Jacques Cousteau/Mullica River (MUL) NERR Water Quality Metadata
1 January 2009 – 31 December 2009
Latest Update: 1 August 2013

I. Data set and Research Descriptors

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2) Entry verification

Deployment data are uploaded from the YSI data logger to a Personal Computer (IBM compatible). Files are exported from EcoWatch in a comma-delimited format (.CDF) and uploaded to the CDMO where they undergo automated primary QAQC; automated depth/level corrections for changes in barometric pressure (cDepth or cLevel parameters); and become part of the CDMO's online provisional database. All pre- and post-deployment data are removed from the file prior to upload. During primary QAQC, data are flagged if they are missing or out of sensor range. The edited file is then returned to the Reserve for secondary QAQC where it is opened in Microsoft Excel and processed using the CDMO's NERRQAQC Excel macro. The macro inserts station codes, creates metadata worksheets for flagged data and summary statistics, and graphs the data for review. It allows the user to apply QAQC flags and codes to the data, remove any overlapping deployment data, append files, and export the resulting data file for upload to the CDMO. Upload after secondary QAQC results in

ingestion into the database as provisional plus data, recalculation of cDepth or cLevel parameters, and finally tertiary QAQC by the CDMO and assimilation into the CDMO's authoritative online database. Where deployment overlap occurs between files, the data produced by the newly calibrated sonde is generally accepted as being the most accurate. For more information on QAQC flags and codes, see Sections 11 and 12.

3) Research Objectives

The water quality of the Mullica River and Great Bay has traditionally been relatively clean and free of excessive nutrient loading from anthropogenic sources. This is due to the fact that there is very little development or industry within the drainage basin of the Mullica River and its tributaries. Great Bay had a large source of nutrient loading coming from a menhaden fish processing factory that was in operation from the early 1930's to the early 1960's and affected the lower portion of the bay. The river is relatively deep, three to nine meters in the section that is monitored. Great Bay averages about two meters in depth. The river also has a dark color due to tannins and humic compounds that are a natural product coming from the Pine Barrens and are present in large amounts within the river. It is believed that nutrients entering the river upstream do not get utilized within the river because of the lack of light penetration. The great depth of the river and the dark color from the tannins flowing down the river from the Pine Barrens hinders the utilization of these nutrients by planktonic organisms. Where the river empties into the bay, light penetration reaches the bottom of the bay and allows the utilization of the nutrients by phytoplankton, making this region more productive (Durand 1979). Water circulation questions within this unique estuary can be addressed by the use of datasondes. Because of the close proximity of the lower station (site name: B6) to Little Egg Inlet, the effects of an influx of ocean water can have dramatic effects on both the water quality and on the biological aspect of the region. Upwelling along the coast is a common occurrence during the summer months. The influx of this water into the bay can and does affect larval fish transport into and out of the bay. The cooler ocean waters can have dramatic effects on the growth rates of many different species living in the area. Datasondes have been useful in tracking the physical changes within the estuary due to occurrences such as upwelling and storm events and will be helpful in translating the resulting biological events.

4) Research Methods

The YSI datasondes (a.k.a. "dataloggers") are programmed to record temperature, specific conductance, salinity, dissolved oxygen, depth, pH, and turbidity every 15 minutes. Presently, four SWMP monitoring stations are established in the Mullica River/Great Bay Reserve. These monitoring sites extend from the fresh water/salt water interface at Lower Bank, approximately 25 kilometers up the Mullica River from the point where it joins Great Bay to the mouth of Great Bay, a distance of eight kilometers. Thus the datasondes cover a total of 33 kilometers in this estuarine system.

Calibration standards required for pH were purchased from Y.S.I. (p/n 003822 (pH 7) and 003823(pH 10)). A two-point calibration was employed for pH, the first being pH 7 followed by pH 10. Calibration of the pH probe was performed via immersion in the standard and using the calibration feature of the EcoWatch software and accepting the reading after sixty seconds.

Calibration standards required for conductivity were purchased from Y.S.I.. A standard of 10 mS/cm (p/n 060911) was used to calibrate for conductivity. Calibration of the conductivity probe was performed via immersion in the standard and using the calibration feature of the EcoWatch software and accepting the reading after sixty seconds.

Dissolved oxygen was calibrated via immersion in a bucket of oxygen-saturated tap water and utilizing the dissolved oxygen calibration function of the datasonde(s). Oxygenation of the water was accomplished via aeration with an aquarium pump and air-stone for a minimum of 2 hours to saturate tap water prior to calibration. Prior to calibration, the membrane was "burned in" by allowing the datasonde to run in discrete mode for a minimum of 10 minutes to assess its suitability and stability. The sensor was then allowed to "rest" overnight prior to calibration. Calibration of the dissolved oxygen probe was performed via immersion in the aerated water and using the calibration feature of the EcoWatch software and accepting the reading after sixty seconds. The membrane on the oxygen probe was changed prior to every deployment. Installation of the D.O. membrane was as follows: the datasonde was inverted (probes facing upwards) and the reservoir of the DO probe was filled with the appropriate solution, allowing a meniscus bubble to form over the DO terminals. The DO membrane was then stretched over the face of the probe and secured using a rubber O-ring. The membrane was inspected for folds or trapped bubbles.

