Field Plan for Cooperative Research Cruise to Document Biotic Effects of the Deepwater Horizon Oil Spill—May 2010

May 4, 2010

Prepared by: Kristopher Benson (NOAA)
Reviewed by Jessie Webber (ENTRIX, for BP)

Participating Institutions

- Florida Fish and Wildlife Research Institute
  Robert McMichael, Jr., Research Administrator
- College of Marine Science, University of South Florida
  Ernst Peebles, Associate Professor
  Andrew Remsen, Research Associate

Investigator Qualifications

- Robert McMichael is the Florida SEAMAP representative and a member of SEAMAP's Reef Fish, Adult Finfish, Shrimp/Groundfish, and Longlining Work Groups. He has 30 years of experience surveying fishes and invertebrates in the nearshore and offshore waters of the eastern Gulf of Mexico.
- Ernst Peebles has 27 years of experience surveying zooplankton and ichthyoplankton in the eastern Gulf of Mexico, primarily in nearshore waters. He is Chair of the Joint Task Group on Fishes for the reference book *Standard Methods*.
- Andrew Remsen is the Principal Investigator for the SIPPER technology that will be used on the cruise. http://marathon.csee.usf.edu/~kkramer/sipper/
- All of the crew have previous research cruise experience, many with the equivalent of more than one month or more at sea.

Objectives

- Establish pre-impact baseline for organism abundance in Gulf of Mexico continental shelf waters near spill. There is urgency in the timing of initiation of sampling due to trajectories indicating oil approaching the SEAMAP sampling areas south of Pensacola, FL (NMFS statistical areas 8 & 9).
- Characterize zooplankton distribution, abundance, and species composition at a minimum of 6 stations in the area to the southeast of the oil plume, and use proprietary SIPPER technology to detect and document mortality of zooplankton and fish larvae in spill area.
- Characterize the distribution of crude oil droplets (number and size) in the vicinity of the oil plume, to 300 m depths.

Scope

- Temporal: Conditions during early May 2010 (10 day cruise including transit, departure scheduled for morning of Tuesday, May 4th).
- Geographic: Two unimpacted, contiguous NMFS stat zones within the eastern Gulf of Mexico (2 within NMFS stat zones 1-10) and impacted locations west or northwest of these in the direct vicinity of the spill. Selection of locations is adaptive, and will depend on observed spill location (impacted sites) and forecast spill location (unimpacted stat zones) at the time of the cruise.
- Biotic: invertebrate zooplankton, fish eggs, fish larvae and postlarvae, shrimp and groundfish, benthic (bottom-dwelling) invertebrates, tissue samples for toxicology and stable-isotope analysis. Stable isotopes may be useful for establishing a linkage between oil and organism tissues.
- Abiotic: water samples, sediment samples.

Methods

Gear Deployments.

The list of deployed gears includes SIPPER, plankton nets, neuston net, 40' SEAMAP trawl, Shipek grab, Capetown dredge, and environmental CTDs and fluorometers. There will be 15-17 stations per NMFS stat zone (a total of 30-34 stations for the 2 stat-zone-design used here). SIPPER will be deployed at alternating stations to provide data for examining diel cycles that are based on multiple locations. In order to conform to existing SEAMAP data, trawling and neuston tows will be conducted during the day and plankton net tows will be conducted at night. Environmental data and water samples will be collected with each gear deployment.

SIPPER (Shadowed Image Particle Profiling Image Evaluation Recorder).
SIPPER will be deployed as oblique surface-to-bottom-to-surface tows that mimic the standard plankton-net deployments, filtering a target of 1 m^3 per meter of vertical depth. SIPPER is equipped with a Sea-Bird 19 CTD and two of the following: (1) a transmissometer, (2) a WET Labs chlorophyll a and blue backscatter ECO meter, or (3) a WET Labs CDOM ECO meter. SIPPER stores this environmental data with the corresponding data images.

Mapping areas such as the oil spill area with SIPPER would be achieved using repeated up-and-down casts (~10 vertical profiles per 1.0-1.5 km), creating sawtooth patterns.

In either deployment mode (oblique vs. sawtooth), SIPPER can provide feedback on major taxonomic group abundance within 1 hr of deployment.

Other Deployed Gears

The cruise will use standardized methods developed for the SEAMAP program http://www.gsmfc.org/default.php?p=sm_ov.htm. SEAMAP has been operating continuously in the Gulf of Mexico since 1981.

SEAMAP Gear Types:

- Plankton nets (zooplankton, fish eggs, larval fishes)
    - Bongo nets: two conical 0.6 meter mouth nets with 333-micron mesh. Surface to near-bottom (or 200 m) and back to surface at 45-degree wire angle. Mechanical flowmeter mounted off-center in the mouth of each bongo net to record the volume of water filtered. This allows catch to be expressed as number of individuals per unit volume of water.
    - Samples are preserved in 5- 10% formalin and transferred after 36-48 h to 95% ethanol for long-term storage. During some surveys, selected samples are preserved initially in 95 % ethanol and later transferred to fresh ethanol. An adequate ethanol supply has not been verified at the time of writing. Isopropanol is available as a substitute if necessary.
    - Alternative gear: We are in the process of preparing standard SEAMAP bongo nets for the cruise. The alternate net is a single, 1.0 meter mouth net with 333-micron mesh, deployed in the same manner as the SEAMAP bongo nets.
- Neuston net (postlarval fishes)
    - 1.0 mm mesh net mounted on a 1 by 2 meter frame towed at the surface at 2.7-3.0 knots for 10 minutes with the frame half submerged.
    - Samples are preserved in 5-10% formalin and transferred after 36 h to 95% ethanol for long-term storage. During some surveys, selected samples are preserved initially in 95% ethanol and later transferred to fresh ethanol.
- 40' SEAMAP Trawl (shrimp and groundfish)
    - 40-ft shrimp nets with 8-ft by 40-inch chain bracketed wooden doors. Tow durations is 30 minutes. All catch is identified and enumerated onboard and length-frequency measurements are obtained for major finfish and shrimp species to document population size structures.

Non-SEAMAP Gear Types:

- Water samplers (chemical analysis, including hydrocarbons)
- Capetown dredge (qualitative samples of large and small bottom animals)
    - Macropscopic items will be documented using photography.
    - Small animals will be rinsed from hard substrates and preserved in 5-10% formalin.
- Shipek grab (sediment)
    - Part of sample will be frozen for geochemical analysis.
    - USEPA standard 500-micron sieves will be used to isolate macrobenthos from sediment for preservation in 5-10% formalin.

