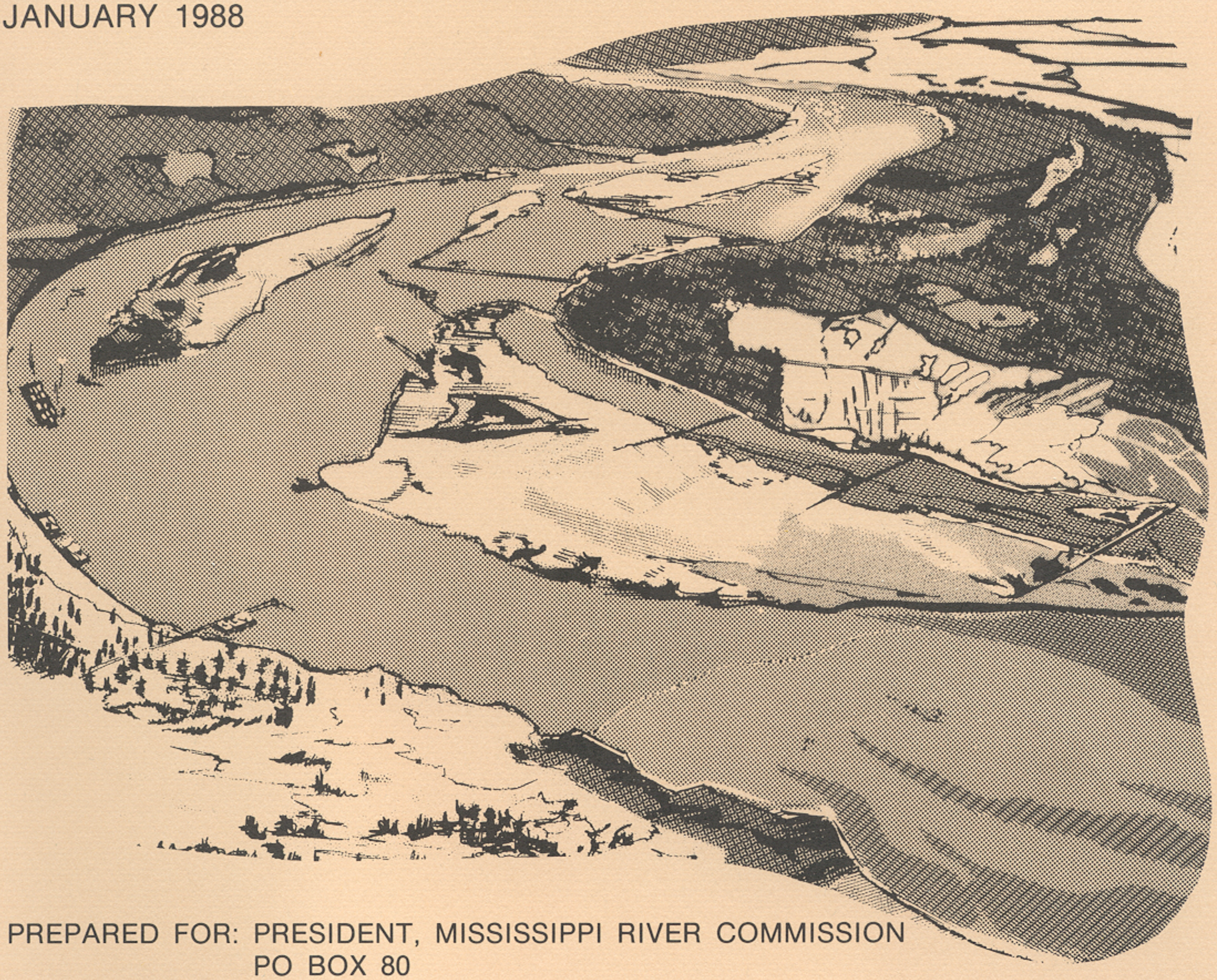
US Army Corps
of Engineers
Mississippi River
Commission

ECOLOGICAL FEATURES OF EDDIES ASSOCIATED WITH REVETMENTS IN THE LOWER MISSISSIPPI RIVER

LOWER MISSISSIPPI RIVER ENVIRONMENTAL PROGRAM

REPORT 8

JANUARY 1988



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A study was conducted from late April through mid-July 1985 to evaluate habitat quality of revetment eddies in the Lower Mississippi River. Sites were established at three locations: river miles 372 (Natchez, Mississippi), 192 (White Castle, Louisiana), and 35 (Port Sulphur, Louisiana). At White Castle, samples were taken at 3-week intervals throughout the study. The Port Sulphur and Natchez sites were visited once in late May/early June. The White Castle eddy was a persistent feature of the river's hydrology. Flow rates were slower in the eddy, and upstream currents were always present at one or more nearshore stations. Variation in current speed and direction was greatest at the eddy's periphery. The Port Sulphur and Natchez eddies were less well defined, and current directions within the eddies were variable.

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19. ABSTRACT (Continued).

Most water quality parameters were not significantly different between microhabitats. Solids and total organic carbon were not associated with a particular habitat or depth. Eddies supported greater deposits of a variety of sediment types depending on current speed and direction. Tubificid worms were very abundant in depositional substrates, while mayflies and mollusks were found most often in sand substrates.

Drifting insects, particularly dipterans, were most abundant in the mainstream at high currents in April and May regardless of diel period. In early June, aquatic insects were most abundant at low-current eddy stations. Diel fluctuations in abundance were evident for Chaoborus spp., mayflies, hemipterans, and mysid shrimp. River shrimp were prevalent at night along nearshore eddy stations in upstream currents. Mysid shrimp were evenly distributed in both habitats but were more abundant at night in April and June.

Zooplankton densities were highest during April when adjacent floodplains were inundated, declining with decreasing river stage. Zooplankton densities were frequently higher nocturnally at lower current velocities, but abundance patterns were variable temporally and among taxa.

Larval fish abundance was not significantly related to habitat or current speed. However, older larvae (freshwater drum) were prevalent in patches within the eddy during early June. Cyprinids were found to be nocturnally abundant, while temperate basses, shads, and freshwater drum exhibited diurnal abundance peaks. Utilization of the eddy by different species was not generally related to diel period. However, temporal microhabitat preferences were evident among the developmental stages of drum.

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PREFACE

The Lower Mississippi River Environmental Program (LMREP) is being conducted by the Mississippi River Commission (MRC), US Army Corps of Engineers. It is a comprehensive program of environmental studies of the leveed floodplain of the lower Mississippi River and the main stem Mississippi River and Tributaries Project (MR&T). Results will provide the basis for recommending environmental design considerations for the navigation and flood control features of the MR&T Project.

One component of the LMREP is the Revetment Investigation. This report contains results of a study documenting the distribution and relative abundance of invertebrates and ichthyoplankton associated with three revetment eddies in the Lower Mississippi River. Data were collected between river miles 35 and 372 from April through July 1985.

Biological and physical data were collected by individuals from the Louisiana Cooperative Fish and Wildlife Research Unit, Louisiana State University, and the US Army Engineer Waterways Experiment Station (WES). This report was prepared by Mr. Steven P. Zimpfer and Drs. William E. Kelso and C. Fred Bryan, Louisiana Cooperative Fish and Wildlife Research Unit, and Dr. C. H. Pennington, WES.

The investigation was managed by the Planning Division of the MRC and was sponsored by the Engineering Division, MRC. Mr. Stephen P. Cobb (MRC) was the program manager for the LMREP. The investigation was conducted under the direction of the President of the Mississippi River Commission, BG Thomas A. Sands, CE.

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LOWER MISSISSIPPI RIVER ENVIRONMENTAL PROGRAM

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PART I: INTRODUCTION

Background

Area investigated

1. The Mississippi River is the fourth largest drainage basin in the world (1,245,000 square miles), exceeded in size only by watersheds of the Amazon, Congo, and Nile Rivers. The river drains 41 percent of the contiguous 48 United States and a portion of Canada.

2. The lower Mississippi River flows from the confluence of the Ohio and Middle Mississippi Rivers at Cairo, Illinois, to the Gulf of Mexico, a distance of approximately 975 river miles (RM). At Vicksburg, Mississippi (RM 437), approximately midway along the Lower Mississippi River, the mean annual discharge of the river is 552,000 cubic feet per second (cfs); the mean monthly maximum and minimum flows are 948,000 cfs in April and 261,000 cfs in September, respectively. The maximum discharge recorded at the Vicksburg gage was 1,806,000 cfs during the flood of 1927; the discharge during this flood has been estimated to have been 2,278,000 cfs due to an additional 472,000 cfs that escaped through crevassed mainline levees (Tuttle and Pinner 1982). The difference in river stage between the average minimum discharge and the average maximum discharge is about 27 feet on the gage at Vicksburg, although river stage may fluctuate more than 45 feet in stage in a particular year. Suspended sediment transported by the river averages 161 million tons per year (Keown, Dardeau, and Cousey 1981).