Calibration of the turbidity probe was performed with a 0 NTU (Nephelometric Turbidity Units) solution (de-ionized water) and a 123 NTU standard (supplied by YSI, inc., p/n 607300) in the longer version of the datasonde cup/cap (YSI p/n 116275). Calibration of the Turbidty probe was performed via immersion in each standard and using the calibration feature of the EcoWatch software and accepting the reading when stable.

Used conductivity and pH standards were stored for rinsing probes and performing post-deployment calibrations after retrieval and prior to cleaning loggers. Great care was taken to clean the datasondes before calibration, and each used standard was used once as a post-calibration solution and once as a rinse solution before being discarded (unless egregious contamination was suspected).

Datasondes were deployed by inserting them in PVC pipes that are affixed to a permanent structure (i.e. two US Coast Guard channel markers (Buoy 126 and Buoy 139), one commercial dock (Chestnut Neck), and one bridge (Lower Bank). The bottoms of the PVC pipes were situated approximately 1m above the sediment. A line was used to lower and recover the datasondes within the pipes. A cross-pin (stainless steel bolt)

was inserted across the bottom of the pipe and served as an end-stop for the datasonde during its descent, assuring a maximum fixed depth and retaining the datasonde if the line parted. Two-inch vent holes or two- by ten-inch-wide slots were drilled or cut in the bottom of the pipe to allow for circulation of water across the probes. An antifouling paint (Petit Trinidad SLR) was used to coat the last few meters of the PVC pipes, both inside and out, to retard biofouling and subsequent blockage of the holes/vents. A locking cap provided security.

In 2009, two methods of deployment and data collection were employed. The first being a stand-alone deployment during which a datasonde autonomously collected data on 15-minute intervals on Eastern Standard Time (EST) and record these data internally, to later be downloaded onto a desktop/laptop computer post-retrieval. This method was employed at stations Buoy 139 (B9) and Lower Bank (BA). The second method employed was the pairing of datasondes with telemetry equipment that received data from the datasondes and broadcast it to the GOES satellite for receipt by the NOAA Hydrometeorological Automated Data System (HADS). These data were also recorded independently every 15 minutes in Eastern Standard Time (EST) by the datasondes for redundancy and to continue with the pre-existing NERRS SOP. Telemetry was employed at Buoy 126 (B6) and Chestnut Neck (NE) in 2007. For more detail concerning these telemetered datasonde stations, see below:

A Sutron Sat-Link2 transmitter was installed at this Buoy 126 (B6) on 06/22/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B00C264. The transmissions are scheduled hourly and contain four (4) datasets reflecting fifteen minute data sampling intervals. The telemetry data are "Provisional" data and not the "Authentic" dataset used for long term monitoring and study. These data can be viewed by accessing http://cdmo.baruch.sc.edu

A Sutron Sat-Link2 transmitter was installed at Chestnut Neck (NE) on 09/19/06 and transmits data to the NOAA GOES satellite, NESDIS ID #3B03E386. The transmissions are scheduled hourly and contain four (4) datasets reflecting fifteen minute data sampling intervals. The telemetry data are “Provisional" data and not the "Authentic" dataset used for long term monitoring and study. These data can be viewed by accessing http://cdmo.baruch.sc.edu

During each sampling period, measurements of specific conductance, salinity, temperature, dissolved oxygen, (percent saturation and concentration measured in mg/L), water level (depth), pH, and turbidity were recorded. After approximately 30 days datasondes were retrieved from the PVC pipe. Deployment periods were occasionally extended during 2007 because of weather restrictions. A YSI 600 datasonde attached to a YSI 650-MDS “handheld unit” was then lowered to depth in order to sample in-situ water conditions at approximately the same depth at which data was recorded. A different calibrated and programmed YSI datasonde was then deployed to replace the datasonde being recovered. The recovered datasonde was brought back to the laboratory for downloading, post-deployment calibration checking, cleaning, and re-calibration. For some retrievals (due to one of our three 6600 datasondes being out for repairs or our

desire to keep the same datasonde at the same SWMP site for consistency), the datasonde was not replaced but rather brought back to the field station, processed as described above, and re-deployed or replaced later that day or the following day.

Upon retrieval, datasondes were wrapped in a white towel and placed in a cooler for transport back to the laboratory. Datasondes were then placed in an aerated bucket of tap water overnight before post-processing according to SWMP standard operating procedures. Post-processing involves the placing of the un-cleaned datasonde in standards and recording of the displayed values, to judge how well the probes maintained calibration, determine the effect of bio-fouling (if any), and judge whether probe failure occurred during the deployment. After this post-deployment calibration check, probes were cleaned as per SWMP standard operating procedures and either re-calibrated for the next deployment or capped for storage for later calibration and deployment.

Datasondes were programmed to start recording data (ranging from one sample period to a few hours) before they were deployed in the field and allowed to run in either a wet, enclosed environment or an aerated water-filled bucket, so these deployment files often contained "tail ends" of non-deployment ("out-of-water event") data, which were used to diagnose the probes but deleted before the data were processed for import into the yearly datasets. The beginning and end of each data file was compared to the 600/650MDS handheld unit values and the data were checked for probe failure and fouling.

