U S DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Center
P 0 Drawer 1207
Pascagoula, Miss. 39568-1207

NOAA Ship Oregon II Cruise 08-04 (282)
06/10 – 7/18/2008

INTRODUCTION

The *NOAA Ship Oregon II* departed Pascagoula, Mississippi on June 10, 2008 for the twenty-eighth annual Summer Southeast Area Monitoring and Assessment Program (SEAMAP) shrimp and bottomfish survey in the northern and western U.S. Gulf of Mexico. SEAMAP is a state-Federal-university program for the collection, management and dissemination of fishery independent data.

The primary goal of this survey is to monitor size composition and spatial distribution of penaeid shrimp stocks across the northern Gulf of Mexico in 5 to 60 fathoms (fms) and to provide additional biological and catch rate information on demersal organisms occurring in the study area.

One and a half survey days were lost due to problems with the ship's electrical power system. Two port calls were made to exchange scientific personnel (both in Galveston, Tex June 24 to 25 and July 3 to 5). The ship returned to Pascagoula, Mississippi on July 16, 2008, 2 days earlier than scheduled, to terminate a very productive and successful survey (all primary objectives were accomplished).

OBJECTIVES

1) Determine size distribution of penaeid shrimp by depth across the U.S. northern and western Gulf of Mexico. Transmitted information weekly for real time reports of catch rates of penaeid species.

2) Obtain samples of brown, pink and white shrimp to determine length-weight relationships.

3) Sample the northern Gulf of Mexico with Southeast Area Monitoring and Assessment Program (SEAMAP) standard sampling gear to determine the abundance and distribution of benthic fauna.

4) Obtain length measurements to estimate size structure of sampled populations.

5) Conduct CTD casts to profile water temperature, salinity, dissolved oxygen (DO), DO percent saturation, fluorescence, transmittance, and density.

6) Collect bottom DO measurements in near real time and transmit the data to the NOAA National Coastal Data Development Center at Stennis Space Center, Mississippi and other researchers to map the hypoxic zone .

7) Collect ichthyoplankton samples to determine the relative abundance and distribution of eggs and larvae of commercially and recreationally important fish species.

8) Collect *Lutjanus campechanus* and *Scomberomorus cavalla* for Dr. Will Patterson of the University of West Florida for age and growth analysis.

9) Collect shark and ray specimens, including *Raja texana* and *Dipturus olseni* for Dr. James Sulikowski of the University of New England for age, growth, and distribution analysis.

10) Collect sharks and rays for Shoals Marine Laboratory, New Hampshire for dissection and identification.

11) Collect *Raja texana, Squatina dumeril, Rhomboplites aurorubens, Epinephelus* and *Mycteroperca sp.,* for the NMFS laboratory at Panama City, Florida for age, growth, identification, gut analysis, and genetical purposes.

12) Collect *Caulolatilus sp.*, *Lutjanus campechanus,* eels, and sharks for scientists of the Mississippi Laboratory for age, growth, identification and distribution purposes.

13) Save all *Rhinoptera sp.* for Christian Jones of the Mississippi Laboratory for identification purposes and confirmation of presence of *Rhinoptera brasiliensis.*

14) Collect *Balistes capriscus* for Eric Saillant, Graduate Student of the Gulf Coast Research Laboratory in Ocean Springs Mississippi.

15) Collect *Decodon puellaris* for Dr. Benjamin Victor of the Guy Harvey Research Institute of California for DNA purposes and to support the Barcode for Life project.

16) Collect *Etrumeus teres* for Larry Thomas, Graduate Student from Jackson State University, Alabama for age, growth, and distribution purposes.

17) Collect *Amusium papyracuem* for Jeanne Serb, Assistant Professor of Iowa State University for phylogenetic analysis.

18) Collect *Ludia sp.* and *Astropecten articulatus* for Dr. Christopher Pomory of the

University of West Florida for identification and growth analysis.

19) Collect *Brevoortia patronus* for Dr. James Simons of the Texas Parks and Wildlife Department, Corpus Christi, Texas for identification and distribution purposes.

20) Collect invertebrate species, including but not limited to shrimp, crab, and jellyfish species for the University of Southern Mississippi's Gulf Coast Research Laboratory.