3. Flooding along the river may occur during the fall, winter, and spring and varies considerably in time, stage, and duration from year to year. Highest stages are typically reached from March through May; peak flows usually occur in April.

4. The approximately 2.5 million acres of leveed floodplain are composed of 81 percent land and 19 percent water, including abandoned channels, oxbow lakes, levee borrow pits, and the main river channel (Ryckman, Edgerly, Tomlinson and Associates 1975). The floodplain of the Lower Mississippi River

is leveed along both banks. The main stem levees are continuous on the west bank except at the confluences of the St. Francis River and the Arkansas-White Rivers. Levee segments and bluffs alternate on the east bank. A system of dikes and revetments is being constructed throughout the river for navigation and flood control purposes.

5. The dike systems investigated are found in the central reach of the Lower Mississippi River between RM 320 and 610, Above Head of Passes (AHP). This reach encompasses the jurisdictional area of the US Army Engineer District (USAED), Vicksburg.

Mississippi River and Tributaries (MR&T) Project

6. Along the course of the Lower Mississippi River and on the associated floodplain, flooding has historically been a major deterrent to development. For example, destructive floods occurred in 1849, 1858, 1882, 1897, 1912, 1913, 1916, 1922, 1927, 1937, and 1973. The Mississippi River Commission (MRC) was established by Congress in 1879 to develop and carry out flood control and navigation measures for the Lower Mississippi River that would be financed by the Federal Government.

7. The devastating flood of 1927, the flood of record, destroyed many existing levees, flooded large areas of farmland and numerous municipalities, and caused loss of livestock and human life in the Lower Mississippi Valley. This flood motivated Congress to pass the Flood Control Act of 1928, which authorized the Mississippi River and Tributaries (MR&T) Project. The MR&T Project is a comprehensive plan for flood control and navigation works on the main stem Lower Mississippi River and tributary streams and consists primarily of levee systems, channel improvement works, and floodways. The MRC is responsible for carrying out the project.

Lower Mississippi River Environmental Program (LMREP)

8. The LMREP is being conducted by the MRC. This 7-year program has as objectives the development of baseline environmental resources data on the river and associated leveed floodplain and the formulation of environmental design considerations for channel training works (dikes and revetments) and the main stem levee system. The LMREP was initiated in fiscal year 1981 and is scheduled for completion in fiscal year 1987. Fishery and wildlife populations and habitat are the main focus of the LMREP. The LMREP is made up of

five work units: (a) levee borrow pit investigations, (b) dike system investigations, (c) revetment investigations, (d) habitat inventories, (e) and development of the Computerized Environmental Resources Data System (CERDS), a geographic information system containing environmental data.

Revetment Investigation

9. The ecological investigation of revetments in the Lower Mississippi River has as objectives the following:

- a. To develop an understanding of the ecological characteristics and functions of revetments in the riverine ecosystem of the Lower Mississippi River.
- b. To formulate and test environmental design considerations for revetments in the Lower Mississippi River.

10. The revetment investigation (RI) consists of several major tasks: (a) a physical description of revetted bank habitat, (b) assessment of aquatic communities associated with revetments, (c) testing of modifications in the ACM surface for environmental improvement and, (d) evaluation of the ecological environmental design considerations. The RI is scheduled for completion in fiscal year 1987. This report contains results of a study that was designed to evaluate the ecological characteristics of eddies that occur along revetted banks in the Lower Mississippi River. Specifically, the following objectives of the study were:

- a. To relate variations in selected physicochemical features of revetment eddies and main channel habitats to the distribution and abundance of larval fishes, invertebrates, and zooplankton.
- b. To determine the habitat value of eddies found along revetted banks.

Lower Mississippi River revetment

11. Revetment constructed in the Lower Mississippi River is made of articulated concrete mattress (ACM). This type of revetment is comprised of blocks of concrete aggregate 14 inches wide by 4 feet long and 3 inches thick tied together to form a mattress. The ACM is laid on the graded river bank from just above the low-water elevation to the bottom of the bank slope. The upper bank area is graded and paved with riprap stone (asphalt was used prior to the 1960's). To date, approximately 850 miles of revetment have been constructed in the lower river.

12. The ACM revetment is designed to stabilize the bank where erosion threatens the levee system or to maintain a desired channel alignment. Revetment is commonly placed on the outside of bends where erosion is active, but may also be used in straight reaches.

PART II: METHODS

Study Area

Lower Mississippi River

13. The eddies under study were located along revetted banks of the Lower Mississippi River between Natchez (RM 372) and Port Sulphur (RM 35). All eddies were associated with emarginations of revetted shorelines; revetment consisted of articulated concrete mattresses and limestone rip-rap. The Port Sulphur eddy (RM 35) was located on the right bank along the Port Sulphur revetment approximately 4 miles downstream of Port Sulphur (RM 35) (Figure 1). The eddy was approximately 25 meters long and 20 meters wide when sampled in early June (the river stage was approximately 2.7 feet on the Venice gage). The White Castle eddy (RM 192) was located approximately 2 miles downstream of Bayou Goula Towhead on the right bank along the White Castle Revetment. The eddy was approximately 50 meters long and 25 meters wide at high stage (24.8 feet at the Donaldsonville gage). The northernmost site was approximately 9 miles upstream of Natchez near RM 372. The Natchez eddy, approximately 120 meters long and 90 meters wide in late May, was located along the Gibson Revetment on the right bank of the river.

Field and Laboratory Techniques

14. Sixteen stations were established at each locality (Figure 2). Ten stations were located within the eddy along Transects B, C, and D, while three mainstream stations were placed both upstream and downstream of the eddy along Transects A and E. Eddy boundaries were determined by tracing the course of a drogue as it drifted downstream past the eddy. Stations were marked with anchored buoys, and sampling was accomplished at each station while the research vessel was moored to the appropriate buoy.

15. The White Castle eddy was sampled five times from late April to mid-July 1985. Sampling dates were 23-25 April (Trip 1), 14-15 May (Trip 2), 5-7 June (Trip 3), 25-26 June (Trip 4), and 17-19 July (Trip 5). Drifting macroinvertebrates and ichthyoplankton were collected during each period, while zooplankton and benthic macroinvertebrates were collected only during the first, third, and fifth trips.

