section 4.3.1. The current velocity data set then is averaged into five minute bins for processing with the final standard processing routines.

The advantage of ensemble processing is that it allows estimation of current velocities for those periods when the ship is drifting on station, turning, accelerating, or decelerating. Additionally, on occasion one or more ensembles in a segment had bad or unrealistic values that resulted in the removal of an entire 5-minute average segment. By quality controlling and discarding bad ensembles prior to averaging into five-minute bins, the data quality is substantially increased.

The success of the ensemble processing depends on reliable, accurate ship position and heading data at intervals of at most one second. This level of accuracy is impossible to achieve by the ship's Sperry gyrocompass. It is achievable with the AshTech ADU2 3DF positioning array, which collects high-precision pitch, roll, and heading information. Pitch and roll information also can be incorporated directly into the ADCP data stream, but this was not done for N7. Jochens and Nowlin (1999) includes additional specific aspects of the ensemble processing.

4.3.3 Results of QA/QC for N5 through N9

Cruise N5: The 150 kHz broadband instrument was returned to the manufacturer in December 1998 for complete refurbishment, repair, and upgrade of firmware. Prior to N5, it was installed on the *R/V Gyre*. Replacement transducer heads, however, were substituted in place of original heads, which had not been completely refurbished prior to the cruise. On-shore calibrations and diagnostics showed all transducers were functioning properly and within instruments tolerances. Diagnostics performed after installation aboard ship and while at sea also were passed. However, it was discovered early in the cruise that there was an unusually low percentage of "good" beam scans. While checking backscatter intensities, it was further discovered that two of the four transducer heads were giving incoming signal intensities above normal. The problem persisted for a day or two, so the instrument was removed from it's housing and all transducer heads, leads, and connections were thoroughly cleaned. The strong signals remained.

A call to RDI while at sea led RDI engineers to believe that the stronger signal intensities were degrading the overall data quality. They believed the low percentage good values were due to the use of a data quality component of the TRANSECT software called the fish algorithm. The fish algorithm compensates for unusually strong signal intensities by assuming that strong backscatter is caused by the instrument passing over a school of fish. The algorithm then excludes these strong signals when determining current velocity. This is ordinarily not a problem because typically schools of fish only affect one beam at a time and three beams are left to produce the three-beam solution necessary for current velocity estimation. However, because two beams were affected, the instrument could not produce the three-beam solution and, therefore, produced a bad data indicator which led to the low percentage good values.

The RDI engineers believed that by turning off the fish algorithm, the data quality could be improved because the algorithm could no longer exclude any beams and both strong and weak transducer beams could be used to produce the three-beam solution for current velocity. The drawback was that when the transducer actually passed over a school of fish, the algorithm would not be on to compensate for it. Accordingly, the instrument was set to mode WM1, which turns off the fish-finder mode. We later learned, however, that the normal mode of operation for the ADCP is mode WM4, which is the mode recommended for moving platforms, and that mode WM1 is recommended only for use with stationary platforms.

Because the broadband penetration depth was nominally 120-130 m, RDI also suggested switching the broadband instrument into narrowband mode (WB1). This provided deeper penetration to 200 m, but increased the noise associated with a single ensemble. However, it was decided that the increased noise was less important than the added benefit of the deeper penetration. The switch to narrowband mode was made at the same time the fish algorithm was turned off. This occurred inshore of Line 11.

After cruise N7, it was determined that setting the instrument to narrowband mode (WB1) and turning off the fish-finder algorithm (WM1) were incompatible when the instrument was in water depths greater than 100 m. Therefore, data recorded during N5 after the inshore station at Line 11 and that are in water depths deeper than 100 m are considered suspect. Data are retained in the data set, with a warning included in the metadata. Heading information was given by the ship gyroscope and standard processing was used.

Cruise N6: The 150 kHz broadband instrument was refitted with the original, refurbished transducer heads for the N6 cruise. The instrument settings were set to the default values used during cruises N2 and N3, using the broadband mode and with the fish-finder mode on. The ADCP data recorded during N6 did not have any significant problems, and the data quality is good. Heading information was given by the ship gyroscope and standard processing was used.