MATERIALS AND METHODS

The sampling gear consisted of 40-ft shrimp nets with 8-ft by 40-in chain bracketed wooden doors. A standard free tickler chain cut 42 inches shorter than the footrope was used to stimulate benthic organisms out of the substrate and into the path of the oncoming net. Towing speed was targeted at 2.50 knots. Sample sites were randomly selected within area, depth and diel strata. Area strata consisted of Gulf coast shrimp statistical zones 11-12 (88°00'-89°00' W long), 13-15 (89°00'-92°00' W long), 16-17 (92°00'-94°00' W long), 18-19 (west of 94°00' W long and north of 28°00' N lat), and 20-21 (26°00'-28°00' N lat). Depth strata consisted of 1-fm intervals from 5 to 20 fms, a 2-fm interval from 20 to 22 fms, a 3-fm interval from 22 to 25 fms, 5-fm intervals from 25 to 50 fms and a 10-fm interval from 50 to 60 fms. Diel strata consisted of day and night, and were delimited by astronomical sunrise and sunset. Minimum and maximum tow durations were 10 and 55 minutes respectively, depending on the time required to transect the respective depth strata. If a stratum was not completed in 55 minutes then additional tows were made until it was covered. Tow direction was determined as the shortest distance between strata boundaries (generally perpendicular to depth contours).

Trawl catch data were electronically recorded at-sea with the Fishery Scientific Computing System (FSCS), version 1.6, developed by NOAA's System Development Branch of the Office of Marine & Aviation Operations. For FSCS to be operational, Scientific Computing System (SCS) version 4.0 was used to collect station metadata, including position, depth, date and time. SCS was also used to collect metadata for ichthyoplankton stations and CTD stations. Catches were either processed in their entirety or subsampled, depending on the total catch weight. If catches exceeded 50 pounds, then at least 10% was taken as a subsample. Catches (or subsamples) were sorted by species with each group being numerated and weighed. Additional data taken for specimens identified down to species level, including length measurements, sex, and gonad condition. Specimens that could not be identified to species level were frozen and brought back to the laboratory for identification.

Ichthyoplankton samples (conducted with bongo and neuston samplers) were collected at half-degree intervals of latitude and longitude within the defined survey area. Plankton sampling sites were occasionally relocated to the nearest trawling sample site to optimize survey time. Bongo tows were made with two conical 61-centimeter nets with

0.333 mm mesh netting. General Oceanic flowmeters were suspended in each side of the frame to measure the amount of water filtered. Single obligque tows were made. Nets were towed at 1.5 to 2.0 knots to maintain a 45° wire angle of towing warp, and were fished to a maximum depth of 200 meters or within two meters of bottom in depths less than 200 meters. Neuston sampling gear consisted of a 0.947 mm mesh net mounted on a 1 by 2 meter frame. The net was towed for 10 minutes with the frame half submerged at the surface. Right bongo samples and neuston samples were initially preserved in 10% buffered formalin and transferred into 95% ethyl alcohol 36 hours later. The left bongo samples were initially preserved in 95% ethyl alcohol and transferred into 95% ethyl alcohol 24 hours later.

Vertical profiles of temperature, conductivity, dissolved oxygen, transmittance and fluorescence were recorded with a Seabird SBE 911+ environmental profiler. Forel-ule water color and percent cloud cover observations were also taken during daylight hours. Daily water samples (maximum depth) were taken at the first station after sunrise of each day in order to perform 3 replicate Winkler titrations to monitor the performance of the DO sensors on the environmental profiler. The values obtained from the Winkler titrations were recorded in the FSCS Access database.. Also, a Hach LDO™ HQ10 portable dissolved oxygen meter was used at these same stations to investigate the possibility of replacing the Winkler titrations as a method of field calibration.

RESULTS AND DISCUSSIONS

One hundred and ninety-seven strata (86%) were successfully sampled by *NOAA Ship Oregon II* (Table 1). An additional 30 strata were sampled by state vessels; 20 by *R/V Tommy Munro* of Mississippi and 10 by *R/V A. E. Verrill* of Alabama. Two strata were not sampled because a net was torn on bottom obstructions and one strata was towed in the wrong depth strata.

Two hundred sixty-two tows were required to sample the selected strata (Table 1, Figure 1). For summary purposes, data were grouped into three geographic areas: East Delta (88°00'-89°15' W long), West Delta (89°15'-94°00' W long), and Texas (94°00'-98°00' W long), and six depth intervals: 5-9, 10-19, 20-29, 30-39, 40-49, and 50-60 fms. Table 2 lists the five most numerous species caught, pink and white shrimp, and red snapper. The mean total catch rate for the entire survey was 88.4 kilograms per hour fished (kg/hr), a 22% decrease in relative abundance as compared to 2007 and a 3% increase relative to the five year mean for 2003-2007 (85.6 kg/hr). Sciaenidae was again the most abundant family caught with Atlantic croaker (*Micropogonias undulatus)* making the greatest contribution (Tables 2 and 3). Brown shrimp, *Farfantepenaeus aztecus*, was the most abundant commercial shrimp species, followed by pink shrimp, *Farfantepenaeus duorarum* and white shrimp, *Litopenaeus setiferus*.