5) Site Location and Character

The Jacques Cousteau National Estuarine Research Reserve (JCNERR) at Mullica River/Great Bay is located on the northeast coast of the United States on the Atlantic Ocean. The estuary is near Tuckerton, New Jersey about 14 kilometers north of Atlantic City. There were four active sampling stations in 2009. All four locations can be characterized by having little macroalgae (few to no established beds in the immediate locale; only occasional seasonal and structurally-dependent fouling-type macroalgal communities), fast moving tidal currents, and tidal ranges of approximately 1m (although this can vary significantly depending on moon state, storm events, and coastal wind conditions (e.g.- "blow out tides" associated with strong offshore winds). All sites are in a relatively undisturbed area with minimal impact from development or pollution.

1) Buoy 126 (B6) - 39deg 30'28.44"N, 74 deg 20'18.67"W- located three kilometers from Little Egg Inlet on the eastern side of Great Bay and is 100 meters from the nearest land that is a natural marsh island. This is a naturally deep area that has never been dredged, but it is located about 0.5 kilometers from an area in the Intracoastal Waterway that is dredged regularly. The datasonde at this location is attached to Intracoastal Waterway Buoy 126 and is the closest monitoring station to Little Egg Inlet. This site can be characterized by having strong tidal currents, 2-3 knots, fine to course sand bottom with an extensive blue mussel bed surrounding the area. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface. In 2008, the reported salinity at this station ranged from 16.5ppt to

33.4ppt, with an average of 28.4ppt. It is important to note that fouling may have occasionally depressed some salinity readings and are “flagged” as such in the dataset, so the aforementioned average and range may not be accurate. Presuming the datasondes were measuring 1m above the sediment as intended, the average depth at the B6 station was 3.91m, with a range of 2.72 to 5.09m.

2) Buoy 139 (B9) - 39deg 29'24.65"N, 74 deg 22'53.83"W- is located 4 kilometers from Buoy 126 on the western side of Great Bay and is located about one to one and one-half kilometers from land. The datasonde at this location is attached to Intracoastal Waterway Buoy 139. The closest landform is an extensive salt marsh approximately 1.5 kilometers wide, which borders the upland area. This area is dredged by the U.S. Army Corp of Engineers approximately every five to six years to maintain the channel at a depth of approximately 2.5 meters. The surrounding depth of the bay is approximately 1.5 to 2 meters. This site is characterized by having maximum currents of about 1.5 knots with a muddy sand bottom and with little structure or shell. Groundwater inputs from margins of the estuary as well as surface flow from Mullica River account for the majority of freshwater coming into the system at this site, followed by input from rainwater from the marsh surface and above. In 2008, the reported salinity at this station ranged from 18.2ppt to 32.9ppt, with an average of 27.9ppt. Presuming the datasondes were measuring 1m above the sediment as intended, and omitting some suspect depth measurements recorded by the instrument (and “flagged” accordingly in the B9 dataset), the average depth at the B9 station was 3.18m, with a range of 2.13 to 4.55m.

3) Chestnut Neck (NE) - 39deg 32'52.37"N, 74deg 27'38.77"W - located 12 kilometers up the Mullica River from the mouth of the river. The river begins at a line drawn between Graveling Point and Oysterbed Point on the northwestern side of Great Bay. The Mullica River at this location is quite wide, about 250 meters. The datasonde is attached to the dock of a small marina along the southern shore of the river adjacent to the main channel. This location has never been dredged. The site is characterized by having tidal currents of less then one knot, during both ebb and flood tide, and has a mixed organic mud/sand bottom. Freshwater input is primarily from groundwater and watershed runoff. In 2008, the reported salinity at this station ranged from 1.3ppt to 25.1ppt, with an average of 15.5ppt. Presuming the datasondes were measuring 1m above the sediment as intended, and omitting some suspect depth measurements recorded by the instrument (and “flagged” accordingly in the NE dataset), the average depth at the NE station was 2.32m, with a range of 1.11 to 3.45m.

4) Lower Bank (BA) - 39deg 35'37.18"N, 74 deg 33'05.44"W- located 13 kilometers upriver of the Chestnut Neck location. The Mullica River at this site is about two hundred meters wide. The datasonde is located at the center of a bridge spanning the Mullica River. The northern bank of the river is sparsely developed with single-family houses and has a steep bank about five meters high. The southern shore has an extensive marsh and fresh water wetland area about three kilometers wide. This site can be characterized by having fast tidal currents, just over one knot, deep water, and fine mixed organic mud and sandy sediment. Freshwater input is primarily from groundwater and watershed runoff. In 2008, the reported salinity at this station ranged from 0.0ppt to

17.7ppt, with an average of 3.7ppt. Presuming the datasondes were measuring 1m above the sediment as intended, and omitting some suspect depth measurements recorded by the instrument (and "flagged" accordingly in the BA dataset), the average depth at the BA station was 2.77m, with a range of 1.43 to 3.98m.