Data Comparability, Chain of Custody, and Interpretation

- Sampling design
    - The sampling design allows comparability to existing SEAMAP data. A stratified-random approach will be used, with NMFS stat zones serving as strata. The general strategy behind the statistical approach can be found at http://webcache.googleusercontent.com/search?q=cache:uONrSUdAoFUJ:www.sos.bangor.ac.uk/~oss405/Thinking%2520about%2520Experimental%2520Design.doc+Kaiser+before+after+control+impact&cd=1&hl=en&ct=clnk&gl=us&client=firefox-a (note that a Word version is also available at this link). Future cruises of the same design will add statistical power to this analysis, as described in the document at the link above. These future cruises are anticipated to take place in other locations as the spill expands and moves away from the original spill site.
- Chain-of-Custody Records
    - All samples will be rigorously labeled and all transfers of samples will be documented using chain-of-custody forms.
- Data types and formats
    - Formats will conform to SEAMAP data standards where applicable. SIPPER data exists in the form of high-resolution gray-scale images obtained using a linescan camera. Regions-of-interest (ROIs) within these images will be identified and analyzed using SIPPER software created by the USF College of Marine Science http://figment.csee.usf.edu/~shallow/sipper/papers/SipperSoftwareManual.pdf. In addition, a sample of individual ROIs will be manually examined for signs of mortality. It is known that SIPPER images of zooplankton and fish larvae are typically of sufficient resolution to allow successful distinction of decomposing individuals from healthy individuals.

Vessel:

All operations will be completed on the *R/V Weatherbird II* (115 ft, 12) operated by the University of South Florida out of St. Petersburg, FL.
The cruise is planned for a 10-day deployment beginning May 4 or May 5, 2010.

Safety Plan:
A full operations and safety plan will be prepared for review and approval before any planned operations.
Estimated Total Costs for Equipment and Ship time:
R/V Weatherbird II ~$6.5K per day
USF sampling personnel and lab costs ~$3.5K per day

If there are external lab costs or vessel decontamination costs, these would be additional. All costs associated with SEAMAP sampling are being covered by the state of FL.

Approval of this work plan is for the purposes of obtaining data for the Natural Resource Damage Assessment. Parties each reserve its right to produce its own independent interpretation and analysis of any data collected pursuant to this work plan.

Attachments: Detailed Cruise Plan

Approved by:

Lisa Dipinto, Ph.D. (NOAA)

5/4/10

Date

Ralph Markarian, Ph.D. (ENTRIX)

5/4/2010

Date

CRUISE PLAN for RV Weatherbird II
Dates: 4 – 14 May 2010

Florida Institute of Oceanography
FWC/Fish and Wildlife Research Institute
USF/College of Marine Science

Contact
Robert McMichael Jr.
[redacted]

Or

Ernst Peebles
[redacted]

I. OBJECTIVES

a. Characterize living marine resources, using a variety of sampling methods, at a minimum of 32 Southeast Area Monitoring and Assessment (SEAMAP) stations in nearshore Florida waters prior to exposure to the oil spill originating from the Deepwater Horizon disaster;
b. Characterize zooplankton distribution, abundance, and species composition at a minimum of 6 stations in the area to the southeast of the oil plume;
c. Characterize the distribution of crude oil droplets (number and size) in the vicinity of the oil plume.

II. STATION POSITIONS and DESCRIPTION OF OPERATIONS

Operations during this cruise will consist of two primary components: a baseline survey of living marine resources at approximately 32 SEAMAP stations prior to anticipated exposure to the oil spill in coastal areas of the Florida panhandle and/or Big Bend region (Figure 1; NMFS statistical zones 7 – 10) and a focused survey of zooplankton, benthos, and physical characteristics of the oil spill in the vicinity of the oil plume (Figure 2). Operations will follow the general cruise timeline outlined below:

Table 1. General cruise plan.

Date	Time	General Activity
4 May 2010	20:00	Depart Bayboro
5 May 2010	20:00	Begin survey of SEAMAP stations
6 May 2010		Continue survey of SEAMAP stations
7 May 2010		Continue survey of SEAMAP stations
8 May 2010		Continue survey of SEAMAP stations
9 May 2010		Continue survey of SEAMAP stations

10 May 2010		Continue survey of SEAMAP stations
11 May 2010	06:00	Complete survey of SEAMAP stations
11 May 2010	12:00	Initiate zooplankton/SIPPER surveys SE of oil spill point source
12 May 2010	06:00	Initiate SIPPER surveys in vicinity of oil spill point source
12 May 2010	12:00	Conduct Shipek benthic survey along transect extending outwards from point source
12 May 2010	18:00	Depart for Bayboro
14 May 2010	06:00	Arrive at Bayboro

For the surveys at the SEAMAP stations (Figures 3 – 6), the RV Weatherbird II will be responsible for the deployment and retrieval of all scientific sampling gear (see section IV below for specific details). At each SEAMAP station, the following samples will be collected: 42' semi-balloon SEAMAP trawl (30 minute tow); profiling hydrographic (CTD) cast (surface to 5 m above the bottom); Capetown dredge (10 minute tow); SEAMAP bongo net (surface to depth of pycnocline – time will vary depending on depth and rate of deployment/retrieval); SEAMAP neuston net (surface with half of the net submerged – 10 minute tow); Shipek bottom grab (surficial sediment sample); water sample (surface). At every other station, a Shadowed Image Particle Profiling Image Evaluation Recorder (SIPPER) oblique cast will be conducted. Estimated duration of station-specific operations is two to three hours, with additional time required at stations where SIPPER will be used.

At present, surveys of SEAMAP stations will begin on 5 May in NMFS statistical zone 8 (Figures 3 and 4) and will continue through NMFS statistical zone 9 (Figures 3 and 5). In the event that surveys of SEAMAP stations are completed prior to the morning of 11 May, additional stations will be sampled within NMFS statistical zone 10 (Figures 3 and 6). Sampling effort will be shifted eastward (i.e., NMFS statistical zones 6 and 7) should planned sampling areas become impacted by the oil spill during the cruise (Figures 3, 7 – 10). Planned order of stations to sample is as follows:

Table 2. Tentative List and Order of SEAMAP Stations to be Sampled

SEAMAP Station ID	Latitude	Longitude	SIPPER	Rosette
Primary Sampling Stations				
E0820	28.8225	-85.1067	Y	
E0816	28.865	-85.1567		
E0818	28.84	-85.2942	Y	
E0817	28.8567	-85.3767		
E0811	29.0908	-85.5108	Y	
E0813	28.9717	-85.3767		
E0814	28.9633	-85.0033	Y	
E0812	29.0317	-85.1142		Y
E0810	29.105	-85.1175	Y	
E0809	29.3	-85.1642		
E0808	29.3575	-85.1342	Y	
E0807	29.3758	-85.1225		

E0806	29.6117	-85.9008	Y	
E0805	29.6642	-85.7433		
E0803	29.74	-85.8425	Y	
E0802	29.8933	-85.625		
E0801	30.1467	-85.8967	Y	
E0910	30.0333	-86.0642		
E0911	30.0292	-86.5808	Y	
E0912	30.0267	-86.1567		
E0903	30.2742	-86.3017	Y	
E0914	29.7608	-86.3283		
E0913	29.8542	-86.4375	Y	
E0909	30.0333	-86.5183		
E0911	30.0292	-86.5808	Y	
E0907	30.085	-86.565		
E0905	30.2217	-86.8092	Y	
E0901	30.3242	-86.815		
E0902	30.2875	-86.9458	Y	Y
E0904	30.2483	-86.9767		
E0906	30.1	-86.8967	Y	
Secondary Sampling Stations – To be sampled if time allows after primary complete				
E1006	29.9642	-87.0875		
E1007	29.9267	-87.1925	Y	
E1009	29.8108	-87.3583		
E1008	29.8625	-87.5033	Y	
E1005	29.9967	-87.275		
E1004	30.0067	-87.275	Y	
E1003	30.1042	-87.2183		Y
E1002	30.2017	-87.42	Y	
E1001	30.2242	-87.7158		
E1010	29.5383	-87.9175	Y	
E1011	29.325	-87.8508		