Forty-six bongo and forty-five neuston stations were accomplished (Figure 2). Neuston and right side bongo samples were returned to Pascagoula for subsequent shipment to the Polish Sorting Center for sorting and identification according to standard

SEAMAP protocol. Left bongo samples were sent to the SEAMAP Plankton Archiving Center at the Institute of Marine Science's Gulf Coast Research Laboratory in Ocean Springs, Mississippi.

Two hundred and twenty-two CTD casts were collected, although two hundred and twenty-four were done. After completing the casts, 2 stations (Pascagoula station number 00033 and 00090) had the data corrupted and are not included in the database, thus noting the difference. One hundred and eleven cloud covers and one hundred and ten water colors were collected (Table 4). Figure 3 shows stations where hypoxic conditions (dissolved oxygen readings ≤ 2 milligrams per liter) were encountered during the survey. During processing of the CTD cast, the secondary sensor suite was used to obtain values. Early in the survey, a problem was noted with the primary suite (Dissolved Oxygen sensor, serial number 0084). Therefore, all the cast were reprocessed, using the secondary suite (DO sensor, serial number 00105). Although the primary side was replaced with a new sensor (DO sensor, serial number 1041) on June 14, 2008, after Pascagoula Station 00019, the secondary suite was used for data retrieval for consistency.

Thirty-four Winkler titrations were performed during the survey, and thirty-three Hach handheld dissolved oxygen readings were obtained (Table 5). The depth refers to the maximum depth sampled by the CTD profiler and is the depth from which water was collected for Winkler titrations and Hach meter readings. During Leg 3, there was a shortage of phenylarsine oxide; therefore only two replicate titrations were performed instead of three.

Specimen collections were shipped to the appropriate requesting scientists upon arrival in Pascagoula.

ACKNOWLEDGMENTS

On behalf of Mississippi Laboratory and the scientific party, I would like to thank the Master and crew of *NOAA Ship OREGON II* for a job well done.

CRUISE PARTICIPANTS

June 10 – 24, 2008

NAME	TITLE	ORGANIZATION
Alonzo Hamilton	Field Party Chief	NMFS, Pascagoula, MS
Michael Felts	Watch Leader	IAP, Pascagoula, MS
Paul Felts	Watch Leader	NMFS, Pascagoula, MS
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Cheryl Bough	Grad. Student	Univ. South Alabama, AL
Kirk Clausen	Grad. Student	Florida State University
Bronson Nagareda	Cooperator, Aquarist	Hawaii

June 25 – July 3, 2008

NAME	TITLE	ORGANIZATION
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July 5 – July 18, 2008

NAME	TITLE	ORGANIZATION
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Table 1. Distribution of sampling effort by strata for *NOAA Ship Oregon II* Cruise 282 (OT-08-04). Numbers in table body indicate number of times strata were sampled. "Ala." and "Miss." indicate strata sampled by the respective states, and "Tore net" indicates strata which were unsuccessfully sampled due to bottom obstructions. "Wrong depth" indicates strata which were accidently sampled in other depth zones

Depth Strata (fathoms)	Diel Strata									
	Day					Night				
	Statistical Zones					Statistical Zones				
	11-12	13-15	16-17	18-19	20-21	11-12	13-15	16-17	18-19	20-21
5-6	Ala.	1	1	1	Wrong depth	Ala.	1	1	1	1
6-7	Ala.	1	1	1	2	Miss.	1	1	1	1
7-8	Ala.	1	1	1	1	Miss.	1	1	1	1
8-9	Miss.	1	1	1	1	Miss.	1	1	1	1
9-10	Ala.	1	1	1	1	Ala.	1	1	1	1
10-11	Ala.	1	1	1	1	Miss.	1	1	1	1
11-12	Ala.	1	1	1	1	Miss.	1	1	1	1
12-13	Miss.	1	1	1	1	1	1	1	1	1
13-14	Miss.	1	1	1	1	1	1	1	1	1
14-15	Miss.	1	1	1	1		1	1	1	1
15-16	Ala.	1	1	1	1	Miss.	1	1	1	1
16-17	Ala.	1	1	1	1	Miss.	1	1	1	1
17-18	Miss.	1	1	1	1	Miss.	1	1	1	1
18-19	Miss.	1	1	1	1	1	1	1	1	1
19-20	Miss.	1	1	1	1	Miss.	1	1	1	1
20-22	Miss.	1	1	1	1	Miss.	1	1	1	1
22-25	1	1	1	1	1	1	1	1	1	1
25-30	Miss.	1	1	1	1	1	1	1	1	1
30-35	Miss.	1	1	1	1	1	1	1	1	1
35-40	1	1	1	1	1	1	1	1	1	1
40-45	1	1	1	1	1	1	1	1	1	1
45-50	1	1	1	1	1	1	1	1	1	1
50-60	1	1	1	1	1	1	1	1	1	Torn

Table 2. Five most numerous organisms caught during *NOAA Ship Oregon II* Cruise 282 (OT-08-04), plus pink and white shrimp, and red snapper (n = 262).

