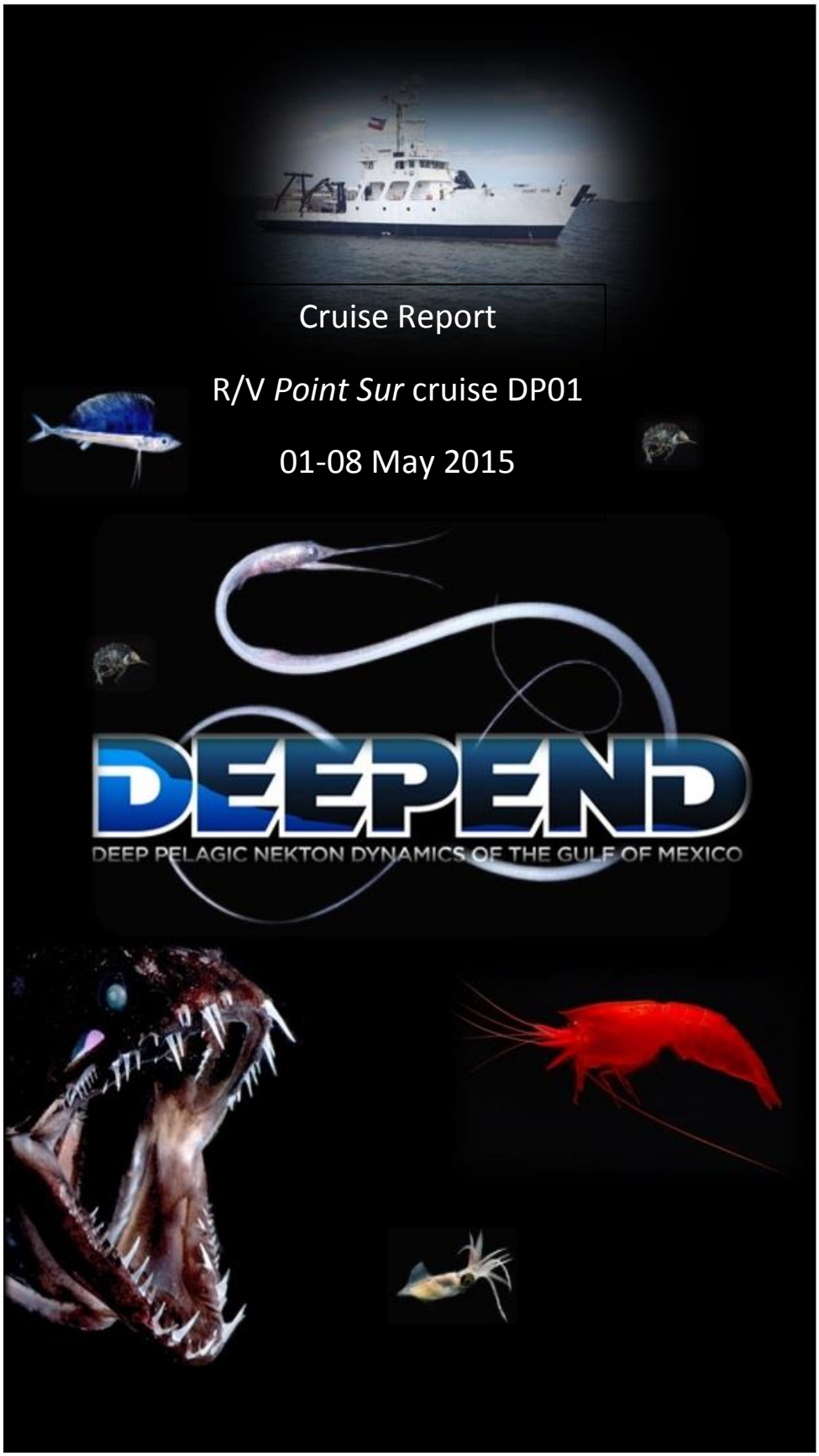

Cruise Report

R/V *Point Sur* cruise DP01

01-08 May 2015

DEEPEND DP01 Cruise Participants on the R/V *Point Sur*

Science Party	Institution	Role
1. April Cook	NSUOC	Sample/data mgmt..
2. Valerie Miranda	NSUOC	Crustacean taxonomy
3. Tammy Frank	NSUOC	Crustacean taxonomy
4. Laura Timm	FIU	Crustacean genetics
5. Nidhi Vijayan	NSUOC	Microbial genomics
6. Max Weber	TAMUG	Fish genetics
7. Ron Eytan	TAMUG	Fish genetics
8. Mike Vecchione	NSL	Cephalopod taxonomy
9. Dante Fenolio	SAZ	Outreach/filming lead
10. Charles Kovach	USF CMS	CTD/bio-optics lead
11. Tracey Sutton	NSUOC	Chief Scientist
12. Jon Moore	FAU	Fish taxonomy
13. Dale Jacques	NOAA/FIU	Hydroacoustics
14. Gray Lawson	CSA	MOCNESS operator


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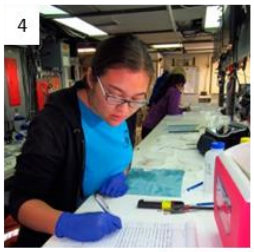
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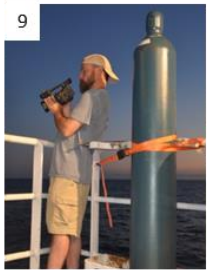
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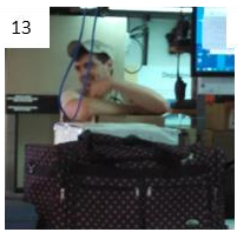
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14 15

Ship's Crew		
15. Marshall Kormanec	LUMCON	Deck Mate
16. Max Wike	LUMCON	Captain
17. Ben Maher	LUMCON	Engineer
18. Erik Gravel	LUMCON	First Mate
19. Joshua Jansen	LUMCON	Asst. Engineer
20. Alex Forsythe	LUMCON	Steward
21. Nick Keeney	LUMCON	Technician


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Report of
DEEPEND Cruise DP01
01-08 May 2015; USM R/V *Point Sur*, Gulfport, MS
Chief Scientist: Tracey Sutton

This report was prepared by: Tracey Sutton, Kevin Boswell, April Cook, Sergio deRada, David English, Ron Eytan, Danté Fenolio, Tammy Frank, Chuanmin Hu, Dale Jacques, Matt Johnston, Heather Judkins, Nick Keeney, Charles Kovach, Gray Lawson, Joe Lopez, Jon Moore, Brad Penta, Nicole Sandoval, Laura Timm, Michael Vecchione, Nidhi Vijayan, and Max Weber

A DEEPEND (Deep Pelagic Nekton Dynamics)
Consortium Report

Available online from the DEEPEND website,
www.deependconsortium.org

Acknowledgements

This was the first DEEPEND cruise in the Gulf of Mexico. The success of the cruise was due to the outstanding efforts of the Captain and Crew of the R/V *Point Sur*, LUMCON Marine Operations, the University of Southern Mississippi Department of Marine Science, OKEANUS Science and Technology, Continental Shelf Associates, Sea-Gear Corporation, the San Antonio Zoo, the NSU Oceanic Ecology Lab (K. Bowen, K. Lord, L. Malarky, A. Marks), and all members of the science party. The cheerfulness, resourcefulness, and hard work of all participants were outstanding. This cruise was supported by the Gulf of Mexico Research Initiative.

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PURPOSE OF THE CRUISE

The DEEPEND Consortium is an ocean realm field project supported by the Gulf of Mexico Research Initiative (GoMRI). The focus of the DEEPEND Consortium is on the development of a quantitative, taxonomically comprehensive assessment of the deep-pelagic assemblages of the northern Gulf of Mexico in the region of the *Deepwater Horizon* oil spill (DWHOS), including examination of longer-term consequences of the DWHOS on these assemblages. The project goals as related to this first cruise include: 1) quantitative assessment of deep-pelagic nekton (fishes, macrocrustaceans, and cephalopods) and gelatinous zooplankton assemblage structure, abundance, and distribution across a range of biophysical conditions; 2) quantitative acoustic profiling of the fine- and mesoscale distributions of oceanic nekton; 3) collection of nekton, plankton and microbial samples for genomics/genetic analyses to be conducted at five research labs (Nova Southeastern University Oceanographic Center, Texas A&M University at Galveston, Florida International University, Smithsonian Institution/National Museum of Natural History, Monterey Bay Aquarium Research Institution); 4) collection of nekton, and plankton samples for stable isotope, hydrocarbon, otolith microchemistry and mercury analyses; 5) collection of particulate organic carbon samples for stable isotope analysis; 6) collection of phytoplankton filtrates (chlorophyll analysis) for remote sensing calibration; 7) collection of *in situ* biophysical oceanographic data for community analyses and assimilation into HYCODE and remote sensing models; 8) collection of fish specimens for genomic fingerprinting of bioluminescent microbial symbionts; and 9) collection of photographic and video content for Outreach & Education efforts.

Sampling was conducted aboard the R/V *Point Sur* along a box transect framing the DWHOS site (Figs. 1, 2) , beginning near the mouth of Desoto Canyon, heading south to 28°N latitude, then west to 88°30'W longitude. Scientific participants on this cruise (see frontispiece) included expert taxonomists in the major deep-pelagic nekton faunal groups, molecular specialists, technicians, an

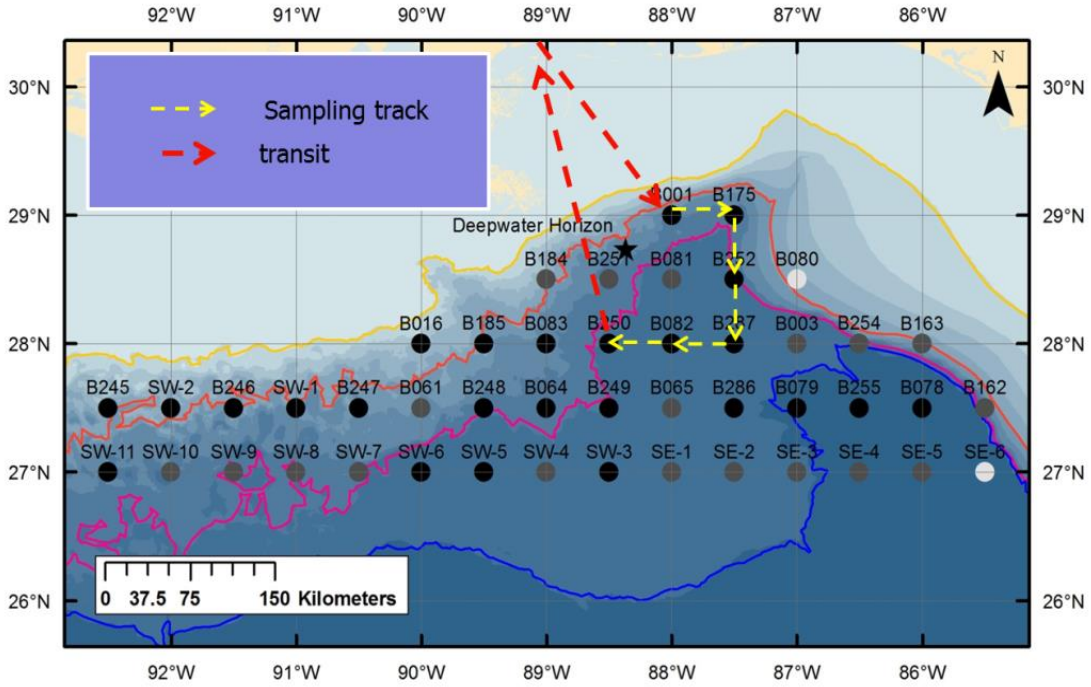


Figure 1. Cruise track of DEEPEND cruise DP01 relative to SEAMAP/NRDA station grid, 01-08 May 2015.

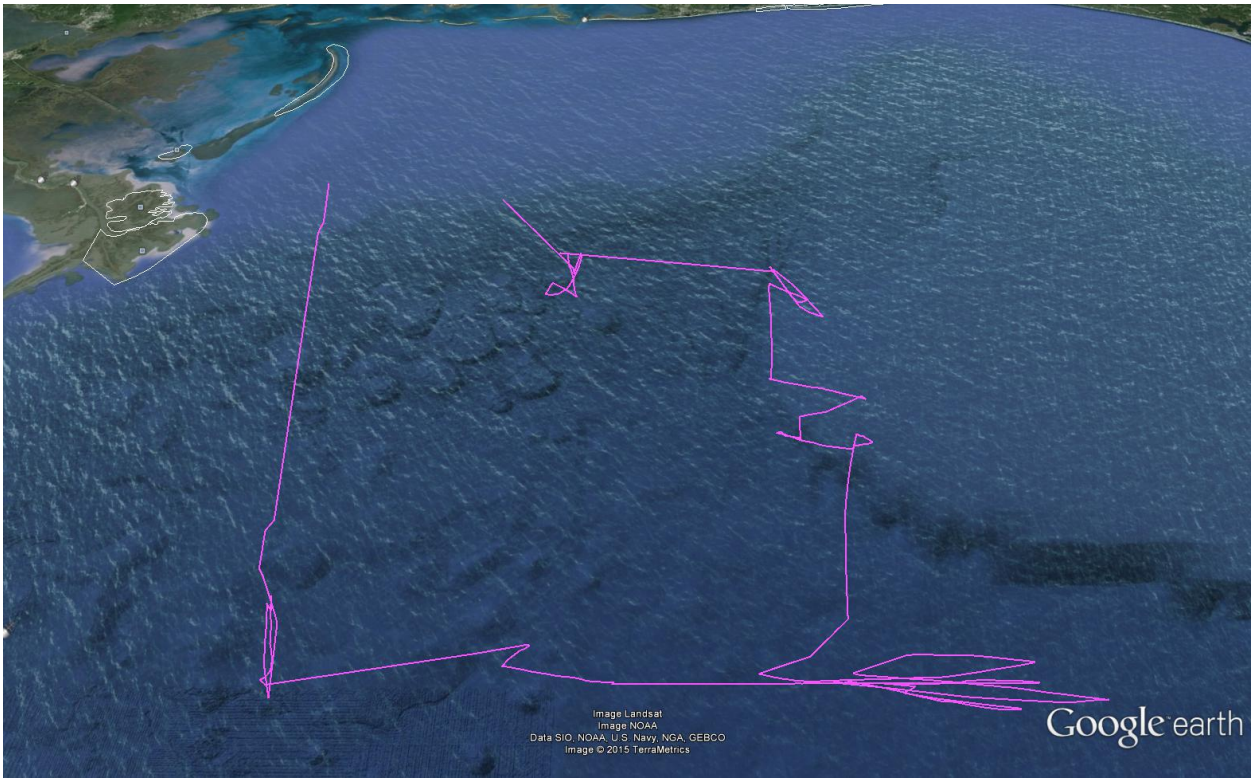


Figure 2. Geo-referenced cruise track of the R/V *Point Sur* during DEEPEND cruise DP01.

acoustician, an outreach/imaging specialist, and graduate students. Specimens were identified at sea using traditional taxonomic approaches. After the cruise, species counts, molecular analyses, and expert taxonomic evaluation and description of any putative new records or undescribed species will be done in association with the DEEPEND Taxonomic Network.

NARRATIVE

Ship's cruise number: PS_15_03_Sutton
DEEPEND cruise number: DP01
All cruise activity times presented as 24-h clock notation in Central Daylight Time (UDT – 5 h).

01 May 2015: After installation of acoustic transducer boom, we left the dock at 02:37. At 15:00 the acoustic transducer boom was lowered and a MOC-10 test tow (trawl 001) was conducted at Station B001 (29°N 88°W; 1200 m bottom depth). 826 m of wire paid out, MOC-10 reached 470 m depth. Nets 1-5 were fished in 100-m depth intervals. Ship's speed ~1.7 kn. Naming structure for trawl samples was determined (see example below). At 18:30 a CTD rosette cast was to 1000 m was made followed by a full-depth MOC-10 deployment at 22:30 (Trawl 002).

Example: DP01-01May15-MOC10-B001D-001-N1.
Key = cruise-date-gear-SEAMAP station code-night or day (N = night)-trawl number-net number
Note: trawls will be cumulatively increased across all sampling years (not restarted each cruise).
Other gear types: TT – Tucker trawl; NN – neuston net; BN – bongo net; CTD – water sample

02 May 2015: MOC-10 deployment completed, trawl secured, samples unloaded, and processing begun. Trawl samples all quantitative, though nets 2 and 3 fished non-standard (200-m) depth intervals (need to be combined to equal one standard net 3 interval) – these due to shallow station depth (1400 m). At 07:00 a bio-optical profiler cast to 200 m was made, and at 09:00 ship motored back to southern end of previous tow. At 10:30 the MOC-10 was deployed (Trawl 003). Maximum depth (1143 m) reached at 12:40, and at 15:18 the MOC-10 was secured on deck, samples unloaded, and processed in lab. Trawl samples 1-3 quantitative, though nets 2 and 3 fished non-standard (200-m) depth intervals (need to be combined to equal one standard net 3 interval) – these due to shallow station depth (1400 m). Sample 4 was non-quantitative and Net 5 did not fish. A CTD rosette cast to 1000 m was made beginning at 16:02 and ending at 16:57.

At 17:00 station B001 complete, transducer boom was raised from water, and we transited to station B175 (29°N 87°30'W). Arrived on station at ~22:00. Bio-optical profiler cast to 200 m was followed by MOC-10 deployment at 23:00 (Trawl 004).

03 May 2015: MOC-10 trawl complete and on-deck by 05:14. Nets 1-5 all quantitative. CTD rosette cast to 1500 m made at 05:40. From 07:20 to 09:14 acoustic transducer calibration with tungsten sphere was conducted. At 11:06 a MOC-10 deployment (Trawl 005) was made. Deployment completed and on-deck by 16:40. Nets 1-5 all quantitative. A CTD rosette cast was made from 19:23 to 21:06. After this CTD cast at B175N, we transited to station B252. At 23:30 the acoustic transducer boom was lowered and MOC-10 deployed (Trawl 006).

04 May 2015: At 06:00 MOC-10 secured on deck. Nets 1-5 all quantitative, though Net 1 non-standard (1200-1400 m depth sampled). At 06:30 acoustic transducer boom raised and transit began to station B252 (28°30'N 87°30'W). Arrived on station at 08:30. From 09:30 to 10:13 a CTD rosette cast was made. MOC-10 deployed at 11:18, retrieved at 17:23 (Trawl 007). Nets 1-5 all quantitative. Bio-optical profiler cast to 200 m made at 18:00. Departed for station B287 (28°N 87°30'W) at 20:00.

05 May 2015: Arrived at B287 10:00. Rough seas prevented daytime MOC10 deployment, vessel ran weather patterns. From 18:36 to 20:05 CTD rosette deployed. From 20:21 to 20:43 bio-optical profiler deployed. At 21:32 the acoustic transducer boom was lowered and at 22:10 MOC-10 deployed (Trawl 008).

06 May 2015: At 04:48 MOC-10 secured on deck. Nets 1 and 2 quantitative, net 3 non-quantitative, nets 4 and 5 did not fish. At 07:30 CTD rosette cast to 1600 m made. At 09:00 bio-optical profiler cast to 200 m made. At 10:22 MOC-10 deployed, at 16:36 MOC-10 secured on deck (Trawl 009). Nets 1-5 all quantitative. Transducer boom raised from water, and we transited to station B082 (28°N 88°W). Arrived station at 21:06 and MOC-10 deployed at 22:00 (Trawl 010).

07 May 2015: MOC-10 secured on deck at 04:21, and transducer calibration conducted. First four nets quantitative; no flow data net 5 due to software reset (i.e. 'meat' sample). At 07:01 bio-optical profiler deployed to 200 m, followed by CTD rosette cast at 07:51. At 10:00 small boat launched. By 11:00 small boat retrieved, boom raised, and transit underway for station B250 (28°N 88°30'W). Arrived on station at 13:00. MOC-10 deployed at 14:30, secured on deck at 19:50 (Trawl 011). Net increments did not work properly, so all net samples considered non-quantitative. CTD rosette cast made at 20:34 and bio-optical profiler cast at 20:58. MOC-10 deployed at 22:45 (Trawl 012).

08 May 2015: At 05:00 MOC-10 secured on deck. Net increments did not work properly, so all net samples considered non-quantitative. Boom raised and transit to Gulfport begun at 05:16. Arrived Gulfport ~20:00.

SUMMARY

There were several challenges for our first DEEPEND research cruise, not the least of which was that this was the first major endeavor of the University of Southern Mississippi's new research vessel, the R/V *Point Sur*, in the Gulf of Mexico. With her new LUMCON crew we proposed to tow a large piece of equipment, new to the vessel and the crew, at the end of 4000 m of cable in order to sample the oceanic Gulf of Mexico from the surface to 1500 m. Thanks to the coordinated efforts of USM, LUMCON, three private sector entities (OKEANUS, Continental Shelf Associates, Sea-Gear Corp.), and the Science Party, we are pleased to report that the cruise was a resounding success. Samples, specimens, data and outreach materials were collected for every DEEPEND Working Group. Not only did we collect thousands of specimens for research, chronicled in this report, our sampling will allow a community analysis of a key pelagic habitat feature of the Gulf, a large, recently shed Loop Current (LC) eddy (detailed further in Section 2). Given the seasonal and spatial unpredictability of the LC, we were fortunate to be able to sample across this feature.

1. OPERATIONS and PROTOCOLS

1.1. Midwater Trawling.

Midwater trawling was conducted using a 10-m^2 mouth area MOCNESS (MOC-10 hereafter) midwater trawl (Fig. 3), leased from OKEANUS Science and Technology (Houma, LA), rigged with six 3-mm mesh nets manufactured for DEEPEND by Sea-Gear Corporation (Melbourne, FL). Each net was fitted with a removable PVC cod end (Fig. 4), numbered consecutively to correlate with depth sampled. Sampling was conducted to 1500 m, bottom depth allowing. The first net (Net 0) was fished from the surface to 1500 m, Net 1 from 1500 to 1200 m, Net 2 from 1200 to 1000 m, Net 3 from 1000 to 600 m, Net 4 from 600 to 200 m, and Net 5 from 200 m to the surface (Fig. 5) This was the same depth scheme used during the NOAA NRDA Offshore Nekton Sampling and Analysis Program.

Each station was sampled twice, with one deployment centered at solar noon (1000 h -1600 h) and one centered at midnight (2200 h – 0400 h). Ship's speed was kept minimal, between 1 and 2.5 kn. Winch deployment and retrieval speeds (non-zero) ranged from 5-25 m min^{-1}, with 15 m min^{-1} typical. The MOCNESS operator stayed in constant radio contact with the winch operator in order to keep the MOCNESS frame at an optimal angle (between 35-50°).

1.2. Near-Surface Sampling.

When opportunities arose (e.g., during nighttime CTD casts) neustonic and near-surface organisms were collected via long-handled dipnet for genetic and/or stable isotope analysis. Examples of species collected included flyingfishes (Exocoetidae) (Fig. 6a) and frogfishes (Fig. 6b).