6) Data Collection Period

Site	Filename	Deploy Date	Time	Retrieve Date	Time
B6	B6121608	12/16/08	12:00	01/12/09	11:30
B6	B6050509	05/05/09	10:15	06/11/09	15:00
B6	B6061109	06/11/09	15:15	07/07/09	11:30
B6	B6070709	07/07/09	11:45	08/13/09	13:00
B6	B6081309	08/13/09	13:15	09/14/09	10:45
B6	B6091509	09/15/09	10:30	10/14/09	13:30
B6	B6101409	10/14/09	14:00	11/10/09	14:45
B6	B6111009	11/10/09	15:15	12/15/09	14:15
B6	B6121509	12/15/09	14:30	12/22/09	12:30
B9	B9121808	12/18/08	6:30	01/12/09	14:00
B9	B9031309	03/12/09	13:30	04/17/09	09:30
B9	B9041709	04/17/09	09:45	05/05/09	04:30
B9	B9052009	05/20/09	13:30	06/22/09	09:15
B9	B9062209	06/22/09	09:30	07/22/09	14:15
B9	B9072209	07/22/09	14:30	08/19/09	09:45
B9	B9081909	08/19/09	15:00	09/14/09	10:30
B9	B9091509	09/15/09	13:45	10/28/09	13:00
B9	B9102809	10/28/09	13:30	12/08/09	10:45
B9	B9120809	12/08/09	11:00	12/22/09	12:15
NE	NE121008	12/10/08	15:15	01/08/09	12:45
NE	NE010809	01/08/09	13:15	02/11/09	12:15
NE	NE021109	02/11/09	12:45	03/11/09	11:15
NE	NE031109	03/11/09	11:30	04/20/09	09:45
NE	NE040209	04/02/09	10:21	05/07/09	11:30
NE	NE050709	05/07/09	12:00	06/04/09	12:00
NE	NE060409	06/04/09	12:30	07/08/09	11:45
NE	NE070809	07/08/09	12:15	08/11/09	11:00
NE	NE081109	08/11/09	11:30	09/09/09	11:00
NE	NE090909	09/09/09	11:30	10/14/09	10:15
NE	NE101509	10/15/09	11:00	11/23/09	09:45
NE	NE112409	11/24/09	12:00	12/21/09	09:45
NE	NE122209	12/22/09	12:00	01/07/10	10:00
BA	BA120308	12/03/08	13:15	01/06/09	13:00
BA	BA010609	01/06/09	13:30	01/12/09	16:30
BA	BA031209	03/12/09	12:00	04/06/09	09:15

BA	BA040609	04/06/09	09:45	05/08/09	11:15
BA	BA050809	05/08/09	11:45	06/10/09	09:30
BA	BA061109	06/11/09	13:00	07/09/09	11:15
BA	BA070909	07/09/09	11:45	08/12/09	11:00
BA	BA081209	08/12/09	11:15	09/10/09	10:30
BA	BA091009	09/10/09	10:45	10/19/09	11:30
BA	BA102009	10/20/09	11:00	11/24/09	12:15
BA	BA112509	11/25/09	12:00	12/22/09	12:15

7) Distribution

NOAA/ERD retains the right to analyze, synthesize and publish summaries of the NERRS System-wide Monitoring Program data. The PI retains the right to be fully credited for having collected and processed the data. Following academic courtesy standards, the PI and NERR site where the data were collected will be contacted and fully acknowledged in any subsequent publications in which any part of the data are used. Manuscripts resulting from this NOAA/OCRM supported research that are produced for publication in open literature, including refereed scientific journals, will acknowledge that the research was conducted under an award from the Estuarine Reserves Division, Office of Ocean and Coastal Resource Management, National Ocean Service, National Oceanic and Atmospheric Administration. The data set enclosed within this package/transmission is only as good as the quality assurance and quality control procedures outlined by the enclosed metadata reporting statement. The user bears all responsibility for its subsequent use/misuse in any further analyses or comparisons. The Federal government does not assume liability to the Recipient or third persons, nor will the Federal government reimburse or indemnify the Recipient for its liability due to any losses resulting in any way from the use of this data.

NERR water quality data and metadata can be obtained from the Research Coordinator at the individual NERR site (please see Principal Investigators and Contact Persons), from the Data Manager at the Centralized Data Management Office (please see personnel directory under the general information link on the CDMO home page) and online at the CDMO home page http://cdmo.baruch.sc.edu/. Data are available in text tab-delimited format.

8) Associated Researchers and Projects

During 2009, weekly ichthyoplankton sampling at Little Sheepshead Creek Bridge (LSCB) continued as part of the long-term sampling conducted by the Rutgers University Marine Field Station (RUMFS) in the Jacques Cousteau National Estuarine Research Reserve (JCNERR). Presence and abundance of larval fishes are determined with a plankton net (1 m, 1 mm mesh) deployed during night flood tides from a bridge near Little Egg Inlet (New Jersey) in the Great Bay/Little Egg harbor portion of the JCNERR.

RUMFS conducts annual trawl survey at numerous sites from offshore of Little Egg Inlet to the freshwater interface up the Mullica River. SWMP data are regularly used in the analysis of community composition and species assemblage.

A wire-mesh trapping survey of fish and crustaceans conducted by RUMFS within the RUMFS boat basin also continued in 2009 as part of long-term sampling within the Reserve.

Rutgers University researchers (Robert Chant et al) utilized data from the Chestnut Neck (NE) station to groundtruth data from an ADCP unit deployed nearby as part of a New Jersey Department of Transportion (NJDOT) study concerning repair and construction at the Garden State Parkway bridge approximately ½ km upriver.