	Name	Percent of Total Number Caught	Percent of Total Catch Weight	Percent Frequency Of Capture	Weight Per Individual (gms)
1	Atlantic croaker (*Micropogonias undulatus*)	33.7	37.2	57.2	32
2	Brown shrimp (*Farfantepenaeus aztecus*)	11.5	5.6	76.7	14
3	Longspine porgy (*Stenotomus caprinus*)	7.4	8.7	71.3	34
4	Gulf butterfish (*Peprilus burti*)	5.9	6.8	59.5	33
5	Bigeye searobin (*Prionotus longispinosus)*	3.1	1.1	48.0	19
6	Pink shrimp (*Farfantepenaeus duorarum*)	0.8	0.5	18.7	18
7	White shrimp (*Litopenaeus setiferus*)	0.4	0.7	13.3	46
8	Red snapper (*Lutjanus campechanus*)	0.1	0.9	42.7	132

Table 3. Mean catch rates (kg/hr) of five abundant species, pink and white shrimp, red snapper, and total live catch for *NOAA Ship Oregon II* Cruise 282 (OT-08-04) by area, depth, and diel strata.

Atlantic croaker

Area	Depth												Diurnal Period				Total	
	5 – 9		10 – 19		20 – 29		30 – 39		40 – 49		50 – 60		Day		Night			
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
East Delta	.	.	4	45.6	6	41.7	3	63.6	4	8.7	2	18.4	7	0.1	12	57.9	19	36.6
West Delta	19	3.0	46	108.0	25	52.4	21	15.9	9	5.6	5	0.9	65	18.4	60	92.1	125	53.8
Texas	19	56.8	41	1.2	28	1.2	17	0.8	8	2.1	5	4.1	62	3.6	56	17.7	118	10.3
Areas Combined	38	29.9	91	57.1	59	27.0	41	13.1	21	4.8	12	5.2	134	10.6	128	56.3	262	32.9

Brown Shrimp

Area	Depth												Diurnal Period				Total	
	5 – 9		10 – 19		20 – 29		30 – 39		40 – 49		50 – 60		Day		Night			
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
East Delta	.	.	4	0.0	6	0.0	3	2.7	4	2.9	2	3.2	7	0.9	12	1.7	19	1.4
West Delta	19	0.0	46	1.3	25	10.5	21	3.9	9	3.9	5	1.7	65	2.8	60	4.5	125	3.6
Texas	19	0.6	41	12.1	28	6.7	17	5.5	8	4.0	5	2.5	62	1.6	56	13.2	118	7.1
Areas Combined	38	0.3	91	6.1	59	7.6	41	4.5	21	3.8	12	2.3	134	2.1	128	8.0	262	5.0

Longspine porgy

Area	Depth												Diurnal Period				Total	
	5 – 9		10 – 19		20 – 29		30 – 39		40 – 49		50 – 60		Day		Night			
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
East Delta	.	.	4	29.3	6	65.7	3	64.8	4	30.3	2	13.8	7	30.6	12	53.4	19	45.0
West Delta	19	0.0	46	3.9	25	11.1	21	6.4	9	4.8	5	6.4	65	4.9	60	5.7	125	5.3
Texas	19	0.1	41	2.8	28	8.3	17	5.4	8	4.6	5	7.5	62	5.8	56	2.7	118	4.3
Areas Combined	38	0.0	91	4.5	59	15.3	41	10.2	21	9.5	12	8.1	134	6.7	128	8.9	262	7.7

Gulf butterfish

Area	Depth												Diurnal Period				Total	
	5 – 9		10 – 19		20 – 29		30 – 39		40 – 49		50 – 60		Day		Night			
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
East Delta	.	.	4	0.0	6	1.6	3	0.4	4	0.1	2	0.0	7	1.6	12	0.0	19	0.6
West Delta	19	0.0	46	8.8	25	19.4	21	4.2	9	3.8	5	0.4	65	13.0	60	2.8	125	8.1
Texas	19	0.3	41	3.5	28	7.7	17	3.1	8	5.3	5	19.2	62	8.3	56	0.8	118	4.7
Areas Combined	38	0.2	91	6.0	59	12.0	41	3.4	21	3.7	12	8.2	134	10.2	128	1.7	262	6.0

Table 3 continued.

