

Jacques Cousteau (JAC) NERR Water Quality Metadata
(formerly known as Mullica River (MUL) NERR)
January through December 1999
Latest update: November 8, 2000

I. DATA SET AND RESEARCH DESCRIPTION

1. Principal Investigator and Contact Person

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2. Entry verification

The data were uploaded to the PC from the YSI data loggers in the PC6000 and comma delimited format and saved with .dat and .csv extensions respectively. Both of these data file formats are archived on site. From January to July graphs were created from this data using PC6000 software. Starting in August graphs were created using EcoWatch software. The graphs were evaluated for suspect data, which may have resulted from probe failure or the data logger being out of water. Pre-deployment and post-retrieval readings were identified by unusual depth and salinity data (depths and salinity values near zero). First and last readings were then compared with pre-deployment and post-retrieval readings taken with a YSI 600 unit. All irregular data observed from graphs were documented on deployment records. The appropriate files were then merged to form complete monthly data sets and were saved as separate EXCEL files. Missing data are denoted by periods (.) documented in section 11 (Missing Data) of this document. Any erroneous data that were identified as being caused by probe failures, as determined upon examination of the data plots, were deleted and replaced with periods and noted in section 11 (Missing Data). Symptoms of probe failure were extreme noise in the record, unrealistically high or negative data, noisy or negative readings in standard solutions. Examples of many such failures are given in the CDMO Manual (Version 3). Sensor readings that greatly deviate from known values of standards after deployments were not necessarily believed to be the result of probe failure. These erroneous readings may have been the result of biofouling. If biofouling was believed to be the reason for these data, the data were retained and noted in section 10 (Data Anomalies) of this document. Finally, the CDMO Excel 5.0 macros (update version August 1999) were then run on these newly created monthly files to identify missing times and /or dates, to format column width and decimal places of each column, and to identify outliers and other erroneous data. When all the macros were run and the data was checked and formatted properly, the monthly data files were saved as text files and then uploaded to the CDMO server. Roger Hoden and Sharon O'Donnell are responsible for data management and transferring data files to CDMO.

3. Research Objectives

The water quality of the Mullica River and Great Bay has traditionally been very 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 which 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, five to nine meters deep in the section that is monitored. Great Bay averages about two meters depth. The river also has a dark color due to tannins and humic compounds which are a natural product coming from the Pine Barrens and are present in large amounts within the river. It is believed that nutrients which enter 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 prevent the utilization of these nutrients in the river 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 data loggers. Because of the close proximity of the lower station 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 colder ocean waters can have dramatic effects on the growth rates of many different species living in the area. Data loggers 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 (YSI Data Loggers)

The data loggers are programmed to record water quality parameters every 30 minutes. Presently, three instruments are located in the Jacques Cousteau 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 data loggers cover a total of 33 kilometers in this estuarine system.

At all three sites, YSI data loggers are deployed in the following manner. A 10 - 20 foot length of schedule 40 PVC pipe is used. Slots one inch wide and eight inches long are cut three inches above the bottom and encircled the pipe. A one half inch bolt is placed below the pipe slots to keep the YSI from falling through the pipe. A PVC cap is placed over the pipe with a slot for a locking mechanism to the pipe. A rope is attached to the cap with the other end fastened to the bail of the data logger for the retrieval of the YSI.

Every thirty minutes (eastern standard time EST) during each sampling period measurements of specific conductance, salinity, temperature, dissolved oxygen, (percent saturation and mg/L), water level, pH, and turbidity are recorded. After approximately 14 days the data logger is removed from the PVC pipe. A YSI 600 data logger attached to a 610-DM handheld unit is then lowered into the pipe and samples in-situ water conditions at the same depth which data is recorded. A different calibrated and programmed YSI data logger is then switched with the data logger being replaced. The data logger is brought back to the laboratory for downloading, re-calibration and reprogramming to be exchanged at a different location. The beginning and end of each data file is compared to the YSI 600 readings and the data is checked for probe failure and fouling. The data loggers are programmed to start recording data a few hours before they are deployed in the field. Records are kept indicating which data loggers are used at each location and if there are any specific problems with each data logger or probes on the data loggers. Uploading, cleaning, maintenance, and calibration are conducted as described in the YSI

Operating Manual (section 3, 4, and 7). Calibration standards required for pH and conductivity are purchased from a scientific supply house. A two point calibration is used for pH, the first being pH 7 followed by pH 4. The lower pH standard is used because of the more acetic properties of the Mullica River. A standard of 20,000 us/cm is used to calibrate for conductivity. The membrane on the oxygen probe is changed when the membrane becomes fouled or is punctured. The membrane is stretched over the face of the probe and is burned in by allowing the data logger to run in an unattended sampling mode sampling every 30 minutes for at least eight hours. Dissolved oxygen is calibrated using a calibration cup filled with about 1/4 inch tap water, which creates a 100% water-saturated air environment for the sensor when the data logger is placed in the cup. The sensors are allowed to equilibrate for at least 15 minutes in the cup before DO (% saturation) is calibrated. DO calibrations are performed immediately before deployment. Data loggers are allowed to sample inside the calibration cup at least one hour following retrieval to assure the membrane functioned properly during deployment. The standard for calibrating turbidity is purchased from a supply house and diluted to give a reading of 100 NTU (National Turbidity Units). Turbidity wipers are replaced after every deployment. Used conductivity, pH, and turbidity standards are stored for post-deployment calibrations which are performed immediately after data loggers return from the field and before data loggers are cleaned. These standards are then discarded after their second use. Servicing an instrument generally takes about two hours for each data logger plus the time involved with retrieval and deployment.