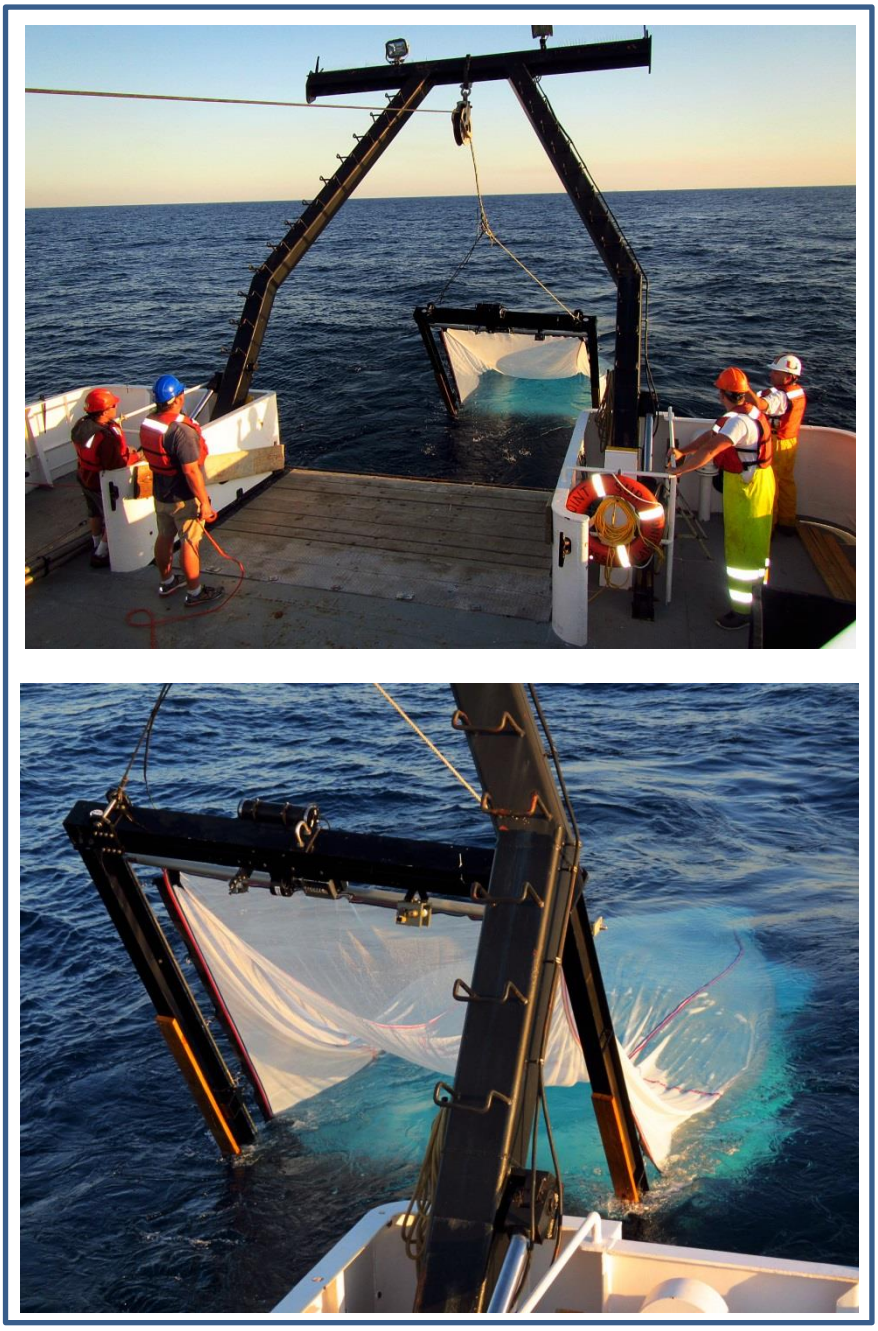


Figure 3. 10-m^2 MOCNESS (MOC-10) unit being deployed on the R/V *Point Sur* during DEEPEND cruise DP01.

Figure 4. MOC-10 cod ends.

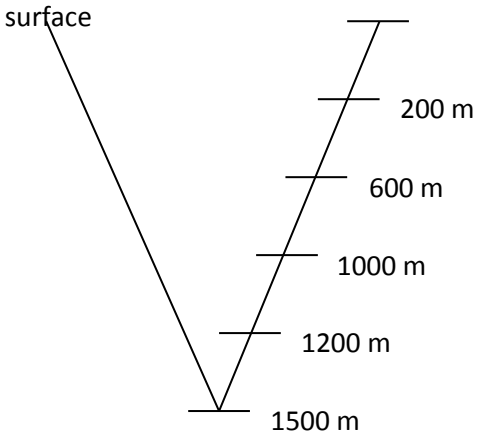


Figure 5. MOC-10 sampling depth scheme.

Figure 6. Near-surface specimens collected during DEEPEND cruise DP01. A) flyingfish; b) Sargassum frogfish. Images courtesy of Danté Fenolio.

1.3. IAUCUC Permit.

All field protocols, fish handling and preservation, and removal of fish tissues were conducted in compliance with Florida Atlantic University IACUC protocol (Protocol #A15-06 Trawl surveys of deep-sea fishes) for the study of vertebrates and adhered to the USA legal requirements.

1.4. Hydroacoustics.

Multi-frequency acoustic profiling (38, 70, and 120 kHz) was conducted continuously during all MOC-10 deployments, CTD casts, and bio-optical profiler casts via a pole-mounted transducer (Fig. 7). Mechanical and electrical noise associated with operating the MOC-10 reduced the effective range of each echosounder. The 38, 70, and 120 kHz echosounders collected meaningful data to depths of approximately 1000 m, 400 m, and 100 m, respectively. An 18 kHz EK80 echosounder was not operational due to an internal conflict to the data acquisition software that could not be rectified at sea. The acoustics were calibrated using a tungsten sphere at sea following well-established procedures (e.g., Foote et al. 1987).

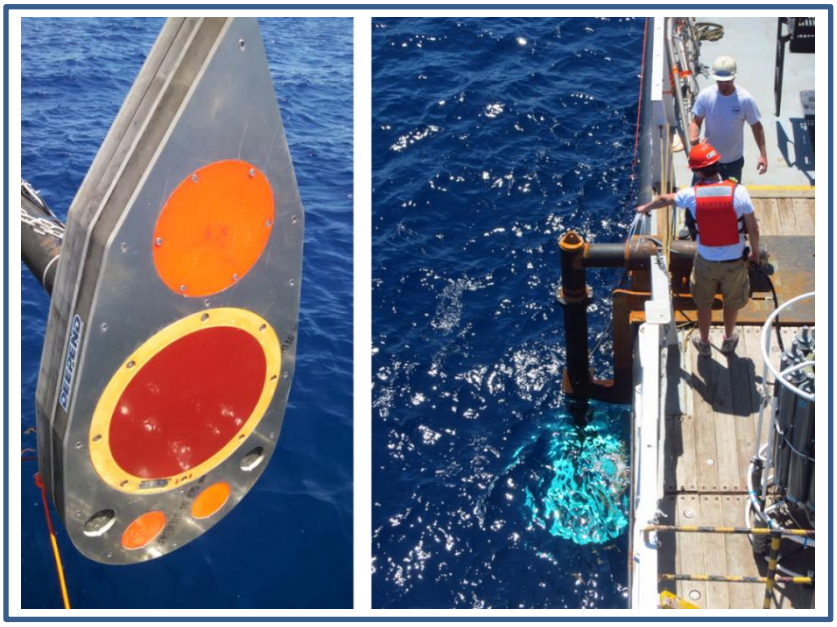


Figure 7. Hydroacoustics transducer (left) and transducer in sensing mode (boom lowered) on R/V *Point Sur* during DEEPEND cruise DP01.

1.5. CTD Profiling.

CTD profiles were conducted using the ship's CTD rosette (Fig. 8) at six stations. Two stations were profiled twice, once at dawn and once at dusk, with the remainder being sampled either at dawn or dusk. Maximum profile depths depended on bottom depth and ranged from 1000-1700 m.

1.6. Water Collection.

Seawater was collected via CTD-mounted Niskin bottles (twelve 12-L bottles) from three or four depths, with multiple bottles per depth, and distributed according to the plan shown in Figure 9. Five additional seawater samples were collected from the ship's flow-through system (intake depth = 3 m).

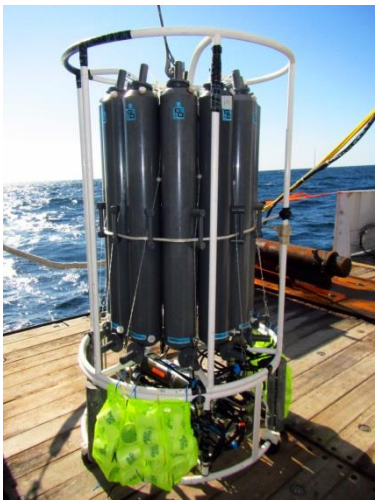


Figure 8. R/V *Point Sur* CTD rosette.

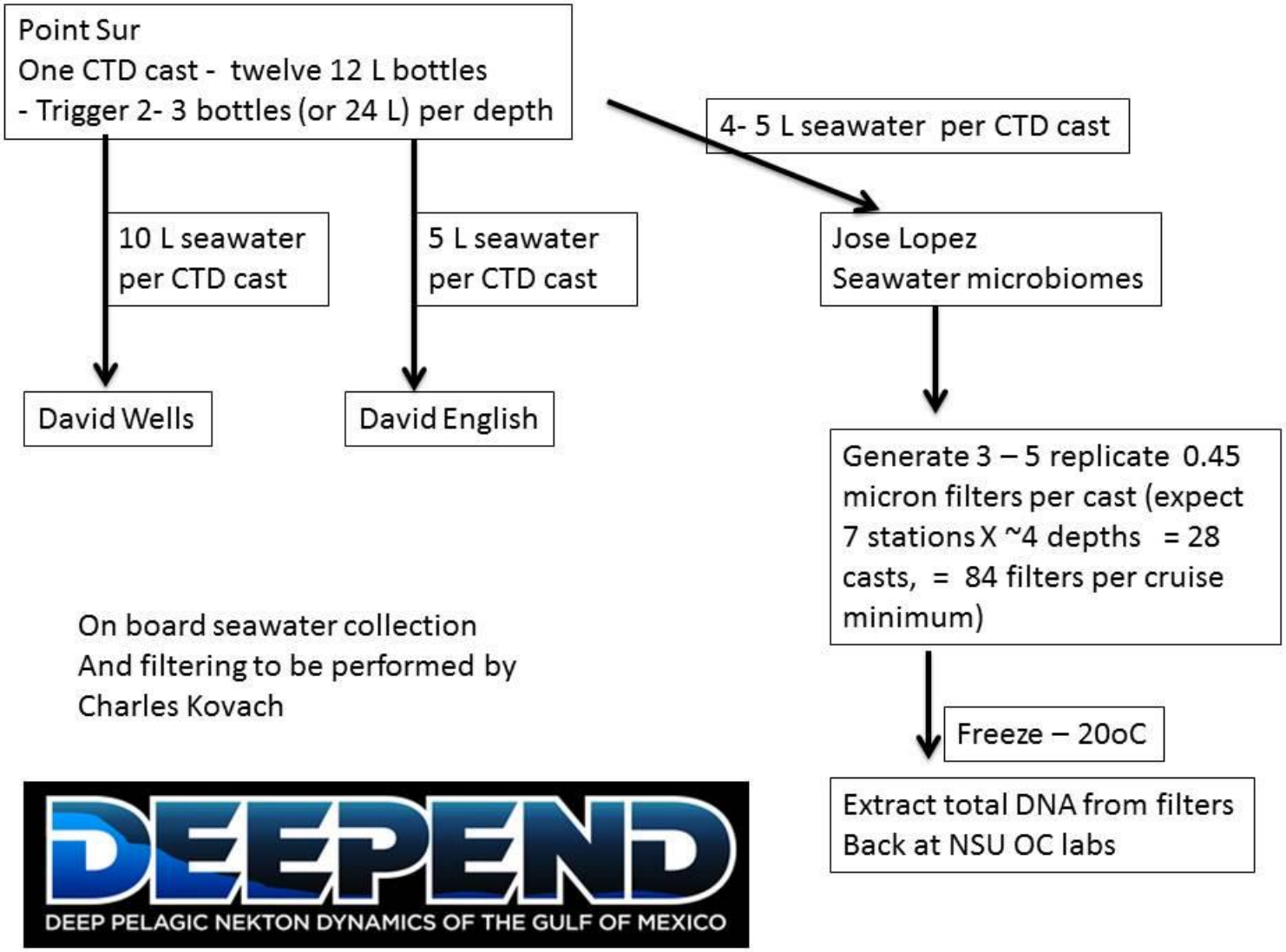


Figure 9. Distribution and processing of water samples collected during DP01.

1.7. Bio-Optical Profiling and Remote Sensing Reflectance Measurement.

Water column optical properties were measured with a bio-optical profiler containing a HOBILabs HS6 and 2 WET Labs ECO instruments (Fig. 10). Profiles were collected at six stations, with one station sampled twice. The HS6 records depth and the backscattering of light at six wavelengths (420, 442, 470, 532, 590, and 700nm) at a scattering angle of ~ 140°. The ECO instruments, a WET Labs ECO BBFL2 and an ECO BBSB, were secured to the HS6's instrument cage. The BBFL2 measures backscattering of red light (650nm) at ~120°, and the stimulated emission of light at wavelengths where chlorophyll_a and dissolved organic material (CDOM) are known to fluoresce. The BBSB measures the backscattering of green light (532nm), also at ~120°.

Figure 10. HS6 bio-optical profiler.

1.8. Sampling on Station.

Sampling and sensing operations on station were organized around daytime and nighttime MOC-10 trawling, with these centered on solar noon and midnight, respectively (Table 1). Each MOC-10 deployment took approximately 6 h. MOC-10 sample processing occurred between MOC-10 deployments, as were CTD and bio-optical profiler casts. Transit to the next station generally occurred during the morning interval after day and night MOC-10 deployments at each station. Acoustic profiling was conducted during all hours except transit time, when transducer boom was raised.

1.9. Sample Processing Protocol.

Microbial genomics samples.

Carboys were rinsed with Millipore or DOI water and rinsed with the sample water from Niskin bottle. Water from CTD rosette Niskin bottles was then drawn into the clean carboy using a sterilized tube. In the ship's lab, sterilized forceps were used to place PALL GN-6 0.45 um onto a filtration rig. Seawater was filtered at each station with a 1.1 cfm/25.5"Hg-60psi/115V vacuum pump. Triplicate filters were generated at each depth, and then stored at -20C for future molecular processing. Flowthrough seawater was retained in rinsed amber bottles, and stored at 4C for chemical nutrient analysis.

Nekton, micronekton, and macroplankton samples. Upon MOC-10 recovery individuals nets were washed down with seawater to assure all collected organisms were concentrated in the cod ends. Cod ends were disconnected from the net one at a time and the contents were poured/washed into 6-L Nalgene bottles filled with pre-chilled seawater. Each Nalgene was numbered to correspond

Table 1. DEEPEND Cruise DP 01 daily schedule. Personnel listed by initials

	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	0:00
	Night MOC; acoustics			CTD		transit				Day MOC; acoustics						CTD		ad hoc sampling				Night MOC; acoustics		
						water filtering												water filtering						
DJ	X	X	X							X	X	X	X	X	X							X	X	X
AC				X	X	X	X	X	X							X	X	X	X	X	X			
RE				X	X	X	X	X	X							X	X	X	X	X	X			
DF				X	X	X	X	X	X							X	X	X	X	X	X			
TF				X	X	X	X	X	X							X	X	X	X	X	X			
CK				X	X	X	X	X	X							X	X	X	X	X	X			
JM				X	X	X	X	X	X							X	X	X	X	X	X			
TS				X	X	X	X	X	X							X	X	X	X	X	X			
LT				X	X	X	X	X	X							X	X	X	X	X	X			
MV				X	X	X	X	X	X							X	X	X	X	X	X			
MW				X	X	X	X	X	X							X	X	X	X	X	X			
GL	X	X	X							X	X	X	X	X	X							X	X	X
NV				X	X	X	X	X	X							X	X	X	X	X	X			
CF				X	X	X	X	X	X							X	X	X	X	X	X			

with the net from which samples were collected. Nalgenes were taken inside the ship's lab as they were washed down and stored cold in a Koolatron refrigeration unit pending processing. Only one sample was processed at a time to prevent cross-sample mixing. "Net 0" (0-1500 m oblique) samples were generally processed first except in cases where live animals suitable for imaging were collected, in which case these samples were processed first. Afterwards, samples were processed in numerical order.

Processing involved the identification, enumeration, weighing (when possible) and measurement of all fish, macrocrustacean, and cephalopod specimens. Once a sample was completely subsampled, then the entire remaining sample was fixed in 10% buffered formalin (v/v formalin:seawater). A running tally was kept of specimens collected for all analyses. In the individual project reports that follow, only data for those portions of samples that were taken for genetic or biochemical analyses are included. The remaining data will be presented after complete laboratory sample work-up.

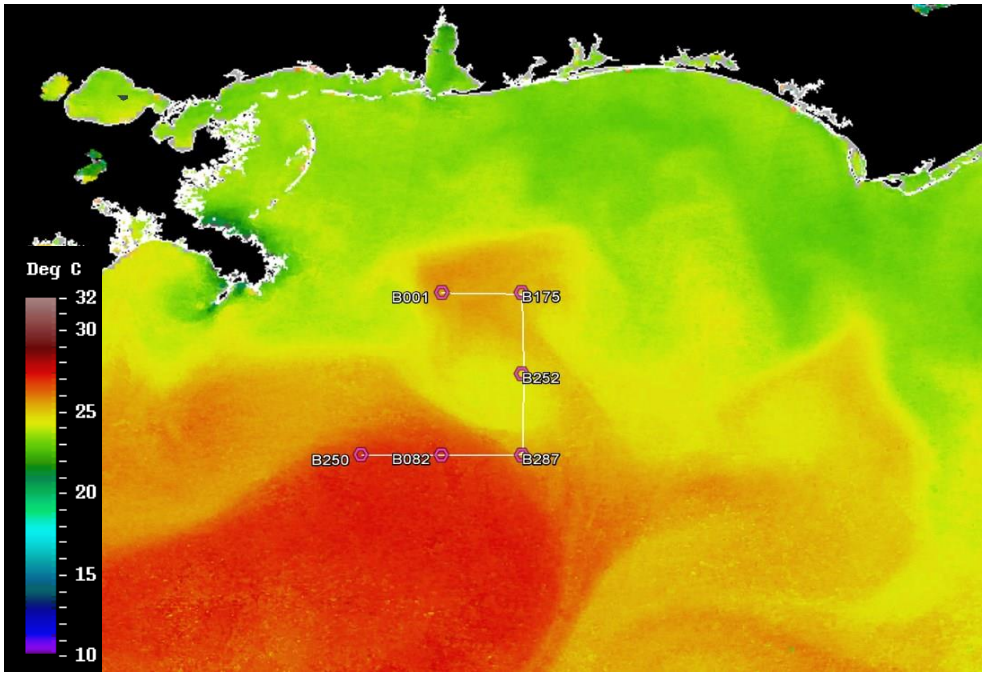
Tissues or whole samples were taken of each taxon according to a pre-determined protocol. Sample processing for genetic analyses was as follows: 1) for fishes lateral muscle tissue was dissected from the specimens' right side and then stored in 95% non-denatured alcohol; 2) for macrocrustaceans whole specimens were stored in RNALater and frozen; 3) for pteropods whole specimens were stored in 100% isopropanol; and 4) for cephalopods tissue samples were stored in RNALater and frozen. A subset of cephalopod specimens for genomic analysis was stored in liquid nitrogen. Fish specimens from which tissue was taken (i.e. vouchers) were individually marked with a paired tag matching that of the tissue sample and fixed in formalin.

For stable isotope (SIA), otolith microchemistry (OM), mercury (Hg), and polycyclic aromatic hydrocarbon (PAH) analyses whole specimens and/or tissue samples were frozen at -20°C. Prior to PAH sample collection, reusable 20-ml VOA vials were washed with water and detergent, rinsed three times with deionized water then combusted in an oven at 450°C for 4-5 hours. Aluminum foil was combusted as well in an oven at 450°C for 4-5 hours and used to cover the inside of each VOA vial plastic cap. Samples were deposited in each vial and then frozen. Prior to lipid extraction (i.e. PAHs) samples will be freeze-dried. Lipid extraction of freeze-dried samples will be conducted under high temperature (100°C) and pressure (1500 psi) with a solvent mixture 9:1 v:v cyclohexane:dichloromethane using an Accelerated Solvent Extraction system (ASE 2001, Dionex) following modified EPA methods. Specimens for the remaining analyses (SIA, OM, Hg) were individually bagged and frozen with the corresponding sample labels.

2. WATER COLUMN STRUCTURE AT THE STATIONS

Detailed hydrographic analyses are currently ongoing, but the predominant mesoscale oceanographic feature during DEEPEND cruise DP01 was a large anticyclonic Loop Current eddy (LCE) in the southwest quadrant of the DEEPEND sample grid. This feature was manifest in sea-surface temperature imaging (Fig. 11a). A smaller, adjacent cyclonic eddy was present north of the LCE, which appeared to entrain a filament of high-chlorophyll Mississippi River water (Fig. 11b). Hydrographic structure at depth is currently being characterized via analysis of CTD (Figs. 12-29) and MOC-10 sensor data. Depths of the chlorophyll maximum varied from 50 m to 100 m (Fig. 30).

A



B

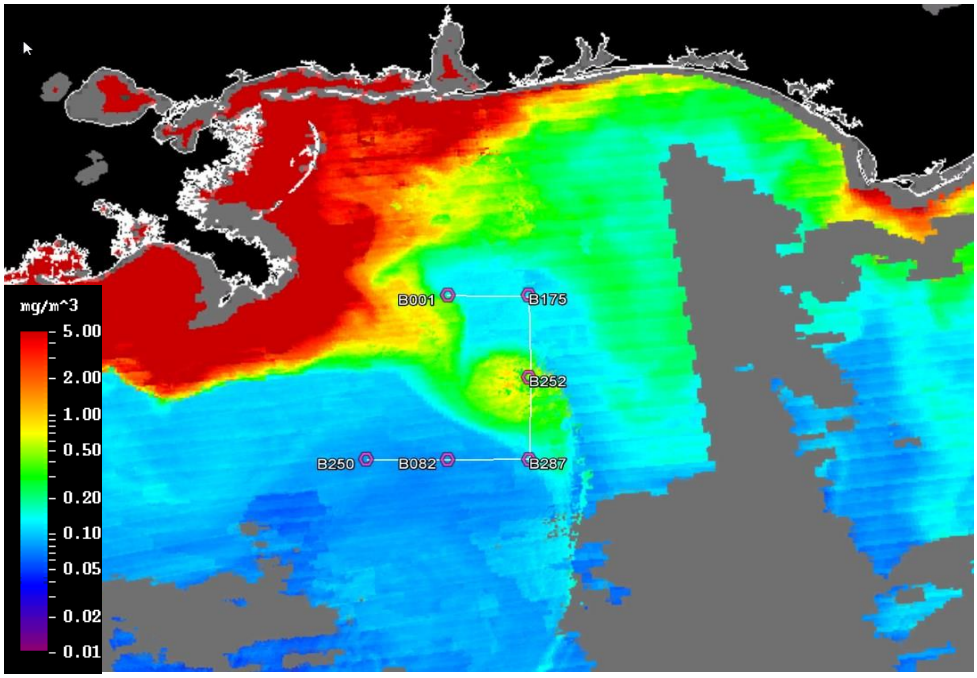


Figure 11. Remotely sensed biophysical oceanographic conditions during DEEPEND cruise DP01. A) sea-surface temperature; b) chlorophyll.