Pink shrimp

Area	Depth												Diurnal Period				Total	
	5 – 9		10 – 19		20 – 29		30 – 39		40 – 49		50 – 60		Day		Night			
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	
East Delta	.	.	4	7.7	6	0.1	3	0.0	4	0.0	2	0.0	7	0.0	12	2.6	19	1.7
West Delta	19	0.0	46	0.1	25	0.0	21	0.0	9	0.0	5	0.0	65	0.0	60	0.0	125	0.0
Texas	19	1.1	41	1.9	28	0.0	17	0.0	8	0.0	5	0.0	62	0.0	56	1.7	118	0.8
Areas Combined	38	0.5	91	1.2	59	0.0	41	0.0	21	0.0	12	0.0	134	0.0	128	1.0	262	0.5

White shrimp

Area	Depth												Diurnal Period				Total	
	5 – 9		10 – 19		20 – 29		30 – 39		40 – 49		50 – 60		Day		Night			
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
East Delta	.	.	4	0.0	6	0.0	3	0.0	4	0.0	2	0.0	7	0.0	12	0.0	19	0.0
West Delta	19	0.0	46	0.4	25	0.2	21	0.0	9	0.0	5	0.0	65	0.0	60	0.3	125	0.2
Texas	19	7.3	41	0.1	28	0.0	17	0.0	8	0.0	5	0.0	62	1.8	56	0.6	118	1.2
Areas Combined	38	3.7	91	0.2	59	0.1	41	0.0	21	0.0	12	0.0	134	0.8	128	0.4	262	0.6

Red snapper

Area	Depth												Diurnal Period				Total	
	5 – 9		10 – 19		20 – 29		30 – 39		40 – 49		50 – 60		Day		Night			
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
East Delta	.	.	4	2.3	6	2.4	3	5.6	4	1.5	2	0.0	7	2.0	12	2.7	19	2.5
West Delta	19	0.0	46	0.2	25	0.4	21	2.9	9	0.0	5	0.0	65	0.3	60	1.1	125	0.7
Texas	19	0.1	41	0.5	28	1.2	17	1.1	8	0.3	5	0.2	62	0.9	56	0.4	118	0.7
Areas Combined	38	0.1	91	0.5	59	1.0	41	2.4	21	0.4	12	0.1	134	0.7	128	0.9	262	0.8

Total catch

Area	Depth												Diurnal Period				Total	
	5 – 9		10 – 19		20 – 29		30 – 39		40 – 49		50 – 60		Day		Night			
	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean	N	Mean
East Delta	.	.	4	122.6	6	196.8	3	169.7	4	75.4	2	70.9	7	61.7	12	182.6	19	138.1
West Delta	19	10.0	46	176.9	25	130.4	21	47.7	9	40.5	5	34.0	65	63.0	60	150.5	125	105.0
Texas	19	152.8	41	50.1	28	44.5	17	30.2	8	42.1	5	73.1	62	55.7	56	70.8	118	62.9
Areas Combined	38	81.4	91	117.4	59	96.4	41	49.3	21	47.8	12	56.4	134	59.5	128	118.7	262	88.4

Table 4. Summary of environmental samples and data collected during *NOAA Ship Oregon II* Cruise 282 (OT-08-04)

	Surface	Mid-depth	Maximum Depth	Total
Temperature	222	222	222	666
Salinity	222	222	222	666
Dissolved Oxygen	222	222	222	666
Light Transmission	222	222	222	666
Water color	--	--	--	110
Cloud cover	--	--	--	111
*CTD	--	--	--	224
Winkler Titrations	--	--		35
HACH DO	--	--		34
**Shrimp trawl	--	--	--	264
Bongo	--	--	--	45
Neuston	--	--	--	46

* Data corrupted on two stations after the CTD cast was completed, thus the data is not included in the database.
** Includes two stations where nets were torn.

Table 5. Bottom dissolved oxygen concentrations (DO, mg/l) measured with a Sea-Bird model 9+ environmental profiler (primary and secondary DO sensors), Winkler titrations, and hand held Hach DO meter values collected during *NOAA Ship Oregon II* Cruise 282 (OT-08-04)