Cruise N7: VMDAS was used to record and process the 150 kHz ADCP data while at sea on cruise N7. Unfortunately, the instrument settings included the WM1 and WB1 modes of operation. This again put the instrument in an incompatible mode similar to the

N5 cruise. During N7, this configuration was used for the entire cruise. Therefore, all data in water depths greater than 100 m are considered suspect. Data are retained in the data set; metadata warnings are given in the data file. VMDAS was determined not to play a roll in the corruption of these data. AshTech heading information was incorporated directly into the instrument during data acquisition and ensemble processing was used.

Cruise N8: Due to the problems encountered during N7, TRANSECT was used as the data acquisition software and standard processing was performed. This also preserved continuity with prior cruises that used the TRANSECT program for data acquisition. The 150 kHz instrument was configured to incorporate pitch and roll information, as well as heading, from the AshTech array into each ensemble. Including pitch and roll information improves data quality by reducing the error associated with each velocity estimate. It was determined during processing that the recorded ship velocity for each five-minute segment was in error. New ship velocities were than calculated from the DGPS fixes and substituted in each segment.

Cruise N9: The broadband 150 kHz ADCP was damaged prior to cruise N9; it was replaced with the narrowband 150 kHz ADCP. TRANSECT was used as the data acquisition software, and standard processing was performed. Navigation data from the AshTech antenna array was incorporated directly into the ADCP data stream. The problem associated with DGPS velocity errors that was encountered during N8 was fixed by correcting the input data stream to the ADCP. All ADCP navigation and instrument systems worked properly during this cruise. The data are thought to be of high quality.

38 kHz Data: Standard processing was performed on the 38 kHz Ocean Surveyor ADCP for cruises N6, N8, and N9; ensemble processing was used for N7. For cruises N6, N8, and N9, the 38 kHz data sets compared well with those of the 150 kHz for velocities in similar water depths and locations. The first bin for the 38 kHz was centered at 40 m. Each bin was 20 m. Thus, the 38 kHz provided data for water depths greater than approximately 50 m. Over deep water, data were collected to ~550 m while steaming and up to 1000 m while on station.

4.4 XBT Measurements

The QA/QC procedures for XBT measurements were detailed in Jochens and Nowlin (1999). The corrections for top and bottom cutoffs, outlier removal, and similar QA/QC actions for cruises N5 through N9 are recorded in the metadata of the file header. Additionally, for cruise N7, one XBT profile (N7L09S21X) originally thought to be good, was determined to be bad and consequently was removed from the data set.

4.5 Underway Measurements

Chlorophyll was computed using fluorescence obtained from the Turner Design model 10 flow-through fluorometer. The computed values generally agreed with the extracted chlorophyll to ±0.1 $\mu g \cdot L^{-1}$ or better in low chlorophyll, bio-optical Type II environments and to ± 0.5 $\mu g \cdot L^{-1}$ or better in high chlorophyll, bio-optical Type I environments on each of cruises N6 through N9. Figures 4.5.1, 4.5.2, 4.5.3, and 4.5.4 summarize these calibration data for the summer and fall 1999 and the spring and summer 2000 cruises. Fluorescence-chlorophyll data that exceeded 3 standard deviations from the mean were excluded from the determination of the calibration curves. These outlier data are shown as triangles on the figures.