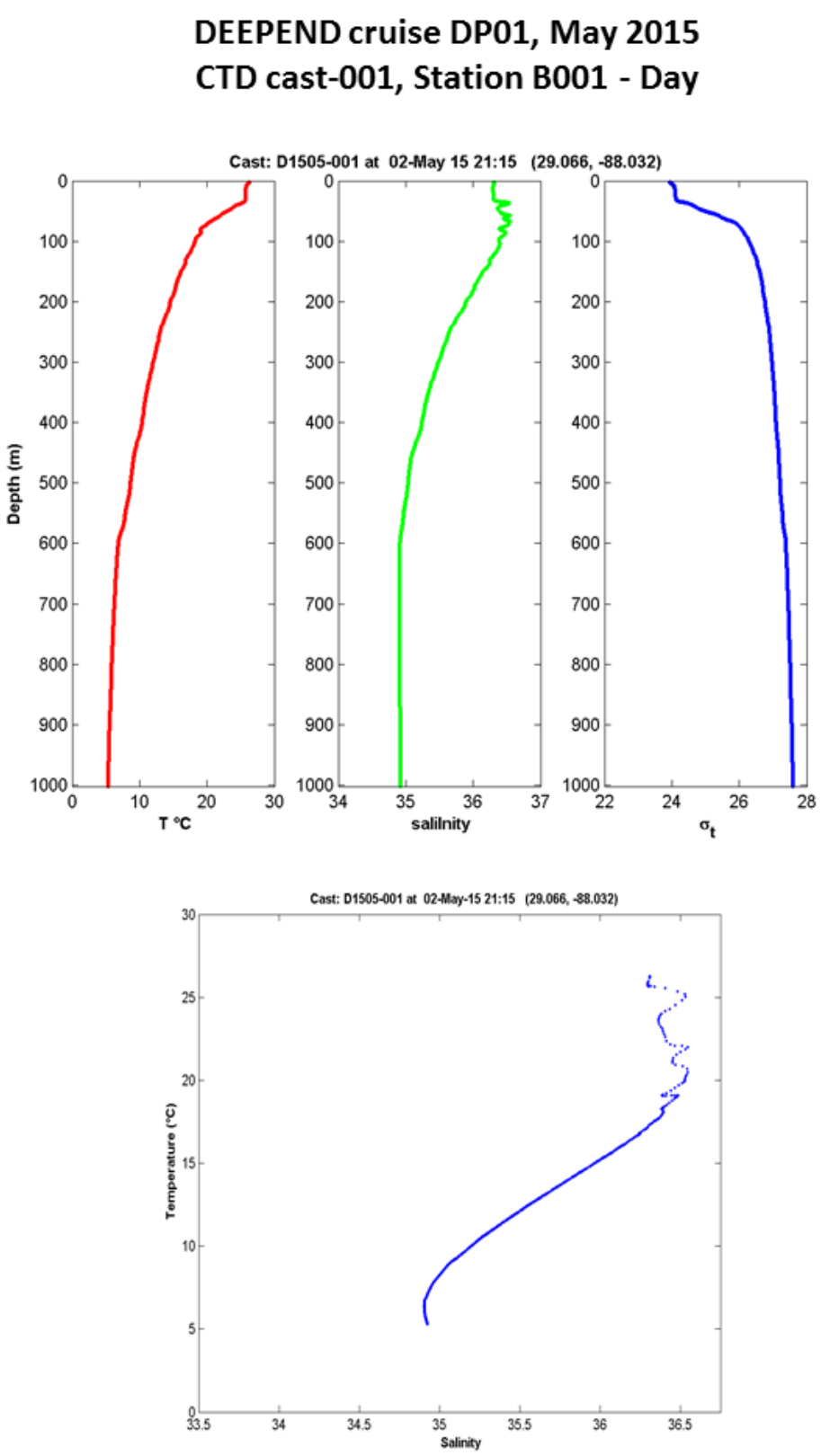


Figure 12. Full-depth CTD profile data – DEEPEND cruise DP01 station B001.

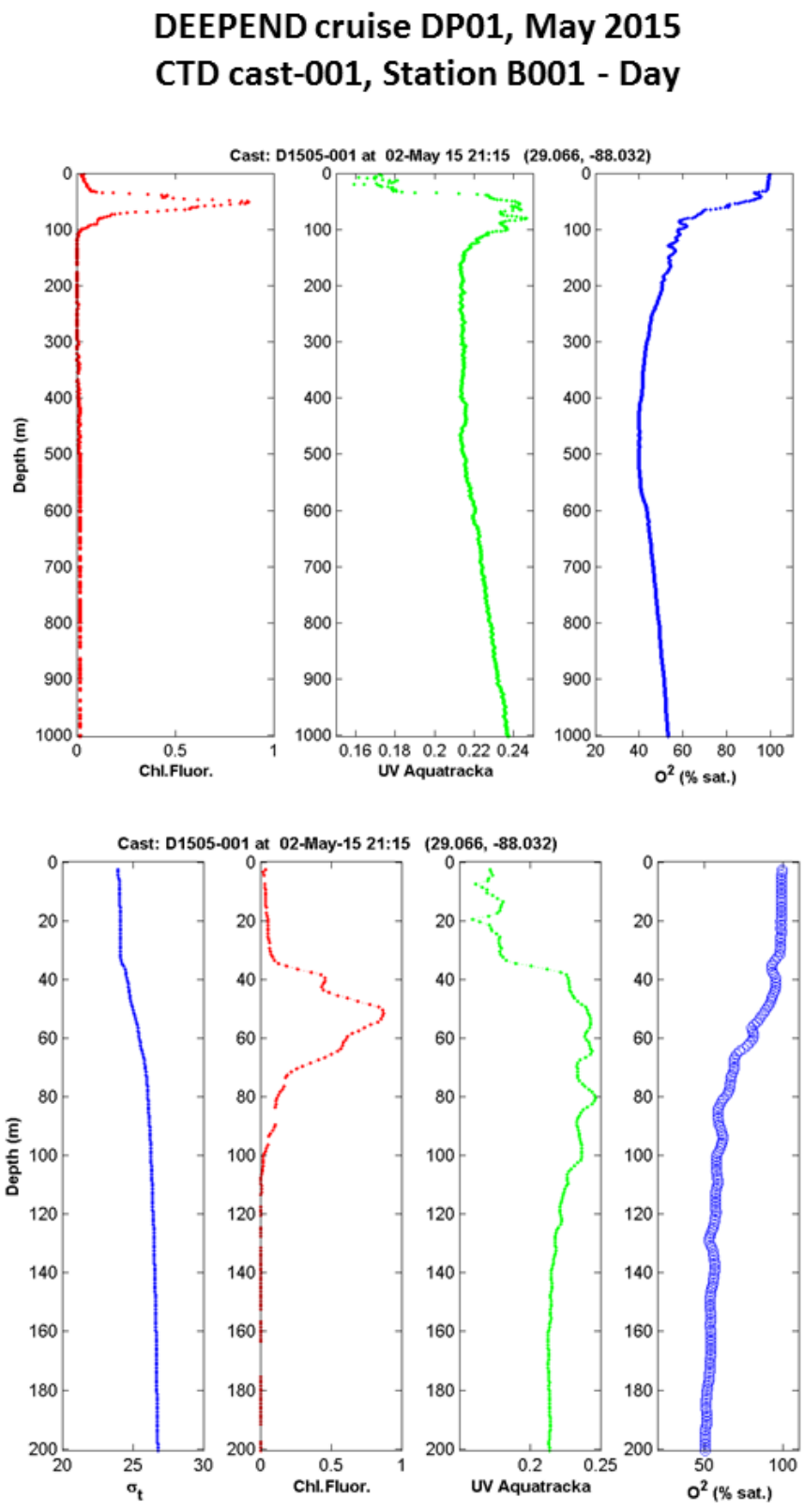


Figure 13. CTD data with 0-200 m expansion – DEEPEND cruise DP01 station B001.

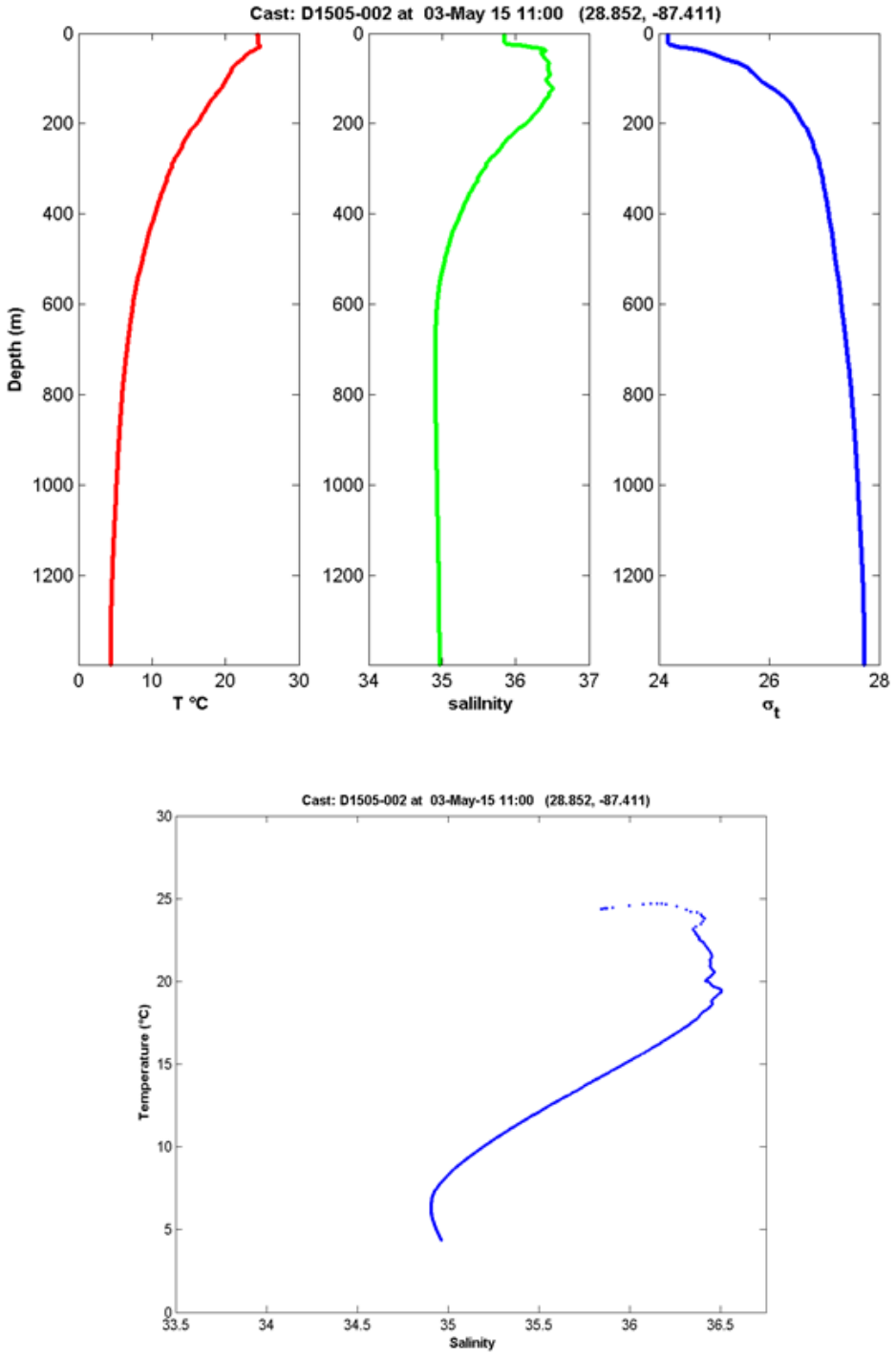


Figure 14. Full-depth CTD profile data – DEEPEND cruise DP01 station B175 (Day).

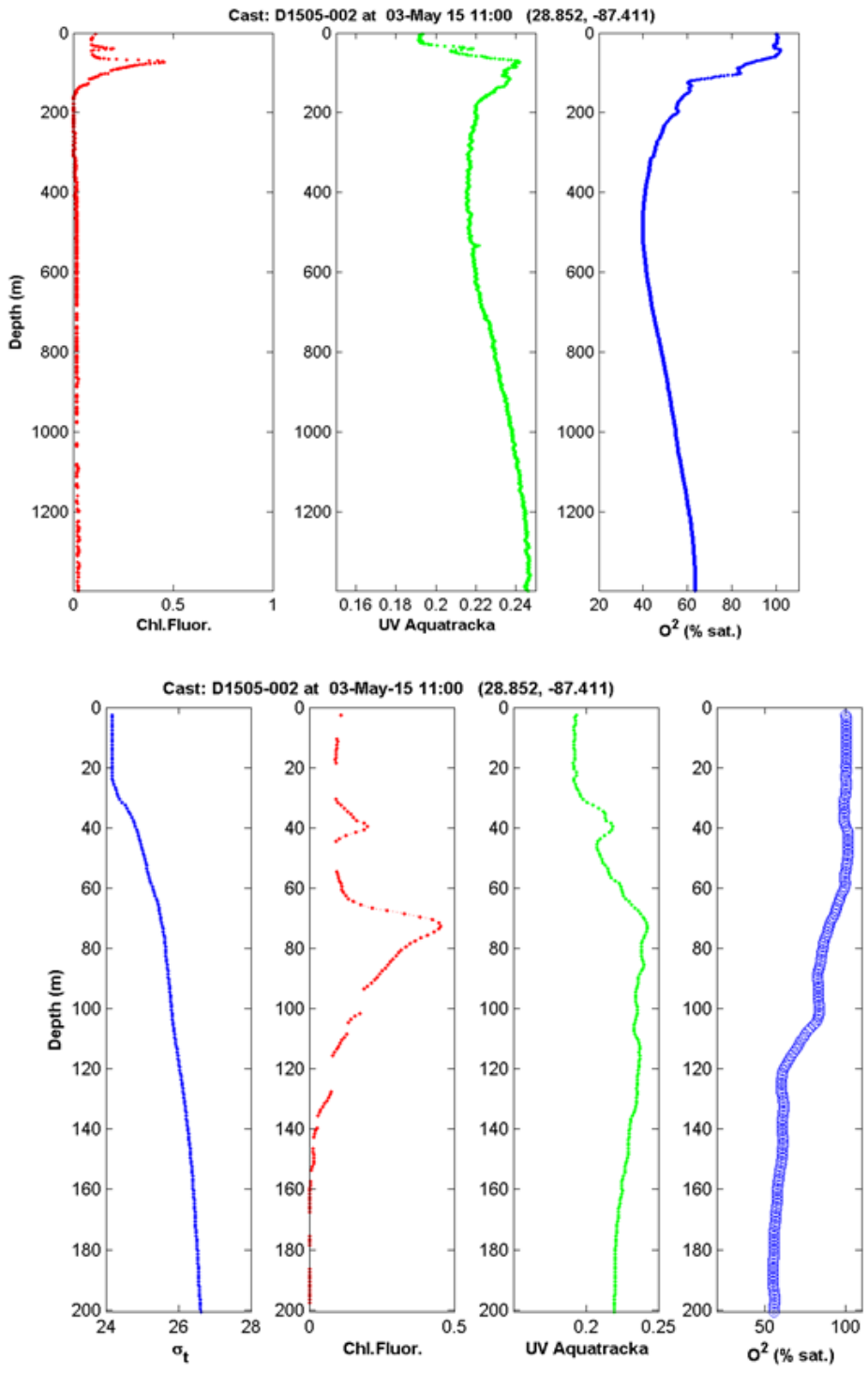


Figure 15. CTD data with 0-200 m expansion – DEEPEND cruise DP01 station B175.

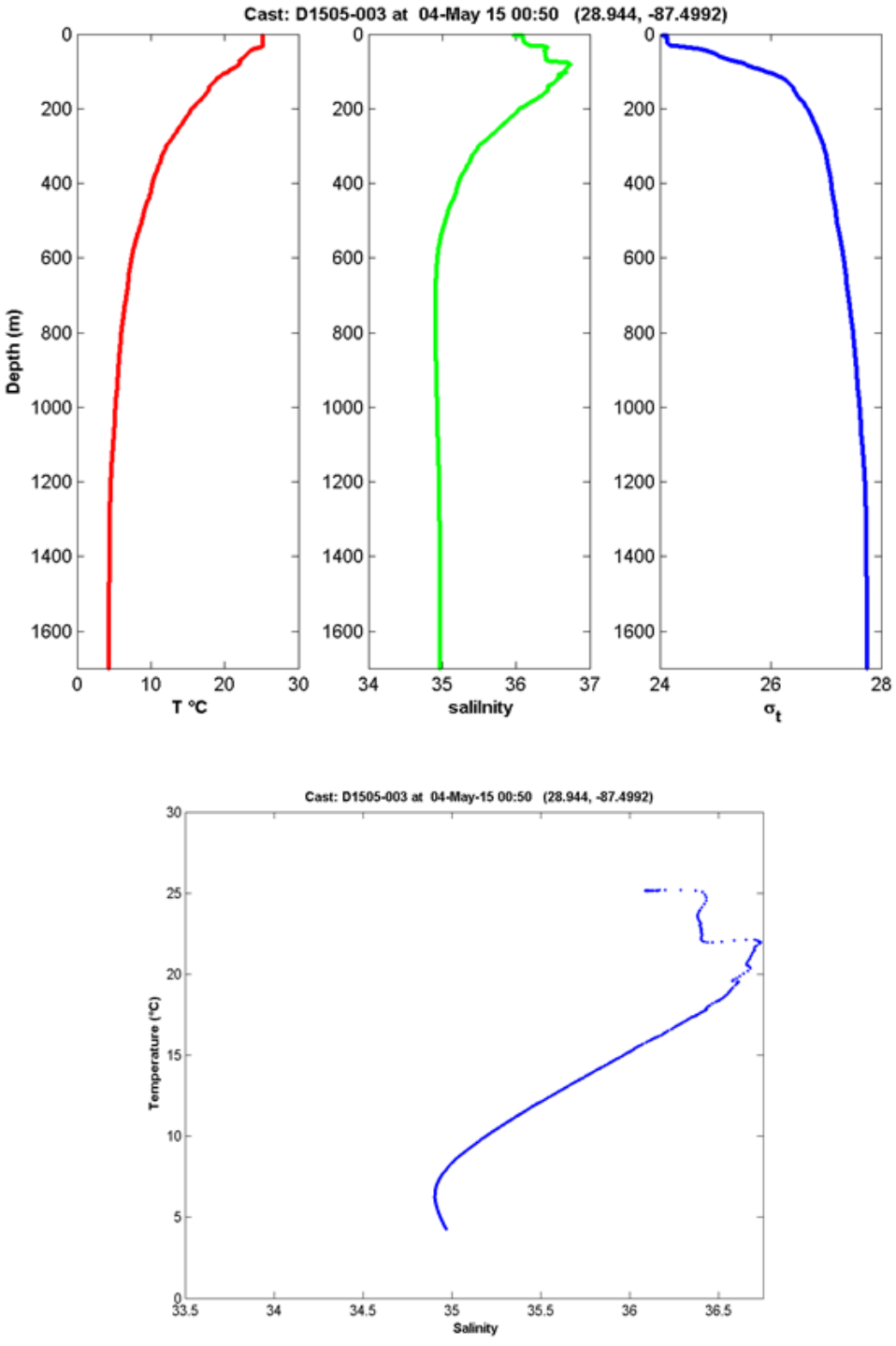


Figure 16. Full-depth CTD profile data – DEEPEND cruise DP01 station B175 (Night).

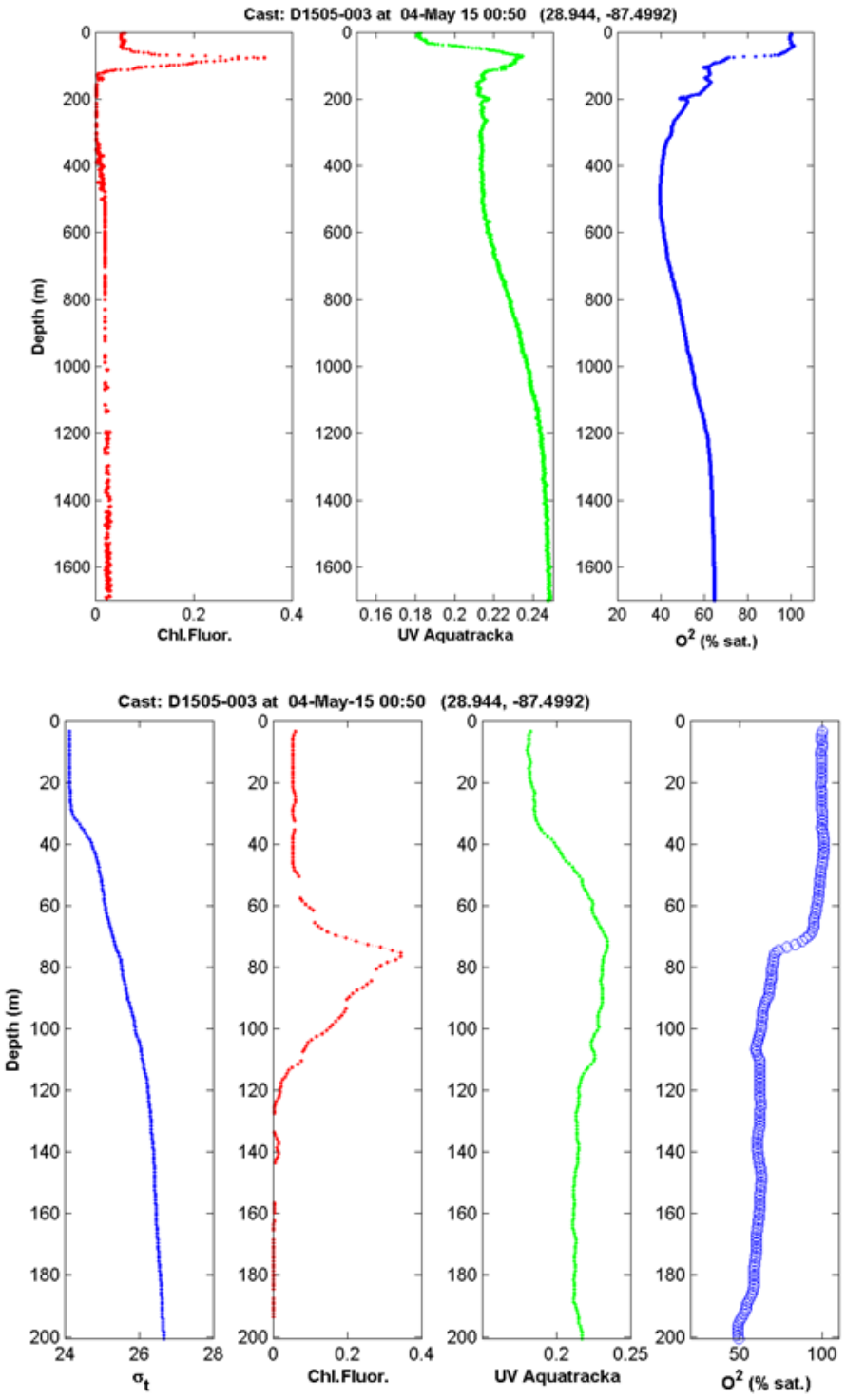


Figure 17. CTD data with 0-200 m expansion – DEEPEND cruise DP01 station B175.