Drs. Kenneth W. Able and Thomas Grotheus from the Rutgers University Marine Field Station (RUMFS) are studying species distributions, daily movements, and seasonal migration patterns of striped bass (*Morone saxatilis*) using surgically implanted hydroacoustic transmitters and an array of buoy-mounted receivers. The study area includes the Mullica River/Great Bay estuary, the southern end of Barneget Bay, and the coastal ocean outside of Little Egg Inlet off Tuckerton, New Jersey. Dr. Thomas Grotheus is using the 2009 SWMP water quality data extensively in his multivariate statistical analyses. Visit www.stripertracker.org for more information.

Jason Turnure, a graduate student at RUMFS, will be utilizing SWMP data in his analyses of movements of telemetered weakfish (*Cynoscion regalis*)

Joan Pravatiner, JCNERR's Graduate Research Fellow, will be utilizing SWMP data in his analyses of movements of telemetered winter flounder (*Pseudopleuronectes americanus*).

Other projects orchestrated in the year 2009 in the JCNERR include the continuation of a biofouling project that was initiated in 2003. Conducted by the Research Coordinator and JCNERR staff, several biofouling panels constructed of PVC plates were secured to cages and placed on the bottom. Many of these panels were deployed near SWMP stations. One set of panels was retrieved per month from June through the end of October and were processed for species content after the samples were preserved.

II. Physical Structure Descriptors

9) Sensor Specifications

YSI 6600EDS datasonde

Parameter: Temperature
Units: Celsius (C)
Sensor Type: Thermistor

Model #: 6560
Range: -5 to 45 °C
Accuracy: +/-0.15 °C
Resolution: 0.01 °C

Parameter: Conductivity
Units: milli-Siemens per cm (mS/cm)
Sensor Type: 4-electrode cell with autoranging
Model #: 6560
Range: 0 to 100 mS/cm
Accuracy: +/-0.5% of reading + 0.001 mS/cm
Resolution: 0.001 mS/cm to 0.1 mS/cm (range dependent)

Parameter: Salinity
Units: parts per thousand (ppt)
Sensor Type: Calculated from conductivity and temperature
Range: 0 to 70 ppt
Accuracy: +/- 1.0% of reading or 0.1 ppt, whichever is greater
Resolution: 0.01 ppt

Parameter: Dissolved Oxygen % saturation
Units: percent air saturation (%)
Sensor Type: Rapid Pulse – Clark type, polarographic
Model #: 6562
Range: 0 to 500 % air saturation
Accuracy: 0-200 % air saturation, +/- 2 % of the reading or 2 % air saturation, whichever is greater; 200-500 % air saturation, +/- 6 % of the reading
Resolution: 0.1 % air saturation

Parameter: Dissolved Oxygen mg/L (Calculated from % air saturation, temperature and salinity)
Units: milligrams per Liter (mg/L)
Sensor Type: Rapid Pulse – Clark type, polarographic
Model #: 6562
Range: 0 to 50 mg/L
Accuracy: 0 to 20 mg/L, +/- 2 % of the reading or 0.2 mg/L, whichever is greater; 20 to 50 mg/L, +/- 6 % of the reading
Resolution: 0.01 mg/L

Parameter: Non-Vented Level – Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 30 ft (9.1 m)
Accuracy: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

Parameter: Vented Level – Shallow (Depth)
Units: feet or meters (ft or m)
Sensor Type: Stainless steel strain gauge
Range: 0 to 30 ft (9.1 m)
Accuracy 0-10 ft: +/- 0.01 ft (0.003 m)
Accuracy 10-30 ft: +/- 0.06 ft (0.018 m)
Resolution: 0.001 ft (0.001 m)

Parameter: pH
Units: units
Sensor Type: Glass combination electrode (glass "globe" type)
Model #: 6561
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: pH
Units: units
Sensor Type: Glass combination electrode (flat glass type)
Model #: 605091
Range: 0 to 14 units
Accuracy: +/- 0.2 units
Resolution: 0.01 units

Parameter: Turbidity
Units: nephelometric turbidity units (NTU)
Sensor Type: Optical, 90 ° scatter, with mechanical cleaning
Model #: 6136
Range: 0 to 1000 NTU
Accuracy: +/- 5 % reading or 2 NTU (whichever is greater)
Resolution: 0.1 NTU

Dissolved Oxygen Qualifier:
The reliability of the dissolved oxygen (DO) data after 96 hours post-deployment for non-EDS (Extended Deployment System) data sondes may be problematic due to fouling which forms on the DO probe membrane during some deployments (Wenner et al. 2001). Many reserves have upgraded to the YSI 6600 EDS data sondes, which increases DO accuracy and longevity by reducing the environmental effects of fouling. The user is therefore advised to consult the metadata and to exercise caution when utilizing the DO data beyond the initial 96-hour time period. However, this potential drift is not always problematic for some uses of the data, i.e. periodicity analysis. It should also be noted that the amount of fouling is very site specific and that not all data are affected. The Research Coordinator at the specific NERR site should be contacted concerning the reliability of the DO data because of the site and seasonal variation in the fouling of the DO sensor.