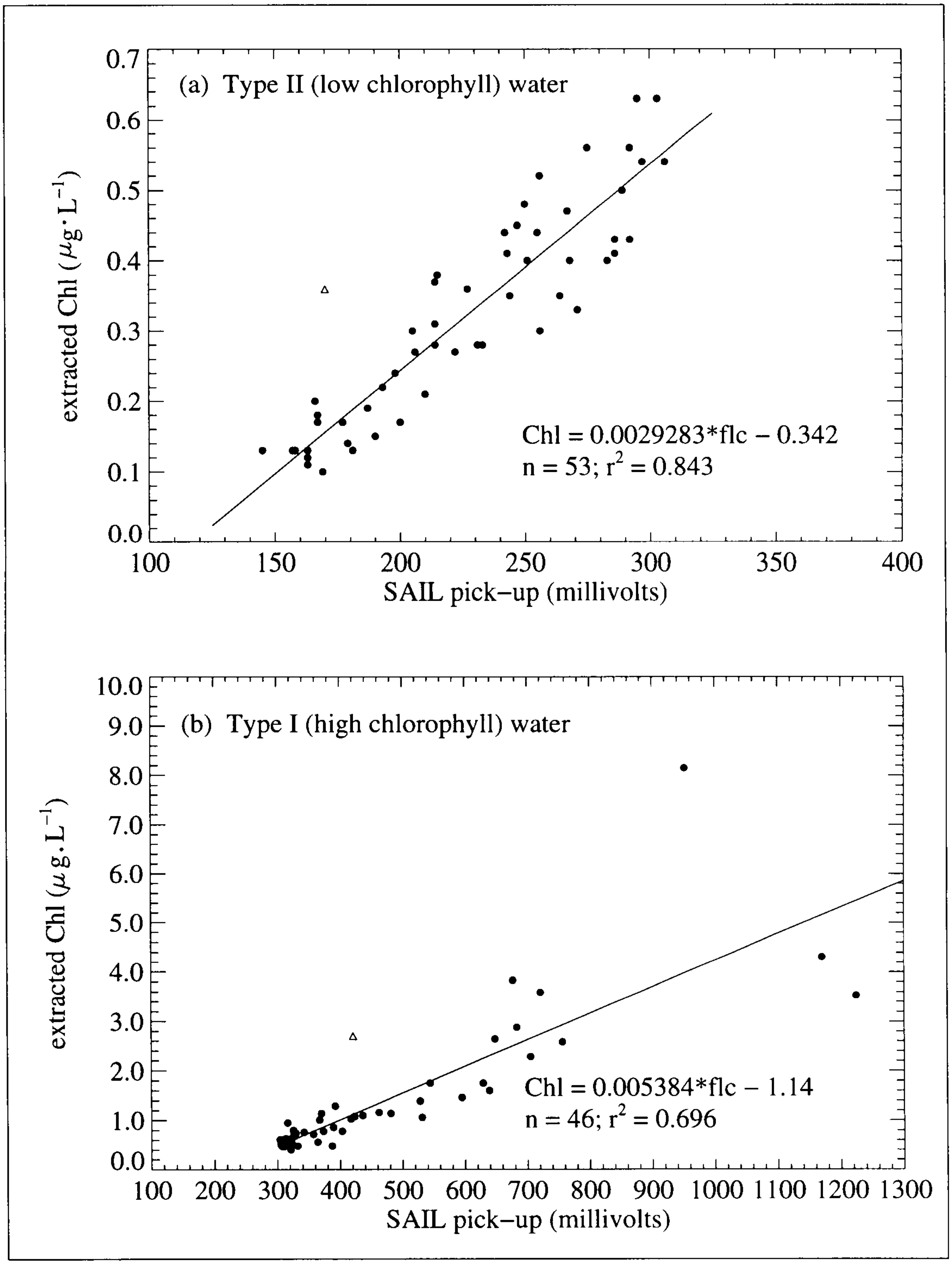

Figure 4.5.1. Flow–through fluorometer calibration for cruise N6 (August 1999). Triangles denote outliers not used in the correlation.