Date	Station	Winkler #1	Winkler #2	Winkler #3	CTD 1st	CTD 2nd	Hach meter	Depth (M)
10 June	001	4.8	5.3	4.7	4.8	4.1	4.7	20
11 June	008	3.5	4.4	3.8	3.2	4.5	5.4	77
13 June	015	4.2	4.3	4.4	2.9	3.8	4.7	77
14 June	019	4.2	4.0	3.8	2.7	3.6	4.3	20
16 June	020	5.5	5.3	5.3	3.5	4.9	5.6	61
16 June	023	5.8	5.2	5.2	3.4	4.8	5.5	83
16 June	024	6.6	5.4	5.2	3.5	5.1	5.6	61
17 June	037	5.7	5.5	5.6	5.0	5.4	5.9	26
18 June	047	5.2	5.0	4.5	3.3	3.9	4.6	85
19 June	054	6.2	6.2	6.2	5.4	5.7	6.3	24
20 June	070	5.4	5.4	5.5	5.0	5.0	5.6	54
21 June	075	4.9	5.4	4.9	4.5	4.5	5.1	29
21 June	079	6.4	6.2	6.0	5.6	5.6	6.2	25
22 June	085	5.0	4.7	4.5	3.6	4.3	4.9	63
23 June	097	4.5	-	4.5	2.4	3.0	4.5	15
23 June	101	1.9	2.5	1.7	0.6	1.4	2.1	28
26 June	108	1.1	1.2	1.1	0.2	1.1	1.9	28
27 June	117	2.6	2.8	2.8	2.0	2.8	3.2	35
28 June	126	4.6	4.5	4.6	4.1	4.5	5.1	64
29 June	137	4.4	4.3	4.4	3.7	4.3	4.9	64
30 June	145	4.7	4.6	4.6	3.9	4.5	5.2	54
01 July	160	0.1	0.1	0.1	-0.9	0.2	0.5	19
02 July	168	3.8*	3.8*	3.9*	1.0	1.4	4.7	19
02 July	170	2.2	2.2	2.2	1.3	2.1	2.6	29
06 July	178	5.5*	5.7*	-	3.1	2.9	-	12
07 July	189	0.2	0.2	-	0.1	0.2	0.4	22
08 July	200	2.5	2.5	-	1.9	2.0	2.8	32
09 July	208	1.4	1.2	1.5	1.1	1.1	1.7	29
10 July	220	5.1	5.0	-	4.7	4.7	5.6	106
11 July	228	4.1	4.2	-	3.6	3.7	4.6	92
12 July	240	5.0	5.0	-	4.3	4.3	5.6	33
13 July	251	1.9	1.8	-	0.4	0.5	2.2	25
14 July	262	4.4	4.6	4.3	2.7	2.8	4.8	55
15 July	273	0.3	0.5	-	0.1	0.1	1.2	13
16 July	284	0.2	0.2	0.3	0.1	0.1	0.5	32

*Problem encountered with collecting water sample, Winkler titration and Hach readings may have been contaminated.