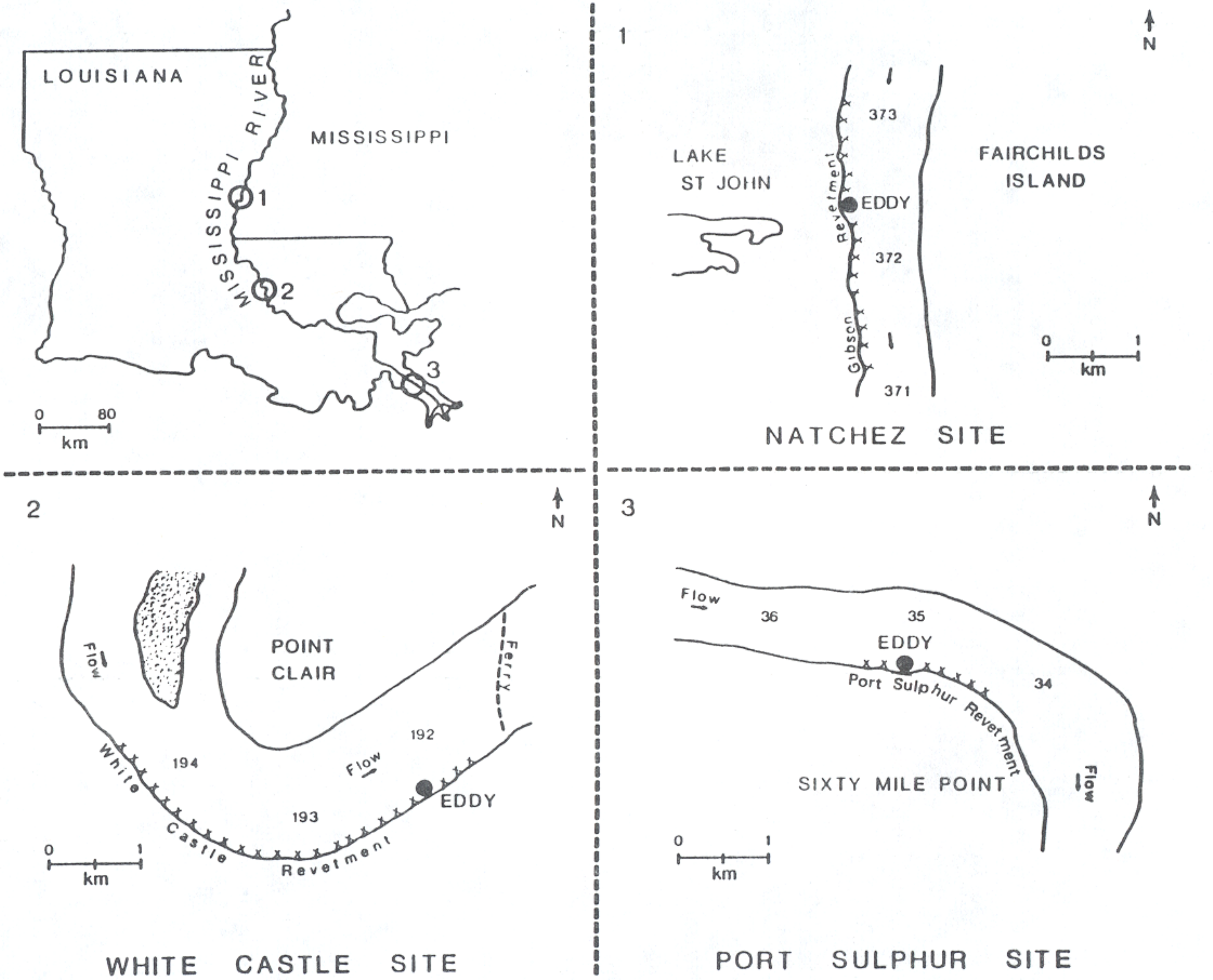

Figure 1. Study area

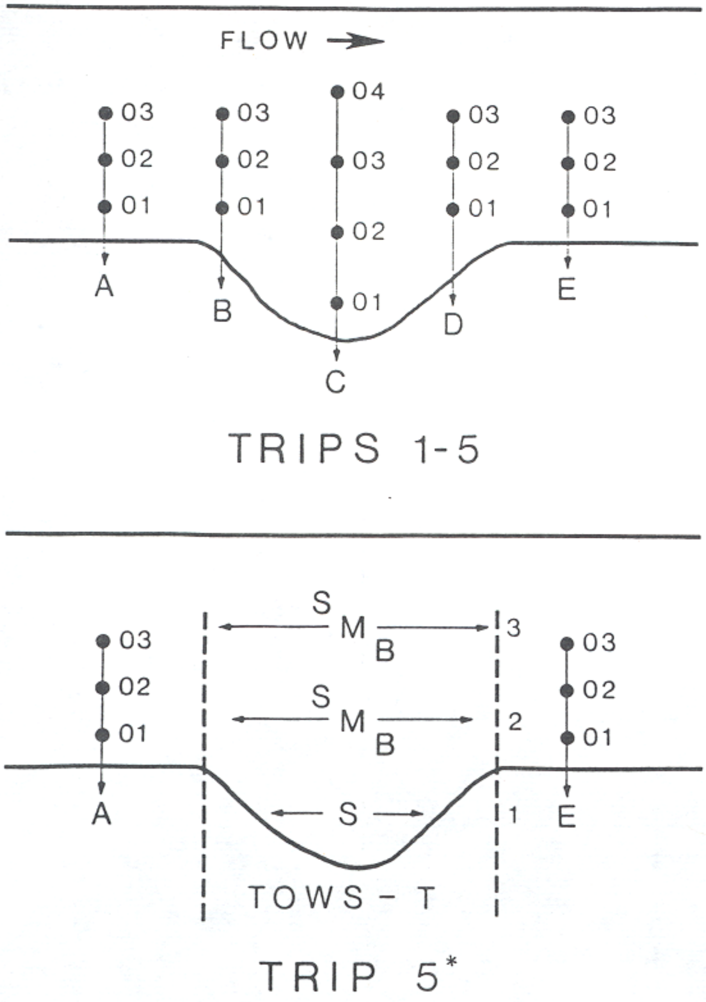

Figure 2. Diagram of station and transect configurations (larval fishes, zooplankton, and invertebrates were collected by towing in the eddy: S = surface, M = mid-depth, B = bottom)

16. The Port Sulphur and Natchez eddies were sampled only during the third sampling effort. The Port Sulphur eddy was sampled from 29-31 May, and the Natchez eddy was sampled from 2-3 June. Collections were limited to daylight hours. Benthos, drifting invertebrates and larval fishes, sediments, water samples, current measurements, and water quality data were collected at both locations.

Physical and chemical measurements

17. Water quality data were collected using a Hydrolab water quality instrument (Model 8000). Water temperature (C), pH, dissolved oxygen (mg/ℓ),

and conductivity (umhos/cm) were measured in situ at 2-m intervals throughout the water column at each station. Measurements were taken both day and night on all occasions after Trip 1. Water quality data were collected only during the day on Trip 1.

18. Measurements of current speed and direction were made with an Endeco current meter. Current readings were recorded at 2-m intervals throughout the water column, and profiles of flow rates and water quality measurements were compiled for each station.

19. A Van Dorn water sampler was used to collect 500 ml of water near the surface and bottom at two stations upstream, two downstream, and five within the eddy. Each sample was partitioned into two 250-ml water bottles. Samples tested for total organic carbon were fixed with 2 ml of concentrated hydrochloric acid and held on ice. Laboratory analysis for filterable (dissolved) and non-filterable (suspended) solids was conducted according to the glass fiber method described by the Environmental Protection Agency (EPA 1971). Total organic carbon was measured with an Ionics TOC analyzer (Model 1270M).

Sediments and benthic invertebrates

20. A Shipek dredge was used to collect bottom sediments from each station. A visual classification of each sediment sample was made in the field and each sediment sample was also analyzed for grain size (Department of the Army, 1970). Sediments were classified as gravel, sand, silt-clay, and revetment (no sediment).

21. Benthic invertebrates were collected from a second grab at each station where sediments were encountered. Grab samples were sieved in the field using a US Standard No. 30 mesh screen and were preserved in 10 percent buffered formalin. In the laboratory, samples were sorted and identified under 3X magnification. Oligochaetes were cleared in lactophenol to enhance their identification. All specimens were transferred to 70 percent ethanol for storage.

Drifting macroinvertebrates

22. Drifting macroinvertebrates were collected at all 16 stations, except during Trip 5 due to low current velocities. At the White Castle site, where sampling occurred night and day, 64 samples were gathered during each trip. At Port Sulphur and Natchez, where sampling was limited to daylight hours, 32 samples were taken.

23. Invertebrates were collected with 0.5-m conical nets of 0.505-mm nytex mesh. The nets were mounted side by side on an aluminum frame affixed to a steel cable. Nets were deployed using a boom and an electric winch. A lead depressor weight was attached to the end of the cable to minimize the angle of descent. The boat was tethered to an anchored buoy, and duplicate depth-integrated samples were taken by lowering the nets to within 1 m of the bottom and raising them through the water column to the surface (Figure 3). As the nets were raised, passive sampling was accomplished by allowing the nets to fish at every 2-m interval for a predetermined length of time. (The length of each tow was determined by using current profiles at each station to predict the length of time needed to filter a target volume of 50 m^3.) Depth intervals were estimated with the depth sensor on the Endeco current meter. A General Oceanics flow meter (Model 2030) was mounted in the mouth of each net and the volume of water filtered was estimated for each sample (Volumes ranged from 1 to 109 m^3 with a mean of 41 m^3).