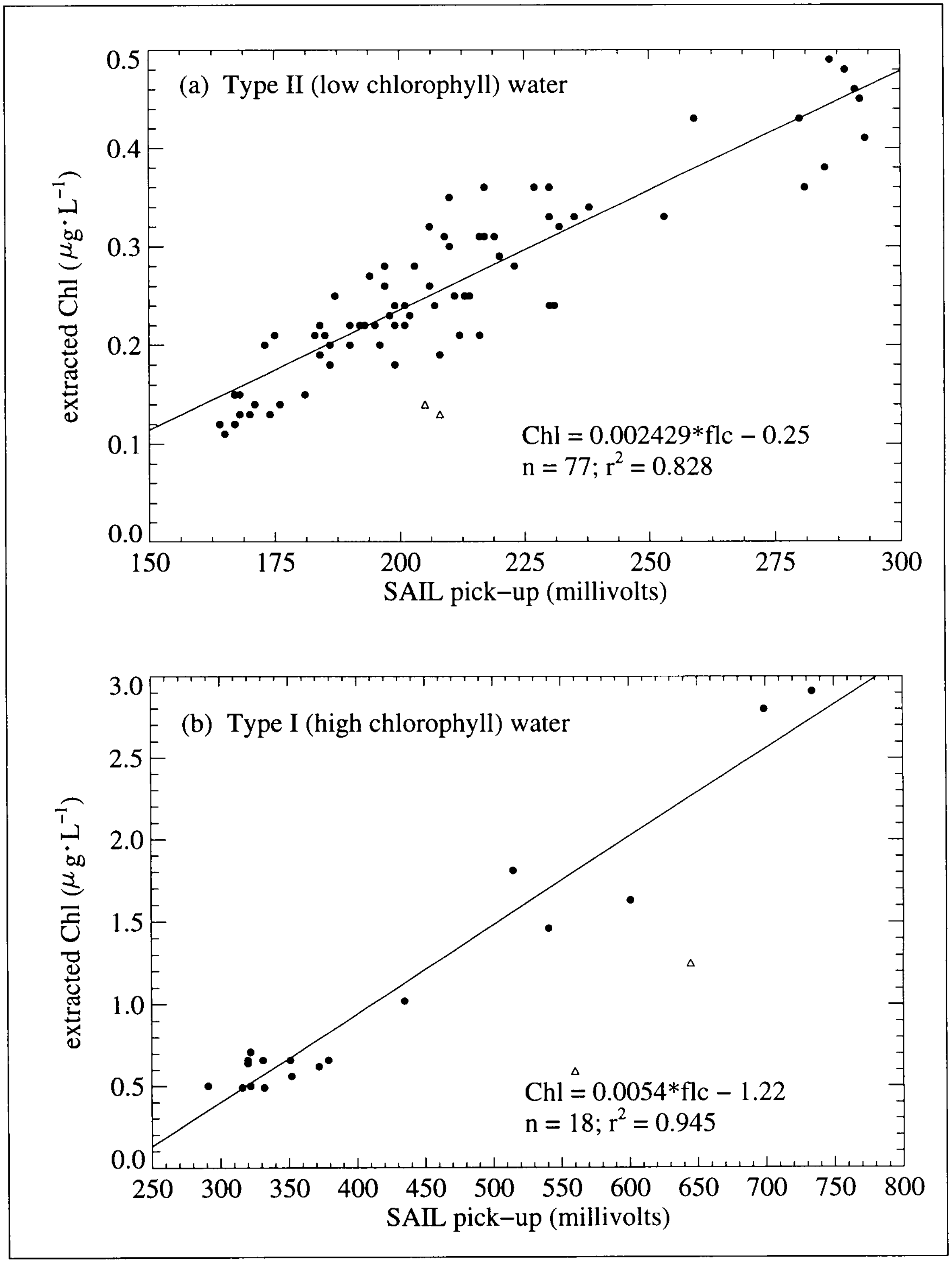

Figure 4.5.2. Flow–through fluorometer calibration for cruise N7 (November 1999). Triangles denote outliers not used in the correlation.