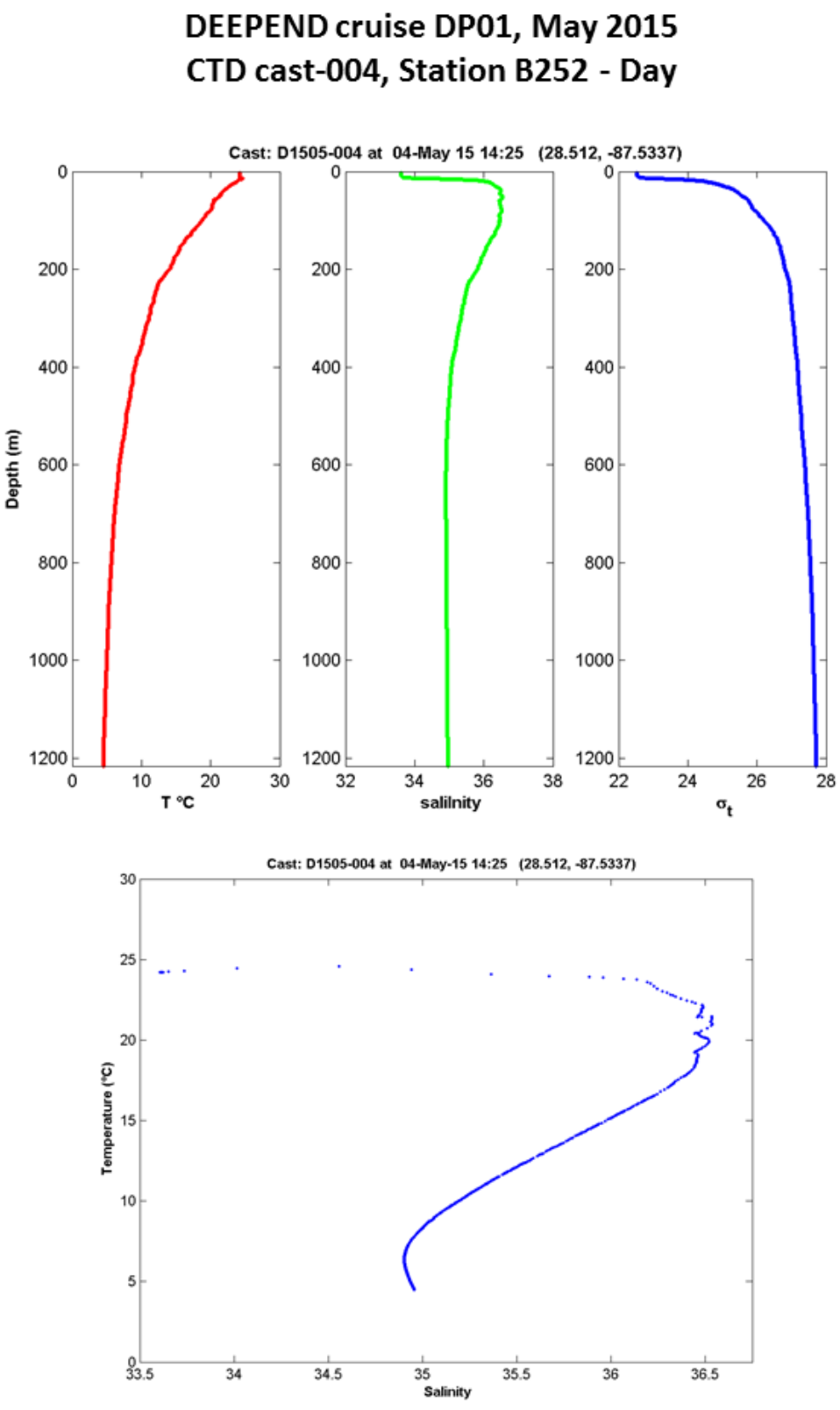


Figure 18. Full-depth CTD profile data – DEEPEND cruise DP01 station B252 (Day).

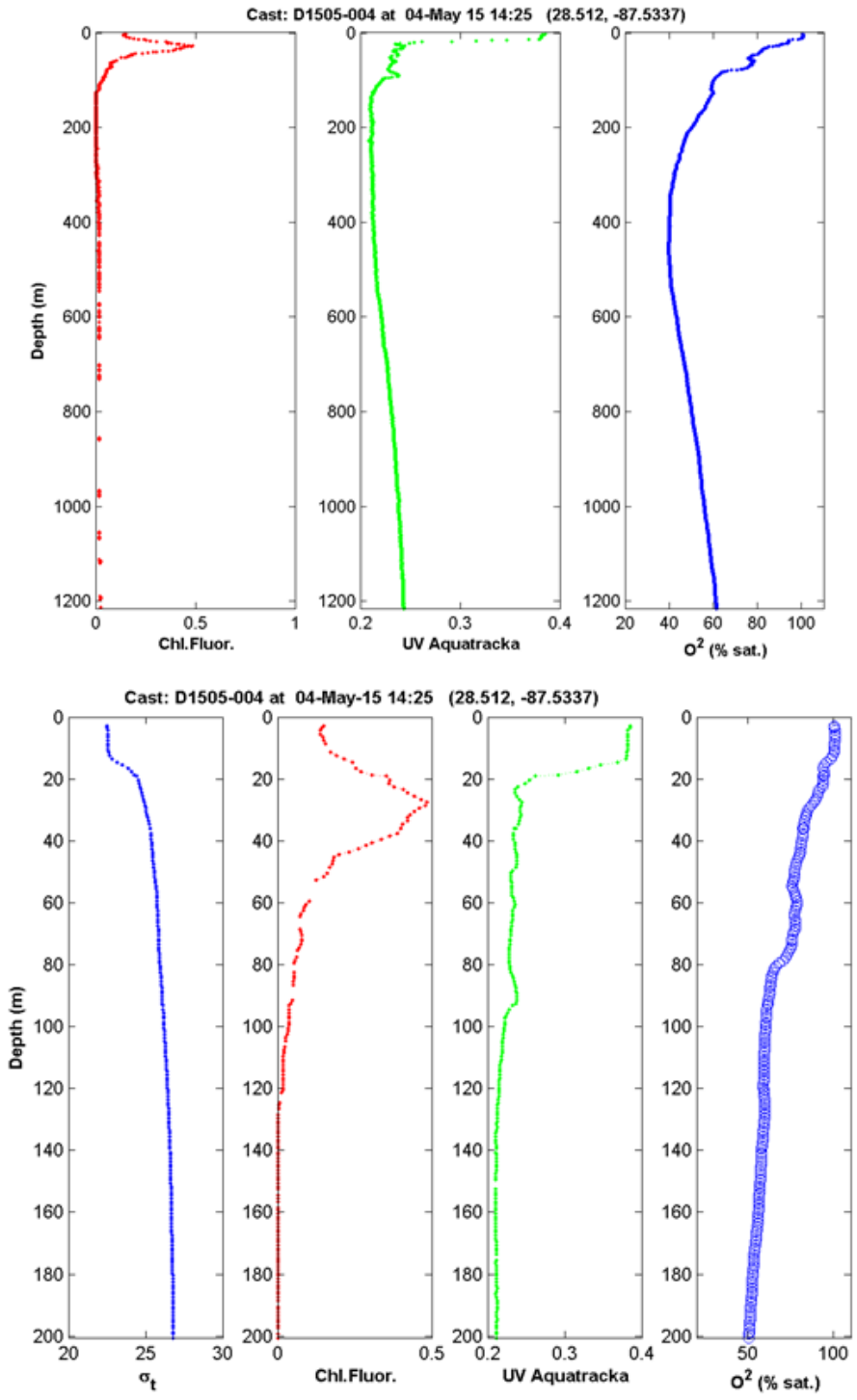


Figure 19. CTD data with 0-200 m expansion – DEEPEND cruise DP01 station B252.

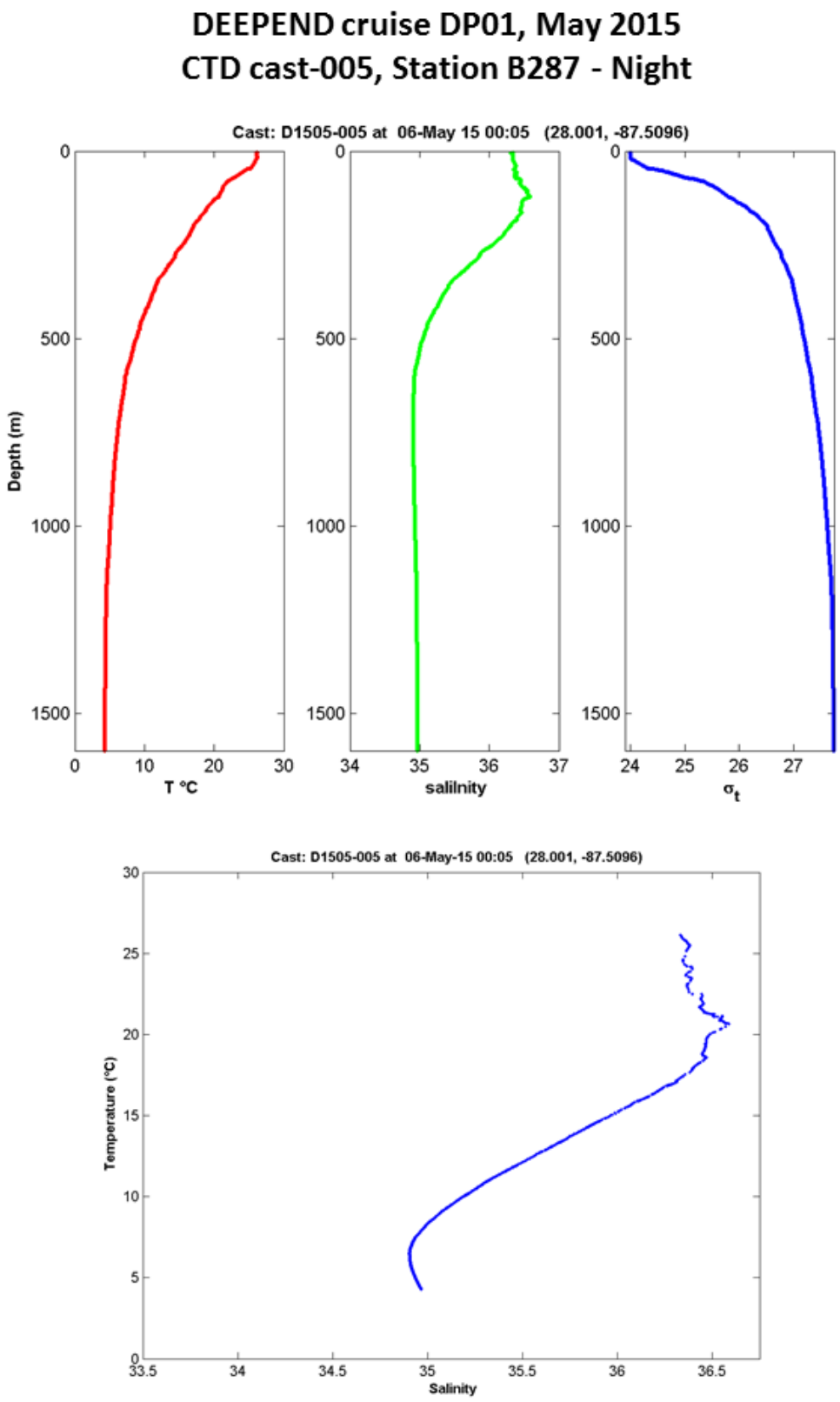


Figure 20. Full-depth CTD profile data – DEEPEND cruise DP01 station B287 (Night).

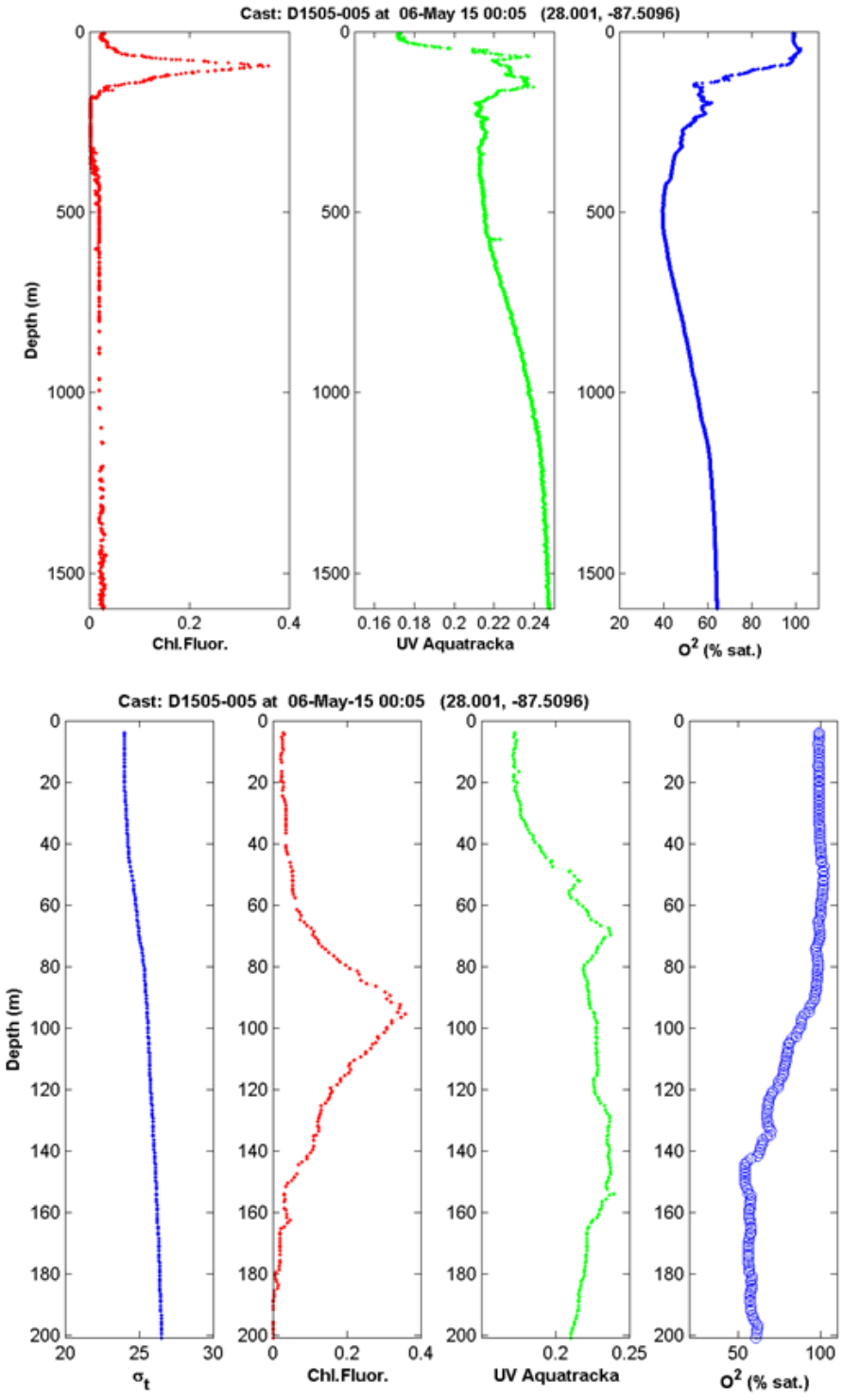


Figure 21. CTD data with 0-200 m expansion – DEEPEND cruise DP01 station B287.

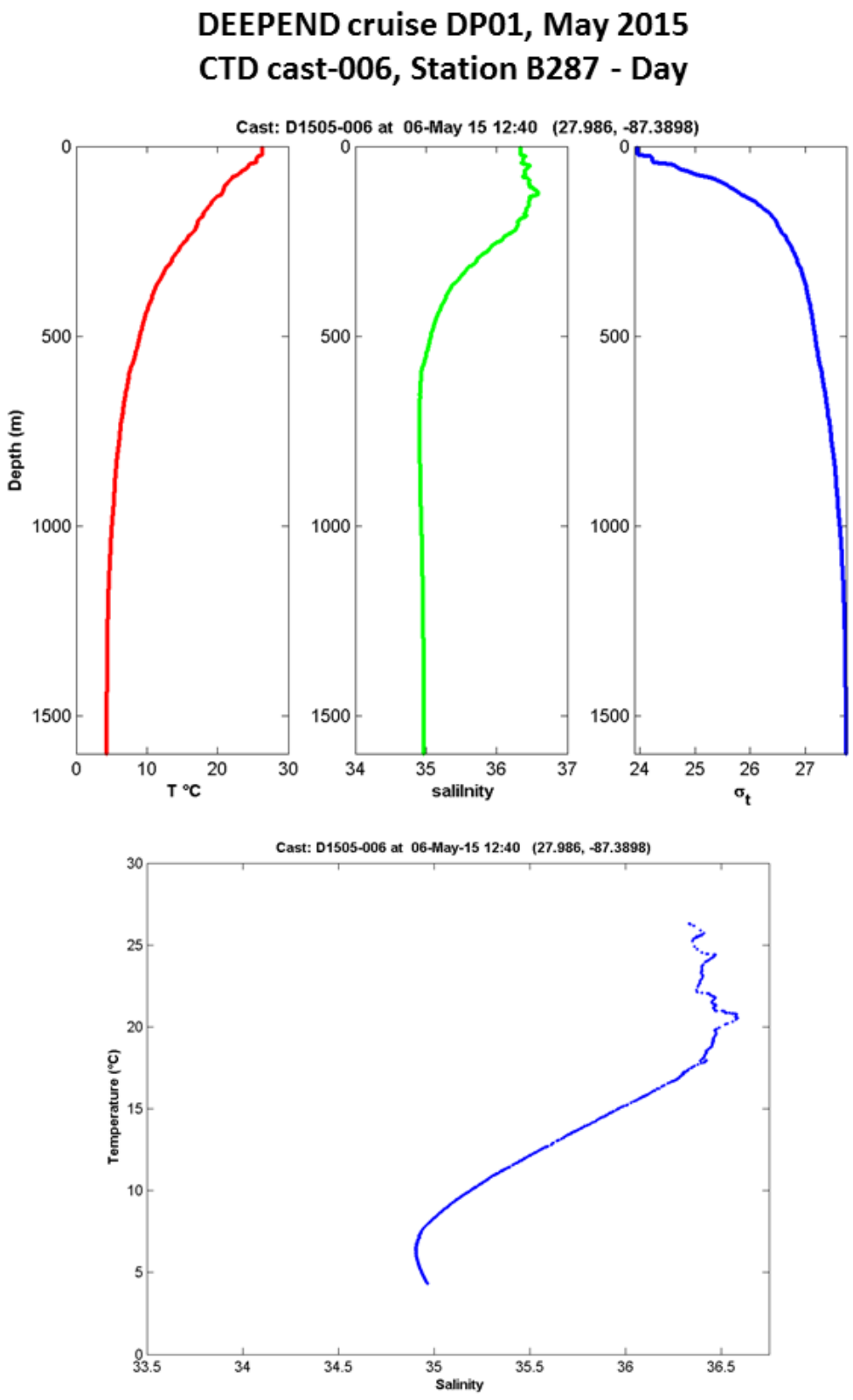


Figure 22. Full-depth CTD profile data – DEEPEND cruise DP01 station B287 (Day).

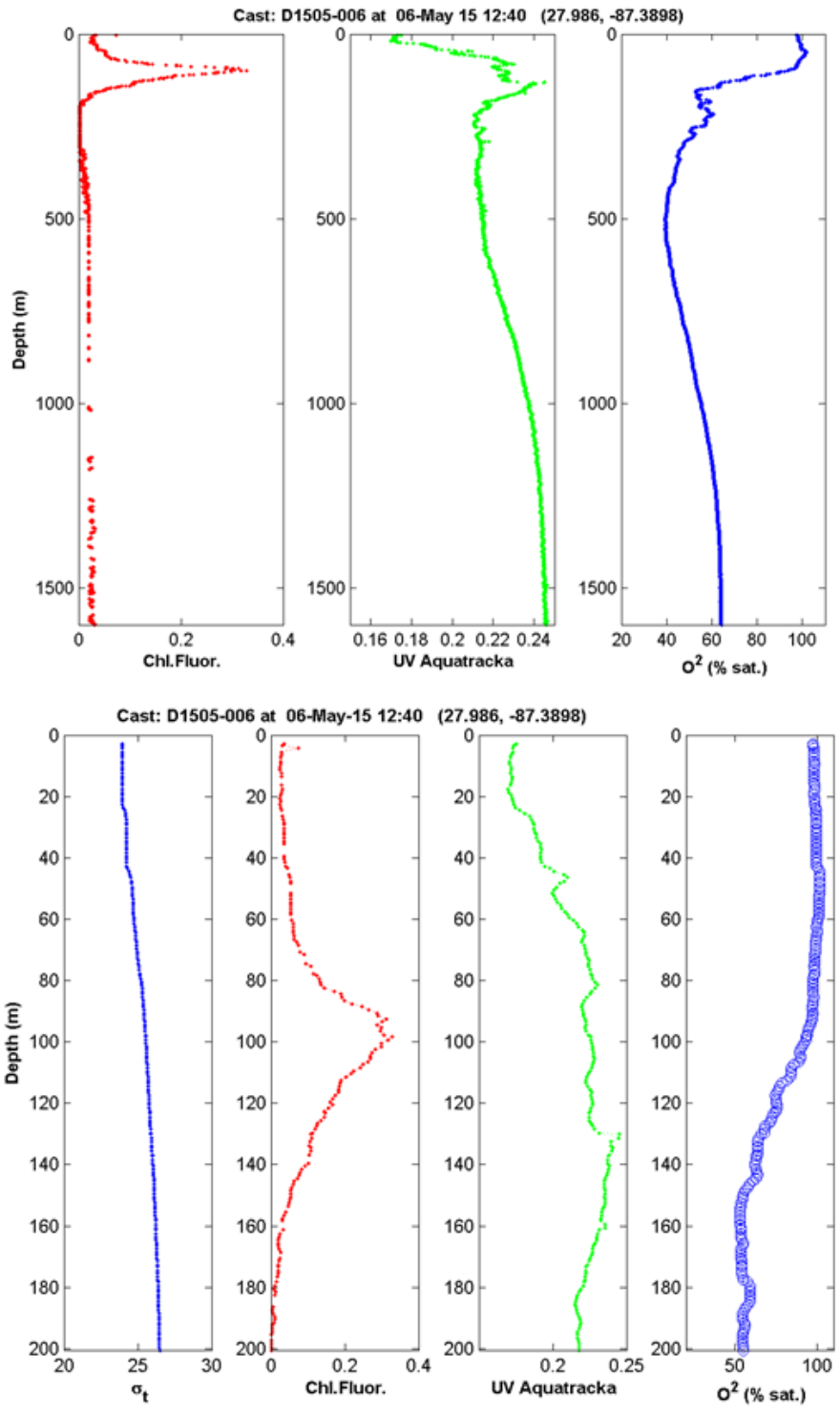


Figure 23. CTD data with 0-200 m expansion – DEEPEND cruise DP01 station B287.