At the completion of SEAMAP surveys on 11 May, a series of stations will be surveyed for zooplankton distribution and abundance above the pycnocline in the region to the southeast of the heaviest concentration of surface oil (Figure 2) using bongo nets, neuston nets, and SIPPER. On the morning of 12 May, a series of surveys of the distribution and dynamics of oil droplet particles will be conducted to the east of the area of heaviest concentration of surface oil using SIPPER (Figure 2), at the completion of which a series of five Shipek bottom grabs will be collected at ~ 10 nm intervals along the 1000 m bathymetric contour (or as deep as can be sampled using the available deployment wire) representing incremental distances from the heaviest oil concentration (Figure 2). One completed, the RV Weatherbird II will steam back to Bayboro.

III. PERSONNEL (emergency contact information)

David Jones (USF – chief scientist) [redacted]

Mandy Tyler-Jedlund (FWC)
Julie Vecchio (FWC)

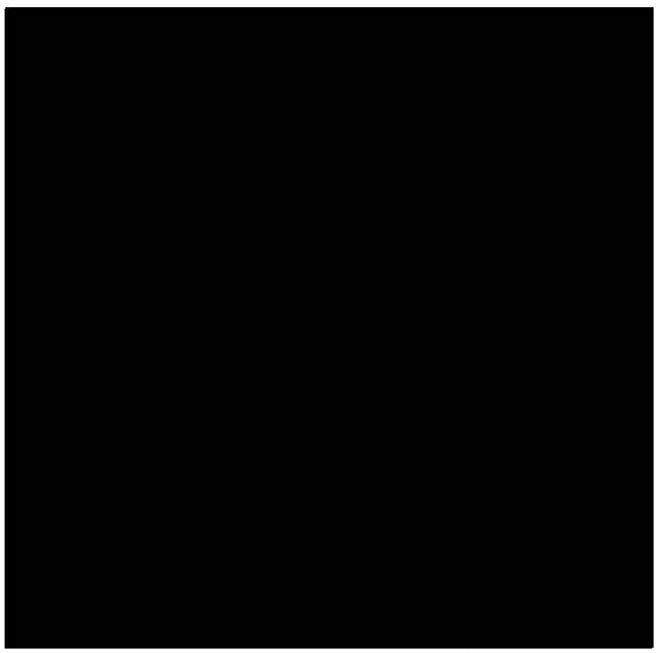
Theresa Kanaszka (FWC)

Steve Warner (FWC)

Elise Brumer (FWC)

Susan Hilber (FWC)
Ralph Kitzmiller (USF)
Kara Radabaugh (USF)
Holly Rolls (USF)
Andrew Remsen (USF)

Kurt Kramer (USF)



* Dietary requirements:
2 vegetarians

IV. STATION SPECIFIC OPERATIONS:

1. Station arrival
    a. GPS assessment – each station has a SEAMAP Station ID associated with pre-selected coordinates from the random site selection procedure. Sampling occurs as close as possible to the pre-selected coordinates.
    b. Weather assessment
2. Shipek Benthic Grab – will be deployed first to check for the presence of subsurface oil prior to trawl deployment
    a. Deployment – lowered through water column while vessel either is drifting or holding position
    b. Fishing – Benthic grab works by self-trigger when grab reaches the sediment surface
    c. Retrieval – vertically through water column
    d. Sample workup – sample divided, with ~400 mL preserved for geochemical analysis and the remainder sieved to isolate macrobenthos from sediment; samples preserved in 10% buffered formalin and labeled
    e. Data recording – record GPS position, time of deployment/retrieval, any pertinent notes on sample
3. Trawling – 42' otter trawl complying with SEAMAP specifications
    a. Deployment – data recording
    b. Fishing – retrieved after 30 minutes tow time
    c. Retrieval – obliquely retrieved through water column, record end position/time, secured on deck
    d. Sample workup – record and release species of concern (turtles, mammals), aggregate sample weight, separate sample into species, species specific weights/measurements, photographic survey of components of

live-bottom community, randomly select individuals for workup (representative and identification samples, life history, toxicology, fish health), sample labeling.

e. Data recording – record GPS position, time of deployment/retrieval, any pertinent notes on sample; proper records kept on species counts, measurements, culls, representative samples, identification samples

4. Hydrographic cast (aka CTD)
   a. Deployment – CTD is deployed vertically through water column and data is recorded real-time. Data record is displayed on computer screen in ship's computer laboratory.
   b. Retrieval – CTD is retrieved vertically through water column.
   c. Data recording – data is recorded internally on CTD hard drive. Data can also be recorded on computer in ship's computer laboratory.
5. Plankton tows – Bongo Net
   a. Deployment – vertically lowered through water column until pycnocline reached
   b. Fishing – obliquely retrieved through water column
   c. Retrieval – time/location recorded, sample washed down into cod-end
   d. Sample workup – plankton sample preserved in 10% buffered formalin and labeled
   e. Data recording – record GPS position, time of deployment/retrieval, any pertinent notes on sample
6. Plankton town – Neuston Net – **10 minutes**
   a. Deployment – lowered through water column until lower half of the net submerged
   b. Fishing – retrieved after 10 minutes tow time
   c. Retrieval – time/location recorded, sample washed down into cod-end
   d. Sample workup – plankton sample preserved in 10% buffered formalin and labeled
   e. Data recording – record GPS position, time of deployment/retrieval, any pertinent notes on sample
7. Capetown Dredge
   a. Deployment – lowered through water column
   b. Fishing – towed along sediment surface; retrieved after 10 minutes tow time
   c. Retrieval - obliquely retrieved through water column
   d. Sample workup – macroscopic fauna will be documented using photography; small animals will be rinsed from hard substrates and preserved in 10% buffered formalin and labeled
   e. Data recording – record GPS position, time of deployment/retrieval, any pertinent notes on sample

V. EQUIPMENT

To be furnished by FIO:

Quantity	Item
1	CTD
1	deck mounted, hydraulic windlass/cathead

1	Rosette sampler

To be furnished by FWC:

7	42' SEAMAP semi-balloon otter trawls
2	Sets of trawl cables
3	Sets of trawl doors
3	Bongo plankton nets
2	Neuston nets
1	Chest freezer

To be furnished by USF:

1	Capetown dredge
1	Shipek sampler
1	SIPPER system

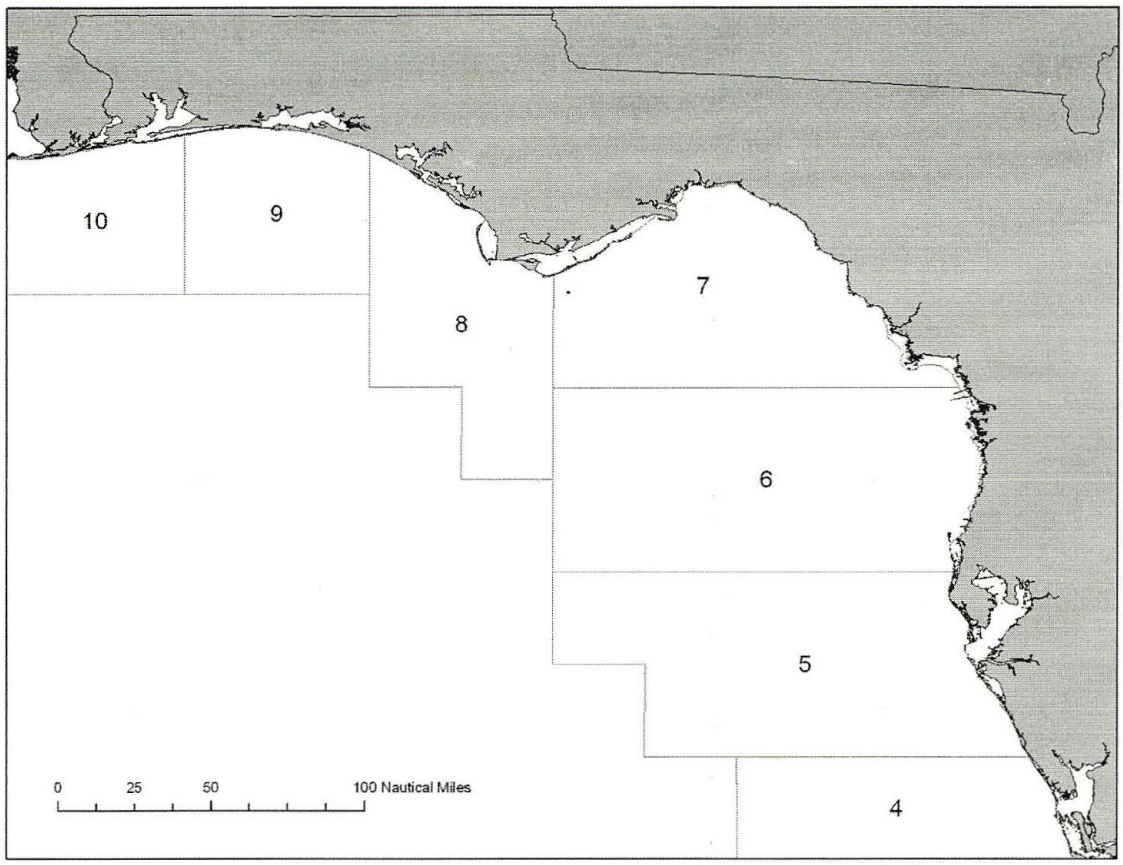


Figure 1: National Marine Fisheries Service (NMFS) statistical shrimp zones (4 – 10) within coastal Florida waters. Based on current projections of areal extent of the oil slick, surveys of living marine resources will likely be conducted at SEAMAP stations within NMFS zones 8 and 9 along with opportunistic sampling within NMFS zone 10 should time permit. Should the oil slick move further east by the time of sampling, survey effort will be shifted to the east to assure that the majority of sampling effort occurs prior to exposure to oil contamination.

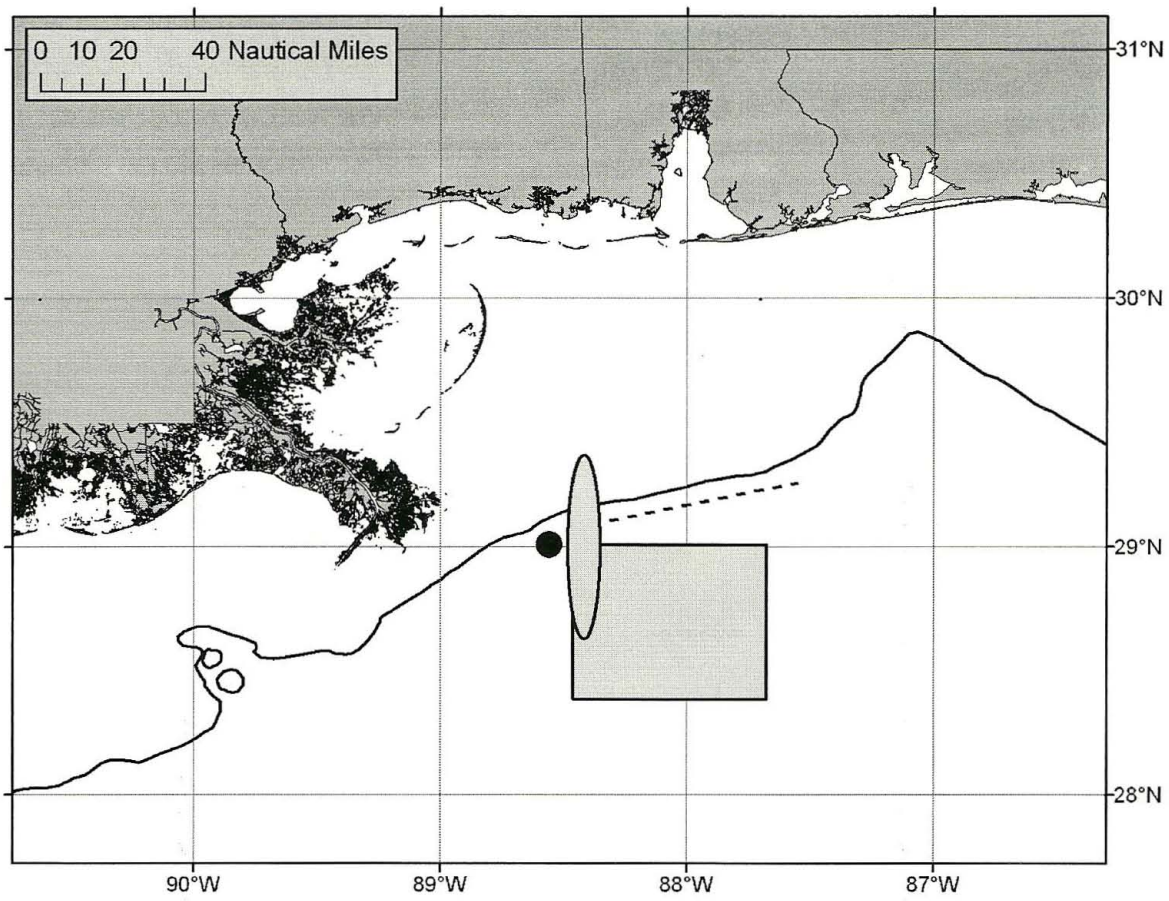


Figure 2. A map of the north-central Gulf of Mexico, including the 600 foot bathymetric contour. The black dot represents the current location (2 May 2010) of the heaviest concentration of surface oil. The dashed line represents the approximate location of the 1000 foot contour along which a series of five Shipek grab samples will be collected. The shaded rectangle represents the general sampling location within which plankton/neuston/SIPPER samples of zooplankton distribution above the pycnocline will be collected. The shaded oval represents the approximate location within which SIPPER surveys of oil droplet dynamics will be conducted.