Depth Qualifier:
The NERR System-Wide Monitoring Program utilizes YSI data sondes that can be equipped with either vented or non-vented depth/level sensors. Readings for both vented and non-vented sensors are automatically compensated for water density change due to variations in temperature and salinity; but for all non-vented depth measurements, changes in atmospheric pressure between calibrations appear as changes in water depth. The error is equal to approximately 1.03 cm for every 1 millibar change in atmospheric pressure, and is eliminated for vented sensors because they are vented to the atmosphere throughout the deployment time interval.

Beginning in 2006, NERR SWMP standard calibration protocol calls for all non-vented depth sensors to read 0 meters at a (local) barometric pressure of 1013.25 mb (760 mm/hg). To achieve this, each site calibrates their depth sensor with a depth offset number, which is calculated using the actual atmospheric pressure at the time of calibration and the equation provided in the SWMP calibration sheet or digital calibration log. This offset procedure standardizes each depth calibration for the entire NERR System. If accurate atmospheric pressure data are available, non-vented sensor depth measurements at any NERR can be corrected.

In 2010, the CDMO began automatically correcting depth/level data for changes in barometric pressure as measured by the Reserve's associated meteorological station during data ingestion. These corrected depth/level data are reported as cDepth and cLevel, and are assigned QAQC flags and codes based on QAQC protocols. Please see sections 11 and 12 for QAQC flag and code definitions.

Reserve-specific information regarding the Depth Qualifier:

In 2009, the two "downriver stations" (B6 and B9) were monitored using non-vented YSI 6600EDS (Extended Deployment System) sondes with deployment periods of approximately 30 days. The depth-offset was applied to calibrations at B6 and B9 throughout 2009. The two "upriver stations" (NE and BA) were monitored using vented-level YSI6600EDS sondes, making the depth-offset not applicable at either of these stations. However, occasional substitution with non-vented sondes is required at these stations (but not during this (2009) period).

10) Coded Variable Definitions

Sampling Station:	Sampling Site Code	Station Code
Buoy 126	B6	jacb6wq
Buoy 139	B9	jacb9wq
Lower Bank	BA	jacbawq
Chestnut Neck	NE	jacnewq

jac = Jacques Cousteau National Estuarine Research Reserve

wq = water quality data

example 1: B6061109 = this demonstrates the naming convention for deployment files. This denotes a deployment at Buoy 126 starting on 06/11/09.

example 2: jacb6wq200= water quality data from JCNERR's Buoy 126 station for the year 200

11) QAQC flag definitions

QAQC flags provide documentation of the data and are applied to individual data points by insertion into the parameter's associated flag column (header preceded by an F_). During primary automated QAQC (performed by the CDMO), -5, -4, and -2 flags are applied automatically to indicate data that is missing and above or below sensor range. All remaining data are then flagged 0, passing initial QAQC checks. During secondary and tertiary QAQC 1, -3, and 5 flags may be used to note data as suspect, rejected due to QAQC, or corrected.

-5 Outside High Sensor Range
-4 Outside Low Sensor Range
-3 Data Rejected due to QAQC
-2 Missing Data
-1 Optional SWMP Supported Parameter
0 Data Passed Initial QAQC Checks
1 Suspect Data
2 *Open - reserved for later flag*
3 Calculated data: non-vented depth/level sensor correction for changes in barometric pressure
4 Historical Data: Pre-Auto QAQC
5 Corrected Data

12) QAQC code definitions

QAQC codes are used in conjunction with QAQC flags to provide further documentation of the data and are also applied by insertion into the associated flag column. There are three (3) different code categories, general, sensor, and comment. General errors document general problems with the deployment or YSI datasonde, sensor errors are sensor specific, and comment codes are used to further document conditions or a problem with the data. Only one general or

sensor error and one comment code can be applied to a particular data point, but some comment codes (marked with an * below) can be applied to the entire record in the F_Record column.

General Errors

GIC	No instrument deployed due to ice
GIM	Instrument malfunction
GIT	Instrument recording error; recovered telemetry data
GMC	No instrument deployed due to maintenance/calibration
GNF	Deployment tube clogged / no flow
GOW	Out of water event
GPF	Power failure / low battery
GQR	Data rejected due to QA/QC checks
GSM	See metadata

Corrected Depth/Level Data Codes

GCC	Calculated with data that were corrected during QA/QC
GCM	Calculated value could not be determined due to missing data
GCR	Calculated value could not be determined due to rejected data
GCS	Calculated value suspect due to questionable data
GCU	Calculated value could not be determined due to unavailable data

Sensor Errors

SBO	Blocked optic
SCF	Conductivity sensor failure
SDF	Depth port frozen
SDG	Suspect due to sensor diagnostics
SDO	DO suspect
SDP	DO membrane puncture
SIC	Incorrect calibration / contaminated standard
SNV	Negative value
SOW	Sensor out of water
SPC	Post calibration out of range
SQR	Data rejected due to QAQC checks
SSD	Sensor drift
SSM	Sensor malfunction
SSR	Sensor removed / not deployed
STF	Catastrophic temperature sensor failure
STS	Turbidity spike
SWM	Wiper malfunction / loss