5. Site Location and Character

The Jacques Cousteau National Estuarine Research Reserve (JACNERR) 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. All three locations can be characterized by having no macro algae and fast moving tidal currents. All sites are in an undisturbed area with little impact from development or pollution. There are three sampling stations:

1) Buoy 126 (B126) - 39 30.478' N, 74 20.308' W- located three kilometers from Little Egg Inlet on the eastern side of Great Bay and is 100 meters from the nearest land which is a natural marsh island. This is a naturally deep area which has never been dredged. It is located about 0.5 kilometer from an area in the intracoastal waterway which is dredged regularly. The dredged material is a coarse sand. The data logger 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 coarse sand bottom with an extensive blue mussel bed surrounding the area. The 1999 averages for this site are as follows: the depth is 2.80 meters with a range of 1.68 to 3.81 meters. The pH averages 8.0 over a year with a range of 6.9 to 8.8. Salinity averages 28.9 with a maximum of 32.4 and a minimum of 19.4.

2) Chestnut Neck (NECK) - 39 32.872' N, 74 27.676' 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 data logger 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 average depth at this location is 1.66 meters with a range of from 0.11 to 2.80 meters. The depth in the middle of the Mullica River at this location is about six meters. The pH averages 7.2 for the year with a range of

from 6.2 to 7.9. The average salinity here is 14.6 with a range of 2.89 to 26.8 ppt. The site is characterized by having tidal currents of less than one knot, during both ebb and flood tide, with a sandy bottom.

3) Lower Bank (BANK) - 39 35.618' N, 74 33.091' W - located 13 kilometers upriver of the Chestnut Neck location. The Mullica River at this site is about two hundred meters wide. The data logger is attached to a bridge going over the Mullica River which was rebuilt three years ago and is located in the center of the 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 freshwater wetland area about three kilometers wide. This site can be characterized by having fast tidal currents, just over one knot, deep water, and fine sand sediment. The average depth is 1.71 meters with a range of 0.60 to 2.60 meters. The pH averages 6.0 with a range of 3.1 to 7.9. The salinity averages 2.7 with a range of from 0 to 18.5 ppt.

Data Collection at Buoy 139, located in the southwest portion of Great Bay, began in August of 1996. Data collected at this site was very similar to the data from the Buoy 126 sampling site, located in the northeast portion of Great Bay, and was therefore discontinued in August of 1999.

6. Data Collection Period

Data collection at Buoy 126 began August 1996, Chestnut Neck began August 1996, and Lower Bank started October 1996. All three sites have been continuously in service since that time. The following are the beginning and ending date and time for each logging run over the year:

Lower Bank

Logging Run Started		Logging Run Ended	
12/16/98	830	1/6/99	1700
1/6/99	1730	1/16/99	0000
1/20/99	1700	2/2/99	1500
2/2/99	1600	2/17/99	1630
2/17/99	1730	3/3/99	1500
3/3/99	1530	3/18/99	1800
3/18/99	1830	4/2/99	730
4/2/99	800	4/15/99	1400
4/15/99	1430	4/29/99	1300
4/29/99	1430	5/18/99	530
5/26/99	1730	6/11/99	630
6/12/99	600	6/24/99	800
6/25/99	1330	7/13/99	1230
7/13/99	1300	7/28/99	530
7/28/99	600	8/13/99	1330
8/13/99	1400	8/26/99	1200
8/26/99	1230	9/10/99	1300
9/10/99	1500	9/23/99	800
9/23/99	830	10/8/99	600
10/8/99	630	10/28/99	1300
10/28/99	1330	11/11/99	1600
11/11/99	1630	11/23/99	1530
11/23/99	1600	12/3/99	900
12/3/99	930	12/16/99	1530
12/16/99	1600	1/4/99	1500

Chestnut Neck

Logging Run Started		Logging Run Ended	
12/23/98	1130	1/5/99	1500

1/6/99	1600	1/22/99	1130
1/25/99	1000	2/10/99	1130
2/15/99	1330	3/4/99	830
3/4/99	1230	3/22/99	1200
3/23/99	1000	4/7/99	1230
4/8/99	1330	4/30/99	800
4/30/99	1430	5/18/99	1130
6/9/99	1430	6/24/99	1030
6/24/99	1600	7/7/99	1130
8/13/99	1330	8/31/99	900
8/31/99	1000	9/14/99	1330
9/15/99	1500	9/28/99	930
9/29/99	1030	10/14/99	1230
10/15/99	1100	11/1/99	1230
11/3/99	1600	11/23/99	830
11/23/99	1100	12/7/99	1200
12/7/99	1700	12/20/99	830
12/21/99	900	1/7/00	930