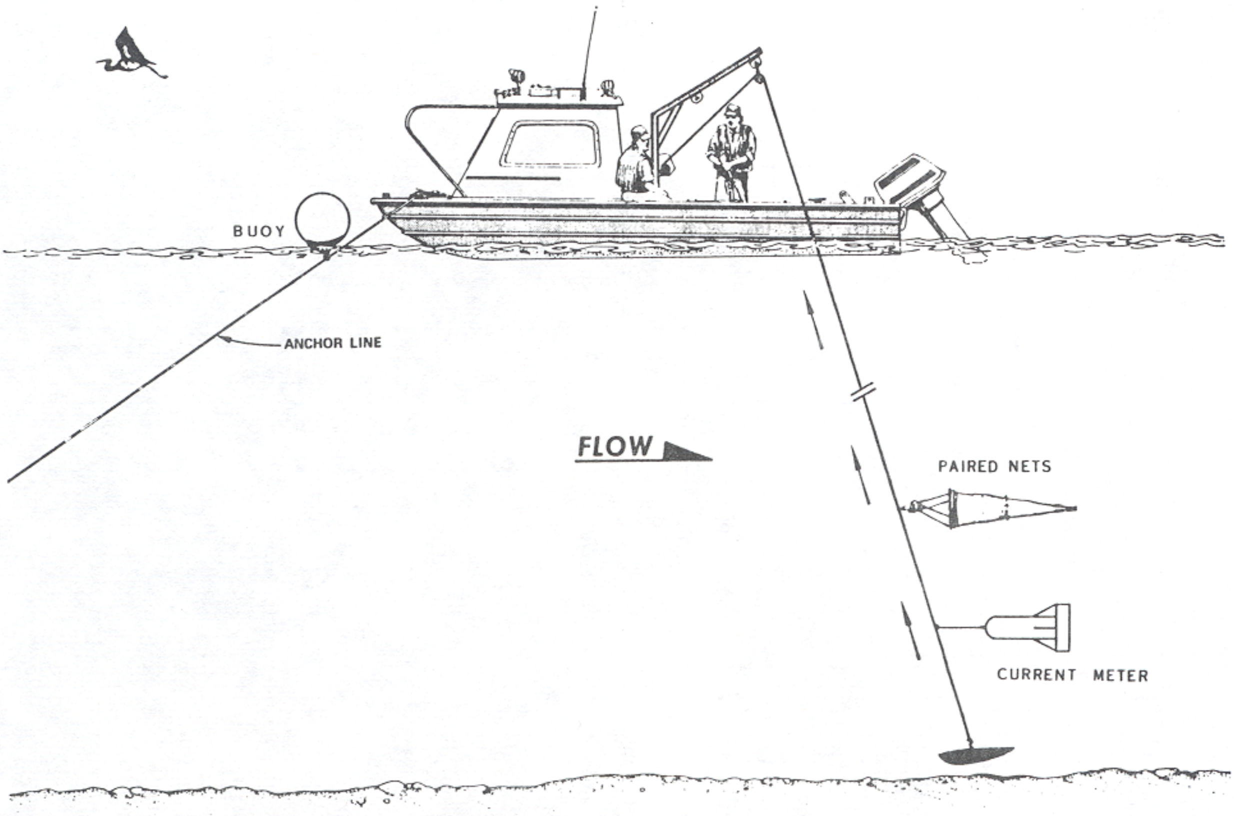

Figure 3. Schematic representation of sampling techniques

24. In July, low current velocities made passive fishing impractical. As a consequence, a different sampling technique was employed within the White Castle eddy during Trip 5. Drifting invertebrates were collected by towing the nets the length of the eddy along three separate transects (Figure 2). Tows were taken at the surface, middepth, and bottom at Transects 2 and 3, although discrete sampling beneath the surface was not achieved because the nets were neither closed prior to sampling, nor upon recovery. The depth of the river at Transect 1 permitted only surface tows. Four samples were taken at each transect-depth, increasing the number of eddy samples from 40 to 56. (Sampling at all mainstream stations was consistent with previous sampling efforts.)

25. Drifting macroinvertebrates were initially fixed in 10 percent formalin. In the laboratory, they were sorted and identified under a dissecting microscope. Specimens were cataloged and later stored in alcohol.

Zooplankton

26. Zooplankton were sampled only at White Castle, and collections were taken only during the first, third, and fifth trips. Thirty-six samples were gathered during each of the first two trips, as duplicate samples were taken both day and night at nine stations, five within the eddy and two each above and below the eddy. Seventy-two samples were collected during Trip 5. Fifty-six were taken by active towing within the eddy, and 16 were taken by passive netting in the main channel.

27. Field techniques were similar to those used to collect drifting macroinvertebrates and ichthyoplankton, with two exceptions. Zooplankton were sampled with 0.5-m nets of 80-micron mesh. The mesh size was much smaller than that used to collect invertebrates and larval fishes, and as a consequence, zooplankton nets were often clogged with suspended sediment upon retrieval. Therefore, the duration of each tow was shortened considerably, usually lasting less than two minutes.

28. Sampling techniques were again modified during Trip 5, wherein horizontal tows were made across stations in the eddy because of low current velocities. Sampling remained consistent with previous efforts at stations upstream and downstream of the eddy.

29. Zooplankton samples were concentrated to a volume of 600 ml and stained with Rose Bengal. Each sample was agitated with a magnetic stirrer to ensure homogeneity of distribution. Three 1-ml subsamples were placed in a

Sedgewick-Rafter counting chamber for enumeration and identification using a dissecting microscope.

Ichthyoplankton

30. Ichthyoplankton were obtained from the drifting macroinvertebrate samples. For a detailed account of field techniques, see paragraphs 22-24. In the laboratory, larval fishes were separated from invertebrates and identified under a dissecting microscope. A developmental stage was assigned to each specimen using terminology established by Snyder (1976). After verification each sample was stored in 3-5 percent buffered formalin.

Analyses and Presentation of Data

31. T-tests were performed to test for differences in flow rate, temperature, dissolved oxygen, pH, conductivity, solids, and total organic carbon between eddy and mainstream microhabitats on each sampling date. Relationships of depth (surface/bottom) to solids and total organic carbon concentrations were also assessed with T-tests.

32. Two-way analysis of variance was used to determine the effects of habitat (eddy/mainstream) and diel periodicity (defined in this report as diurnal versus nocturnal) on the number of three taxonomic groups (drifting invertebrates, zooplankton, and larval fishes) captured during each trip. Identical analyses were also conducted on abundant taxa within each of the three major groups. Because the distribution of decapod crustacean catches was highly variable, numbers were log transformed prior to analyses to stabilize the variance. The effects of microhabitat and diel period on the distribution and abundance of developmental stages of freshwater drum were also investigated (Trips 2-4) using a two-way analysis of variance. Stations having an inadequate volume of water filtered were omitted.

33. Because of different sampling techniques during Trip 5, analysis of variance procedures were performed only on data collected by active towing within the eddy. The effects of transect (1,2,3), depth (surface, middepth, bottom), and diel periodicity were analyzed separately for drifting invertebrates, zooplankton, and larval fishes. As before, major taxonomic groups were tested in addition to total catch, and freshwater drums were partitioned into developmental stages for analysis of microhabitat preferences and diel periodicity of movement.

34. Pearson correlation coefficients were computed to compare the numbers of invertebrates, zooplankton (when applicable), and larval fishes with mean current velocity at each station during each trip. Data from Trip 5 were excluded because correlations between organisms and current were not possible due to slack water or low current velocities at several stations.

35. Statistical tests were not performed on sediments and benthic macroinvertebrates. ACM covered most of the bottom of the eddies, and dredge samples from these locations frequently yielded little sediment and few organisms. Overall, less than half of the eddy stations and only 10 percent of the mainstream stations were covered with sediment.

PART III: RESULTS

Eddy Habitats

White Castle

36. Trip 1. River stage was highest and currents greatest during Trip 1 (Table 1). The eddy was well defined, as six stations were characterized by upstream flow (Figure 4). The swiftest currents were measured at mainstream stations while minimal current speeds (0.3 m/sec) were observed at nearshore stations. Substantial change in current direction with depth (i.e., $\Delta°$ per meter depth) was observed at stations near shore (C01), in the center of the eddy (B02, D03), and at the eddy periphery (C04).

37. Trip 2. During Trip 2, the width of the eddy decreased to approximately 20 m. Mean current speed was still very high in the mainstream (0.7 m/sec) but was greatly reduced in the eddy (0.3 m/sec) (Table 1). Seven stations were characterized by upstream flow (Figure 4). The swiftest currents were recorded at mainstream stations, while most of the slowest currents were observed in the eddy (Table A2). Within the eddy, surface currents were greatest at peripheral and nearshore stations (Table A2). Current direction was highly variable near the eddy periphery.

38. Trip 3. By Trip 3, the river stage at Donaldsonville had fallen to 10.8 ft (Figure 4). Currents were still significantly higher in the mainstream, but the difference between eddy and mainstream current speeds was less substantial than during previous trips (Table 1). Upstream current vectors were observed at six stations (Table 1) (Figure 4). Mean current speed (i.e., average value for all depths combined) was highest at river stations above the eddy (approximately 0.7 m/sec) and lowest at mid-eddy and nearshore eddy stations (0.1 m/sec). Mid-eddy stations were most variable in current direction within the water column.

39. Trip 4. A slight increase in river stage (2.5 ft) had occurred by 25-26 June. Even so, average current speeds were the slowest observed in the mainstream, and for the first time were not statistically different from the eddy (Table 1). The eddy was poorly defined and net downstream movement was noted at mid-eddy and nearshore eddy stations. Upstream currents were observed at only four stations (Figure 4) and there was no clear pattern of flow to characterize the eddy. High velocity currents (0.6 m/sec) were noted

Table 1

Current (Velocity, m/sec; Direction Range, 0° True North) and Water Quality Characteristics Relative to Flow Regime in the Lower Mississippi River, 23 April Through 13 July 1985