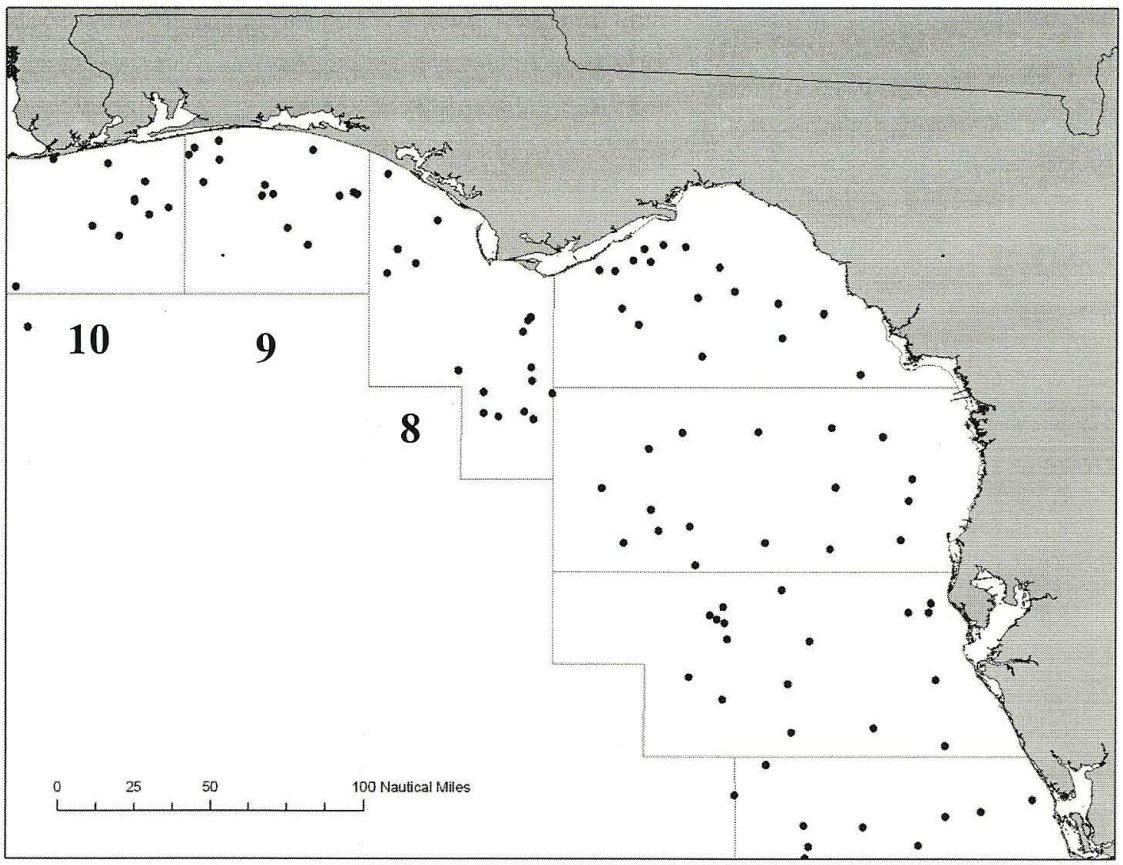
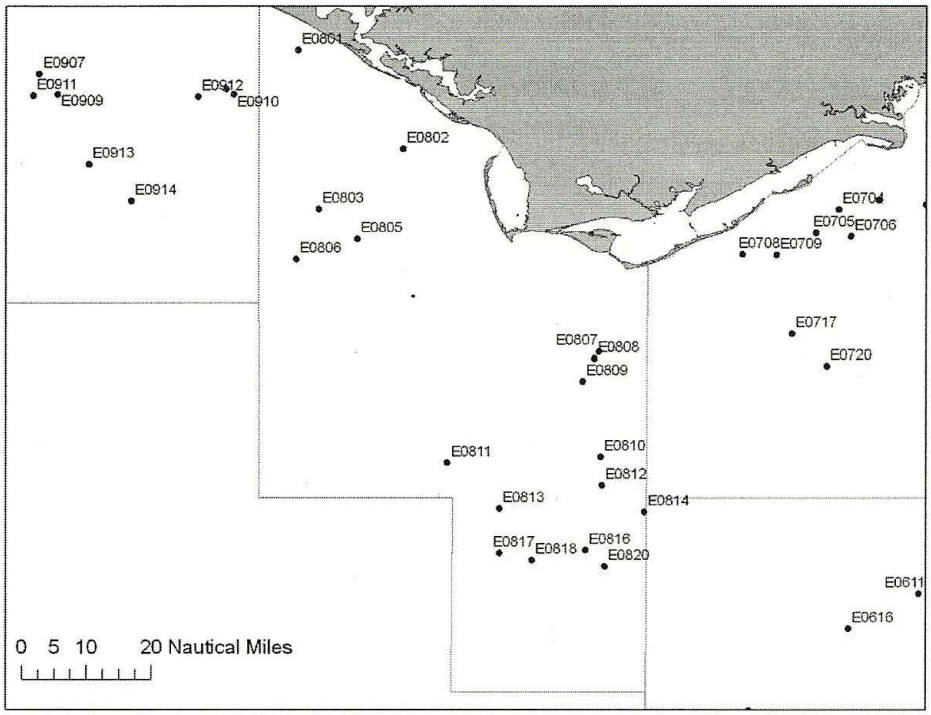
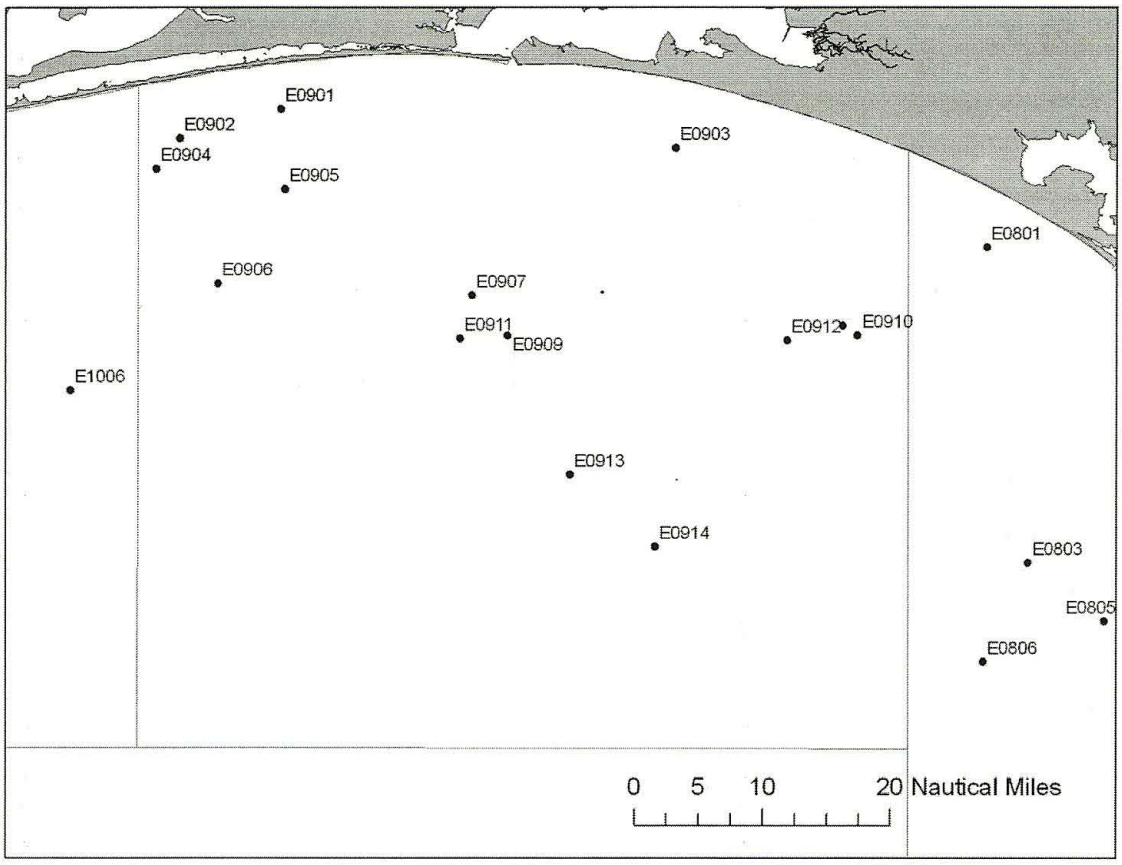