Buoy 126

Logging Run Started

Logging Run Ended

12/16/98	1330	1/5/99	1600
1/5/99	1630	1/21/99	1100
2/5/99	1130	2/18/99	1100
2/18/99	1130	3/11/99	1100
3/16/99	1430	3/30/99	1500
3/30/99	1530	4/15/99	830
4/15/99	900	5/4/99	1000
5/4/99	1030	5/13/99	1530
5/26/99	1300	6/9/99	800
6/9/99	1900	6/23/99	800
6/23/99	1630	7/7/99	930
7/12/99	1400	7/21/99	1330
7/21/99	1430	8/9/99	2130
8/11/99	300	8/24/99	900
8/25/99	900	9/8/99	1630
9/8/99	1730	9/20/99	1200
9/20/99	1230	10/6/99	130
10/6/99	900	10/19/99	1600
10/28/99	930	11/18/99	1100
11/18/99	1200	12/3/99	1130
12/3/99	1230	12/15/99	1100
12/15/99	1130	1/5/00	1600

7. Associated Researchers and Projects

A National Estuarine Research Reserve System Graduate Research Fellow, Melissa Neuman, has been working in coordination with the Research Coordinator, K. Able, and the Research Technician, R. Hoden, on a project entitled "The effect of upwelling on the occurrence and abundance of larval fish in the Mullica River-Great Bay NERRS". This study incorporates data collected through the NERRS ecological monitoring program and an ongoing long-term ichthyoplankton sampling program within the Mullica River-Great Bay NERRS. This research fosters collaboration with members of the Marine Remote Sensing Laboratory at the Institute of Marine and Coastal Sciences, Rutgers University. Another National Estuarine Research Reserve System Graduate Research Fellow, Edward Martino, will be working in coordination with the Research Coordinator on a study to describe the spatial, seasonal, and annual variation in the structure of fish assemblages within tidal creek and adjacent open waters within the

Jacques Cousteau National Estuarine Research Reserve. The title of this project is "Spatial and temporal trends in the structure of an estuarine fish assemblage: observations from tidal creek and adjacent open waters".

The Research Coordinator is also the principal investigator on a project that attempts to investigate the influence of Phragmites invasion on the structure and function of brackish marsh fish nurseries in the Mullica River. This project is funded by New Jersey Sea Grant. Ongoing sampling efforts within the NERRS site include an estuarine-wide otter trawling survey that has been conducted since 1991 and has been supported by the Institute of Marine and Coastal Sciences, Rutgers University. With support from NOAA Cooperative Marine Education and Research (CMER) Program, R. Chant (Rutgers/Institute of Marine and Coastal Sciences) is studying estuarine circulation patterns and their effects on the transport of winter flounder larvae within the NERRS.

II. PHYSICAL STRUCTURE DESCRIPTIONS

8. Variable Sequence, Range of Measurements, Units, Resolution, and Accuracy:

Date, 1-12, 1-31, 00-99, MMDDYY, 1 month, 1 day, 1 year, NA

Time (EST), 0-24, 0-60, 0-60, HHMMSS, 1 hr, 1 min, 1 sec, NA

Temp, -5-45 C, 0.01 C, +/- 0.15 C

Sp Cond, 0-100 (mS/cm), 0.01 mS/cm, +/-0.5% of reading + 0.001 mS/cm

Salinity, 0-70 parts per thousand (ppt), 0.01 ppt, +/- 1.0% of reading or 0.1ppt, whichever is

greater

DO Sat, 0-200 % air saturation, 0.1 % air saturation on, +/- 2 % air saturation

DO Sat, 200-500% air saturation, 0.1 % air saturation on, +/- 6% air saturation

DO mg/L, 0-20 mg/L, 0.01 mg/L, +/- 0.2 mg/L

DO mg/L, 20-50 mg/L, 0.01 mg/L, +/- 0.6 mg/L

Depth-Shallow, 0-9.1 meters, 0.001 m, +/- 0.018 m

pH, 2 to 14 units, 0.01 units, +/- 0.2 units

Turbidity, 0-1000 NTU, 0.1NTU, +/- 5% of reading or 2 NTU, whichever is greater

Data columns are separated by 1 tab

9. Coded Variable Indicator and Variable Code Definitions:

BANK ba = Lower Bank

NECK ne = Chestnut Neck

B126 b6 = Buoy 126

10. Data Anomalies:

Included in this section are the month and year of data collection, the location and the file name for that month along with all anomalies data points.

Unless otherwise noted, all anomalous data remain in the dataset.