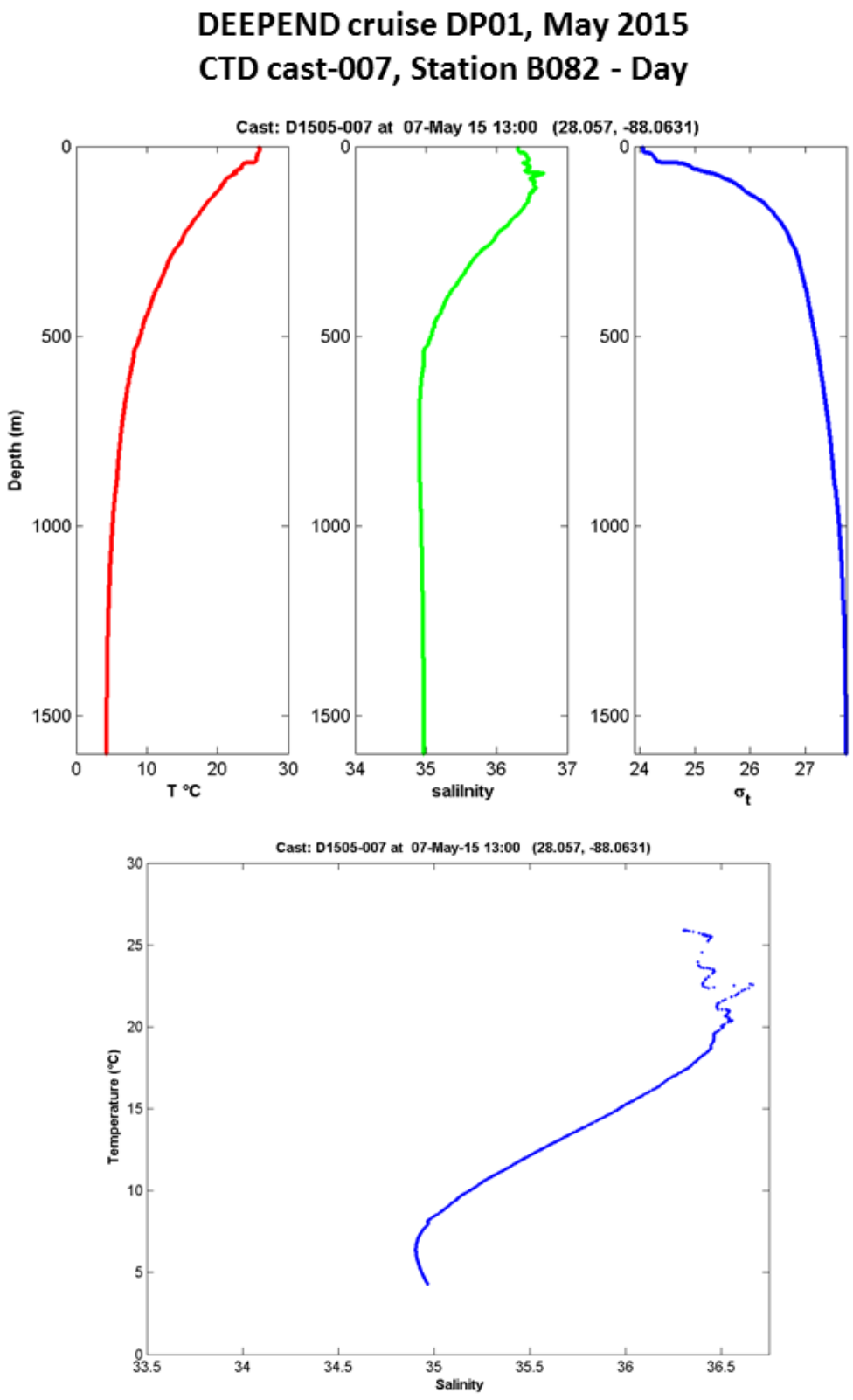


Figure 24. Full-depth CTD profile data – DEEPEND cruise DP01 station B082 (Day).

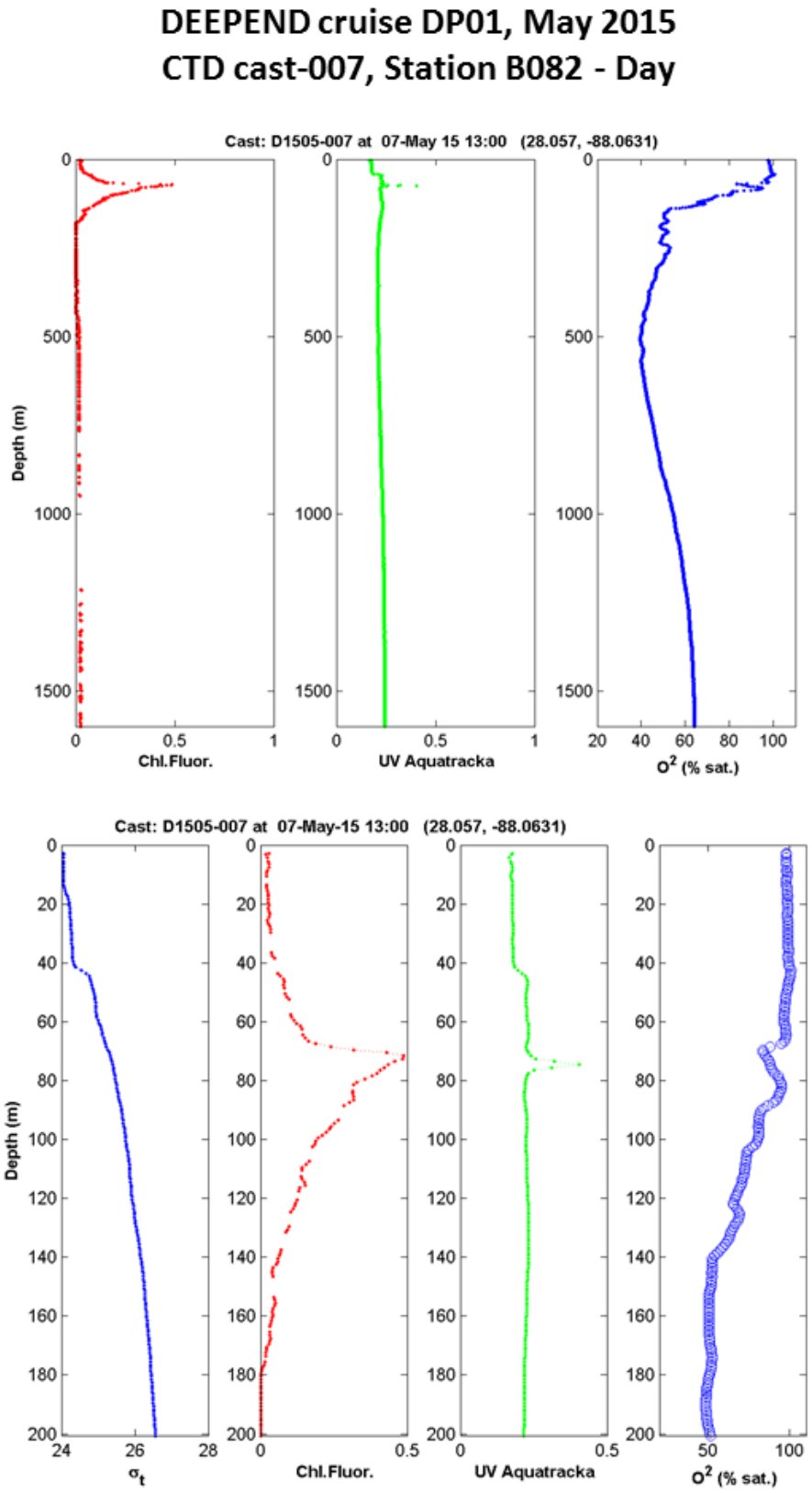


Figure 25. CTD data with 0-200 m expansion – DEEPEND cruise DP01 station B082.

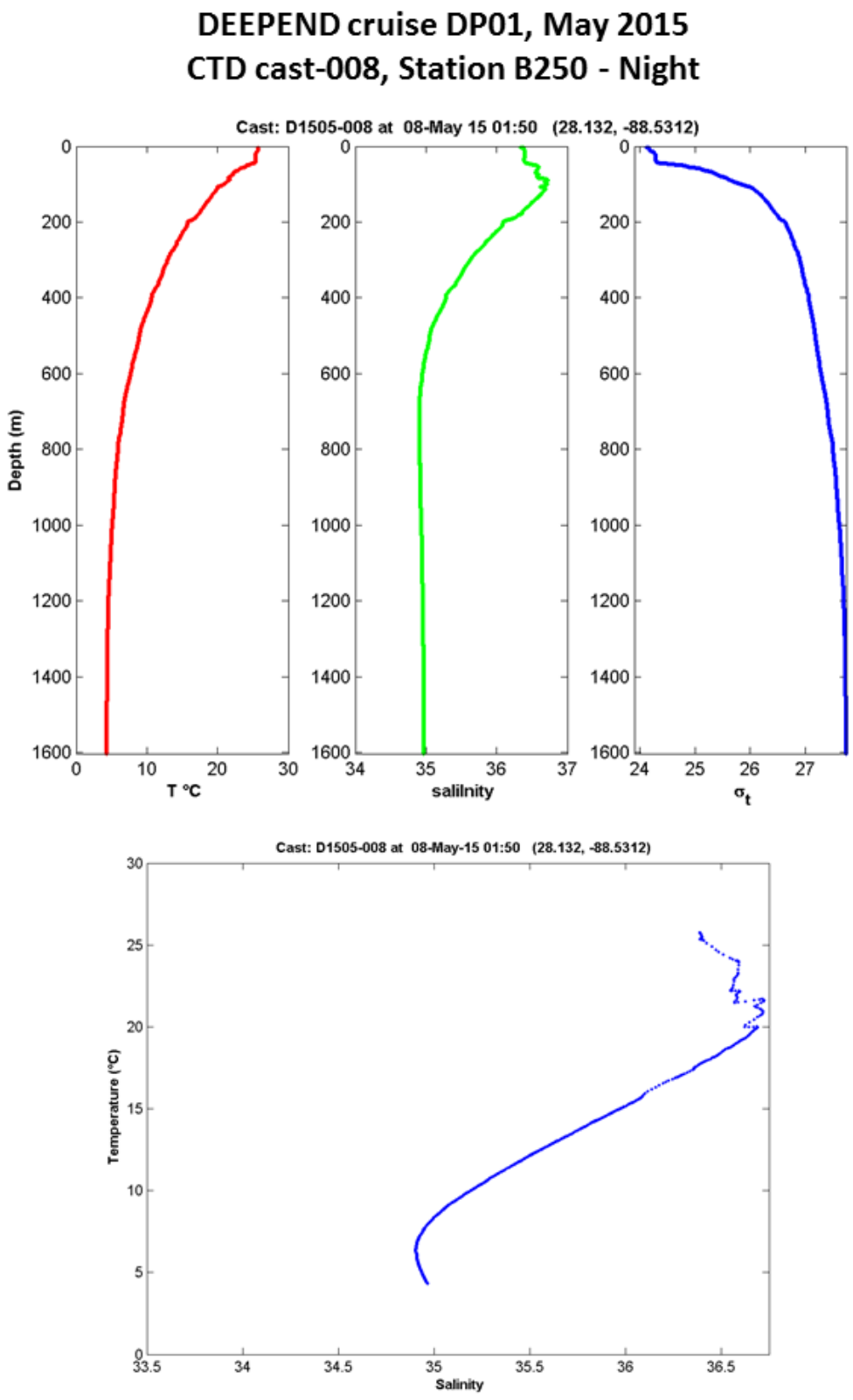


Figure 26. Full-depth CTD profile data – DEEPEND cruise DP01 station B250 (Night).

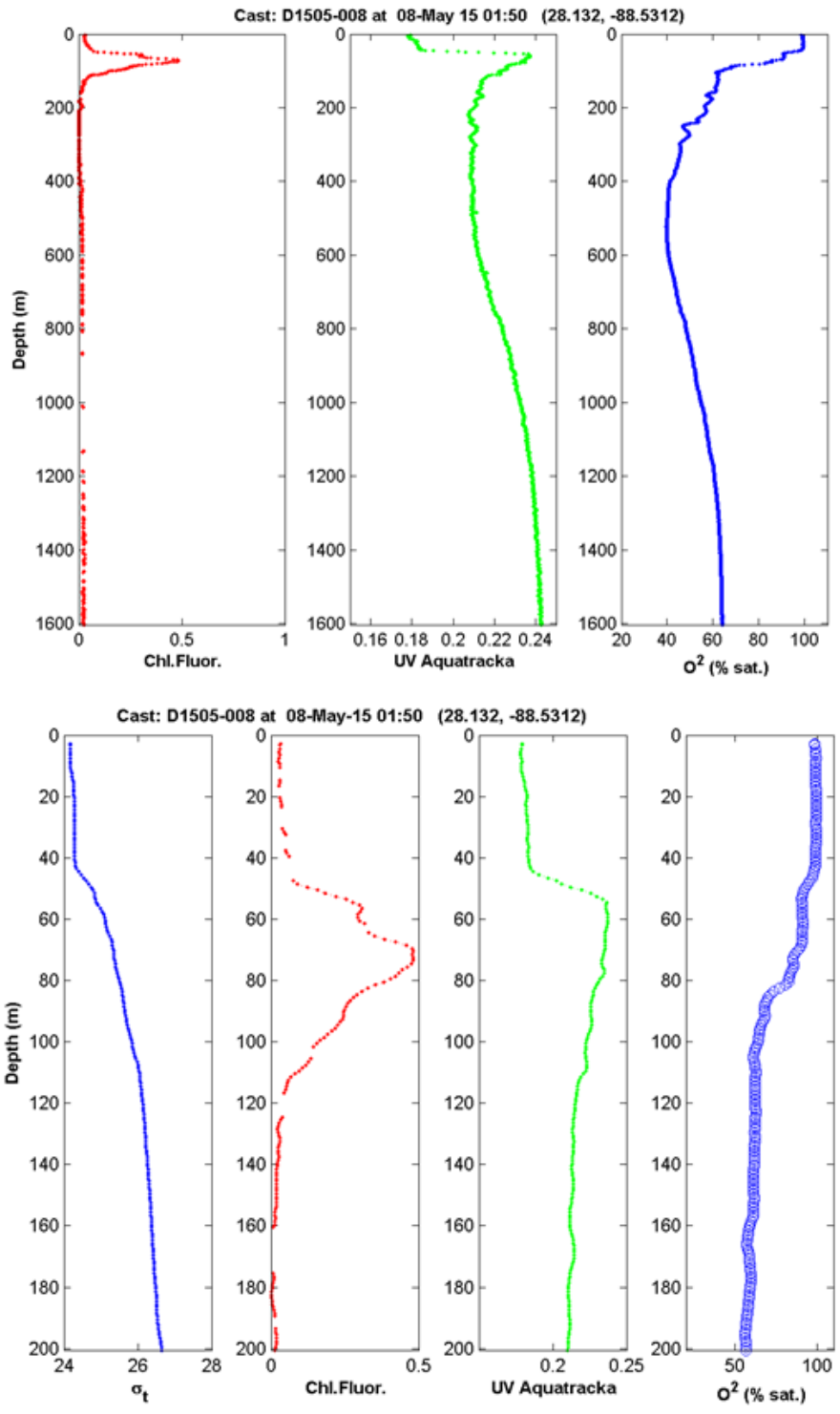


Figure 27. CTD data with 0-200 m expansion – DEEPEND cruise DP01 station B250.

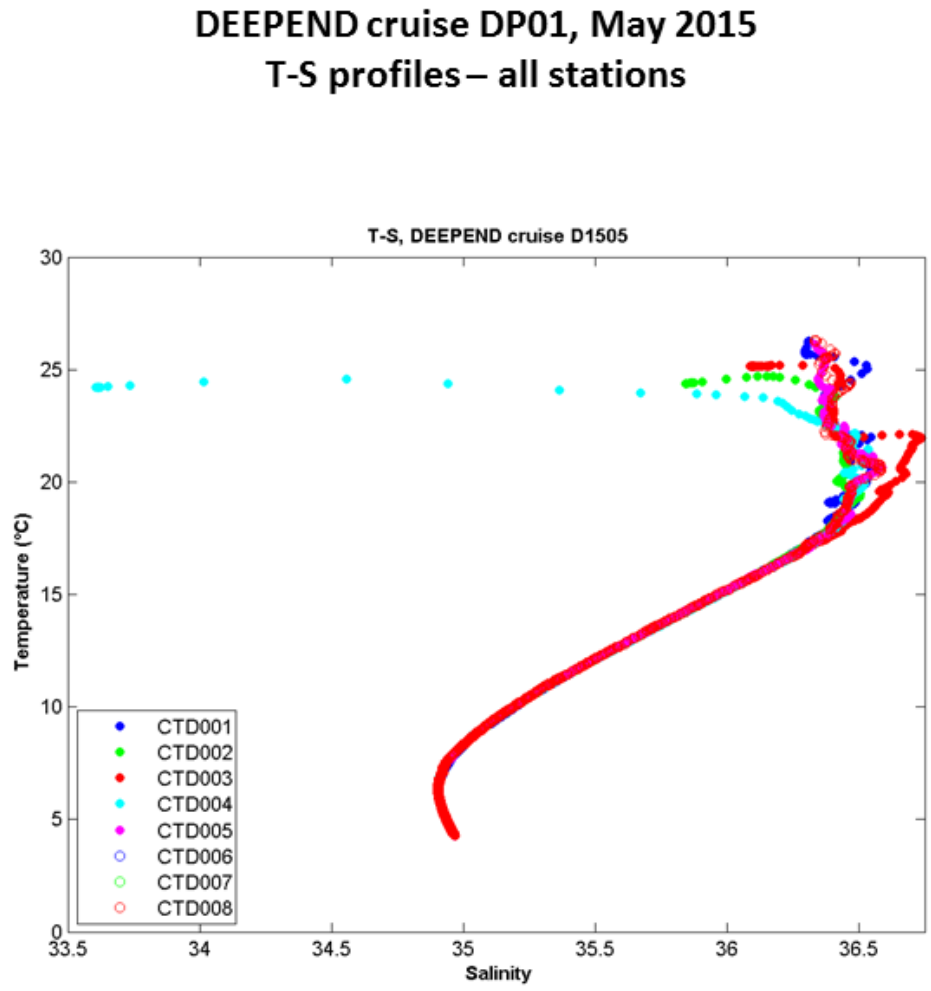


Figure 28. Temperature-salinity diagram – DEEPEND cruise DP01 CTD stations.

DEEPEND cruise DP01, May 2015
Seawater density profiles – all stations

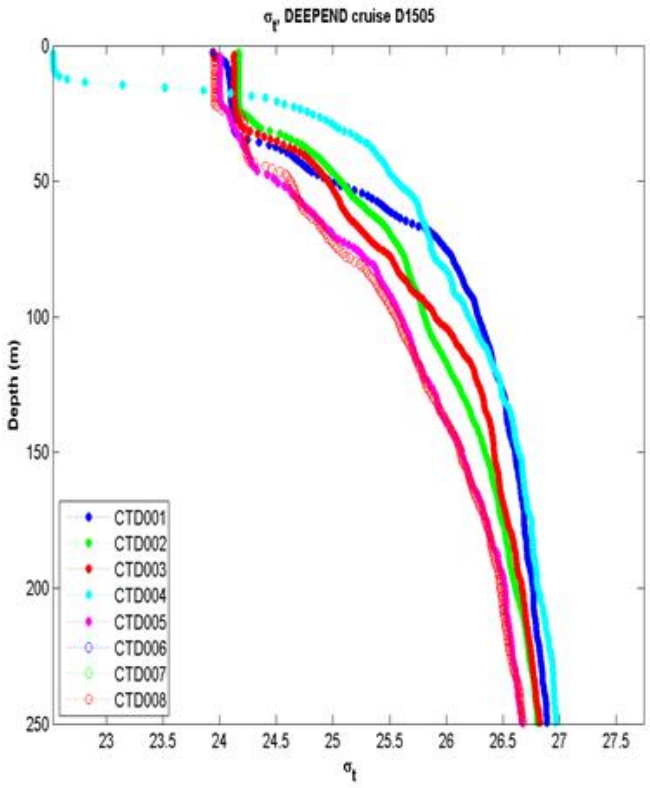


Figure 29. Seawater density profiles – DEEPEND cruise DP01 CTD stations.

DEEPEND cruise DP01, May 2015
Chlorophyll fluoresence profiles – all stations

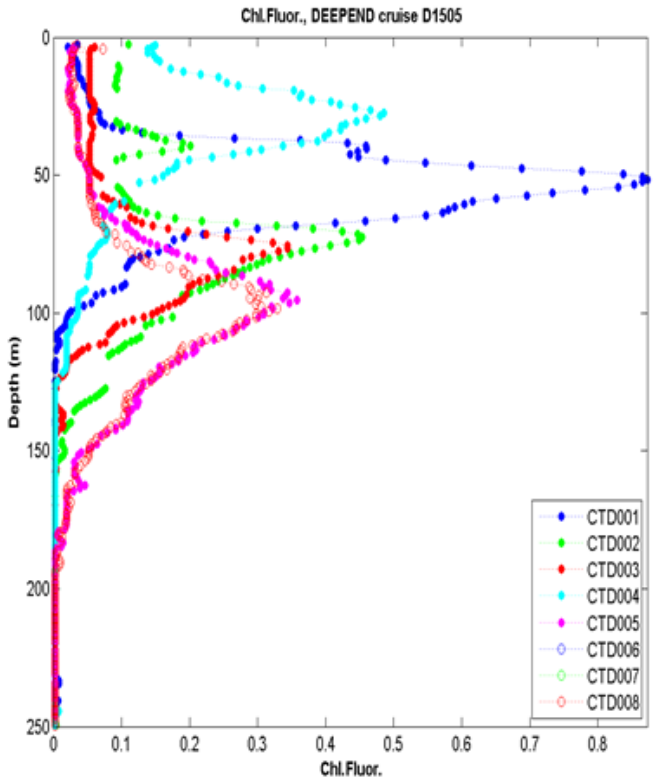


Figure 30. Chlorophyll fluorescence profiles – DEEPEND cruise DP01 CTD stations.