Figure 3. Map of all SEAMAP sampling sites within NMFS statistical zones shown in Figure 1 above. Sampling for this cruise will occur in two of these zones (likely zones 8 and 9 above) with additional sampling occurring in zone 10 should time allow.



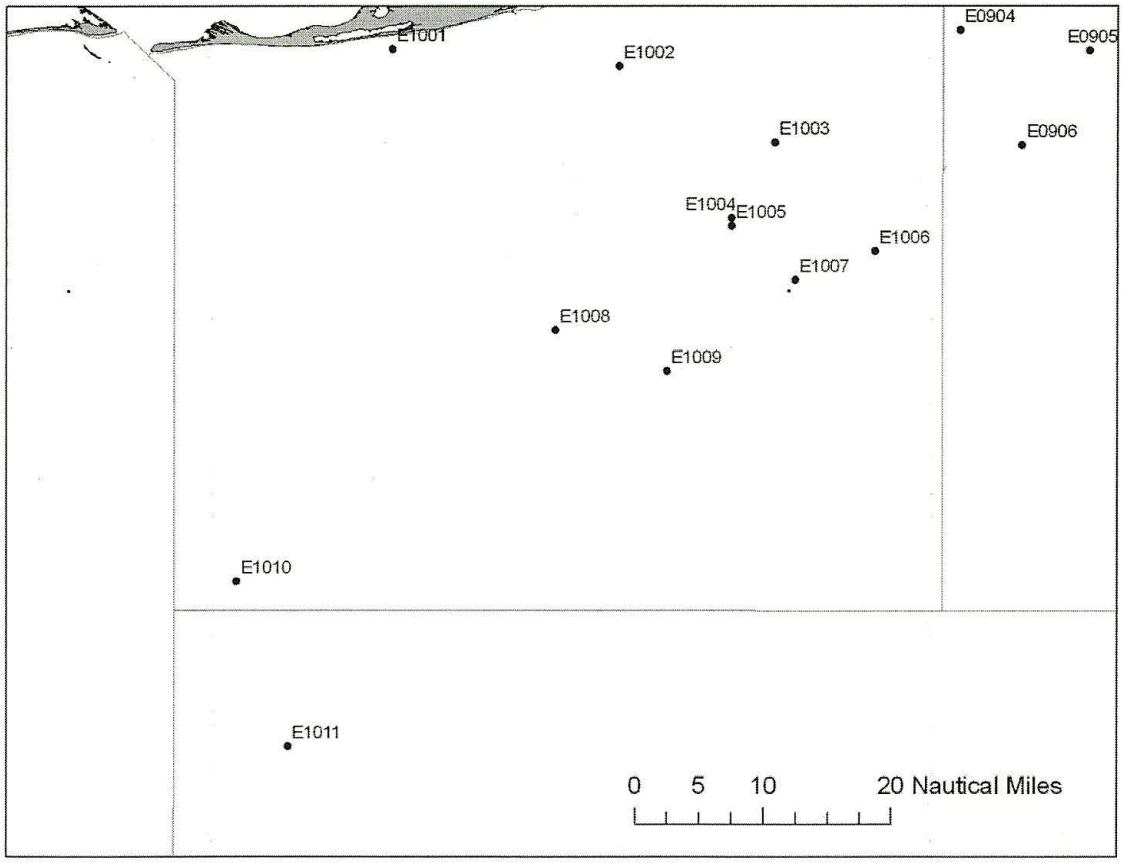
SEAMAP Summer Station ID	Latitude	Longitude
E0801	30.1467	-85.8967
E0802	29.8933	-85.625
E0803	29.74	-85.8425
E0805	29.6642	-85.7433
E0807	29.3758	-85.1225
E0808	29.3575	-85.1342
E0809	29.3	-85.1642
E0810	29.105	-85.1175
E0812	29.0317	-85.1142
E0806	29.6117	-85.9008
E0811	29.0908	-85.5108
E0813	28.9717	-85.3767
E0814	28.9633	-85.0033
E0816	28.865	-85.1567
E0817	28.8567	-85.3767
E0818	28.84	-85.2942
E0820	28.8225	-85.1067

Figure 4. Locations of SEAMAP sampling stations within NMFS statistical zone 8.