Date	Location	Flow Regime	Velocity		Direction	Temperature (°C)		DO (mg/l)		pH		Conductivity	
			Mean	Range	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
23 April	White Castle	Eddy	0.5	0.1-1.2	15-340	16.8*	16.7-16.9	7.8	7.3-8.1	7.5*	7.3-7.9	300	289-311
		Mainstream	0.8*	0.4-1.1	25-60	16.7	16.7-16.8	8.0*	7.8-8.2	7.4	7.3-7.5	306*	298-310
14-15 May	White Castle	Eddy	0.3	0.1-0.7	30-350	22.1	22.0-22.2	6.4	6.0-6.9	7.3	7.1-7.6	353	313-375
		Mainstream	0.7*	0.2-1.1	35-60	22.1	21.9-22.5	6.5*	6.2-6.9	7.4*	7.1-7.6	359	334-378
29 May	Port Sulphur	Eddy	0.3	0.1-0.6	45-310	24.0*	23.9-24.2	6.2	5.9-6.7	7.4	7.3-7.7	428	423-434
		Mainstream	0.5*	0.2-0.6	60-105	23.9	23.9-24.1	6.2	6.0-6.4	7.4	7.3-7.6	426	405-432
2 June	Natchez	Eddy	0.5	0.1-1.1	0-325	24.3	24.2-24.5	7.1	6.4-7.4	7.3	7.2-7.4	397	395-398
		Mainstream	0.7*	0.1-1.5	60-330	24.3	24.3-24.8	7.0	6.0-7.4	7.4*	7.2-7.4	397	396-401
6-7 June	White Castle	Eddy	0.4	0.1-0.6	5-315	26.0	25.9-26.2	6.6	5.8-7.0	7.4	7.2-8.0	406	389-428
		Mainstream	0.5*	0.3-0.7	25-260	26.1	26.0-26.4	6.8*	6.6-7.0	7.4	7.2-7.9	404	381-416
25-26 June	White Castle	Eddy	0.4	0.1-0.8	5-190	26.5	26.4-26.7	6.9	6.4-7.5	7.7	7.5-7.9	405	360-415
		Mainstream	0.4	0.3-0.7	25-45	26.6	26.4-26.7	7.0	6.4-7.5	7.8	7.5-7.9	405	398-415
17-18 July	White Castle	Eddy	0.2	0.0-0.5	15-340	28.8	28.7-28.9	7.0	6.4-7.5	7.5	7.3-7.6	427	424-433
		Mainstream	0.6*	0.4-0.8	15-50	28.8	28.8-28.9	7.2*	6.6-7.5	7.5	7.3-7.6	428	424-433

* Mean value of the designated variable is significantly greater ($\sigma = 0.05$) than that of the alternate flow regime.

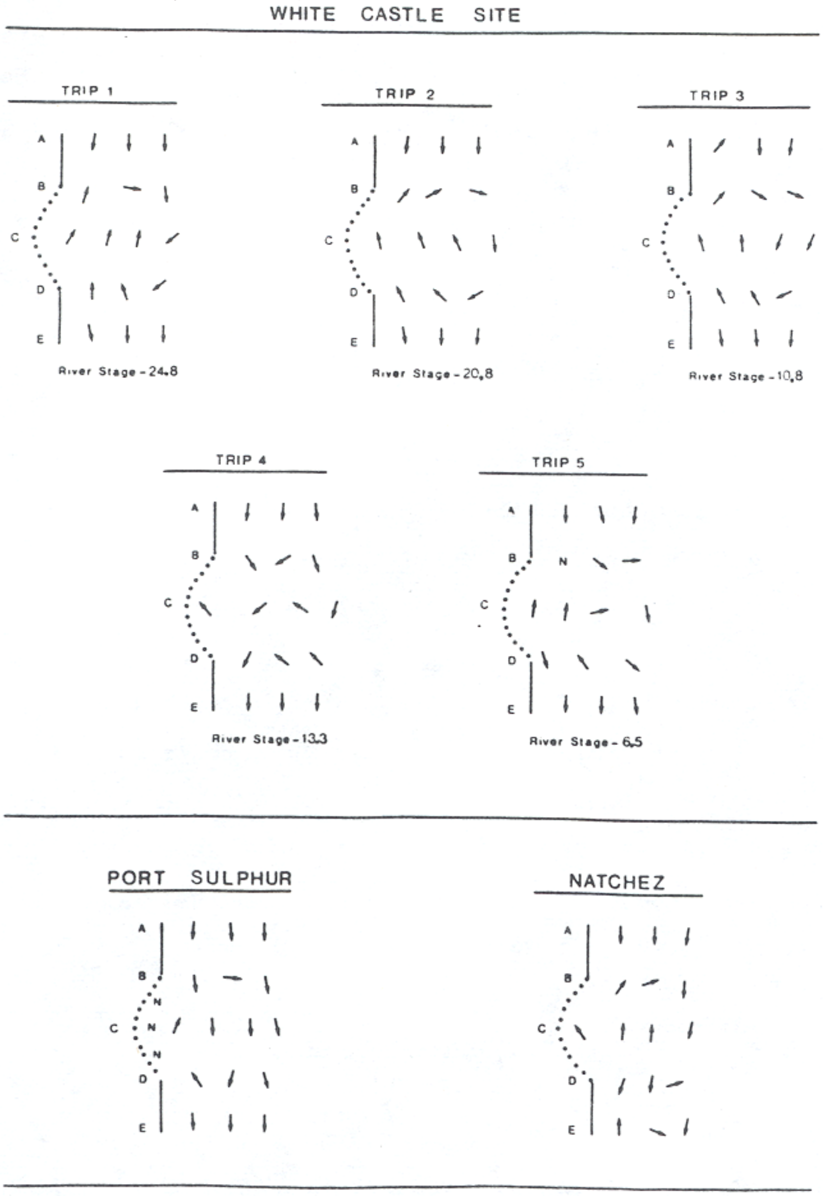

Figure 4. Diagrammatic representation of mean current directions at White Castle, Port Sulphur, and Natchez (Areas without current are marked with an "N." River stages were recorded at Donaldsonville, Louisiana)

within and below the eddy, with the slowest currents near the shoreline (0.1 m/sec). Variation in current direction within the water column was greatest at mid-eddy stations.

40. <u>Trip 5.</u> In July, the river stage (6.5 ft at Donaldsonville) was the lowest recorded during the study. The size of the eddy had decreased to

approximately 30 meters long by 12 meters wide. Mean current velocities increased in the mainstream but decreased to a low of 0.2 m/sec in the eddy. Upstream currents were noted at only three stations; water entered the eddy at D02 and flowed upstream through C01 and C02. No flow was recorded further upstream within the eddy. Mean flow rates were greatest at mainstream stations below the eddy (0.7 m/sec). Current direction was again most variable near the eddy's periphery.

Port Sulphur

41. At the Port Sulphur eddy, currents in the mainstream were significantly faster than currents in the eddy (Table 1). Mean flow rates did not exceed 0.2 m/sec at the first two transects in the eddy, and the area nearest the shore had no detectable current (Figure 4). Currents were highly variable at the top and bottom of the eddy, but there was little variation in direction elsewhere. Upstream flow was recorded only at shoreline stations.

Natchez

42. At the Natchez site, maximum current velocities were measured at mainstream stations (1.0 m/sec). However, the slowest currents were also located in the mainstream below the eddy (approximately 0.2 m/sec). Upstream currents were measured at nearshore and mid-eddy stations. Highly variable currents at stations in the D and E transects indicated that the lower boundary of the eddy was not well defined.

Water Quality

43. Water quality did not differ statistically among stations on most sampling dates (Table 1). Water temperatures were significantly higher at eddy stations than at mainstream stations at the White Castle site during Trip 1, and at Port Sulphur. Dissolved oxygen levels were significantly higher at mainstream stations near White Castle on four of five occasions. The pH was higher in the mainstream at White Castle during Trip 2 and at Natchez during Trip 3. However, pH was higher in the White Castle eddy during the first trip. Conductivity was statistically greater in the mainstream at White Castle during April, but it was generally unrelated to microhabitat throughout the remainder of the study.

Suspended and Dissolved Solids and Total Organic Carbon

44. Suspended solids and total organic carbon were not significantly related to depth or microhabitat (defined in this report as eddy versus mainstream) throughout the study (Table 2). Total and dissolved solids exhibited significant differences between microhabitats at White Castle during Trip 3, as both were higher in mainstream stations.

Sediments

White Castle

45. Altogether, sediments were collected at less than 30 percent of the stations at White Castle, as scouring by water currents apparently kept large portions of the concrete mattresses swept clean. In April, sediments were collected at seven stations, five within the eddy and two in the mainstream. Both mainstream samples were primarily sand (Figure B1). Within the eddy, two stations were also classified as sand (97 percent), one as silt-clay, and two were characterized by mixtures of sand and silt. In June (Trip 3), samples were collected at only one mainstream and two eddy stations; all were predominantly sand. In July (Trip 5), samples were collected from silt-clay, sand, and sand and silt sediments. All mainstream stations were without sediment.

Port Sulphur

46. Sediment deposition was most prevalent at Port Sulphur, where 90 percent of the eddy stations contained sediments. This was expected, since eddy current speeds at Port Sulphur were among the slowest observed during the study. In general, silt-clay was collected at nearshore stations, while sand was collected with increasing frequency at the outer stations (Figure B2). Exposed concrete mattresses occurred at one eddy and all mainstream stations.

Natchez

47. At Natchez, revetment was exposed at all but three stations. Of those three, one yielded a mixture of sand and gravel, one was predominantly silt (99 percent), and one was mostly sand (Figure B2).