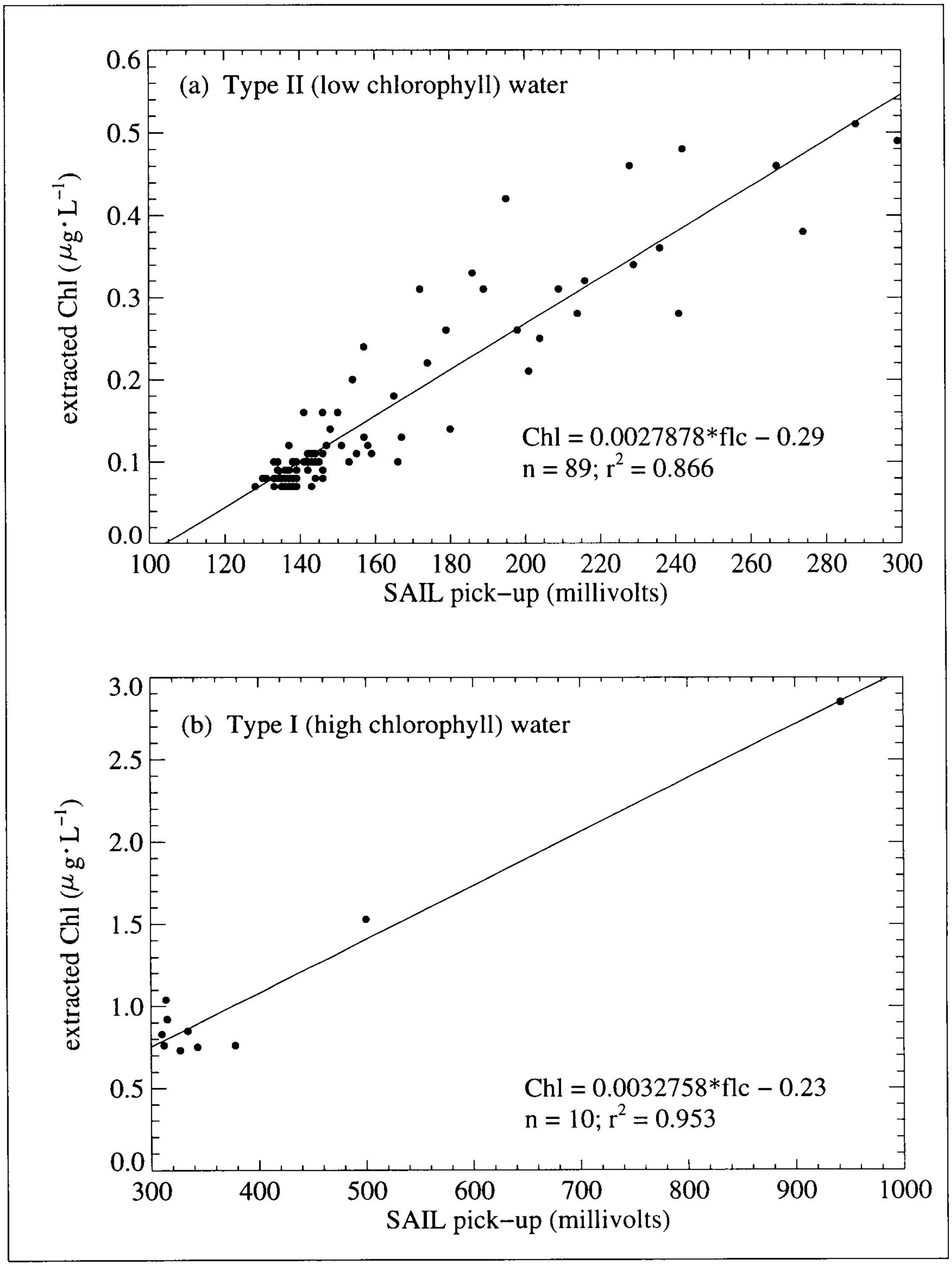

Figure 4.5.3. Flow–through fluorometer calibration for cruise N8 (April 2000).