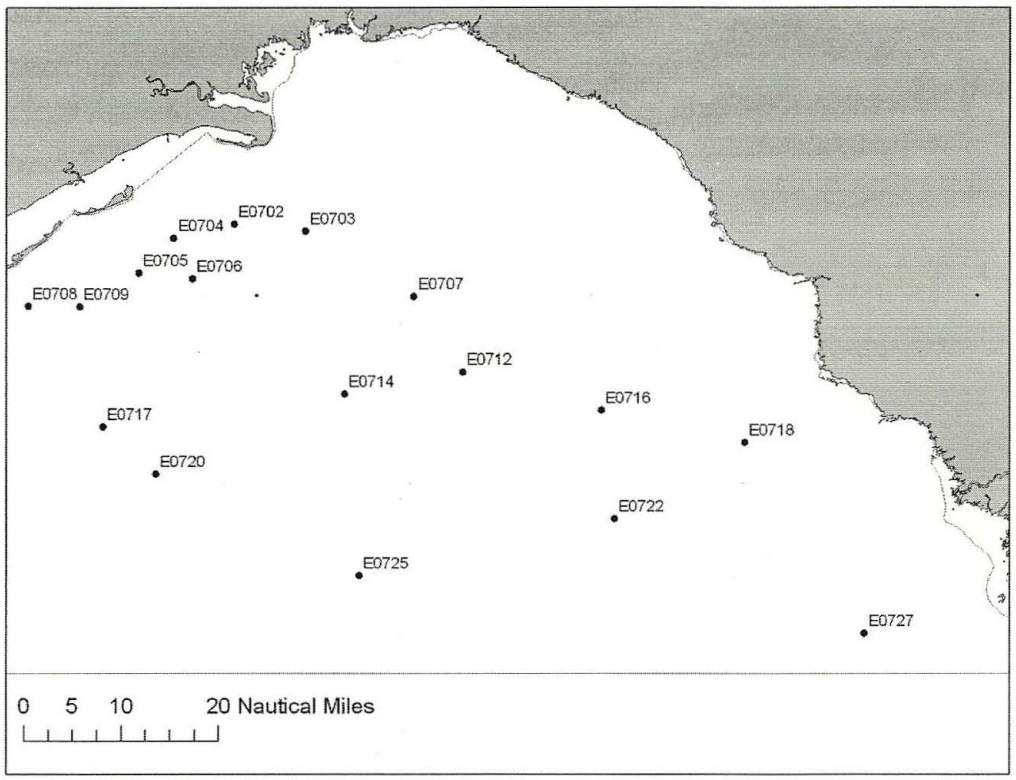
SEAMAP Summer Station ID	Latitude	Longitude
E0901	30.3242	-86.815
E0902	30.2875	-86.9458
E0903	30.2742	-86.3017
E0904	30.2483	-86.9767
E0905	30.2217	-86.8092
E0908	30.0458	-86.0833
E0910	30.0333	-86.0642
E0912	30.0267	-86.1567
E0906	30.1	-86.8967
E0907	30.085	-86.565
E0909	30.0333	-86.5183
E0911	30.0292	-86.5808
E0913	29.8542	-86.4375
E0914	29.7608	-86.3283

Figure 5. Locations of SEAMAP sampling stations within NMFS statistical zone 9.



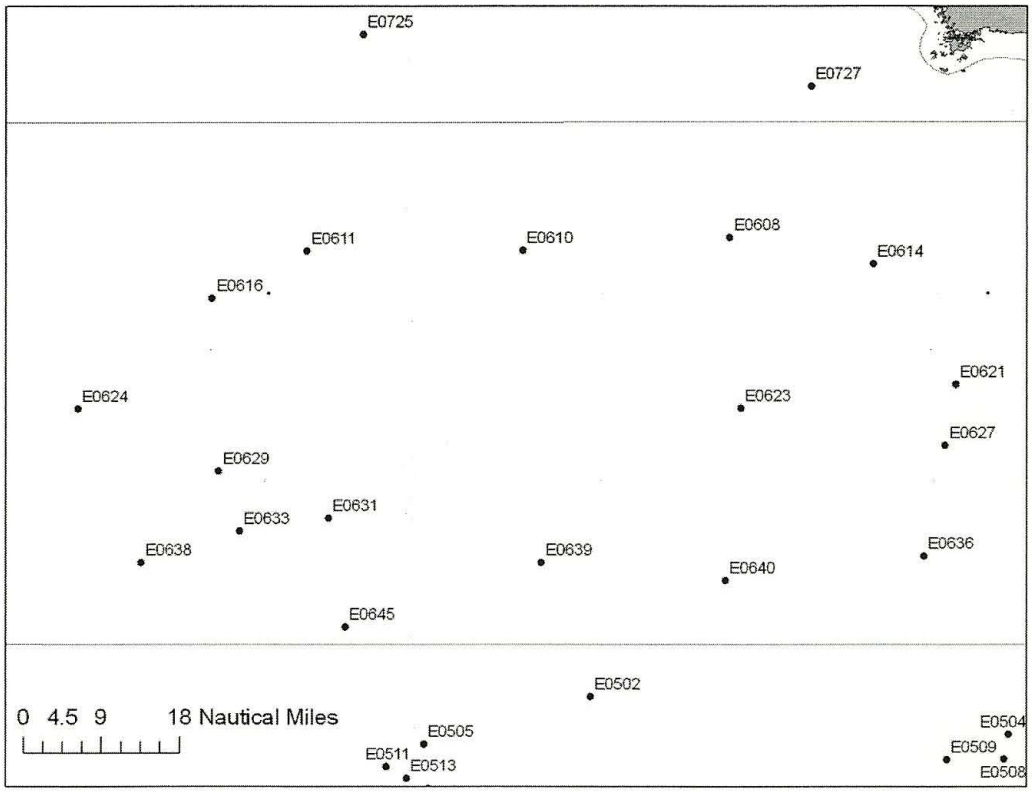
SEAMAP Summer Station ID	Latitude	Longitude
E1001	30.2242	-87.7158
E1002	30.2017	-87.42
E1003	30.1042	-87.2183
E1004	30.0067	-87.275
E1005	29.9967	-87.275
E1008	29.8625	-87.5033
E1010	29.5383	-87.9175
E1006	29.9642	-87.0875
E1007	29.9267	-87.1925
E1009	29.8108	-87.3583
E1011	29.325	-87.8508

Figure 6. Locations of SEAMAP sampling stations within NMFS statistical zone 10. At present we do not anticipate sampling within NMFS statistical zone 10 unless sampling within NMFS statistical zones 8 and 9 are completed ahead of schedule.