Comments

CAB*	Algal bloom
CAF	Acceptable calibration/accuracy error of sensor

CAP	Depth sensor in water, affected by atmospheric pressure
CBF	Biofouling
CCU	Cause unknown
CDA*	DO hypoxia (<3 mg/L)
CDB*	Disturbed bottom
CDF	Data appear to fit conditions
CFK*	Fish kill
CIP*	Surface ice present at sample station
CLT*	Low tide
CMC*	In field maintenance/cleaning
CMD*	Mud in probe guard
CND	New deployment begins
CRE*	Significant rain event
CSM*	See metadata
CTS	Turbidity spike
CVT*	Possible vandalism/tampering
CWD*	Data collected at wrong depth
CWE*	Significant weather event

13) Post-deployment information

Deployment Datasonde ID#, Dissolved Oxygen #1, Dissolved Oxygen #2, depth measured/expected offset, Specific Conductivity, pH7, pH10, Turbidity0

B6121608	11, 99.2, 99.4, 0.005/-0.001, 9.95, 6.97, 9.93, 5.9
B6050509	13, 100.3, 100.2, -0.076/-0.061, 9.76, 6.84, 9.82, 0.1
B6061109	14, 98.8, 98.9, -0.062/-0.065, 6.46, 7.19, 10.20, 4.8
B6070709	11, *
B6081309	13, 72.6, 71.3, 0.001/-0.001, 10.16, 7.18, 10.24, 1.3
B6091509	13, 99.9, 99.6, 0.088/0.080, 9.18, 7.38, 10.37, 751.0
B6101409	11, 89.2, 88.6, 0.094/0.097, 10.08, 7.00, 9.98, 0.5
B6111009	14, 101.1, 101.1, 0.001/0.000, 10.13, 7.11, 10.04, 3.5
B6121509	13, 81.3, 82.7, 0.061/0.061, 10.16, 7.49, 10.67, 0.7
B9121808	14, 90.7, 90.3, -0.015/-0.004, 9.87, 6.68, 9.74, 0.3
B9031309	13, 101.1, 100.6, 0.102/0.102, 10.03, 6.93, 9.80, 0.9
B9041709	14, 500.0, 500.0, 0.132/0.129, 9.96, 6.84, 9.92, -1.4
B9052009	11, 103.9, 104.3, -0.112/-0.105, 9.79, 6.98, 9.95, 1.2
B9062209	13, 103.1, 102.8, 0.023/0.017, 9.94, 6.87, 9.93, **
B9072209	14, 103.9, 103.4, 0.021/0.027, 10.03, 7.19, 10.08, 1.2
B9081909	14, 105.5, 104.4, 0.006/-0.001, 9.97, 6.79, 9.76, 32.2
B9091509	14, 101.6, 101.2, 0.115/0.113, 9.94, 6.75, 9.81, 2.8
B9102809	13, 98.6, 98.9, 0.144/0.152, 10.08, 6.94, 9.68, 3.6
B9120809	11, 97.7, 98.9, -0.041/0.068, 9.96, 6.86, 10.03, **
NE121008	12, 102.0, 102.1, -0.007/0.000, 9.92, 7.26, 10.33, 2.6

NE010809 5, 57.5, 57.0, -0.002/0.000, 9.85, 7.06, 9.97, 1.4
NE021109 X, 108.5, 107.9, 0.000/0.000, 10.07, 7.11, 10.02, 0.6
NE031109 5, 106.7, 106.5, -0.002/0.000, 10.10, 7.00, 9.97, 2.5
NE040209 X, 99.9, 100.2, -0.006/0.000, 10.25, 7.02, 9.98, 0.0
NE050709 12, 105.2, 104.3, 0.031/0.000, 8.28, 7.21, 10.20, 0.7
NE060409 5, 103.5, 103.5, 0.000/0.000, 9.98, 7.27, 9.98, 0.1
NE070809 12, 67.0, 66.4, 0.000/0.000, 9.92, 7.04, 9.94, 1.6
NE081109 X, 102.4, 102.4, -0.001/0.000, 10.15, 7.09, 10.10, 1.4
NE090909 5, 100.4, 101.0, -0.001/0.000, 10.17, 7.07, 10.09, 0.3
NE101509 5, 113.5, 113.5, -0.002/0.000, 9.94, 6.99, 10.00, 0.1
NE112409 5, 103.6, 103.7, -0.004/0.000, 10.01, 7.04, 10.06, 3.2
NE122209 5, 105.0, 105.0, -0.001/0.000, 10.04, 7.04, 10.00, 1.0

BA010609 X, 97.5, 97.5, 0.001/0.000, 9.63, 7.03, 9.93, 2.0
BA031209 12, 104.0, 103.6, -0.003/0.000, 10.03, 7.13, 10.07, 0.2
BA040609 5, 111.8, 111.5, -0.001/0.000, 10.06, 7.02, 9.97, -0.9
BA050809 X, 110.9, 110.4, 0.001/0.000, 9.80, 7.02, 9.99, 0.6
BA061109 X, 107.9, 107.1, 0.001/0.000, 10.03, 6.99, 9.94, 1.7
BA070909 5, 111.5, 111.7, 0.000/0.000, 9.96, 6.91, 9.97, 2.5
BA081209 12, 108.5, 108.5, 0.002/0.000, 10.00, 7.24, 10.13, 0.4
BA091009 X, 103.8, 103.8, 0.000/0.000, 10.02, 5.21, 5.70, 0.4
BA102009 X, 103.3, 103.4, 0.000/0.000, 10.02, 7.09, 10.06, 0.5
BA112509 X, 121.4, 121.5, -0.002/0.000, 10.02, 7.26, 10.26, -0.1