LOWER BANK

January--ba0199

Negative temperature readings 1/1/99 500-1230, 1900-2330

Negative temperature readings 1/2/99 000-330, 530-2330

Turbidity value >1000 1/2/99 1830, 1930-2030

Negative temperature readings 1/3/99 000-830

Turbidity value >1000 1/3/99 600-930

Turbidity value >1000 1/5/99 1900

pH irregular 1/6/99 1730-1/16/00 000 low battery power causing internal data logger errors

No data 1/6/99 1900-2100 internal data logger error

No data 1/7/99 130,1030,1330,1530,1630-1800,2130 internal data logger error

No data 1/8/99 000, 100, 1330 internal data logger error

No data 1/9/99 200, 830, 1200, 1300, 1400, 1500-1830, 1930-2330 internal data logger error
No data 1/10/99 000-100, 200, 230, 400, 500-700, 800, 900, 1030, 1100, 1200-1330, 1430-1700,
1800-1930, 2030-2330 internal data logger error
No data 1/11/99 000-300, 400-430, 600, 830, 1000-1130, 1230-1600, 1800, 2030-2100, 2200-
2330 internal data logger error
No data 1/12/99 030, 130, 400, 1030, 1130-1330, 1430-1500, 1600, 1700-2200 internal data logger error
No data 1/13/99 000-730, 830-1200, 1300-1500, 1600-1630, 1730-2000, 2100-2200, 2300-2330 internal data logger error
No data 1/14/99 000-100, 230-400, 530-1200, 1300, 1400-1530, 1700-1730, 1830-2130, 2300-
2330 internal data logger error
No data 1/15/99 000-100, 200-530, 700-900, 1000, 1100-1330, 1600, 1900, 2200-2330 internal data logger error
pH irregular 1/20/99 1700-1/31/99 2330 diagnostic report indicated miscalibration

February--ba0299

pH irregular 2/1/99-2/2/99 1500 diagnostics report indicated miscalibration
DO out of range 2/17/99 1730 -2/28/99 2330 puncture or miscalibration

March--ba0399

DO out of range 3/1/99 000-3/18/99 1800 puncture or miscalibration
Irregular DO 3/3/99 1530 values spike (129.6%, 15.7 mg/L)
Irregular salinity 3/15/99 1000-1030 values spike (16.5 mS/cm)
Irregular DO 3/18/99 1830-3/31/99 2330 following readings indicate possible miscalibration

April--ba0499

Irregular DO 4/1/99 000-4/2/99 730 following readings indicate possible miscalibration
Irregular DO 4/2/99 800-4/15/99 1400 preceding readings indicate possible miscalibration or puncture

May--ba0599

None to report

June--ba0699

Turbidity value >1000 6/3/99 330
Turbidity value >1000 6/4/99 730-800
DO irregular 6/5/99 800 (39.4%)
Turbidity >100 6/5/99 800
Turbidity value >1000 6/6/99 1700
Turbidity value >100 6/9/99 1300-1330, 1530
Turbidity values irregular 6/10/99 100, 300-6/11/99 630
Turbidity value >200 6/16/99 630
Turbidity value >1000 6/18/99 1330
Turbidity value >100 6/19/99 330, 1030
Turbidity value >100 6/20/99 130
DO irregular 6/20/99 430, 500, 1230 (59.6%, 160.5%, 56.5%) possible puncture due to fouling
Turbidity value >100 6/21/99 700, 2330
No DO 6/22/99 1600-6/24/99 800 values removed due to fouling and presumed puncture

Turbidity value >200 6/24/99 400
Turbidity value >1000 6/26/99 130-200
Turbidity values >100 6/30/99 100-2330

July--ba0799

DO irregular 7/13/99 1300-7/28/99 530 preceding readings indicate miscalibration
Turbidity >200 7/15/99 1130
Turbidity >100 7/16/99 1130-1230, 1330, 2100 negative values >1000 for 1630, 1830, 2300
Turbidity >100 7/17/99 000, 030, 300, 630, 1130, 1230, 2130, 2200
Turbidity >100 7/18/99 700, 1100, 1700
Turbidity >100 7/19/99 200, 1500
Turbidity >100 7/24/99 1300

August--ba0899

No data 8/1/99 000 internal data logger error
DO irregular 8/13/99 1400-8/26/99 1200 preceding readings indicate possible miscalibration
Salinity irregular 8/14/99 630 rapid decline indicates rainfall and end of summer-long drought
Turbidity irregular 8/23/99 730-8/30/99 900 erratic readings indicate runoff following rain storms
pH irregular 8/27/99 300 rapid decline indicates runoff following rain storms
(Please see September for data following the above anomalies)

September--ba0999

pH irregular 9/10/99 1500-9/25/99 330 prior deployment indicates slight miscalibration, followed by the effects of Hurricane Floyd
Salinity irregular 9/16/99 1300-9/25/99 2100 effects of Hurricane Floyd
Turbidity >500 9/18/99 1030

October--ba1099

DO value out of range 10/28/99 1330-10/31/99 2330 puncture or miscalibration (100-120%)

November ba1199

DO value out of range 11/1/99 000-11/11/99 1600 puncture or miscalibration (100-120%)

December ba1299

DO value out of range 12/3/99 930 reading spikes immediately after deployment
Turbidity value >100 12/10/99 2300, 2330

CHESTNUT NECK

January--ne0199

DO values out of range 1/1/99 000-1/5/99 1500 puncture or miscalibration (120-140%)
Negative temperature readings 1/2/99 230-600, 730, 930-2330
Negative temperature readings 1/3/99 000-430, 530, 900-1000
Turbidity reading >100 1/3/99 900-1200
No data 1/3/99 1100, 1800 internal data logger error
No data 1/4/99 300 internal data logger error
DO values irregular 1/6/99 1600-1/22/99 1130 following readings indicate possible miscalibration
Negative temperature readings 1/6/99 1600-1630, 1930-2100, 2200-2330
Negative temperature readings 1/7/99 000-1300, 2000-2130, 2300-2330