3. INDIVIDUAL PROJECT REPORTS

3.1. MOCNESS Sampling.

A total of 64 trawl samples were collected during 12 deployments (Table 2, Fig. 12). Of these, 34 samples were considered 'quantitative,' having met the criteria of: 1) proper opening and closing at prescribed depths; 2) proper flowmeter (volume) readings; 3) proper net behavior (mouth angle, net speed) during deployment; and 4) no signs of mechanical failure (tears, holes). These samples combined for a cumulative total of ~2.5 million cubic meters of water filtered. Ten samples were "Net 0's" that fished from the surface to max depth, which we classified as "non-standard," though flow data were taken. The remaining samples fished non-standard depth strata, had flow meter validation errors, or suffered mechanical problems. Specimens for genetic and biochemical analyses (see below) were taken from all trawls.

Table 2. MOC-10 trawl deployment time and location during DEEPEND cruise DP01

Trawl_No	Station	Sample Start Date	Start Time (CDT)	Start Lat	Start Lon	Sample End Date	Tow End Time (CDT)	End Lat	End Lon
001	B001	5/1/2015	16:28	28.99	-88.00	5/1/2015	18:50	29.07	-87.99
002	B001	5/1/2015	22:25	29.05	-87.99	5/2/2015	03:15	28.92	-88.04
003	B001	5/2/2015	10:21	28.92	-88.00	5/2/2015	15:12	29.06	-88.02
004	B175	5/2/2015	22:50	29.00	-87.50	5/3/2015	05:10	28.86	-87.41
005	B175	5/3/2015	11:02	29.00	-87.50	5/3/2015	16:44	28.91	-87.44
006	B252	5/3/2015	23:36	28.66	-87.55	5/4/2015	05:51	28.61	-87.35
007	B252	5/4/2015	11:25	28.51	-87.53	5/4/2015	17:18	28.49	-87.36
008	B287	5/5/2015	22:15	28.00	-87.46	5/6/2015	4:45	27.96	-87.20
009	B287	5/6/2015	10:16	28.00	-87.41	5/6/2015	16:06	28.00	-87.17
010	B082	5/6/2015	22:00	28.00	-88.00	5/7/2015	04:13	28.03	-88.09
011	B250	5/7/2015	14:25	28.00	-88.50	5/7/2015	19:46	28.16	-88.54
012	B250	5/7/2015	22:48	28.00	-88.50	5/8/2015	3:37	27.97	-88.49

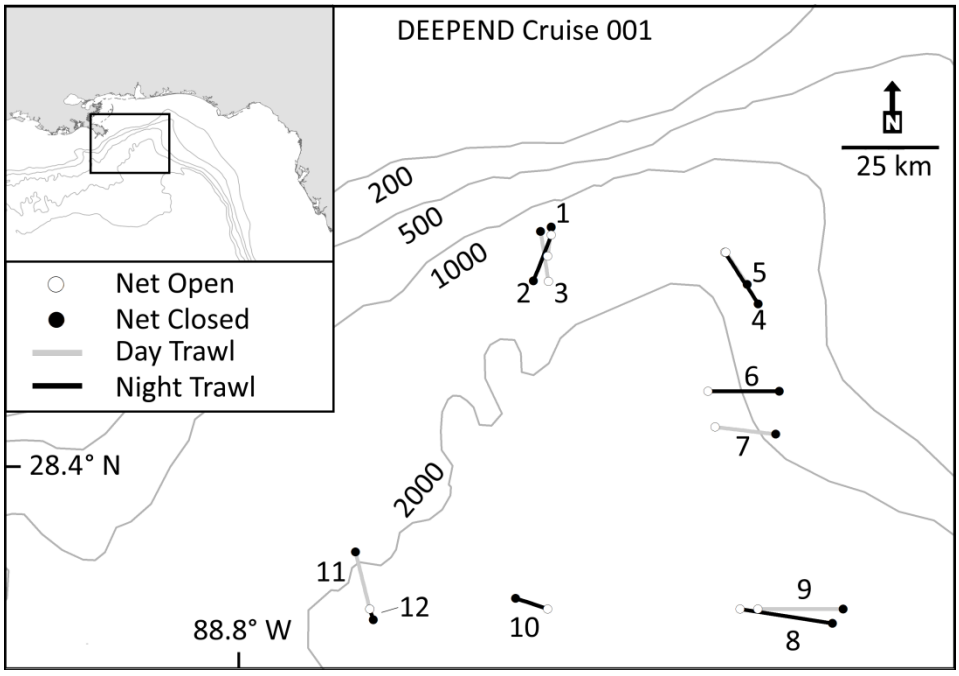


Figure 12. DEEPEND cruise DP01 MOC-10 trawl locations and trajectories.

3.1.1. Crustacea.

Approximately 3000 crustaceans were preserved in formalin for abundance and depth distribution studies (e.g., Fig. 13). This included approximately 450 oplophorids (including *Acanthephyra acanthetelsonis, A. acutifrons, A. brevirostris, A. curtirostris, A. purpurea, A. stylorostratis, Ephyrina ombango* and *E. benedicti, Hymenodora gracilis, Janicella spinacauda, Meningodora marptocheles, mollis* and *vesca, Notostomus elegans* and *gibbosus, Oplophorus gracilirostris* and *spinosus,* and *Systellaspis cristata* and *debilis),* 150 pandalids (dominated by *Stylopandalus richardi* and *Plesionika sp.*), 50 pasiphaeids (dominated by *Pasiphaea merriami*), 600 sergestids (dominated by *Sergestes sp., Sergia tenuiremis, robusta, grandis* and *splendens*), 475 lophogastrids (dominated by the three *Eucopia* species – *sculpticauda, australis* and *grimaldi*, with 15 *Gnathophausia ingens* and *zoea*), over 800 euphausiids that need to be identified under a microscope, 500 benthesicymids (dominated by *Gennadas valens, capensis and scutatus)* and five individuals of the relatively rare disciadid *Lucaya bigelowi*.

Figure 13. The oplophorid *Acanthephyra purpurea* collected during DEEPEND cruise DP01. Image courtesy of Tamara Frank.

3.1.2. Mollusca.

122 cephalopod specimens, representing 17 families and 23 species, were collected, along with numerous pteropod and heteropod specimens (9 species, 2 families) whose analysis is ongoing (e.g., Fig. 14).

Figure 14. Octopus and pteropod specimens collected during DEEPEND cruise DP01.

3.1.3. Fishes.

Thousands of fish specimens were collected, with analysis currently ongoing. A minimum total of 212 species were identified at sea, including at least one putative undescribed species of the dragonfish genus *Astronesthes* (Fig. 15).

Figure 15. *Astronesthes* sp. nov. (Sutton in progress), collected during DEEPEND cruise DP01.

3.1.4. Other Invertebrates.

All invertebrates other than macrocrustacea (gelantinous zooplankton, chaetognaths, nemerteans, polychaetes, gastropods, etc) were kept with the original sample and fixed in 10% formalin. These will be processed in detail in lab.

3.2. Genetic/Genomics Analyses.

3.2.1. Pelagic Microbial Assemblages.

Microbial communities at each station were sampled by 5-7 L CTD water collections at various depths (Table 3), which were then filtered through combusted GFF filters and PALL GN-6 0.45 micron. This sampling was designed to capture microbial eukaryotes, and then bacterioplankton, respectively, at various depths and provide a basis for comparison. A maximum of 5 L seawater was required for microbial sampling. Each filter was handled with gloves and in such a way to avoid as much contamination as possible. Following the filtering, filters were stored at -20°C for the duration of the cruise and returned to the NSU Molecular microbiology lab (Co-PI Lopez) for future DNA processing. Selected 125-ml water samples were also delivered to Dr. Piero Gardenilli for nutrient analyses. Ancillary samples of anglerfish "esca" (lures) were also sampled for preliminary analysis of esca microbiomes and symbionts.

3.2.2. Crustacea.

Nine of the most common species of crustacean were collected from the various sites and stored in RNAlater® for population genetics studies. These included *Acanthephyra purpurea* (21), *Acanthephyra stylorostrata* (30), *Eucopia sculpticauda* (25), *Stylopandalus richardi* (29), *Sergia grandis* (29), *Sergia robusta* (12), *Sergia splendens* (38), *Sergia tenuiremis* (7), and *Systellaspis debilis* (34). An additional 300 individuals were collected in ethanol for barcoding, and are in the process of being identified.

3.2.3. Cephalopoda and Other Pelagic Mollusca.

A total of nine cephalopod species were collected for genetic barcoding, with four additional species (*Cranchia scabra*, *Mastigoteuthis agassizi*, *Pyroteuthis margaritifera* and *Vampyroteuthis infernalis*) collected for population genetics studies (Table 4). Additionally, 12 cephalopod species were frozen in liquid nitrogen for genomics studies at the Smithsonian Institution (Table 5), along with eight pteropod species and four heteropod species.

3.2.4. Gastropoda (pteropods).

After manual micronekton and nekton sorting, pteropods were removed (Table 6) and preserved in isopropanol for identification and genetic sequencing by Dr. Stephanie Bush, Monterey Bay Aquarium Research Institute. Pteropods were not counted at sea, with total numbers exceeding 1000.

3.2.5. Fishes

A total of 1,067 fish tissue samples were collected for genetic analysis from 212 species (Table 7). All tissues and voucher specimens were individually matched with paired tissue tags. Those specimens not identified to species level were primarily larval forms (e.g., leptocephalus stage) or males for which no key currently exists (e.g., ceratioid anglerfishes). From the total list of fish species, adequate sample size for barcoding (n = 15) was achieved for 19 species (Appendix I). Following the cruise a taxonomic scheme was developed to parse the fish samples between Eytan's (TAMUG) and Shivji's (NSU OC) labs (Appendix II).

Table 3. Pelagic microbial assemblage samples collected during DEEPEND cruise DP01

DATE	SITE	DEPTH	BOTTLE	DAY/NIGHT	REPLICATES
5/1/2015	B001	50m	CTD 9	Day	3
		470m	CTD 6	Day	3
		1000m	CTD 12	Day	3
5/3/2015	B175	35m	CTD9	Day	3
		505m	CTD6	Day	3
		1700m	CTD 1	Day	3
		85m	CTD 9	Night	2
5/4/2015	B252	30m	CTD 12	Day	3
		415m	CTD 7	Day	3
		1215m	CTD 1	Day	3
		1215m	CTD 1	Night	3
5/5/2015	B287	95m	CTD 12	Day	3
		90m	CTD 12	Night	3
		450m	CTD 4	Night	3
		1600m	CTD 1	Night	3
5/6/2015	B082	65m	CTD 12	Day	3
		465m	CTD 8	Day	3
		1600m	CTD 4	Day	3
5/7/2015	B250	75m	CTD 9	Night	3
		450m	CTD 5	Night	3
		1600m	CTD 1	Night	3

Table 4. Cephalopod species collected for genetics studies during DEEPEND cruise DP01

Species	N
Bathyteuthis abyssicola	1
Bathyteuthis sp. A	1
Bolitaena pygmaea	1
Brachioteuthis sp.	1
Cranchia scabra	24
Cranchiidae	1
Discoteuthis discus	1
Helicocranchia pfefferi	1
Japetella diaphana	1
Mastigoteuthis agassizii	3
Pyroteuthis margaritifera	8
Vampyroteuthis infernalis	2
Leachia atlantica	1
Neoteuthis thielei	1

Table 5. Pelagic mollusc samples flash-frozen in liquid nitrogen for genomics analysis at the Smithsonian Institution

Biorepository Number	Genus	Species	ML (mm)	Date_Collected	sta	gear
AB1LO40	*Bathyteuthis*	sp.A	14	1-May-15	B001N-002-N2	MOC-10
AB1LO41	*Stigmatoteuthis*	*arcturi*	70	2-May-15	B175N-004-N4	MOC-10
AB1LO42	*Japetella*	*diaphana*	65	2-May-15	B175N-004-N2	MOC-10
AB1LO43	*Helicocranchia*	*pfefferi*	47	2-May-15	B175N-004-N2	MOC-10
AB1LO44	*Neoteuthis*	*theilei*	50	2-May-15	B175N-004-N0	MOC-10
AB1LO45	*Vampyroteuthis*	*infernalis*	55	3-May-15	B175D-004-N1	MOC-10
AB1LO46	*Bolitaena*	*pygmaea*	32	3-May-15	B175D-004-N2	MOC-10
AB1LO47	*Mastigoteuthis*	*agassizii*	76	3-May-15	B175D-004-N3	MOC-10
AB1LO48	*Macrotritopus*	*defillipi*	12	3-May-15	B175D-004-N5	MOC-10
AB1LO49	*Pterygioteuthis*	*gemmata*	20	4-May-15	B252D-007-N0	MOC-10
AB1LO50	*Pterotrachea*	*hippocampus?*		5-May-15	B287N-008-N0	MOC-10
AB1LO51	*Clio*	*pyramidata*		5-May-15	B287N-008-N0	MOC-10
AB1LO52	*Leachia*	*atlantica*	42	5-May-15	B287N-008-N2	MOC-10
AB1LO53	*Oxygyrus*	*inflata*		5-May-15	B287N-008-N3	MOC-10
AB1LO54	*Peraclis*	*bispinosa*		5-May-15	B287N-008-N3	MOC-10
AB1LO55	*Clio*	*recurva*		5-May-15	B287N-008-N3	MOC-10
AB1LO56	*Diacria*	*trispinosa* gp.		5-May-15	B287N-008-N3	MOC-10
AB1LO57	*Discoteuthis*	*discus*	38	5-May-15	B287D-009-N0	MOC-10
AB1LO58	*Cavolinia*	*tridentata*		5-May-15	B287D-009-N0	MOC-10
AB1LO59	*Cavolinia*	*gibbosa*		5-May-15	B287D-009-N0	MOC-10
AB1LO60	*Pterotrachea*	*scuttata*		6-May-15	B082N-010-N5	MOC-10
AB1LO61	*Carinaria*	*lamarcki*		7-May-15	B250D-011-N0	MOC-10
AB1LO62	*Pterotrachea*	*coronata*		7-May-15	B250D-011-N4	MOC-10

Table 6. Samples from DEEPEND cruise DP01 from which pteropods were removed, with curation comments

Sample_ID	Comments
DP01-01MAY15-MOC10-B001D-001-N0	
DP01-01MAY15-MOC10-B001D-001-N5	
DP01-01MAY15-MOC10-B001N-002-N1	
DP01-01MAY15-MOC10-B001N-002-N2	
DP01-01MAY15-MOC10-B001N-002-N3	
DP01-01MAY15-MOC10-B001N-002-N5	
DP01-02MAY15-MOC10-B001D-003-N0	
DP01-02MAY15-MOC10-B001D-003-N2	
DP01-02MAY15-MOC10-B001D-003-N4	
DP01-02MAY15-MOC10-B175N-004-N0	
DP01-02MAY15-MOC10-B175N-004-N3	
DP01-02MAY15-MOC10-B175N-004-N5	2 containers, 1 lacking preservative
DP01-03MAY15-MOC10-B175D-005-N2	
DP01-03MAY15-MOC10-B175D-005-N3	Lacking preservative, frozen
DP01-03MAY15-MOC10-B175D-005-N4	
DP01-03MAY15-MOC10-B175D-005-N5	Lacking preservative, frozen
DP01-03MAY15-MOC10-B252N-006-N3	
DP01-03MAY15-MOC10-B252N-006-N5	Lacking preservative, frozen
DP01-04MAY15-MOC10-B252D-007-N0	
DP01-04MAY15-MOC10-B252D-007-N3	
DP01-04MAY15-MOC10-B252D-007-N4	
DP01-04MAY15-MOC10-B252D-007-N5	Lacking preservative, frozen
DP01-05MAY15-MOC10-B287N-008-N3	
DP01-06MAY15-MOC10-B287D-009-N3	
DP01-06MAY15-MOC10-B287D-009-N5	
DP01-06MAY15-MOC10-B082N-010-N0	
DP01-06MAY15-MOC10-B082N-010-N3	
DP01-06MAY15-MOC10-B082N-010-N5	
DP01-01MAY15-MOC10-B001D-001-N3	
DP01-01MAY15-MOC10-B001D-001-N1	

Table 7. Fish species/taxa collected for genetics studies during DEEPEND cruise DP01

Species/Taxon	N
Acanthurus sp.	7
Albula vulpes	1
Alepocephalidae	1
Anoplogaster cornuta	3
Antennarius sp.	3
Anthias nicholsi	1
Anthias woodsi	1
Anthiinae	12
Apogon sp.	2
Argyropelecus aculeatus	32
Argyropelecus gigas	6
Argyropelecus hemigymnus	14
Ariosoma sp.	1
Ariosoma balearicum	1
Aristostomias xenostoma	1
Astronesthes gemmifer	1
Astronesthes macropogon	8
Astronesthes micropogon	1
Astronesthes niger	1
Astronesthes richardsoni	1
Astronesthes similus	2
Astronesthes undescribed TS1	1
Avocettina infans	13
Bathophilus longipinnis	1
Bathophilus pawneei	3
Benthosema suborbitale	14
Bolinichthys photothorax	1
Bolinichthys supralateralis	6
Bonapartia pedaliota	2
Brama sp.	1
Bramidae	1
Bregmaceros sp.	10
Bregmaceros mcclellandii	1
Bregmaceros undescribed TS1	1
Cantherhines pullus	1
Canthigaster sp.	8
Caranx sp.	2
Caranx ruber	4
Centrobranchus nigroocellatus	1
Centropyge sp.	6
Ceratoscopelus warmingii	44

Cetomimus sp.	2
Cetostoma regani	5
Chaetodon sp.	2
Chaetodontidae	1
Chauliodus sloani	24
Chaunax sp.	1
Cheilopogon exsiliens	2
Chiasmodon sp.	2
Chlorophthalmus agassizi	12
Coccorella atlantica	6
Coryphaena equiselis	1
Coryphaena hippurus	2
Cryptopsaras couesii	3
Cyclothone acclinidens	11
Cyclothone alba	14
Cyclothone braueri	16
Cyclothone microdon	1
Cyclothone obscura	36
Cyclothone pallida	15
Cyclothone pseudopallida	15
Diaphus anderseni	1
Diaphus brachycephalus	3
Diaphus dumerilii	17
Diaphus lucidus	11
Diaphus mollis	14
Diaphus perspicillatus	1
Diaphus rafinesquii	1
Diaphus roei	2
Diaphus splendidus	2
Diaphus subtilis	1
Diaphus taaningi	3
Diaphus termophilus	1
Dibranchus sp.	1
Diogenichthys atlanticus	11
Diplospinus multistriatus	14
Diretmoides pauciradiatus	1
Ditropichthys storeri	4
Dolicholagus longirostris	7
Dysomma sp.	1
Dysomma anguillare	8
Echiostoma barbatum	3
Epigonus sp.	2
Epigonus pandionis	1

Eurypharynx pelecanoides	1
Eustomias monodactylus	1
Exocoetidae	1
Facciolella sp. B FWNA	1
Facciolella sp. C FWNA	1
Flagellostomias boureei	1
Gadella imberbis	2
Gadomus sp.	1
Gibberichthys pumilus	1
Gigantactis vanhoeffeni	1
Gigantura sp.	1
Gigantura chuni	2
Gigantura indica	2
Gnathophis sp.	6
Gymnothorax moringa	1
Gymnothorax ocellatus	1
Gyrinomimus sp.	1
Haplophryne mollis	3
Hemanthias aureorubens	2
Holacanthus sp.	2
Holocentridae	1
Hoplostethus mediterraneus	1
Hoplunnis macrura	10
Hoplunnis tenuis	9
Howella atlantica	5
Hygophum hygomii	7
Hygophum macrochir	3
Hygophum reinhardtii	2
Hygophum taaningi	10
Labichthys carinatus	1
Laemonema barbatulum	1
Laemonema goodebeanorum	1
Lagocephalus sp.	3
Lampadena luminosa	3
Lampanyctus alatus	16
Lepidophanes guentheri	14
Leptostomias sp.	1
Lestidiops affinis	3
Linophrynidae	14
Lobianchia dofleini	2
Lobianchia gemellarii	5
Macrouridae	2
Malacosteus niger	2

Margrethia obtusirostra	1
Maurolicus weitzmani	9
Melamphaes longivelis	7
Melamphaes polylepis	6
Melamphaes simus	10
Melanocetus sp.	3
Melanolagus bericoides	2
Melanonus zugmayeri	6
Monacanthus ciliatus	1
Monolene sessilicauda	1
Monomitopus sp.	1
Moringua edwardsi	1
Myctophum affine	4
Myctophum obtusirostre	1
Myrophis punctatus	1
Nannobrachium atrum	6
Nannobrachium cuprarium	6
Nannobrachium lineatum	3
Nealotus tripes	1
Nemichthys curvirostris	10
Nesiarchus nasutus	1
Nettenchelys pygmaea	5
Nezumia sp.	1
Notolychnus valdiviae	14
Notoscopelus caudispinosus	1
Notoscopelus resplendens	13
Omosudis lowii	6
Oneirodidae	3
Ophichthus rex	5
Pachystomias microdon	1
Paracaristius maderensis	2
Paraconger sp.	1
Parasudis truculenta	1
Photonectes braueri	1
Photostomias guernei	14
Photostylus pycnopterus	1
Physiculus fulvus	3
Platytroctes apus	1
Pleuronectiformes	3
Poecilopsetta sp.	1
Pollichthys mauli	8
Polyipnus clarus	4
Polymixia lowei	5

Pomacanthidae	1
Poromitra "Gibbsi" undescribed JM1	3
Poromitra megalops	1
Prognathodes sp.	1
Rhynchoconger flavus	8
Rondeletia bicolor	1
Sargocentron sp.	5
Scopelarchoides danae	1
Scopelarchus analis	3
Scopelarchus michaelsarsi	1
Scopeloberyx opercularis	16
Scopeloberyx opisthopterus	11
Scopeloberyx robustus	2
Scopelogadus mizolepis	4
Scopelosaurus mauli	4
Scopelosaurus smithii	1
Scorpaena plumieri	1
Scorpaenidae	2
Sigmops elongatus	14
Stemonosudis bullisi	1
Stephanolepis setifer	1
Sternoptyx diaphana	40
Sternoptyx pseudobscura	41
Stomias affinis	5
Stylephorus chordatus	1
Sudis atrox	2
Symphysanodon berryi	4
Synagrops spinosus	1
Taaningichthys sp.	4
Taaningichthys bathyphilus	1
Talismania homoptera	1
Taractes asper	5
Tiluropsis sp.	2
Trachipterus arcticus	1
Uncisudis quadrimaculata	1
Uroconger syringinus	1
Valenciennellus tripunctulatus	17
Vinciguerria nimbaria	2
Vinciguerria poweriae	17
Xenolepidichthys dalgleishi	8
Xenomystax congroides	5
Zenion hololepis	1

3.3. Polycyclic Aromatic Hydrocarbon (PAH) Analysis.

A total of 137 samples were collected for PAH analysis. Large fish specimens were dissected at sea and organs/tissues kept separate (guts/liver, muscle, skin, ovaries). Other fish specimens and all invertebrates were frozen as whole bodies (Table 8).