*-complete sonde failure, no post-deployment data
**-no turbidity data recorded

Deployment= deployment file name

#= datasonde ID number

D.O.% (1)= first datasonde output in a 100% Dissolved Oxygen-saturated environment

D.O.% (2)= second datasonde output in a 100% Dissolved Oxygen-saturated environment

Depth displayed/expected offset = depth in meters (m) displayed by the datasonde when in a depth=0.000m environment. The offset reflects expected depth value, adjusted for local atmospheric pressure (applicable only to non-vented datasondes (#11, 13, 14, and the 600XLS-M unit); vented datasondes (#X, 5, and 12) have an expected offset = 0.000)

SpCond= datasonde output in a 10 milliSiemens per centimeter cubed conductivity standard solution

pH7= datasonde output in a pH7 standard solution

pH10= datasonde output in a pH10 standard solution

Turbidity0= datasonde output in a 0 NTU turbidity standard (e.g.- Deionized water)

14) Other Remarks/Notes

This section details comments concerning data in the data set that are not adequately described by the coding convention or require additional comment/qualification.

Data are missing due to equipment or associated specific probes not being deployed, equipment failure, time of maintenance or calibration of equipment, or repair/replacement of a sampling station platform. Any NANs in the dataset stand for "not a number" and are the result of low power, disconnected wires, or out of range readings. If additional information on missing data is needed, contact the Research Coordinator at the reserve submitting the data.

There were a few instances at this NERR site where negative turbidity values between -0001 and -0002 NTU's were recorded. Because such values fall within the range of accuracy (+/-2 NTU) of the turbidity probes, these data were considered suspect but not rejected.

Note to users: When utilizing these data, it is always best to also review the SWMP Meteorological (MET) dataset from this reserve to provide weather conditions that may affect the SWMP Water Quality (WQ) data from this reserve. For example, strong precipitation and strong sustained winds may cause elevations in turbidity and alter dissolved oxygen levels. Periods of drought may alter salinity patterns and lead to anoxic conditions in poorly-circulated regions of reserve waters. Hurricane and Nor'easter events may alter WQ parameters in the above, and other, manners. Provisional MET data from the JCNERR's MET station (station code: jacncmet) are available at the CDMO website (http://cdmo.baruch.sc.edu/), and are scheduled for review mid-April 2009.

Station-Specific Remarks/Notes:

Buoy 126 (site code: B6)

There are no data for this station from 04/16/09 00:00 to 05/05/09 10:00 due to extensive repairs that had to be made to this station due to damage by ice the previous winter.

Dissolved oxygen concentration and depth values for the B6061109 deployment from (approximately) 06/19/09 00:00 to the end of the deployment (07/07/09 11:30) are suspect because of their dependence on the accuracy of the Specific Conductivity probe, which was affected by biofouling during this deployment.

Turbidity data from 9/27 22:30 – 10/1 13:15 are marked 1 GSM CBF and data from 10/1 13:45 – 10/14 13:30 are marked -3 GSM CBF. Japanese skeleton shrimp were present and most likely affected turbidity data during this time.

Dissolved oxygen concentration and depth values for the B6091509 deployment from (approximately) 10/06/09 00:00 until the end of the deployment (10/14/09 13:30) are suspect because of their dependence on the accuracy of the Specific Conductivity probe, which was affected by biofouling during this deployment.

During the B6101409 deployment, from the period of approximately 10/30/09 13:00 to the time of cleaning on 11/05/09 13:45, and for a brief period on 11/05/09 15:15-17:30, a number of very high turbidity values were observed. During the cleaning on /05/09 14:00, infestation of the probe guard and probes by Japanese Skeleton Shrimp was observed.

There are not data for this station from 12/22/09 12:45 for the remainder of the year (12/31/09 23:45); the station was deactivated and equipment removed in anticipation for the winter ice.

Buoy 139 (site code: B9)

Upon recovery of the B9081909 deployment, it was observed that some bristles from the EDS brush had bent over the end of the turbidity probe and may have intermittently blocked the optics. Data from 09/02/09 10:45 to 09/14/09 10:30 are therefore considered suspect.

Chestnut Neck (site code: NE)
DO data from 1/8 13:15 to 2/11 12:15 marked 1 GSM CIP or -3 GSM CIP There was surface ice present that seems to have impacted the DO data during this time. The post cal for the DO probe was 57% and the matchup with the new deployment on 2/11 was 67%/120%.

During the NE050709 deployment from approximately 05/29/09 05:45 until the end of the deployment at 06/04/09 12:00, Specific Conductivity/Salinity appears to have been depressed by biofouling (amphiphods in the conductivity probe ports). Dissolved oxygen concentration and depth values for this period are suspect because of their dependence on the accuracy of the Specific Conductivity probe (although they post-calibrated well and appear to fit conditions).

Lower Bank (site code: BA)

None to note.