No data 1/7/99 1330 internal data logger error
Negative temperature readings 1/8/99 000-2330
Negative temperature readings 1/9/99 000-800, 1000
No data 1/10/99 930 internal data logger error

February--ne0299
Turbidity irregular 2/4/99 630-2/10/99 1130 readings considerably higher than previous values

March--ne0399

April--ne0499
Depth irregular 4/8/99 1330-4/30/99 2330 data logger not at permanent location
Turbidity value >500 4/22/99 430

May--ne0599
Depth irregular 5/1/99 000-5/18/99 1130 data logger not at permanent location

June--ne0699
DO crash 6/30/99 1100-2330 cause unknown

July--ne0799
DO crash 7/1/99 000-7/7/99 1130 cause unknown
Turbidity values >100 7/3/99 1800, 1930, 2030-2330
Turbidity values >200 7/4/99 000-530, 630-7/7/99 1130

August--ne0899
DO irregular 8/31/99 1000-2330 removed, data indicates puncture

September--ne0999
DO irregular 9/1/99 000-9/14/99 1330 removed, data indicates puncture
Salinity irregular 9/16/99 1530-9/17/99 1030 effects of Hurricane Floyd (see DROUGHT at end of document)

October ne1099
DO irregular 10/15/99 1100-10/31/99 2330 preceding values indicate data logger miscalibrated

November ne1199
DO irregular 11/1/99 000-11/1/99 1230 preceding values indicate data logger miscalibrated
Turbidity >50 11/4/99 330, 1500
Turbidity >50 11/6/99 330, 400, 2230
Turbidity >200 11/7/99 330

December-ne1299
No DO 12/21/99 900 - 12/31/99 2330 probe failure

BUOY 126

January--b60199
DO irregular 1/5/99 1630-1/21/99 1100 preceding readings stabilize at higher saturation
pH irregular 1/5/99 1630-1/21/99 1100 following readings indicate miscalibration
Turbidity value >100 1/1/99 1230-1400, 1600-1700
Turbidity value >100 1/2/99 200
Turbidity value >100 1/9/99 1830-2030

Turbidity value >100 1/13/99 2200
Turbidity value >100 1/15/99 2100
Turbidity value >100 1/16/99 230, 300
Turbidity value >100 1/19/99 1500, 1800, 1830
No data 1/21/99 11:30-1/31/99 23:30 due to internal data logger error

February--b60299

Turbidity value >100 2/12/99 2330
Turbidity value >100 2/13/99 000, 130, 200
Turbidity value >100 2/18/99 1130

March--b60399

Turbidity value >100 3/4/99 1300-1630, 1730-1830, 1930-2100
Turbidity value >100 3/5/99 030-100
Turbidity value >100 3/7/99 630, 730, 1530, 1600, 1900, 2000, 2100, 2130
Turbidity value >100 3/8/99 400
Turbidity value >100 3/28/99 1700
Turbidity value out of range 3/30/99 2100 negative values
Turbidity value out of range 3/31/99 900 negative values

April--b60499

Turbidity value out of range 4/2/99 930, 1030 negative values
Turbidity value out of range 4/3/99 2330 negative values
Turbidity value out of range 4/4/99 000, 1200 negative values
Turbidity value out of range 4/5/99 130-230, 1300, 1530 negative values
Turbidity value out of range 4/6/99 130, 1300, 1400 negative values
Turbidity value out of range 4/7/99 530 negative values
Turbidity value out of range 4/8/99 400, 1430, 1600, 1930, 2000 negative values
Turbidity value out of range 4/9/99 300, 430, 2030, 2100 negative values
DO irregular 4/9/99 930 drastic drop in values
Turbidity value out of range 4/10/99 500, 530, 1800 negative values
Turbidity value out of range 4/11/99 530-600, 1830, 1900, 2000-2100, 2200 negative values
Turbidity value out of range 4/12/99 630, 900-930, 1030-1130, 1900, 2000-2130, 2230 negative values
Turbidity value out of range 4/13/99 700-930, 1030-1200, 2000-2130, 2230 negative values
Turbidity value out of range 4/14/99 000, 830, 1100, 2030-2330 negative values
Turbidity value out of range 4/15/99 100-130, 730-800 negative values

May--b60599

Turbidity value out of range 5/4/99 830 value >1000
DO irregular 5/4/99 1030-5/11/99 1900 previous readings indicate miscalibration
Turbidity value out of range 5/9/99 16:00-16:30, 2100 negative values
Turbidity value out of range 5/10/99 500-530, 1000-1030, 1700-1730, 1830, 2200 negative values
Turbidity value out of range 5/11/99 530, 1800 negative values
Turbidity value >100 5/13/99 1200-1530
No data 5/11/99 1930 - 5/12/99 1800 internal data logger error
Salinity irregular 5/26/99 1300-5/31/99 2330 previous readings indicate miscalibration
DO irregular 5/26/99 1300-5/31/99 2330 previous readings indicate miscalibration interrupted by fouling before end of deployment
Turbidity value >100 5/29/99 1500, 2030, 2100, 2330
Turbidity value >100 5/30/99 000-030, 300-430, 530-2330
Turbidity value >100 5/31/99 000-130, 1530-2300