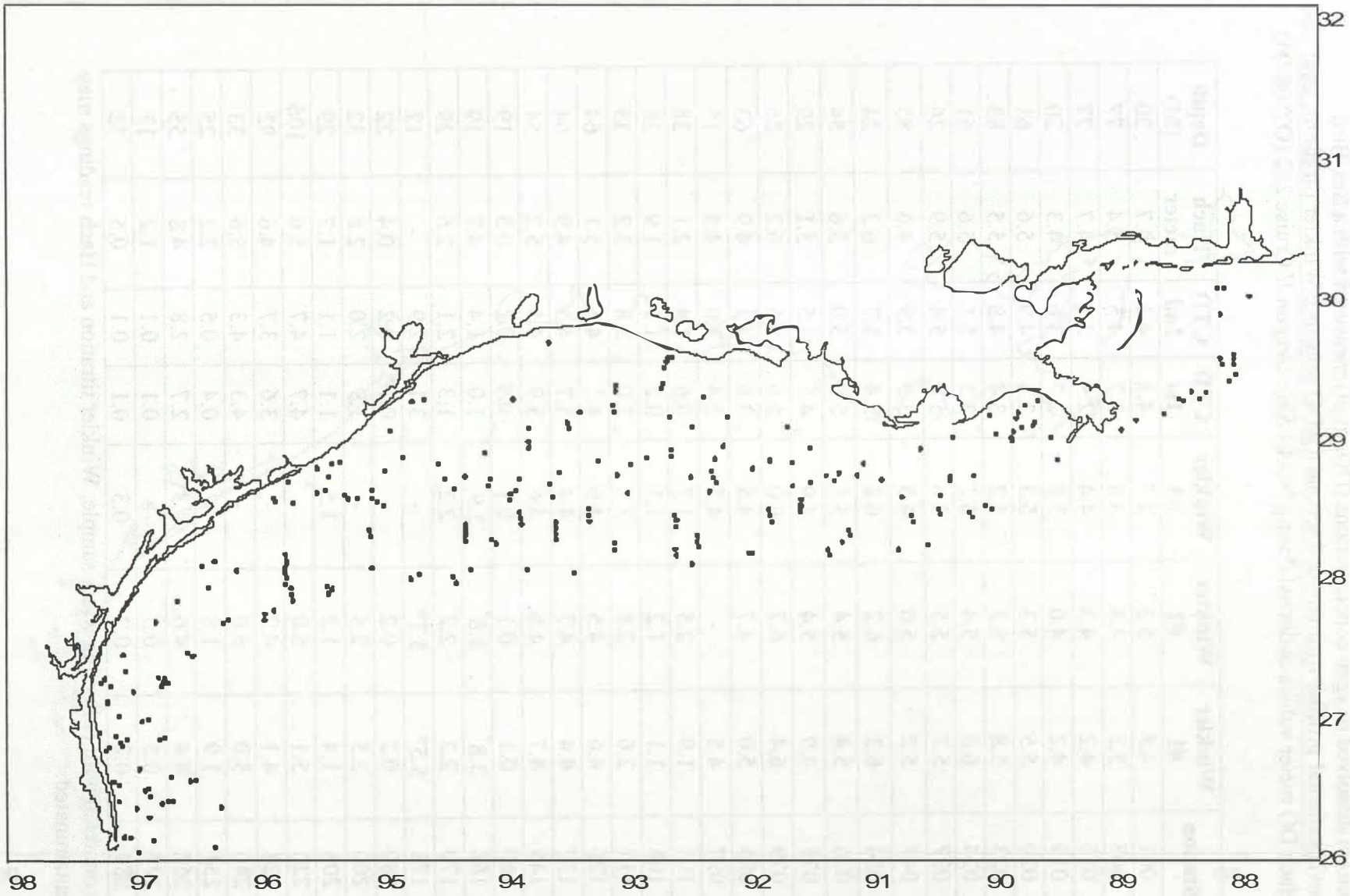

Figure 1. Shrimp trawl stations accomplished during *NOAA Ship Oregon II* Cruise 282 (OT-08-04).

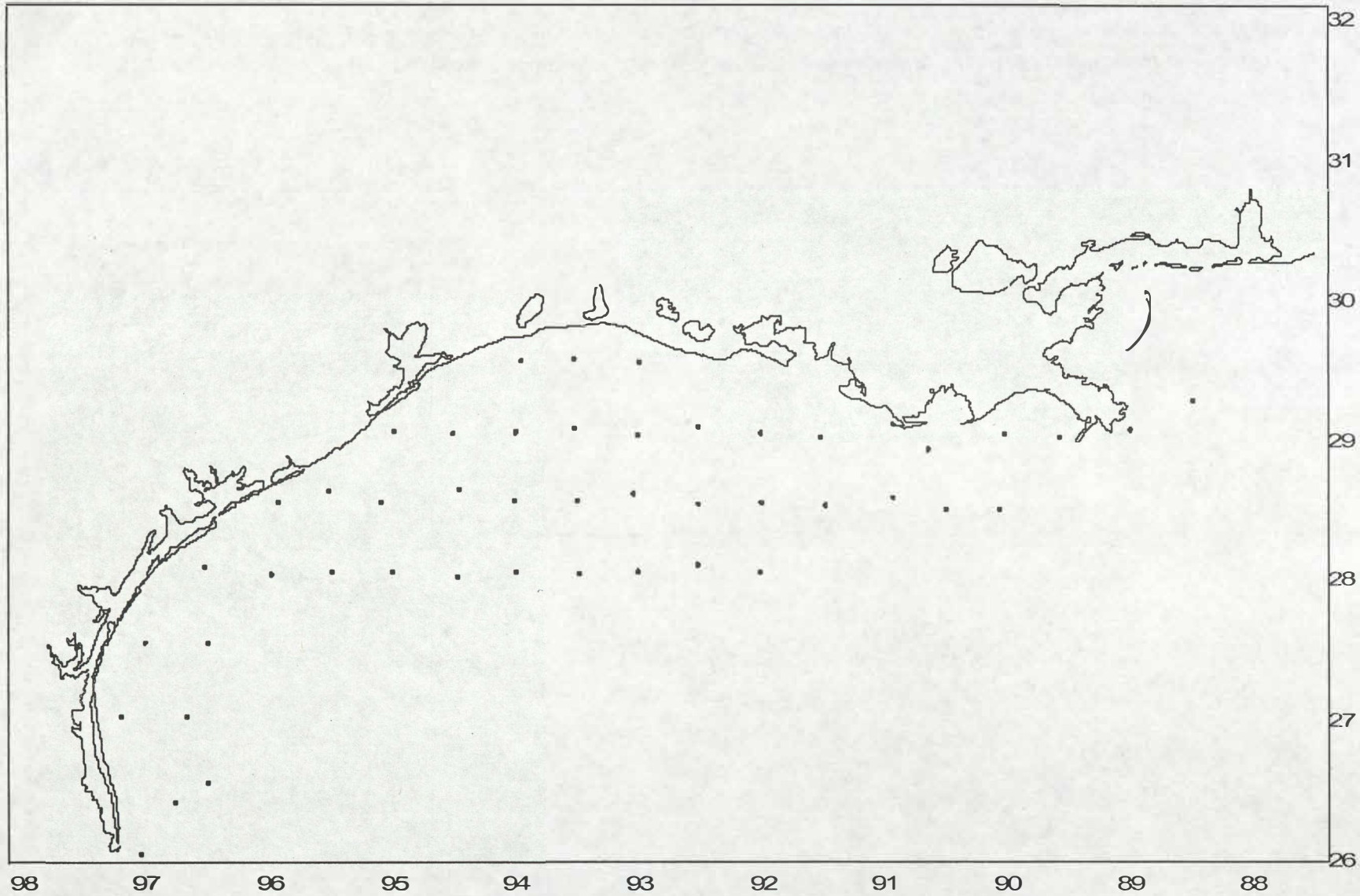

Figure 2. Ichthyoplankton sampling stations completed during *NOAA Ship Oregon II* Cruise 282 (OT-08-04).