Table 2

Solids and Total Organic Carbon Relative to Depth and Flow Regime in the Lower Mississippi River, 23 April Through 16 July, 1985

Date	Location	Depth Flow Regime	N	Total Solids (mg/l) Mean	Total Solids (mg/l) Range	Suspended Solids (mg/l) Mean	Suspended Solids (mg/l) Range	Dissolved Solids (mg/l) Mean	Dissolved Solids (mg/l) Range	Total Organic Carbon (ppm) Mean	Total Organic Carbon (ppm) Range
23 April	White Castle	Surface	9	311	292-350	226	211-250	85	77-106	4.4	4.0-5.2
		Bottom	5	308	278-331	231	213-249	77	65-87	4.4	4.2-4.7
		Eddy	8	306	278-331	224	211-249	82	65-97	4.4	4.0-5.2
		Mainstream	6	316	293-350	233	215-250	83	71-106	4.3	4.1-4.5
30 May	Port Sulphur	Surface	9	357	326-423	274	256-335	83	69-94	4.6	4.4-5.1
		Bottom	6	365	343-395	270	261-285	95	81-134	4.7	4.4-4.9
		Eddy	8	364	326-423	275	257-335	90	69-134	4.7	4.4-5.1
		Mainstream	7	355	340-366	270	256-283	85	81-92	4.6	4.4-4.9
2 June	Natchez	Surface	9	465	427-510	341	319-385	123	104-143	4.6	3.5-5.0
		Bottom	5	446	397-483	317	258-354	129	124-139	4.8	4.6-4.9
		Eddy	8	452	397-510	328	258-385	124	104-139	4.5	3.5-4.8
		Mainstream	6	467	443-483	340	319-367	127	116-143	4.8	4.6-5.0
4 June	White Castle	Surface	9	414	384-431	274	249-291	140	132-151	5.2	4.6-5.7
		Bottom	5	401	383-409	265	254-279	136	127-142	5.2	4.9-5.5
		Eddy	8	403	383-413	267	249-279	136	127-142	5.1	4.6-5.6
		Mainstream	6	419*	404-431	276	262-291	144*	137-151	5.4	5.1-5.7
16 July	White Castle	Surface	9	400	272-493	264	197-293	136	75-233	4.7	4.4-5.5
		Bottom	5	399	376-415	262	256-265	137	114-150	4.5	4.3-4.8
		Eddy	8	418	376-493	270	256-293	148	114-233	4.6	4.3-5.5
		Mainstream	6	375	272-410	254	197-272	121	75-146	4.6	4.3-4.9

* Variable mean is significantly greater (σ = 0.05) within the designated flow regime.

Benthic Macroinvertebrates

White Castle

48. Trip 1. During Trip 1, the most abundant benthic invertebrates were oligochaetes (Table C1). Tubificids were present at all of the eddy stations that yielded sediment and were extremely abundant in sand and silt substrates. Pelecypods were present at the eddy stations where sand had settled, while dipterans were scattered throughout the eddy. *Cryptochironomus* spp. were prevalent in sand, *Chernovskiia orbicus* and *Robackia claviger* were predominant in mixed sand (65 percent) and silt (35 percent), and *Rheotanytarsus* spp. were present only in silt-clay. Benthic invertebrates were absent from samples collected at the two mainstream stations.

49. Trip 3. During Trip 3, tubificid worms were again the most abundant organisms. Numbers were lowest in the mainstream and highest at C01, the eddy station with the lowest flow rate. Gastropods and pelecypods were present in eddy and river sediments. *Chernovskiia orbicus*, the only dipteran, was present only in mainstream sediments.

50. Trip 5. During Trip 5, the benthic community was comprised of oligochaetes, mayflies (*Pentagenia vittigera*), and caddisflies (*Hydropsyche orris*). Oligochaetes were the most abundant organisms, with highest densities at D02, a station characterized by silt-clay deposition. Mayflies and caddisflies were found exclusively in sand substrates within the eddy.

Port Sulphur

51. The benthic community was most diverse at Port Sulphur, where currents were slow and sediment collections were common in the eddy (Table C2). However, no benthic macroinvertebrates were collected in the mainstream microhabitat. Oligochaetes were present at all stations but were most abundant at C01 and D01, where flow rates were low and silt-clay was deposited. Identifiable tubificids included *Aulodrilus pigueti*, *Limnodrilus cervix*, *L. hoffmeisteri*, *L. maumeensis*, and *L. udekemeanus*. Dipterans were distributed throughout the eddy, and included *Chaoborus* spp., *Harnischia curtilamellata*, *Polypedilum halterale*, *Bezzia* spp., and *Cryptochironomus* spp. Mayflies were present in sand at the three peripheral eddy stations, and one, *Pentagenia vittigera*, was the most abundant invertebrate collected at B03. Pelecypods appeared exclusively in sand.

Natchez

52. At Natchez, oligochaetes comprised all or most of the catch at mid-eddy stations. Tubificids were most abundant in silt-clay but were also abundant in fine sand. The highest diversity of organisms occurred at C04, a station with coarse sand and gravel substrate. Amphipods (*Gammarus fasciatus*), caddisflies (*Potamyia flava*), dipterans (*Polypedilum convictum*, *Robackia claviger*), and pelecypods (*Corbicula* sp., *Lampsilis* sp.) were all present, while tubificids were notably absent (Table C2).

Drifting Macroinvertebrates

White Castle

53. Trip 1. Abundance and diversity of drifting invertebrates were highest during April (Tables D1 and D2). Dipterans, river shrimp, mayflies, and mysid shrimp were the most abundant invertebrate groups. Coelenterates, *Hydra* spp. and *Cordylophora* spp., were also encountered but were not enumerated. Chironomidae, unidentified dipteran imago, and Culicidae (*Chaoborus* spp.) were the predominant dipterans, while the most abundant mayflies were in the family Heptageniidae (primarily *Stenonema integrum*).

54. Two groups exhibited density differences between eddy and mainstream microhabitats. Dipterans were found to be significantly more abundant nocturnally at mainstream stations, while the river shrimp *Macrobrachium ohione* was more abundant in the eddy (Table 3). River shrimp were collected at 60 percent of the eddy stations but were found at less than 20 percent of the mainstream stations. At night, the largest numbers of shrimp (94 percent of the total) were collected from eddy stations located near the shoreline. Ninety percent of the river shrimp collected during the first trip were caught at night, but the difference was not statistically significant ($P = 0.13$), due to a large variance between samples. There was no statistically significant correlation between river shrimp catches and water velocity, but this species was most abundant at stations with an average velocity of 0.5 m/sec.

55. Mysid shrimp exhibited diel differences in drift densities, being significantly more abundant during nocturnal periods. However, unlike dipterans and river shrimp, mysid shrimp showed no significant microhabitat preferences.

Table 3

Mean Numbers of Major Groups of Drifting Invertebrates (No./100 m^3) Relative to Flow Regime and Diel Period in the Lower Mississippi River, 24 April through 26 June, 1985. Totals Include Miscellaneous Groups not Tabulated

Date	Location	Invertebrate Group	Flow Regime: Eddy	Flow Regime: Mainstream	Diel Period: Day	Diel Period: Night
24-25 April	White Castle	Mysidacea	3.1	3.0	2.1	4.0*
		Decapoda	10.1*	0.4	1.3	11.2
		Ephemeroptera	2.6	3.6	2.8	3.2
		Diptera	25.4	41.8*	27.2	36.7
		Total	54.8	64.6	50.7	66.7
14-15 May	White Castle	Mysidacea	1.4	1.6	1.9	1.1
		Decapoda	15.5	0.7	12.2	7.7
		Ephemeroptera	1.7	1.6	1.6	1.8
		Diptera	7.1	12.6*	7.9	10.5
		Total	30.7	19.3	28.3	24.5
30-31 May	Port Sulphur	Mysidacea	16.0	17.5		
		Diptera	7.0	6.7		
		Total	23.8	25.8		
3 June	Natchez	Mysidacea	4.4	3.5		
		Ephemeroptera	4.8	3.7		
		Trichoptera	17.5	15.9		
		Diptera	31.6	26.0		
		Total	61.0	50.5		
5-6 June	White Castle	Mysidacea	19.2	15.5	13.4	22.1*
		Ephemeroptera	8.8	6.3	3.2	12.5*
		Hemiptera	12.1	5.3	0.2	18.9*
		Trichoptera	9.2	6.4	7.5	8.8
		Diptera	26.8*	16.0	15.3	30.1*
		Total	81.4*	53.9	44.2	98.0*
25-26 June	White Castle	Decapoda	15.5*	0.1	0.2	18.4*
		Ephemeroptera	4.2	3.6	2.7	5.2
		Diptera	14.5	12.0	10.4	16.7
		Total	37.1*	18.4	16.3	42.8*

Note: Effects of flow regime and diel periodicity on abundance of drifting invertebrates were tested using analysis of variance procedures. Means marked with an "*" are significantly greater (σ = 0.05) within the designated flow regime or diel period.