June b60699

DO irregular 6/1/99 000-200 previous readings indicate miscalibration interrupted by fouling before end of deployment (negative values removed)

No DO 6/1/99 230 - 6/9/99 800 negative and irregular values removed

Salinity irregular 6/1/99 000-6/9/99 800 previous readings indicate miscalibration

Turbidity value out of range 6/1/99 200, 300 values >500

Turbidity value out of range 6/3/99 1000 values >1000

Turbidity value out of range 6/4/99 900, 1230-2030 values >200

DO irregular 6/9/99 1900-6/14/99 300 membrane fouled/punctured some time during deployment (negative values removed)

No DO 6/14/99 330 - 6/23/99 800 removed values (<50%) not consistent with prior deployment

Turbidity value out of range 6/13/99 700, 900, 1800, 1830, 1930 - 2030, 2230-2300 values >200

Turbidity value out of range 6/14/99 530-1030, 1530-1630, 1800-2000, 2100-2300 values >200

Turbidity value out of range 6/15/99 000-200, 330-400, 500-530, 700-730, 1000, 1200, 1930, 2130, 2300-2330 values >200

Turbidity value out of range 6/16/99 000-130, 300-500, 800-830, 1030, 1300-1330, 1500-1630, 2030-2130, 2330 values >200

Turbidity value out of range 6/17/99 200-600, 800-930, 1030-1230, 1330-1400, 1630 values >200

Turbidity value out of range 6/18/99 200, 1030, 1130, 1930, 2030-2100, 2230 values >200

Turbidity value out of range 6/19/99 130, 300, 600, 1300, 1400, 1730 values >1000

Irregular temperature 6/20/99 2300-6/22/99 930 temperature becomes less tidally effected following 1.88 inches of rain.

Turbidity value out of range 6/21/99 300 negative values

pH irregular 6/23/99 1630-6/30/99 2330 previous readings indicate miscalibration or probe failure

DO irregular 6/23/99 1630-6/30/99 2000 membrane fouled/punctured some time during deployment (negative values removed)

Salinity irregular 6/23/99 1630-6/30/99 2330 previous readings indicate miscalibration

Turbidity value out of range 6/30/99 600, 1000-1030, 1500-1600, 1900, 2000-2330 value >200

No DO 6/30/99 2030 - 2330 removed values which crashed at ~1%, turn negative in b60799

July--b60799

No DO 7/1/99 000 - 7/7/99 930 negative values removed

pH irregular 7/1/99 000-7/7/99 930 previous readings indicate miscalibration or probe failure

Salinity irregular 7/1/99 000-7/7/99 930 previous readings indicate miscalibration

Turbidity values unusually high 7/1/99 000-7/7/99 930, see below for outliers:

Turbidity out of range 7/1/99 1730, 1830, 2100-2330 values >1000

Turbidity out of range 7/2/99 000-330, 1000 values >1000

Turbidity out of range 7/3/99 2100 value >1000

Turbidity out of range 7/7/99 800 value >1000

Turbidity out of range 7/12/99 1400, 1930-2030 negative values

DO value irregular 7/12/99 1400 removed values of 63% and 4.54 mg/L

pH irregular 7/12/99 1400-7/21/99 1330 previous readings indicate miscalibration

Turbidity >200 7/14/99 1800, 1830

Turbidity >100 7/15/99 730-830, 1800
Turbidity >100 7/16/99 2000
Turbidity >200 7/17/99 2200
Turbidity >100 7/18/99 900
No turbidity data 7/24/99 1300-7/31/99 2330 probe failure, data deleted

August b60899

No turbidity data 8/1/99 000-8/9/99 2130 probe failure, data deleted
DO values irregular 8/2/99 630 -8/9/99 2130 readings <50% several times, then recover immediately
DO values irregular 8/12/99 700 - 8/24/99 900 data deleted due to excessive fouling (values >150%)
pH irregular 8/25/99 900-8/31/99 2330 values much lower than previous deployment, diagnostics indicate possible probe failure
DO values irregular 8/25/99 900 - 8/31/99 2330 readings start at 107.0% and fluctuate to 14.2%, see CLEANING in section 12

September b60999

DO values irregular 9/1/99 000-9/8/99 1630 readings fluctuate between 107.0% and 14.2%, see CLEANING in section 12
pH irregular 9/1/99 000-9/8/99 1630 values much lower than previous deployment, diagnostics indicate possible probe failure
DO values irregular 9/8/99 1730-9/20/99 1200 following readings indicate miscalibration
Salinity irregular 9/16/99 1830-9/17/99 800 effects of Hurricane Floyd
Turbidity values out of range 9/17/99 400-600, 930-1030, 1200-1300, 1600-1630, 1800 Hurricane Floyd present at this time