Table 8. Specimens collected for PAH analysis on DEEPEND cruise DP01.

Vial_No	Sample	Species	Sample_Type
00001	DP01-02MAY15-MOC10-B001D-003-N3	*Chauliodus sloani*	Skin
00002	DP01-02MAY15-MOC10-B001D-003-N3	*Chauliodus sloani*	Gut
00003	DP01-01MAY15-MOC10-B001N-002-N1	*Chauliodus sloani*	Skin
00004	DP01-01MAY15-MOC10-B001N-002-N1	*Chauliodus sloani*	Muscle
00005	DP01-01MAY15-MOC10-B001N-002-N1	*Chauliodus sloani*	Gut
00006	DP01-02MAY15-MOC10-B001D-003-N3	*Chauliodus sloani*	Muscle
00007	DP01-02MAY15-MOC10-B175N-004-N3	*Cyclothone pallida*	Whole
00008	DP01-02MAY15-MOC10-B175N-004-N3	*Cyclothone pallida*	Whole
00009	DP01-02MAY15-MOC10-B175N-004-N3	*Cyclothone pallida*	Whole
00010	DP01-02MAY15-MOC10-B175N-004-N3	*Cyclothone pallida*	Whole
00011	DP01-02MAY15-MOC10-B175N-004-N3	*Cyclothone pallida*	Whole
00012	DP01-02MAY15-MOC10-B175N-004-N3	*Cyclothone pallida*	Whole
00013	DP01-02MAY15-MOC10-B175N-004-N3	*Cyclothone pallida*	Whole
00014	DP01-02MAY15-MOC10-B175N-004-N3	*Grimalditeuthis bonplandi*	Whole
00015	DP01-02MAY15-MOC10-B175N-004-N2	*Chauliodus sloani*	Gut
00016	DP01-02MAY15-MOC10-B175N-004-N2	*Chauliodus sloani*	Skin
00017	DP01-02MAY15-MOC10-B175N-004-N2	*Chauliodus sloani*	Muscle
00018	DP01-02MAY15-MOC10-B175N-004-N0	*Chauliodus sloani*	Gut
00019	DP01-02MAY15-MOC10-B175N-004-N0	*Chauliodus sloani*	Skin
00020	DP01-02MAY15-MOC10-B175N-004-N0	*Chauliodus sloani*	Muscle
00021	DP01-02MAY15-MOC10-B175N-004-N0	*Ceratoscopelus warmingii*	Whole
00022	DP01-03MAY15-MOC10-B175D-005-N3	*Lampanyctus alatus*	Whole
00023	DP01-03MAY15-MOC10-B175D-005-N4	*Histioteuthis corona*	Whole
00024	DP01-03MAY15-MOC10-B175D-005-N0	*Ceratoscopelus warmingii*	Whole
00025	DP01-03MAY15-MOC10-B175D-005-N0	*Sternoptyx pseudobscura*	Whole
00026	DP01-03MAY15-MOC10-B175D-005-N0	*Sternoptyx pseudobscura*	Whole
00027	DP01-03MAY15-MOC10-B175D-005-N0	*Sternoptyx pseudobscura*	Whole
00028	DP01-03MAY15-MOC10-B175D-005-N0	*Sternoptyx pseudobscura*	Whole
00029	DP01-03MAY15-MOC10-B175D-005-N0	*Lampanyctus alatus*	Whole
00030	DP01-03MAY15-MOC10-B175D-005-N0	*Lampanyctus alatus*	Whole
00031	DP01-03MAY15-MOC10-B175D-005-N0	*Lampanyctus alatus*	Whole
00032	DP01-03MAY15-MOC10-B175D-005-N0	*Lampanyctus alatus*	Whole
00033	DP01-03MAY15-MOC10-B175D-005-N0	*Lampanyctus alatus*	Whole
00034	DP01-03MAY15-MOC10-B175D-005-N0	*Lampanyctus alatus*	Whole
00035	DP01-03MAY15-MOC10-B175D-005-N0	*Cyclothone obscura*	Whole
00036	DP01-03MAY15-MOC10-B175D-005-N0	*Cyclothone obscura*	Whole

00037	DP01-03MAY15-MOC10-B175D-005-N0	*Cyclothone obscura*	Whole
00038	DP01-03MAY15-MOC10-B252N-006-N3	*Sternoptyx pseudobscura*	Whole
00039	DP01-03MAY15-MOC10-B252N-006-N3	*Sternoptyx pseudobscura*	Whole
00040	DP01-03MAY15-MOC10-B252N-006-N3	*Lampanyctus alatus*	Whole
00041	DP01-03MAY15-MOC10-B252N-006-N3	*Lampanyctus alatus*	Whole
00042	DP01-03MAY15-MOC10-B252N-006-N3	*Lampanyctus alatus*	Whole
00043	DP01-03MAY15-MOC10-B252N-006-N3	*Lampanyctus alatus*	Whole
00044	DP01-03MAY15-MOC10-B252N-006-N3	*Lampanyctus alatus*	Whole
00045	DP01-03MAY15-MOC10-B252N-006-N3	*Sternoptyx pseudobscura*	Whole
00046	DP01-03MAY15-MOC10-B252N-006-N4	*Sternoptyx diaphana*	Whole
00047	DP01-03MAY15-MOC10-B252N-006-N4	*Sternoptyx diaphana*	Whole
00048	DP01-03MAY15-MOC10-B252N-006-N5	*Caulolatilus*	Whole
00049	DP01-03MAY15-MOC10-B252N-006-N5	*Ceratoscopelus warmingii*	Whole
00050	DP01-03MAY15-MOC10-B252N-006-N5	*Ceratoscopelus warmingii*	Whole
00051	DP01-03MAY15-MOC10-B252N-006-N0	*Ceratoscopelus warmingii*	Whole
00052	DP01-03MAY15-MOC10-B252N-006-N0	*Lampanyctus alatus*	Whole
00053	DP01-04MAY15-MOC10-B252D-007-N0	*Sternoptyx diaphana*	Whole
00054	DP01-04MAY15-MOC10-B252D-007-N0	*Argyropelecus aculeatus*	Whole
00055	DP01-04MAY15-MOC10-B252D-007-N0	*Acanthephyra purpurea*	Whole
00056	DP01-04MAY15-MOC10-B252D-007-N0	*Acanthephyra purpurea*	Whole
00057	DP01-04MAY15-MOC10-B252D-007-N0	*Acanthephyra purpurea*	Whole
00058	DP01-04MAY15-MOC10-B252D-007-N2	*Sergia splendens*	Whole
00059	DP01-04MAY15-MOC10-B252D-007-N2	*Sergia splendens*	Whole
00060	DP01-04MAY15-MOC10-B252D-007-N2	*Sergia splendens*	Whole
00061	DP01-04MAY15-MOC10-B252D-007-N2	*Sergia splendens*	Whole
00062	DP01-04MAY15-MOC10-B252D-007-N2	*Acanthephyra stylorostratis*	Whole
00063	DP01-04MAY15-MOC10-B252D-007-N2	*Acanthephyra stylorostratis*	Whole
00064	DP01-04MAY15-MOC10-B252D-007-N3	*Acanthephyra purpurea*	Whole
00065	DP01-04MAY15-MOC10-B252D-007-N4	*Lampanyctus alatus*	Whole
00066	DP01-04MAY15-MOC10-B252D-007-N4	*Lampanyctus alatus*	Whole
00067	DP01-04MAY15-MOC10-B252D-007-N4	*Chauliodus sloani*	Gut
00068	DP01-04MAY15-MOC10-B252D-007-N4	*Chauliodus sloani*	Skin
00069	DP01-04MAY15-MOC10-B252D-007-N4	*Chauliodus sloani*	Muscle
00070	DP01-05MAY15-MOC10-B287N-008-N0	*Sergia splendens*	Whole
00071	DP01-05MAY15-MOC10-B287N-008-N0	*Sergia splendens*	Whole
00071	DP01-05MAY15-MOC10-B287N-008-N0	*Sergia splendens*	Whole
00072	DP01-05MAY15-MOC10-B287N-008-N0	*Sergia splendens*	Whole
00073	DP01-05MAY15-MOC10-B287N-008-N0	*Sergia splendens*	Whole
00074	DP01-05MAY15-MOC10-B287N-008-N0	*Sergia splendens*	Whole
00075	DP01-05MAY15-MOC10-B287N-008-N0	*Sergia splendens*	Whole
00076	DP01-06MAY15-MOC10-B287D-009-N0	*Ceratoscopelus warmingii*	Whole
00077	DP01-06MAY15-MOC10-B287D-009-N0	*Ceratoscopelus warmingii*	Whole
00078	DP01-06MAY15-MOC10-B287D-009-N0	*Ceratoscopelus warmingii*	Whole

00079	DP01-06MAY15-MOC10-B287D-009-N0	*Sternoptyx diaphana*	Whole
00080	DP01-06MAY15-MOC10-B287D-009-N0	*Sternoptyx diaphana*	Whole
00081	DP01-06MAY15-MOC10-B287D-009-N0	*Sternoptyx diaphana*	Whole
00082	DP01-06MAY15-MOC10-B287D-009-N0	*Sternoptyx diaphana*	Whole
00083	DP01-06MAY15-MOC10-B287D-009-N0	*Argyropelecus aculeatus*	Whole
00084	DP01-06MAY15-MOC10-B287D-009-N0	*Sigmops elongatus*	Whole
00085	DP01-06MAY15-MOC10-B287D-009-N0	*Argyropelecus hemigymnus*	Whole
00086	DP01-06MAY15-MOC10-B287D-009-N0	*Argyropelecus hemigymnus*	Whole
00087	DP01-06MAY15-MOC10-B287D-009-N0	*Cyclothone obscura*	Whole
00088	DP01-06MAY15-MOC10-B287D-009-N0	*Cyclothone pallida*	Whole
00089	DP01-06MAY15-MOC10-B287D-009-N0	*Cyclothone obscura*	Whole
00090	DP01-06MAY15-MOC10-B287D-009-N0	*Cyclothone pallida*	Whole
00091	DP01-06MAY15-MOC10-B287D-009-N0	*Cyclothone pallida*	Whole
00092	DP01-06MAY15-MOC10-B287D-009-N0	*Cyclothone pallida*	Whole
00093	DP01-06MAY15-MOC10-B287D-009-N0	*Anoplogaster cornuta*	Gut
00094	DP01-06MAY15-MOC10-B287D-009-N0	*Anoplogaster cornuta*	Skin
00095	DP01-06MAY15-MOC10-B287D-009-N0	*Anoplogaster cornuta*	Muscle
00096	DP01-06MAY15-MOC10-B287D-009-N1	*Ceratoscopelus warmingii*	Whole
00097	DP01-06MAY15-MOC10-B287D-009-N1	*Cyclothone obscura*	Whole
00098	DP01-06MAY15-MOC10-B287D-009-N1	*Cyclothone obscura*	Whole
00099	DP01-06MAY15-MOC10-B287D-009-N1	*Cyclothone obscura*	Whole
00100	DP01-06MAY15-MOC10-B287D-009-N1	*Cyclothone obscura*	Whole
00101	DP01-06MAY15-MOC10-B287D-009-N3	*Japetella diaphana*	Whole
00102	DP01-06MAY15-MOC10-B287D-009-N4	*Argyropelecus hemigymnus*	Whole
00103	DP01-06MAY15-MOC10-B287D-009-N4	*Argyropelecus hemigymnus*	Whole
00104	DP01-06MAY15-MOC10-B082N-010-N0	*Sternoptyx pseudobscura*	Whole
00105	DP01-06MAY15-MOC10-B082N-010-N0	*Sternoptyx diaphana*	Whole
00106	DP01-06MAY15-MOC10-B082N-010-N0	*Ceratoscopelus warmingii*	Whole
00107	DP01-06MAY15-MOC10-B082N-010-N0	*Ceratoscopelus warmingii*	Whole
00108	DP01-06MAY15-MOC10-B082N-010-N0	*Sigmops elongatus*	Whole
00109	DP01-07MAY15-MOC10-B250D-011-N0	*Argyropelecus hemigymnus*	Whole
00110	DP01-06MAY15-MOC10-B082N-010-N3	*Sternoptyx diaphana*	Gut
00111	DP01-06MAY15-MOC10-B082N-010-N3	*Sternoptyx diaphana*	Skin
00112	DP01-06MAY15-MOC10-B082N-010-N3	*Sternoptyx diaphana*	Muscle
00113	DP01-06MAY15-MOC10-B082N-010-N3	*Sternoptyx diaphana*	Ovaries
00114	DP01-06MAY15-MOC10-B082N-010-N3	*Sternoptyx diaphana*	Gut
00115	DP01-06MAY15-MOC10-B082N-010-N3	*Sternoptyx diaphana*	Skin
00116	DP01-06MAY15-MOC10-B082N-010-N3	*Sternoptyx diaphana*	Muscle
00117	DP01-06MAY15-MOC10-B082N-010-N3	*Grimalditeuthis bonplandi*	Whole
00118	DP01-07MAY15-MOC10-B250D-011-N1	*Sigmops elongatus*	Whole
00119	DP01-07MAY15-MOC10-B250D-011-N2	*Sternoptyx pseudobscura*	Whole
00120	DP01-07MAY15-MOC10-B250D-011-N3	*Argyropelecus hemigymnus*	Whole
00121	DP01-07MAY15-MOC10-B250D-011-N3	*Argyropelecus hemigymnus*	Whole

00122	DP01-07MAY15-MOC10-B250D-011-N3	*Argyropelecus hemigymnus*	Whole
00123	DP01-07MAY15-MOC10-B250D-011-N3	*Sigmops elongatus*	Whole
00124	DP01-07MAY15-MOC10-B250D-011-N3	*Sigmops elongatus*	Whole
00125	DP01-07MAY15-MOC10-B250D-011-N3	*Sigmops elongatus*	Whole
00126	DP01-07MAY15-MOC10-B250D-011-N3	*Sigmops elongatus*	Whole
00127	DP01-07MAY15-MOC10-B250D-011-N3	*Sigmops elongatus*	Whole
00128	DP01-07MAY15-MOC10-B250D-011-N3	*Sigmops elongatus*	Whole
00129	DP01-07MAY15-MOC10-B250D-011-N3	*Sigmops elongatus*	Whole
00130	DP01-07MAY15-MOC10-B250N-012-N0	*Acanthephyra purpurea*	Whole
00131	DP01-07MAY15-MOC10-B250N-012-N0	*Acanthephyra purpurea*	Whole
00132	DP01-07MAY15-MOC10-B250N-012-N0	*Acanthephyra purpurea*	Whole
00133	DP01-07MAY15-MOC10-B250N-012-N0	*Acanthephyra purpurea*	Whole
00134	DP01-07MAY15-MOC10-B250N-012-N0	*Acanthephyra purpurea*	Whole
00135	DP01-07MAY15-MOC10-B250N-012-N0	*Japetella diaphana*	Whole
00136	DP01-07MAY15-MOC10-B250N-012-N0	*Japetella diaphana*	Whole
00137	DP01-07MAY15-MOC10-B250N-012-N0	*Japetella diaphana*	Whole

3.4. Mercury Analysis.

3.4.1. Fishes.

Four species of fishes were collected for mercury analysis: *Benthosema 49uborbital* (active mesopelagic vertical migrator; n = 7), *Cyclothone pallida* (non-migratory meso/bathypelagic spanner; n = 14), *Lampanyctus alatus* (active mesopelagic vertical migrator; n = 7) and *Photostomias guernei* (active mesopelagic vertical migrator; n = 1).

3.4.2. Crustacea.

Three crustacean species were collected for mercury analysis: *Eucopia sculpticauda* (non-migratory meso/bathypelagic spanner; n = 11), *Sergia splendens* (active mesopelagic vertical migrator; n = 1) and *Acanthephyra stylorostratis* (non-migratory meso/bathypelagic spanner; n = 6).

3.5. Stable Isotope Analysis.

3.5.1. Crustacea.

Several vertically migratory and non-migratory crustaceans were frozen for stable isotope studies. The vertical migrators included *Acanthephyra purpurea, Systellaspis debilis, Stylopandalus richardi* and *Sergia splendens.* The non-migrators included *Acanthephyra stylorostratis* and *Eucopia sculpticauda.*

3.5.2. Cephalopoda.

Three cephalopod species were frozen for stable isotope analysis, including *Histioteuthis corona* (n = 2)*, Japatella diaphana* (n = 2)*,* and *Stigmatoteuthis arcturi* (n = 3).

3.5.3. Fishes.

Twenty-one fish species were collected for stable isotope analysis (Table 9). These species encompassed a range of trophic levels, vertical distributions, and vertical migration habits. In the process of catching fishes for genetic studies, samples of pelagic *Sargassum* sp. were also frozen for stable isotope analysis.

Table 9. Fishes collected for stable isotope analysis. N = sample number; VM = vertical migrator or non-migrator; M = mesopelagic, B = bathypelagic

Species	N	VM?	Primary habitat
Argyropelecus aculeatus	8	Y	M
Argyropelecus hemigymnus	11	Y	M
Avocettina infans	1	?	M/B
Benthosema suborbitale	19	Y	M
Ceratoscopelus warmingii	28	Y	M/B
Chauliodus sloani	6	Y	M/B
Cyclothone obscura	36	N	B
Cyclothone pallida	21	N	M/B
Diaphus dumerilii	6	Y	M
Diaphus mollis	3	Y	M
Diplospinus multistriatus	1	Y	M
Lampanyctus alatus	2	Y	M
Lepidophanes guentheri	9	Y	M
Melamphaes simus	2	Y	M
Notolychnus valdiviae	8	Y	M
Photostomias guernei	2	Y	M/B
Sigmops elongatus	48	Y	M/B
Sternoptyx diaphana	13	Y	M/B
Sternoptyx pseudobscura	32		M/B
Valenciennellus tripunctulatus	8	Y	M
Vinciguerria poweriae	5	Y	M

3.5.4. Gelatinous Zooplankton.

Two species of gelatinous zooplankton were collected for stable isotope analysis, including the colonial tunicate *Pyrosoma* sp. (n = 21 colonies) and the coronate cnidarian *Periphylla periphylla* (n = 21 individuals).

3.5.5. Particulate Organic Matter (POM).

Twenty-five water samples were filtered for particulate organic carbon for use in stable isotope studies (Table 10).

Table 10. Water samples filtered for stable isotope analysis of POM (n = 25). Sample code follows designations of CTD rosette deployments (see Section 3.8)

SAMPLE	CODE	N
D1505	004M	1
D1505	006D	1
D1505	001D	1
D1505	001S	1
D1505	004S	1
D1505	006M	1
D1505	006S	1
D1505	007FT	1
D1505	005D	1
D1505	008D	1
D1505	005M	1
D1505	005S	1
D1505	005FT	1
D1505	004D	1
D1505	004FT	1
D1505	003D	1
D1505	003M	1
D1505	007M	1
D1505	007D	1
D1505	002S	1
D1505	002M	1
D1505	00352	1
D1505	002D	1
D1505	008S	1
D1505	008M	1

3.6. Otolith Microchemistry Analysis Samples.

3.6.1. Fishes.

All fishes frozen for stable isotope analysis (see Section 3.5.3., Table 9) are available for otolith microchemistry analysis.

3.7. Hydroacoustic Data Collected.

More than 32 gigabytes of data were collected over the duration of the cruise. These data are currently being processed. A screen shot of raw backscatter data on May 4, 2015, at three frequencies, is shown in Figure 16.

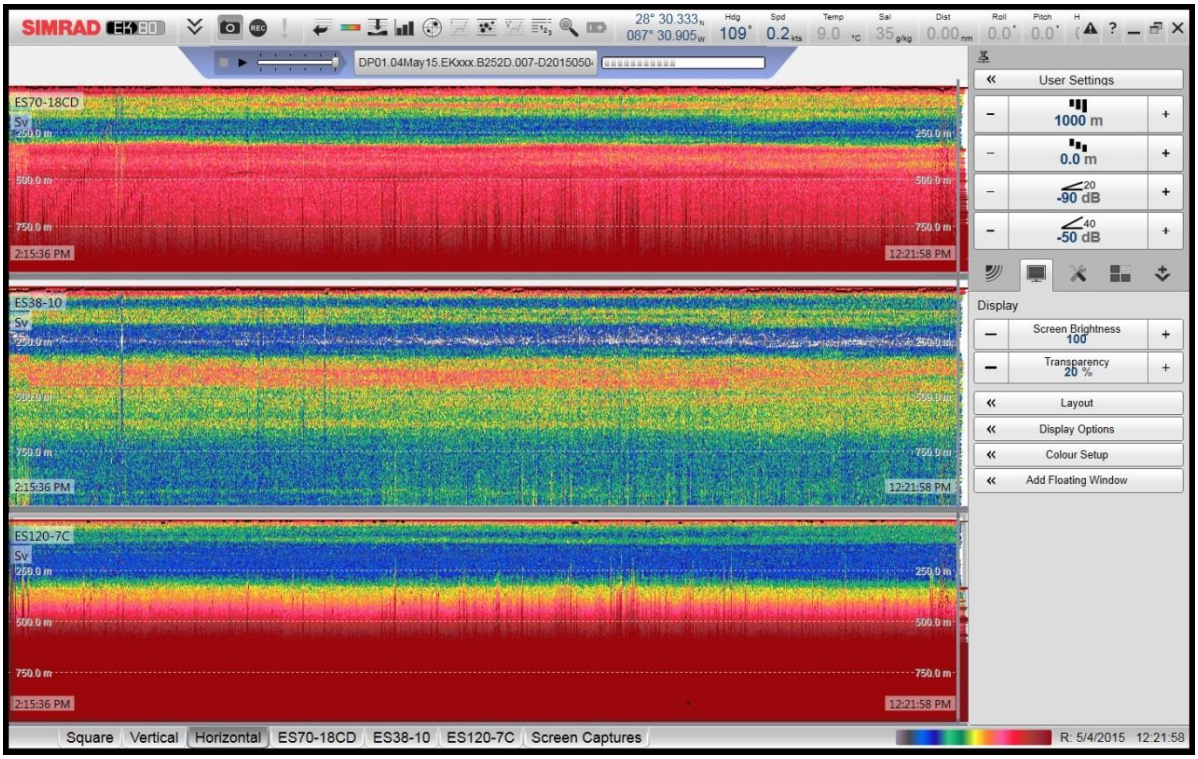


Figure 16. Acoustic backscatter data recorded during DEEPEND cruise DP01.

3.8. Physical Oceanographic Data Collected.

A combination of physical oceanographic data was collected during DP01. These data are summarized in Table 11.

Table 11. Physical oceanographic sampling efforts during the DEEPEND DP01 cruise

Location designation	Time (UTC) near station	CTD	HS6	Rrs	Flow-Through sample
B001	21:00 01 May to 23:00 02 May	1	1	3	-
B175	02:00 03 May to 02:00 04 May	2	1	1	-
B252	13:30 04 May to 01:00 06 May	1	1	1	1
B287	14:30 05 May to 21:30 06 May	2	2	1	2
B082	03: 00 07 May to 16:00 07 May	1	1	-	1
B250	20:00 07 May to 10:00 08 May	1	1	1	1

3.8.1. CTD and Water Samples.

The CTD and water sampling rosette was deployed at eight stations during the DEEPEND DP01 cruise, listed in Table 12.