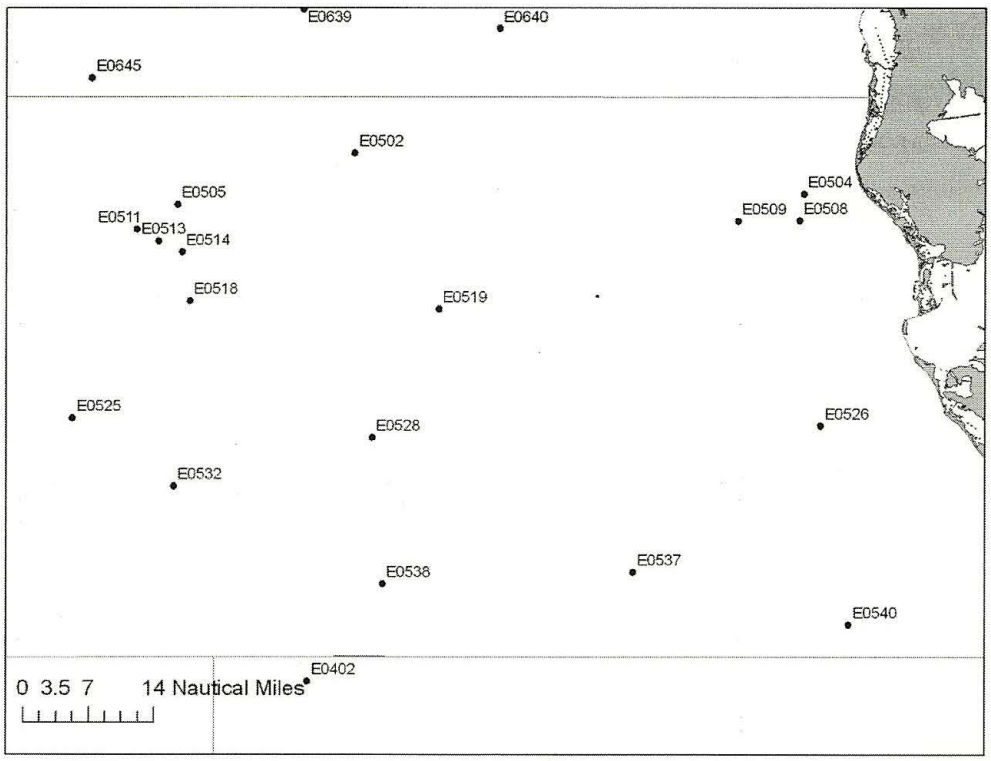
SEAMAP Summer Station ID	Latitude	Longitude
E0702	29.7625	-84.3975
E0703	29.7508	-84.2767
E0704	29.7383	-84.5008
E0705	29.6792	-84.5608
E0706	29.6692	-84.4692
E0707	29.6392	-84.0925
E0708	29.6233	-84.75
E0709	29.6225	-84.6617
E0712	29.5125	-84.0092
E0714	29.4758	-84.2108
E0716	29.4475	-83.7717
E0717	29.42	-84.6217
E0718	29.3925	-83.5275
E0720	29.3383	-84.5317
E0722	29.2625	-83.7492
E0725	29.1658	-84.1858
E0727	29.0675	-83.3233

Figure 7. Locations of SEAMAP sampling stations within NMFS statistical zone 7. Sampling will not be conducted within NMFS statistical zone 7 during this cruise unless areas to the west are impacted by oil prior to our arrival.



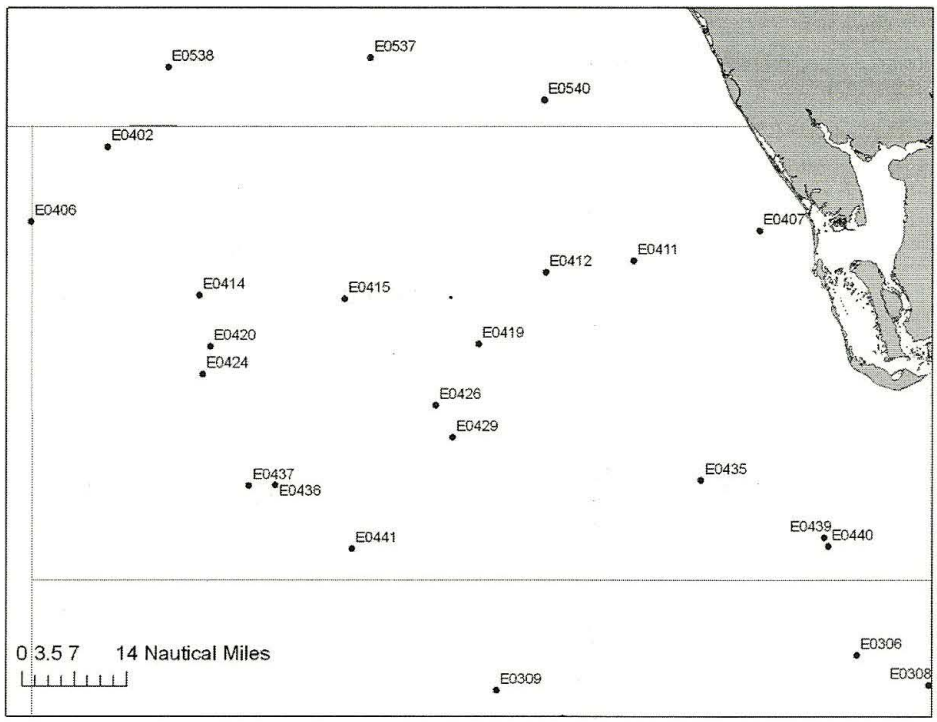
SEAMAP Summer Station ID	Latitude	Longitude
E0608	28.7792	-83.4808
E0610	28.7542	-83.8783
E0611	28.7533	-84.2942
E0614	28.7283	-83.2033
E0616	28.6633	-84.4758
E0621	28.5	-83.0433
E0623	28.4542	-83.4592
E0627	28.3825	-83.0642
E0636	28.17	-83.1058
E0640	28.1225	-83.4892
E0624	28.4533	-84.7333
E0629	28.3325	-84.4633
E0631	28.2425	-84.2525
E0633	28.2183	-84.4233
E0638	28.1567	-84.6117
E0639	28.1567	-83.8417
E0645	28.0342	-84.2208

Figure 8. Locations of SEAMAP sampling stations within NMFS statistical zone 6. Sampling will not be conducted within NMFS statistical zone 6 during this cruise unless areas to the west are impacted by oil prior to our arrival.



SEAMAP Summer Station ID	Latitude	Longitude
E0504	27.8275	-82.9425
E0508	27.78	-82.9508
E0509	27.7792	-83.0608
E0526	27.415	-82.9125
E0537	27.1517	-83.2492
E0540	27.0575	-82.8617
E0502	27.9	-83.7483
E0505	27.8083	-84.0683
E0511	27.765	-84.1408
E0513	27.7433	-84.1017
E0514	27.7233	-84.06
E0518	27.6367	-84.0458
E0519	27.6225	-83.5975
E0525	27.4292	-84.255
E0528	27.3933	-83.7167
E0532	27.3067	-84.0742
E0538	27.1308	-83.6983

Figure 9. Locations of SEAMAP sampling stations within NMFS statistical zone 5. Sampling will not be conducted within NMFS statistical zone 5 during this cruise unless areas to the west are impacted by oil prior to our arrival.



SEAMAP Summer Station ID	Latitude	Longitude
E0407	26.7708	-82.3842
E0411	26.7042	-82.6633
E0412	26.6783	-82.8575
E0435	26.2192	-82.5133
E0439	26.0933	-82.2392
E0440	26.0733	-82.23
E0402	26.9558	-83.8333
E0406	26.7917	-84.0042
E0414	26.6275	-83.6283
E0415	26.62	-83.3058
E0419	26.5208	-83.0067
E0420	26.515	-83.6033
E0424	26.4558	-83.62
E0426	26.3867	-83.1017
E0429	26.3158	-83.0642
E0436	26.2092	-83.4592
E0437	26.2083	-83.5175
E0441	26.0683	-83.2883

Figure 10. Locations of SEAMAP sampling stations within NMFS statistical zone 4. Sampling will not be conducted within NMFS statistical zone 4 during this cruise unless areas to the west are impacted by oil prior to our arrival.