October b061099

Turbidity values unusually high 10/3/99-10/6/99 130, see below for outliers:
Turbidity >200 10/4/99 200, 230
Turbidity >1000 10/8/99 1400
Turbidity >200 10/17/99 430-830

November b61199

Turbidity >200 11/8/99 1030
Turbidity >100 11/9/99 530
Turbidity >100 11/15/99 300
No DO 11/18/99 1200-11/30/99 2330 membrane punctured; data removed

December b61299

No DO 12/1/99 000-12/3/00 1430 membrane punctured; data removed
DO values irregular 12/3/99 1500 - 12/15/99 1100 readings very high, indicate miscalibration
Turbidity >100 12/11/99 530-600, 1930, 2000
Turbidity >100 12/12/99 600, 630
No DO 12/15/99 1130-12/31/99 2330 membrane punctured, removed values

11. Missing Data:

Included in this section are the month and year of data collection, the location, and the file name for that month along with all missing data points.

LOWER BANK

January--ba0199

No data 1/6/99 1900-2100 internal data logger error

No data 1/7/99 130,1030,1330,1530,1630-1800,2130 internal data logger error
No data 1/8/99 000, 100, 1330 internal data logger error
No data 1/9/99 200, 830, 1200, 1300, 1400, 1500-1830, 1930-2330 internal data logger error
No data 1/10/99 000-100, 200, 230, 400, 500-700, 800, 900, 1030, 1100, 1200-1330, 1430-1700, 1800-1930, 2030-2330 internal data logger error
No data 1/11/99 000-300, 400-430, 600, 830, 1000-1130, 1230-1600, 1800, 2030-2100, 2200-2330 internal data logger error
No data 1/12/99 030, 130, 400, 1030, 1130-1330, 1430-1500, 1600, 1700-2200 internal data logger error
No data 1/13/99 000-730, 830-1200, 1300-1500, 1600-1630, 1730-2000, 2100-2200, 2300-2330 internal data logger error
No data 1/14/99 000-100, 230-400, 530-1200, 1300, 1400-1530, 1700-1730, 1830-2130, 2300-2330 internal data logger error
No data 1/15/99 000-100, 200-530, 700-900, 1000, 1100-1330, 1600, 1900, 2200-2330 internal data logger error
No data 1/16/99 030 - 1/20/99 1630 batteries dead

February--ba0299

No data 2/2/99 1530 data logger down for service

March--ba0399

None to report

April ba0499

No data 4/29/99 1330-1400 data logger down for service

May ba0599

No data 5/18/99 600 - 5/26/99 1700

June ba0699

No data 6/11/99 700 - 6/12/99 530 data logger down for service

No DO 6/22/99 1600-6/24/99 800 data indicates puncture; data removed

No data 6/24/99 830 - 6/25/99 1300 data logger down for service

July ba0799

No turbidity 7/1/99 000 - 7/13/99 1230 not enough battery power to operate probe

No turbidity 7/28/99 600-7/31/99 2330 probe out of service

August ba0899

No data 8/1/99 000 internal data logger error

No turbidity 8/1/99 000 - 8/13/99 1330 probe out of service

September ba0999

No data 9/10/99 1330 - 9/10/99 1430 data logger down for service

October ba1099

None to report

November ba1199

None to report

December ba1299

None to report

CHESTNUT NECK

January--ne0199

No data 1/3/99 1100, 1800 internal data logger error
No data 1/4/99 300 internal data logger error
No data 1/5/99 1530 - 1/6/99 1530 data logger down for service
No data 1/7/99 1330 internal data logger error
No data 1/10/99 930 internal data logger error
No data 1/22/99 1200 - 1/25/99 930 data logger down for service

February--ne0299

No data 2/10/99 1200 - 2/15/99 1300 data logger down for service
No turbidity from 2/15/99 1330-2/28/99 2330 probe out of service

March-- ne0399

No turbidity 3/1/99 000 - 3/4/99 830 probe out of service
No data 3/4/99 900-1200 data logger down for service
No data 3/22/99 1230 - 3/23/99 930 data logger down for service

April--ne0499

No data 4/7/99 1300 - 4/8/99 1300 data logger down for service
No data 4/30/99 830 - 4/30/99 1400 data logger down for service

May-- ne0599

No data 5/18/99 1200 - 5/31/99 2330 data logging location (boat dock) under construction

June ne0699

No data 6/1/99 000 - 6/9/99 1400 data logging location (boat dock) under construction
No data 6/24/99 1100-1530 data logger down for service
No pH 6/24/99 1600 - 6/30/99 2330 probe out of service

July ne0799

No pH 7/1/99 000 - 7/7/99 1130 probe out of service
No data 7/7/99 1200 - 7/31/99 2330 data logger down for service

August ne0899

No data 8/1/99 000 - 8/13/99 1300 data logger down for service
No data 8/31/99 930 data logger down for service
DO irregular 8/31/99 1000-2330 removed, data indicates puncture

September ne0999

DO irregular 9/1/99 000-9/14/99 1330 removed, data indicates puncture
No data 9/14/99 1400 - 9/15/99 1430 data logger down for service
No data 9/28/99 1000 - 9/29/99 1000 data logger down for service