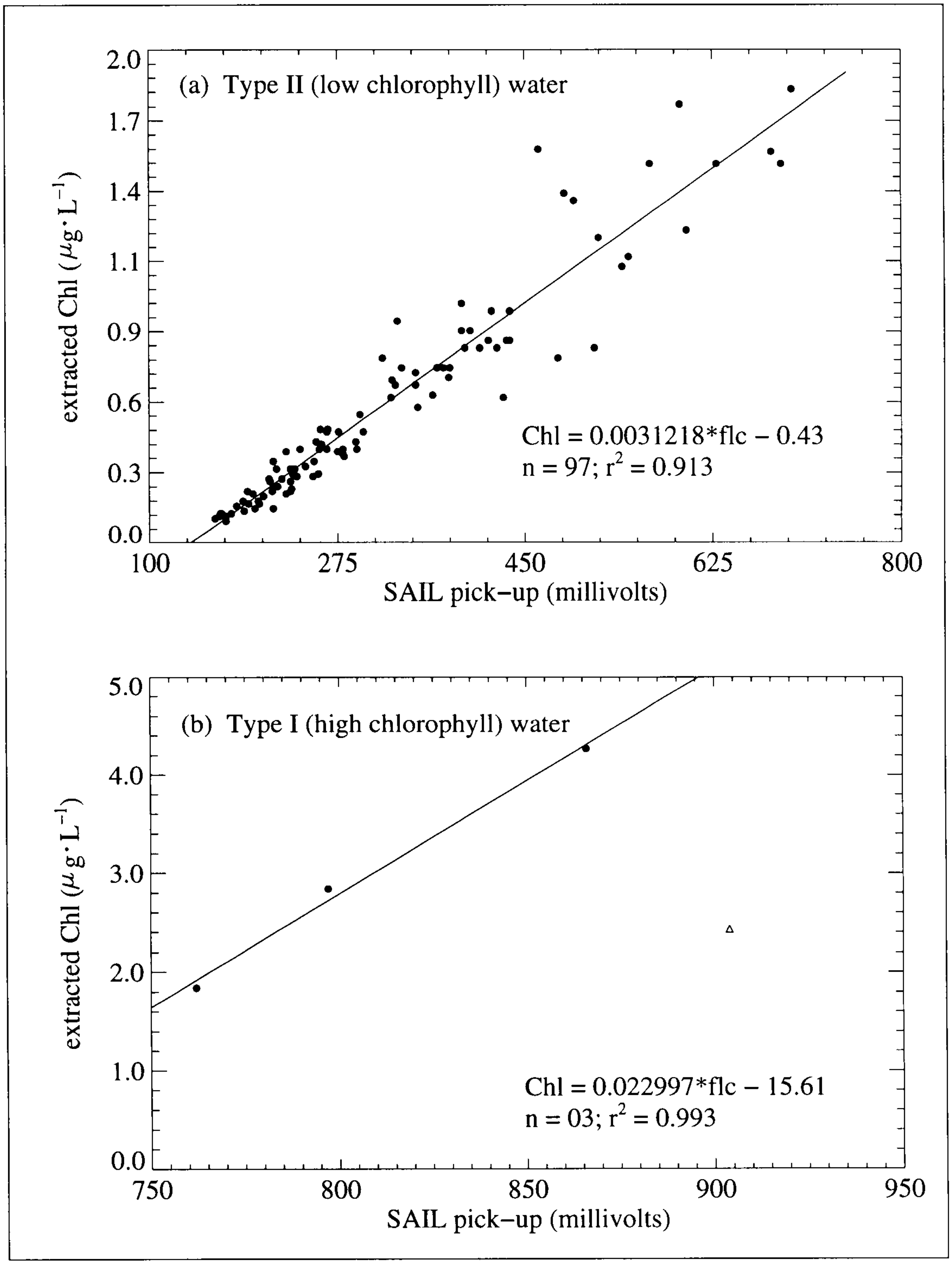

Figure 4.5.4. Flow–through fluorometer calibration for cruise N9 (July/August 2000). Triangles denote outliers not used in the correlation.

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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 **Royalty Management Program** 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.