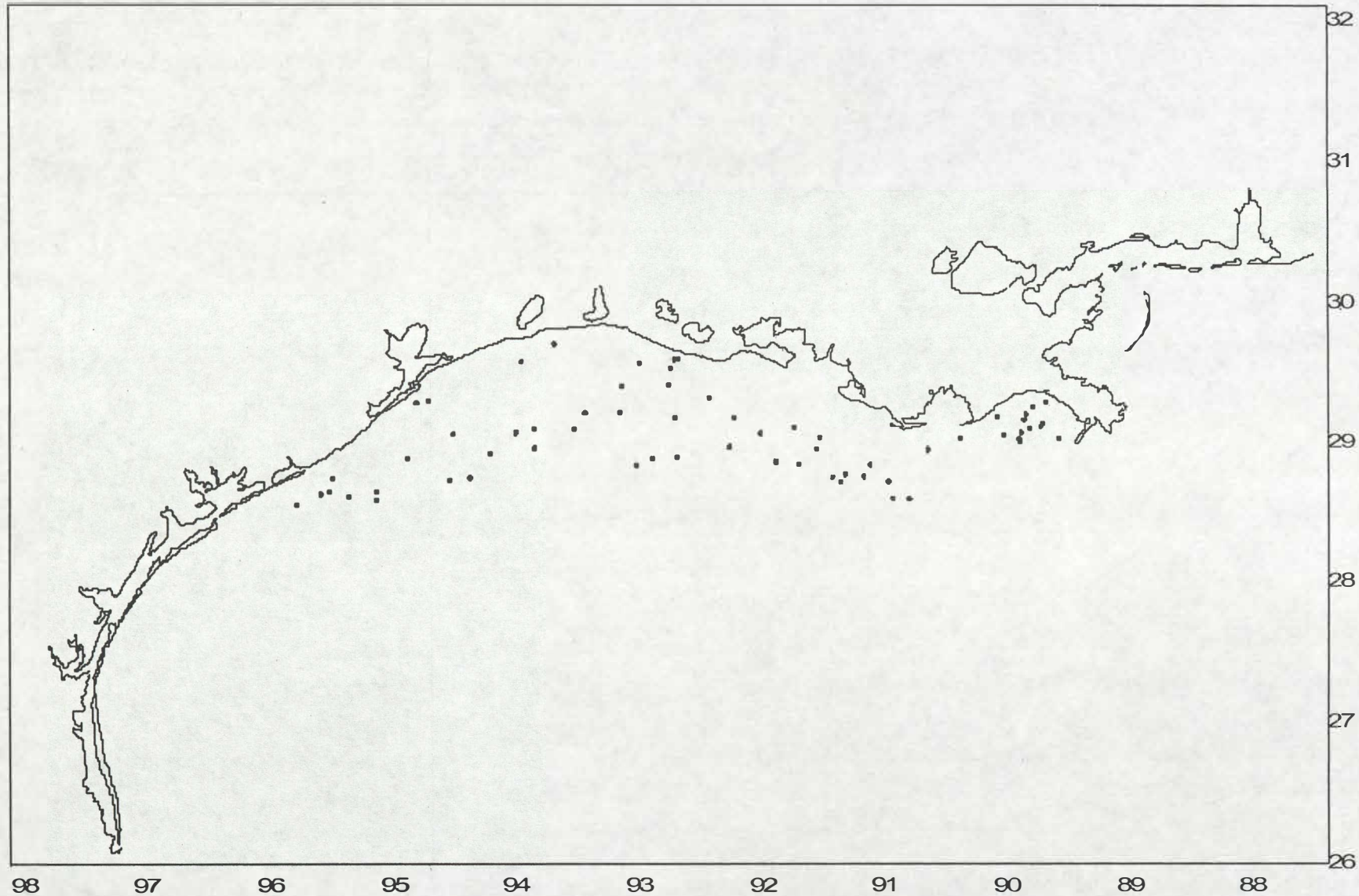

Figure 3. Locations where hypoxic conditions (bottom dissolved oxygen measurement ≤2.0 milligrams per liter) were encountered during *NOAA Ship Oregon II* Cruise 282 (OT-08-04).