October ne1099

No data 10/14/99 1300 - 10/15/99 1030 data logger down for service

November ne1199

No data 11/1/99 1300 - 11/3/99 1530 data logger down for service
No data 11/23/99 900 - 11/23/99 1030 data logger down for service

December-ne1299

No data 12/7/99 1230 - 12/7/99 1630 data logger down for service
No data 12/20/99 900 - 12/21/99 830 data logger down for service

No DO 12/21/99 900 - 12/31/99 2330 probe failure

BUOY 126

January--b60199

No data 1/21/99 1130 - 1/31/99 2330 internal data logger error

February--b60299

No data 2/1/99 000 - 2/5/99 1100 internal data logger error

March--b60399

No data 3/11/99 1130 - 3/16/99 1400 data logger down for service

April--b60499

None to report

May--b60599

No data 5/11/99 1930 - 5/12/99 1800 internal data logger error

No data 5/13/99 1600 - 5/26/99 1230 data logger down for service

June--b60699

No DO 6/1/99 230 - 6/9/99 800 negative and irregular values removed

No data 6/9/99 830 - 6/9/99 1830 data logger down for service

No DO 6/14/99 330 - 6/23/99 800 removed values (<50%) not consistent with prior deployment

No data 6/23/99 830-1600 data logger down for service

No DO 6/30/99 2030 - 2330 removed values which crashed at ~1%, turn negative in b60799

July--b60799

No DO 7/1/99 000 - 7/7/99 930 negative values removed

No data 7/7/99 1000 - 7/12/99 1330 data logger down for service

No DO 7/12/99 1400 removed irregular values of 63% and 4.54 mg/L

No data 7/21/99 1400 data logger down for service

No turbidity data 7/24/99 1300-7/31/99 2330 probe failure, data deleted

August b60899

No turbidity data 8/1/99 000-8/9/99 2130 probe failure, data deleted

No data 8/9/99 2200 - 8/11/99 230 batteries dead

No DO 8/12/99 700 - 8/24/99 900 data deleted due to excessive fouling (values >150%)

No data 8/24/99 930 - 8/25/99 830 data logger down for service

No turbidity 8/25/99 900 - 8/31/99 2330 turbidity probe out of service

September b60999

No turbidity 9/1/99 000 - 9/8/99 1630 turbidity probe out of service

No data 9/8/99 1700 data logger down for service

October b61099

No data 10/6/99 200 - 10/6/99 830 batteries dead

No data 10/19/99 1630 - 10/28/99 900 batteries dead

November b61199

No data 11/18/99 1130 data logger down for service

No DO 11/18/99 1200-11/30/99 2330 membrane punctured; data removed

December b61299

No DO 12/1/99 000-12/3/99 1430 membrane punctured; data removed
No data 12/3/99 1200 data logger out of water during service
No DO 12/15/99 1130-12/31/99 2330 membrane punctured, values removed

12. Other remarks

Other sampling locations were investigated in 1999 using data loggers in the JCNERR. The first site, Tuckerton Creek, is a tidally influenced creek receiving freshwater outflow from Lake Pohatcong. This lake, much like the Mullica River, is characterized by tannic acids leaching from the surrounding Pine Barrens. There is potential for a fish stocking program as well as installation of a fish ladder on this lake. There has also been a recent development of a replica historical community at this site.

The Lower Mullica River data logger station is 2.5 kilometers up the Mullica River from the mouth of the river, and 9.5 kilometers downstream of the Chestnut Neck site. The data logger is attached to the dock of an abandoned hunting lodge located on a narrow 10 meter wide boating channel connecting two segments of the river. The lodge is surrounded on all sides by saltmarsh. Sampling was discontinued at this site due to heavy icing over of the river in winter months.

CALIBRATIONS--All data loggers underwent simultaneous calibrations and were deployed in same controlled environment from approximately 5/18/99 to 5/26/99.

CLOCK--B1261499 clock readings 8/11/99 3:16:48 - 8/24/99 10:46:48 off by 16 minutes, 48 seconds.

DROUGHT--A total of 2.84 inches of rain fell in June of 1999. 1.75 inches fell in July and was considered a summer drought. The drought promptly ended when a total of 6.29 inches of rain fell in the month of August, with two storms bringing the majority of the rain (2.16 inches August 14 and 2.82 inches August 20). Data from sites within the Mullica River show evidence of this drought.

CONSTRUCTION--From 5/18/99 to 5/31/99, the data logging location at Chestnut Neck was under construction. This required a temporary relocation of the data logger to a site approximately 10 feet upriver. The only parameter which showed significant change during this time period was depth. HURRICANE FLOYD--September 16, 1999 Hurricane Floyd passed over the Jacques Cousteau National Estuarine Research Reserve. The effects of this hurricane are reflected in data logger data, most noticeably in temperature and salinity.

CLEANING--August 25, 1999 Buoy 126 was cleaned with a chimney sweep brush. Blue mussels and other fouling organisms were removed. The following dissolved oxygen values fluctuate between 107% and 14% and appear to be legitimate based on post retrieval calibration readings.