56. Trip 2. During this sampling period, 712 invertebrates were collected. Decapods and dipterans were the most abundant groups followed by mayflies, mysid shrimp, and ostracods. *Cordylophora* spp. were also common. *Chaoborus* spp. and chironomids were predominant among the dipterans, and Heptageniidae was the prevalent mayfly family.

57. Statistical analyses revealed no significant diel differences in abundance for any major invertebrate group during Trip 2. Dipterans were diurnally and nocturnally more abundant at mainstream stations (Tables 3 and D3 and D4). Abundance was positively related to current speed ($r = 0.46$, $P < 0.05$), with the highest densities recorded from currents over 0.8 m/sec.

58. Because of large between-sample variance, there was no significant difference in the density of river shrimp between eddy and mainstream stations (Table 3). However, river shrimp were collected at only one mainstream station, and over 95 percent of the shrimp collected were caught in the eddy. During the day, river shrimp were extremely abundant at D01 but were present at only one other eddy station (Table D3). At night they were abundant at both two nearshore eddy stations. River shrimp abundance was significantly ($r = 0.40$, $P < 0.05$) related to current speed with maximum densities at 0.5 m/sec.

59. Trip 3. Drifting invertebrates were abundant during Trip 3. Diptera and Mysid shrimp were predominant, but Hemiptera, Trichoptera, and Ephemeroptera were also abundant. All major groups, with the exception of dipterans, were more abundant during Trip 3 than during any other trip. Coelenterates, both *Hydra* spp. and *Cordylophora* spp., were present at most stations. *Chaoborus* spp., *Chironomidae*, and an unidentified dipteran imago were again the predominant dipterans, but for the first time the *Chaoborus* spp. were more numerous than the chironomids. Ninety-eight percent of the hemipterans were water boatman (Corixidae), and 94 percent of the trichopterans were members of Hydropsychidae (primarily *Hydropsyche orris*). *Tortopus incertus* was the most abundant mayfly followed by a baetid.

60. In contrast to the distribution patterns observed in April and May, the overall abundance of dipterans was higher in the eddy during early June (Table 3). *Chaoborus* spp., the predominant dipterans of Trip 3, were significantly more abundant in the eddy ($P = 0.01$). Chironomids and unidentified dipterans were evenly distributed in both microhabitats. Mean densities of

other invertebrate groups were consistently highest at low-current eddy stations, even though differences between microhabitats were not significant.

61. All major invertebrate groups in the drift except Trichoptera exhibited nocturnal abundance peaks (Table 3). Overall, nocturnal densities of drifting macroinvertebrates were twice as high as diurnal densities (Table 3). Nocturnal density of Diptera increased at fifteen of sixteen stations, while mayflies and mysid shrimp increased in abundance at thirteen and eleven stations, respectively. Species of Hemiptera occurred in collections at eleven of sixteen stations at night after appearing only twice during the day (Table D7, D8).

62. Trip 4. During this sampling period, total catch and diversity of invertebrates were dramatically lower than during the previous trip. Dipterans were the most abundant group followed by river shrimp and mayflies. Coelenterates, mostly *Cordylophora* spp., were also abundant. *Chaoborus* spp. were again the predominant dipterans, and *Tortopus incertus* was still the most abundant mayfly.

63. River shrimp were significantly more abundant at eddy stations, exhibiting maximum densities at a current velocity of 0.5 m/sec. River shrimp were also significantly more abundant at night, with nocturnal collections accounting for 99 percent of the shrimp captured during Trip 4.

64. Chironomids and unidentified dipterans were nocturnally more abundant ($P < 0.01$). However, the number of *Chaoborus* spp. collected was not affected by time of day.

65. Trip 5. Diversity and total catch of drifting macroinvertebrates were lowest in July. Dipterans were the most numerous group, but mayflies and Cnidaria were also present in substantial numbers (Tables D11 and D12). *Chaoborus* spp. comprised over half of the total number of Diptera collected. *Tortopus incertus* was the predominant ephemeropteran. (Trip 5 data were not included in Table 3 since sampling procedures varied from methods used during Trips 1 through 4.)

66. Total catch, Diptera, and Ephemeroptera densities were not significantly different among stations and depths within the eddy. However, dipteran numbers and total catch were significantly higher at night.

67. During the day, river shrimp were found only near the bottom at Transect 2. At night, shrimp were most abundant at the surface nearest the

shore. No shrimp were collected near the bottom at night (Tables D11 and D12).

Port Sulphur

68. Five invertebrate groups were collected at Port Sulphur (Table D5). Of those, Mysidacea was the most abundant followed by Diptera. Cordylophorans were present at every station, while mayflies and amphipods were present in very low numbers. There were no microhabitat preferences exhibited by any drifting macroinvertebrates (Table 3).

Natchez

69. A total of 544 invertebrates was collected at the Natchez site. Dipterans were the most abundant group, followed by trichopterans. Mysid shrimp, Ephemeroptera, and coelenterates were also common. Diptera consisted primarily of *Chaoborus* spp. and unidentified chironomids. Caddisflies were more abundant at the Natchez site than at the other sites. The hydropsychid caddisflies *Hydropsyche orris* and *Potamyia flava* comprised over 97 percent of all trichopterans collected. *Baetis* was the most abundant mayfly (Table D6).

70. The major invertebrate groups exhibited no significant microhabitat preferences (Table 3). However, total invertebrate abundance was inversely correlated ($r = -0.40$, $P < 0.05$) with current speed and high densities occurred most often at stations within the eddy.

Zooplankton

White Castle

71. The zooplankton assemblage at White Castle eddy was comprised of copepods, cladocerans, rotifers, and larval *Corbicula*. Immature copepods were identified only as nauplii or copepodites. Identifiable adults represented the genera *Cyclops*, *Diaptomus*, and *Erytemora*. Cladocerans included *Bosmina longirostris*, *Daphnia* spp., *Ceriodaphnia quadrangula*, *Diaphanosoma brachyurum*, *Simocephalus* spp., and *Moina kingi*. Rotifers were not keyed to species, but several brachionid genera, particularly *Brachionus* and *Keratella* were commonly encountered during the study.

72. Trip 1. Zooplankton abundance during April (mean = $45{,}553/m^3$) was the highest encountered during the study. Rotifers, copepods, and cladocerans comprised 62, 24, and 14 percent of the total catch, respectively. Eighty-three percent of all copepods were classified as nauplii or copepodites, while

Diaptomus spp. were the most abundant adult copepods, followed by Cyclops spp. and Erytemora affinis. Bosmina longirostris was the most abundant cladoceran, followed by Daphnia spp. and Ceriodaphnia quadrangula.

73. Due to large between-sample variance, there were no significant difference in zooplankton densities between eddy and mainstream microhabitats during Trip 1 (Table E1). However, mean densities were higher within the eddy for all major groups except Corbicula (Table 4), and zooplankton abundance was inversely correlated with current speed (4 = -0.42, P = 0.01). Total zooplankton and rotifer densities were significantly higher during nocturnal sampling periods ($P < 0.05$). Diel period-microhabitat interactions were noted for copepods, rotifers, and cladocerans, with peak abundances shifting from the river stations diurnal to the eddy nocturnally.

74. Trip 3. The abundance of zooplankton declined sharply by Trip 3; only Corbicula densities increased from levels found during Trip 1 (Tables 4, E2). Copepoda was the most abundant zooplankton group, followed by Rotifera and Cladocera, the latter comprising only 1 percent of the total catch.

Table 4

Mean Number of Zooplankton (No./m^3) Relative to Flow Regime and Diel Period in the Lower Mississippi River, 24 April (Trip 1) and 5-6 June (Trip 3), 1985

Date	Zooplankton Group	Flow Regime		Diel Period	
		Eddy	Mainstream	Day	Night
24-25 April	Copepoda	11,586	10,072	9,582	12,730
	Cladocera	6,850	5,883	5,657	7,460
	Rotifera	30,703	25,227	24,106	33,941*
	Corbicula	6	11	6	12
	Total	49,145	41,193	39,351	54,143*
5-6 June	Copepoda	8,256*	4,038	5,970	6,792
	Cladocera	181	153	152	185
	Rotifera	6,766*	4,471	5,296	6,196
	Corbicula	439	329	411	369
	Total	15,642*	8,991	11,829	13,542

Note: Effects of flow regime and diel periodicity on abundance of zooplankton were tested using analysis of variance procedures. Zooplankton means marked with an "*" are significantly greater ($\sigma = 0.05$) within the designated flow regime or diel period.

75. Rotifers and copepods were significantly more abundant in the eddy than in the mainstream (Table 4); both taxa exhibited peak densities at eddy stations near the shoreline (Table E2). Zooplankton density was negatively correlated with flow rate ($r = -0.70$, $P < 0.01$). Zooplankton abundance did not show significant diel periodicity, but similar to the pattern found in April, nocturnal densities increased in the eddy and decreased in the mainstream.