Table 12. CTD rosette deployments during the DEEPEND DP01 cruise. Note: times/dates are presented here in local time, but data records are kept in UDT (dates of some casts will differ)

Station	Identifier	Date – Time (CDT)	Latitude	Longitude	Bottom depth	Water sample depths
B001	CTD_001	02-May-15 16:30	29.07	-88.04	1100	50, 470, 1000
B175	CTD_002	03-May-15 06:00	28.85	-87.41	1800	75, 455, 1400
B175	CTD_003	04-May-15 20:00	28.93	-87.52	1800	35, 85, 505, 1700
B252	CTD_004	04-May-15 09:30	28.51	-87.51	2500	30, 415, 1215
B287	CTD_005	06-May-15 19:30	28.02	-87.51	2500	95, 475, 1600
B287	CTD_006	06-May-15 07:00	27.99	-87.38	2800	90, 450, 1600
B082	CTD_007	07-May-15 07:45	28.06	-88.07	2384	65, 465, 1600
B250	CTD_008	08-May-15 20:00	28.16	-88.54	1950	75, 450, 1600

From these deployments 29 water samples (Table 13) were collected by the USF-Optical Oceanography Laboratory for determining chlorophyll-a concentration and the spectral absorption due to total particulate material, $a_p(\lambda)$, detrital material, $a_d(\lambda)$, and colored dissolved organic matter, $a_{CDOM}(\lambda)$. Water samples from a maximum of three sample depths were collected using Niskin bottles on the CTD rosette, or from the ship's flow-through (FT) system. Duplicate samples were collected at select stations.

Table 13. Summary of chlorophyll and absorption samples collected on DP01.

	Date:	5/2	5/3	5/3	5/4	5/5	5/6	6/6	5/7	5/7
	Location Designation:	B001	B175	B175	B252	B287	B287	B082	B082	B250
	CTD Cast ID:	001	002	003	004	005	006		007	008
Sample Depth	Flow-through (3m)				X	X	X^D	X^D	X	X
	Deep chl-max. (30-95m)	X	X	X^D	X	X	X^D		X	X^D
	O_2 minima (400-500m)	X	X	X	X	X				
	Deep (1000-1600m)	X	X	X	X	X				

^{D}: duplicates

Both $a_p(\lambda)$ and $a_d(\lambda)$ will be determined in a shore-based lab using the quantitative filter technique. A custom-built spectroradiometer (~330-880nm, <2 nm resolution) will be used for measuring the spectral transmission of total particulate material collected on a glass fiber filter (Whatman's GF/F) relative to a wetted blank. The subsequent extraction of the pigments from the particles captured by the filter followed by re-measurement of both filters will allow for the separation between the living (phytoplankton) and non-living (detrital) components of the total particulate material. This pigment extraction technique also enables Chl-a to be determined fluorometrically. Thus the same water sample is used for the determination of the particulate, $a_p(\lambda)$, and detrital, $a_d(\lambda)$, absorption spectra, and Chl-a.

Seawater samples, filtered first through a GF/F filter and then through a 0.2μm polycarbonate filter, are used to determine $a_{CDOM}(\lambda)$. These filtered samples are stored at 5°C for less than two weeks prior to being measured using a Hitachi U3900H UV/Vis spectrophotometer equipped with 10-cm pathlength cells and using Milli Q water as a reference. Absorption is measured from 200-800nm at 0.5nm increments.

3.8.2. Bio-Optical (HS6) Data.

At seven stations during the DEEPEND DP01 cruise a HOBILabs HS6 was vertically profiled through the water column to a depth of ~200m (Table 14).

Table 14. HS6/ECO sampling data during the DP01 DEEPEND cruise. Note: times/dates are presented here in local time, but data records are kept in UDT (dates of some casts will differ)

Station	Identifier	Date-Time (CDT)	Latitude	Longitude	Cast depth	Comments
B001	HS6_001	02-May-15 7:07	28.92	-88.06	186	
B175	HS6_002	03-May-15 21:46	29.01	-87.51	188	
B252	HS6_003	04-May-15 17:55	28.50	-87.36	171	
B287	HS6_004	06-May-15 20:30	28.00	-87.51	125	
B287	HS6_005	06-May-15 09:00	27.99	-87.38	188	
B082	HS6_006	07-May-15 06:55	28.05	-88.07	188	
B250	HS6_007	08-May-15 21:58	28.15	-88.54	207	Significant scattering layer

Because all three instruments can be powered by internal batteries, each could operate and record its measurements independently. This allowed the instrument cage to be profiled without the need for power & communication cabling between the instruments and the ship. Data were processed using a combination of the manufacturer's and custom software. The time stamps of each instrument, as well as distinct surface scattering features, were used to synchronize the three instruments for each cast. Because fluorescence efficiencies vary and part of the cage was near the edge of field of view for the ECO instruments during the May cruise, the measurements made by the ECO instruments reflect relative fluorescence. But, combining these instrument values with the discrete water sample measurements enables estimation of *in situ* fluorescence, and chlorophyll and CDOM concentrations at depths where discrete water samples were not collected (Fig. 17).

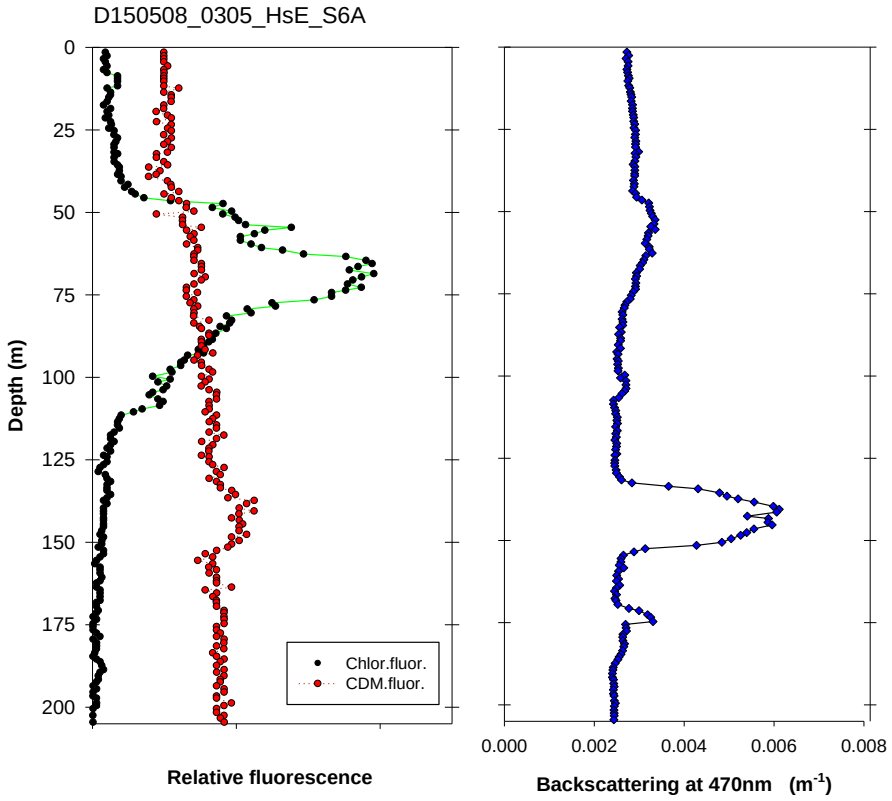


Figure 17. Fluorescence retrieved from the WET Labs ECO instruments (left panel) and backscattering at 470nm from the HOBILabs HS6 (right panel), when deployed at station B250. The phytoplankton present between ~45 to 110 m increased the backscattering of blue light between 50 and 100m, but the backscattering increase is detected between ~130 to 150 m is greater.

Changes in the spectral backscattering shape and slope measured by the HS6 (e.g. Fig. 18) can be compared to changes in the *in situ* particulates at various depths. Combining the scattering information with the fluorescence measurements allows estimation of the relative amounts of scattering from phytoplankton versus other living and non-living particles. Figure 17 shows vertical profiles of chlorophyll_a and CDOM fluorescence from the WET Labs ECO BBFL2, and the corresponding HS6 470nm backscattering measurements, from a cast at ~0300 (2200 CDT) at station B250. Here, the distinct scattering increase detected at ~140m is not directly caused by the phytoplankton population, which appears most abundant at ~65m.

3.8.3. Remote Sensing Reflectance Data.

Remote sensing reflectance ($R_{rs}(\lambda)$) data were collected from the deck of the R/V *Point Sur* at nine times during the DEEPEND DP01 cruise (Table 15). These measurements help relate the near surface water samples to the observations made by ocean color satellites (e.g. Fig. 10). An ASD, Inc. (PANalytical) HandHeld2-Pro spectroradiometer was used to collect $R_{rs}(\lambda)$. The data from seven sites were used to compute initial $R_{rs}(\lambda)$ estimates, which will be further optimized using some of the water sample information. Figure 19 shows median $R_{rs}(\lambda)$ spectra from DP01. The measurements from the last two sites are presently stored in the instrument, as a connector failure during the cruise prevented retrieval of the data from the latter portion of the cruise. The instrument is being sent to the manufacturer for repair, which may allow the last two series of measurements to be retrieved from the instrument.

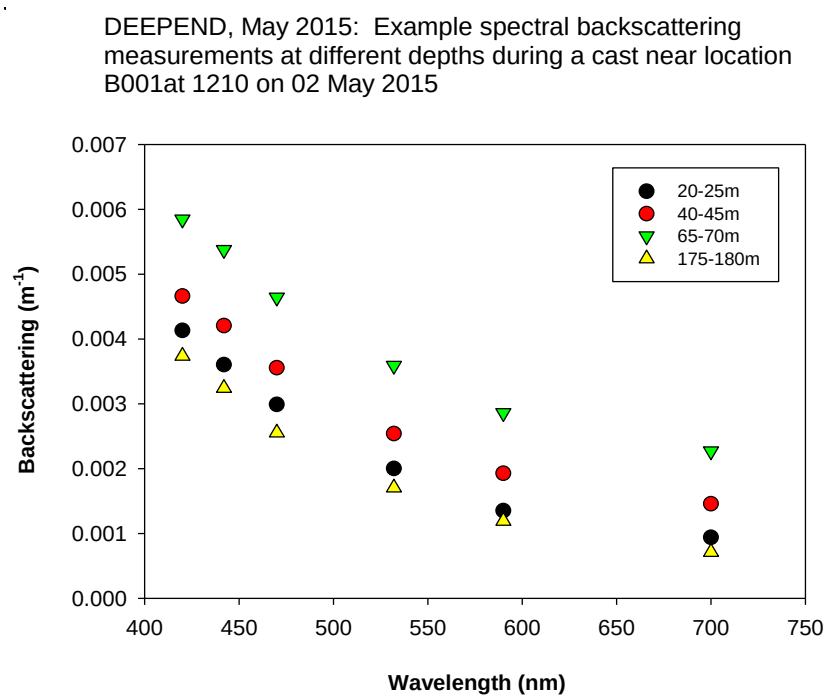


Figure 18. Examples of average spectral backscattering measurements collected at several 5-m depth intervals during a cast at station B001. On this cast, a chlorophyll fluorescence maximum was observed at ~45m depth. While optical scattering at 45m was greater than that of shallower waters, the depth of maximum scattering was located at ~65-75m, just below the depth intervals of increased chl. fluorescence.

Table 15. Remote sensing reflectance (ASD Inc. HandHeld2-Pro) data collected during the DP01 DEEPEND cruise

Station	Identifier	Date- Time (CDT)	Latitude	Longitude	Sky
NA	Rrs_001	01-May-15 09:15	29.51	-88.39	clear
B001	Rrs_002	01-May-15 16:20	29.00	-88.01	clear
B001	Rrs_003	02-May-15 09:30	28.94	-88.02	clear
B001	Rrs_004	02-May-15 11:00	28.94	-88.00	clear
B001	Rrs_005	02-May-15 13:40	29.01	-88.02	clear
B175	Rrs_006	03-May-15 10:20	29.00	-87.51	clear
B252	Rrs_007	04-May-15 15:08	28.49	-87.44	cirrus
B287	Rrs_008	05-May-15 15:20	28.01	87.20	patchy, altocumulus?
B250	Rrs_009	07-May-15 15:15	28.03	-88.50	clear

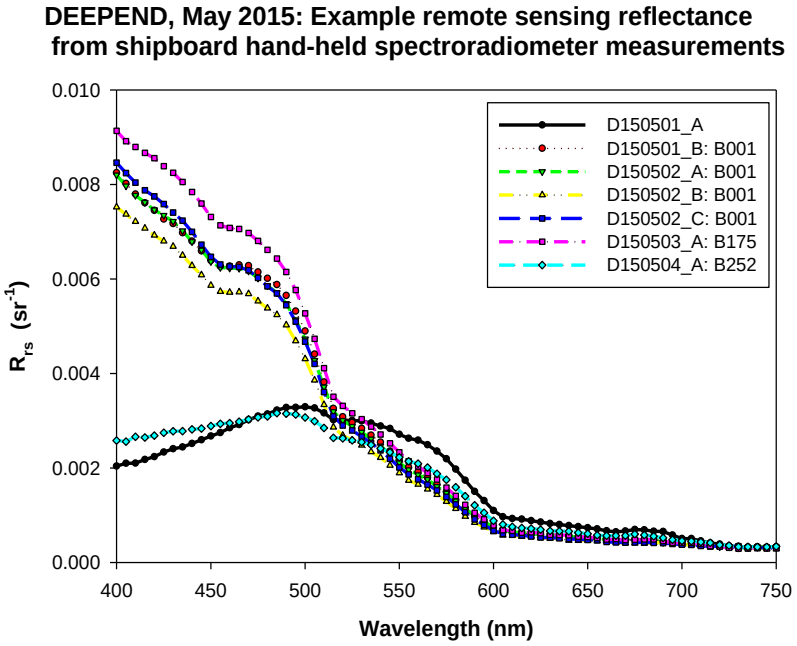


Figure 19. Initial (non-optimized) remote sensing reflectance (Rrs(l)) derived from measurements made at 4 stations between 01 May and 04 May 2015. Satellite observations show stations B001 & B175 located in warmer, lower chlorophyll waters relative to the coastal/river plume waters of D150501_A and D150504_A (B252).

4. OUTREACH ACTIVITIES

During DP01, much of focus of our imaging program (Dr. Danté Fenolio, Lead) was on gathering content for education and outreach. All of the images in this report were generated by this project, as was video of live animals. Figure 20 gives a good example of a bioluminescent display by a live deep-sea shrimp, which will be used in a learning module on bioluminescence.

Outreach efforts included all levels of students as well as the public during the first DEEPEND Cruise. Before the cruise, on April 18, 2015, 13, grade 6-12 teachers participated in a one-day workshop learning about DEEPEND projects, science content and ways to incorporate our program into their classroom activities. They brought teaching activities and graphics back to classrooms to use. They followed the team via the adult blog on the main DEEPEND page and shared activities with their students. Teaching Collections for PI's also began this trip. Postcards from the Deep have been added to the E/O page on the DEEPEND site for students in grade K-5 to view and share.

The public outreach component focused on the Kids blog introduced "Squirt" (Fig. 21) to the public, who will be guiding the kids through the DEEPEND adventures. Activities at sea were explained an age-appropriate level. The adult blog was maintained as well as can be expected on the first cruise by the E/O team, as internet connection was challenging. Blogs were tied to the daily shiptracker, updated daily on the DEEPEND home page (Fig. 22). Facebook, Twitter, and Instagram accounts were linked to the DEEPEND website. Styrofoam cups were also attached to deep CTD deployments and shrunk for students who will be participating 'virtually' on the August DEEPEND cruise through the Creep into the Deep Program (Fig. 23).

Figure 20. Still image of the expulsion of bioluminescent fluid (below) by a deep-sea caridean shrimp (above).

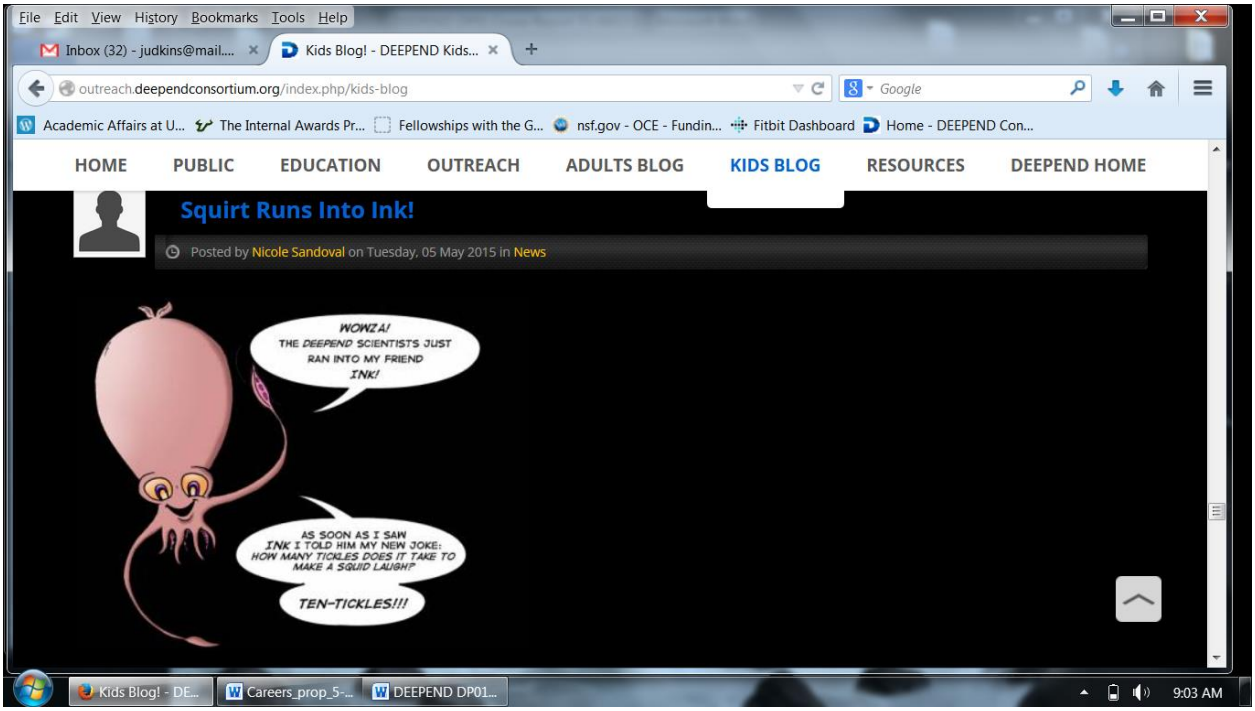


Fig. 21. "Squirt"- cartoon and soon to be animated character within the kids blog to explain the DEEPEND science to kids.

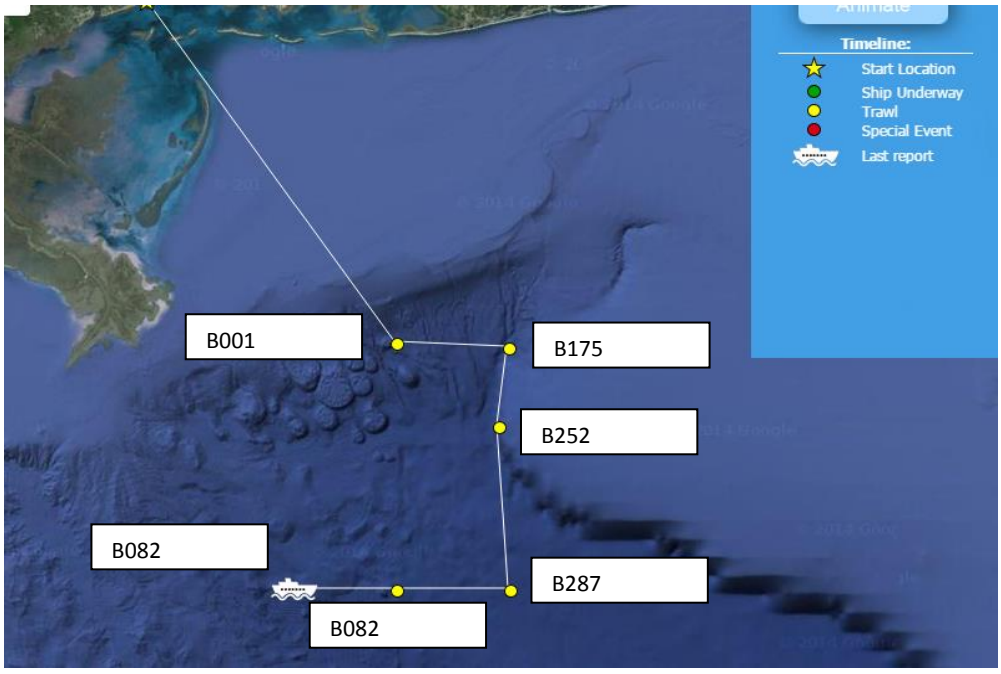


Figure 22. Real-time Shiptracker map of cruise DP01 on the DEEPEND home page.

Fig. 23. Education team shrinking cups on CTD for students who will be participating 'virtually' on the August DEEPEND cruise through the Creep into the Deep Program.

5. APPENDICES

Appendix I. Fish species for which adequate (n = 15) sample size was completed for genetic barcoding.

Species	Family
Cyclothone pallida	Gonostomatidae
Lampanyctus alatus	Myctophidae
Valenciennellus tripunctulatus	Sternoptychidae
Benthosema suborbitale	Myctophidae
Notolychnus valdiviae	Myctophidae
Vinciguerria poweriae	Phosichthyidae
Cyclothone alba	Gonostomatidae
Sigmops elongatus	Gonostomatidae
Argyropelecus hemigymnus	Sternoptychidae
Photostomias guernei	Stomiidae
Diaphus mollis	Myctophidae
Lepidophanes guentheri	Myctophidae
Scopeloberyx opercularis	Melamphaidae
Cyclothone pseudopallida	Gonostomatidae
Sternoptyx diaphana	Sternoptychidae
Cyclothone braueri	Gonostomatidae
Diplospinus multistriatus	Gempylidae
Sternoptyx pseudobscura	Sternoptychidae
Diaphus dumerilii	Myctophidae

Appendix II. Laboratory apportionment of DEEPEND fish tissue samples for genetic barcoding analyses, listed by taxon

Eytan Lab		Shivji Lab	
Order	est. no spp.	Order	est. no spp.
Perciformes	135	Anguilliform	95
Stomiiformes	115	Myctophiformes	73
Scorpaeniformes	12	Lampridiformes	10
Melam/Bery/Ceto	50	Lophiiformes	50
Gadiform/Ophidiiform	20	Pleuronectiformes	20
Tetraodontiformes	12	Zeiformes	8
		Aulopiformes	35
		Osmeriformes/Argentiniformes	30
		Albuliformes	1
		Scombridae and Istiophoridae	15
	344		337