76. Trip 5. With the exception of the copepod *Eurytemora affinis*, zooplankton densities were substantially lower during Trip 5 than during previous sampling periods. Immature copepods and rotifers comprised 98 percent of the total number collected, while cladocerans and *Corbicula* were present at very low densities (Table E3). *Moina kingi* appeared for the first time in July and was the most abundant cladoceran.

77. Analyses for Trip 5 were performed only on data collected by active towing in the eddy. Rotifers and cladocerans were both significantly more abundant at night. There were no significant depth-abundance relationships, although density shifts suggested a vertical migration from the bottom during the day to the surface at night (Table 5).

Ichthyoplankton

White Castle

78. Trip 1. Thirteen genera were represented in the April ichthyoplankton collections, with *Dorosoma* (shads) comprising over 80 percent of the total catch. *Cyprinus* (common carp), *Ictiobus* (buffalo), *Morone* (temperate basses), and *Pomoxis* (crappies) were also commonly encountered (Tables F1, F2). Shad density and total catch were not significantly different between microhabitats or diel periods (Table 6).

79. Trip 2. Ichthyoplankton densities increased in May (Tables F3 and F4). Freshwater drum (primarily early protolarvae) and shad were the most abundant taxa, followed by grass carp and temperate bass. The remaining catch was composed primarily of carp, buffalo, river carpsucker (*Capriodes carpio*) and silver chub (*Hybopsis storeriana*), the latter two appearing for the first time.

80. Freshwater drum abundance was not significantly different between microhabitats (Table 6). However, significant diel differences were noted as

Table 5

Means of Zooplankton Abundance (No./m^3) within the White Castle Eddy

Relative to Depth and Distance from Shore,

17-18 July 1985 (Trip 5)

Zooplankton Group	Diel Period	Depth* S	Depth* M	Depth* B	Transect** 1	Transect** 2	Transect** 3
Copepoda	Day	3,292	3,081	3,007	3,680	3,032	3,095
	Night	3,672	3,104	3,023	3,885	3,453	3,009
	Mean Total	3,482	3,096	3,015	3,783	3,423	3,052
Cladocera	Day	42	58	82	58	67	48
	Night	145	108	77	217	88	108
	Mean Total	93	83	79	138	77	78
Rotifera	Day	2,055	2,034	2,222	2,699	1,888	2,104
	Night	3,658	3,645	3,646	3,748	4,010	3,070
	Mean Total	2,856	2,698	2,933	3,223	2,949	2,587
Corbicula	Day	34	46	22	44	36	26
	Night	33	39	41	56	33	35
	Mean Total	34	40	32	50	35	31
Total	Day	5,423	5,222	5,333	6,482	5,024	5,274
	Night	7,509	6,612	6,787	7,906	7,585	6,222
	Mean Total	6,466	5,917	6,060	7,194	6,304	5,748

* S = Surface; M = Middepth; B = Bottom.
** 1 = Nearshore; 2 = Middle; 3 = Outer edge.

diurnal densities were nearly four times those found during nocturnal periods (Tables F3 and F4).

81. Shad abundance was not significantly related to microhabitat or diel period (Table 6). Grass carp was the only major species of Trip 2 that was significantly more abundant at night, although common carp exhibited a similar pattern (Tables F3 and F4). Temperate basses were significantly more abundant diurnally.

82. Trip 3. Ichthyoplankton was most abundant during Trip 3 (Tables F7 and F8). Drum accounted for nearly 80 percent of the total catch, while shad were second in abundance, with densities similar to those observed in April. The speckled chub, *Hybopsis aestivalis*, first appeared in early June samples, while crappies, temperate basses, and buffalo appeared for the last time.

Table 6

Means of Larval Fish Abundance (No./100 m^3) Relative to Flow Regime and Diel Period, 24 April Through 26 June, 1985 Totals Include Miscellaneous Taxa Not Tabulated

Date	Location	Major Group or Species	Flow Regime: Eddy	Flow Regime: Mainstream	Diel Period: Day	Diel Period: Night
24-25 April	White Castle	Shad	10.5	14.6	12.7	11.6
		Total	13.6	18.1	15.4	15.4
14-15 May	White Castle	Freshwater drum	10.8	9.6	16.1*	4.6
		Shad	3.4	5.6	4.4	4.1
		Grass carp	2.7	3.0	2.2	3.4*
		Temperate basses	2.4	1.8	3.2*	1.1
		Total	22.4	22.8	28.0	17.1
30-31 May	Port Sulphur	Freshwater drum	6.0	6.7		
		Shad	3.8	2.7		
		Total	12.3	12.3		
3 June	Natchez	Freshwater drum	31.7	41.6		
		Shad	1.5	7.3*		
		River carpsucker	5.4	5.3		
		Total	43.1	56.8		
5-6 June	White Castle	Freshwater drum	71.8	49.1	61.1	65.5
		Shad	13.3	6.5	17.5*	4.0
		River carpsucker	3.6	2.8	3.9	2.6
		Silver chub	3.4	1.4	1.1	4.2*
		Total	94.1	61.8	85.0	78.9
25-26 June	White Castle	Freshwater drum	11.5	16.8*	23.3*	4.0
		Shad	2.5	3.7	5.0*	1.1
		River carpsucker	6.1	7.4	8.8*	4.5
		Grass carp	3.4	2.3	2.2	3.7
		Total	25.6	32.9	42.2*	14.8

Note: Effects of flow regime and diel periodicity on larval fish abundance were tested using analysis of variance procedures. Fish means marked with an "*" are significantly greater (σ = 0.05) within the designated flow regime or diel period.

83. Statistical analyses revealed no significant differences in the numbers of freshwater drum relative to microhabitat or diel period (Table 6). However, significant differences were noted for drum early life-history stages (Table 7). Metalarvae and juveniles were more abundant during Trip 3 than during any other trip, and densities of both were significantly greater at night. Protolarvae, the predominant developmental stage captured during Trips 2 and 4, were significantly more abundant during the day (Table 7). Protolarvae and mesolarvae were found to be evenly distributed throughout both microhabitats (Table 7), while older drum were significantly more abundant in the eddy.

84. Protolarvae and mesolarval shads were significantly more abundant during the day (Table 6); there were no statistical differences among microhabitats, however. River carpsucker showed no significant difference between microhabitats or times of day (Table 6). Density of silver chub, however, was significantly higher at night, a trend noted for other cyprinids.

85. Trip 4. The total catch was less than 50 percent of that collected earlier in June (Tables F9 and F10). Freshwater drum was the dominant

Table 7

Means of Developmental Stages (No./100 m^3) of Freshwater Drum Relative to Flow Regime and Diel Period at the White Castle Site, 14 May through 26 June, 1985

Date	Stage of Development	Eddy	Main-stream	Day	Night	Total
14-15 May	Protolarvae	10.6	9.5	15.8*	4.6	10.2
5-6 June	Protolarvae	22.6	21.0	41.2*	2.8	22.0
	Mesolarvae	3.8	3.6	4.1	3.2	3.7
	Metalarvae	41.6	23.4	14.6	55.0*	34.8
	Juveniles	3.8*	1.3	1.3	4.4*	2.8
25-26 June	Protolarvae	5.2	10.1*	13.3*	1.0	7.2
	Mesolarvae	2.5	2.7	4.8*	0.4	2.6
	Metalarvae	2.6	2.9	3.8*	1.5	2.7
	Juveniles	1.2	1.1	1.4	0.9	1.2

Note: Effects of flow regime and diel periodicity were tested using analysis of variance procedures. Means marked with an "*" are significantly greater (σ = 0.5) within the designated flow regime or diel period.

species, comprising 48% of the total. Numbers of river carpsucker peaked in late June, when it was the second most abundant larval fish taxon.

86. Freshwater drum protolarvae were significantly more abundant at mainstream stations (Table 7); all other early life-history stages were evenly distributed in the two habitats (Table 6). Mean densities for every larval stage were higher during the daytime (Table 7). Protolarvae and meolarvae comprised 78 percent of the catch during daylight hours but were proportionally less abundant at night (35 percent).

87. Carpsucker abundance was unaffected by habitat, though densities were significantly higher during the day (Table 6). Shads were also more abundant during the day; and, in fact, grass carp was the only prominent taxon that did not exhibit higher daytime densities.

88. Trip 5. During this trip the total catch was only 418 larval fish (Tables F11 and F12). Freshwater drum was the most abundant species, followed by river carpsucker. Unidentified minnows and speckled chub peaked during mid-July and were the third and fourth most abundant taxa, respectively.

89. Freshwater drum within the eddy were significantly more abundant during the daytime. The greatest diel differences were noted for protolarvae and mesolarvae, as 95 percent were collected in the daytime. Conversely, metalarvae and juveniles did not exhibit diel changes in density. The distribution of drum was also related to depth (Table 8), as both protolarvae and mesolarvae were significantly more abundant at the surface (Table 9). No difference with respect to transect was noted for all developmental stages of freshwater drum combined. However, protolarvae were statistically more abundant at the eddy's outer periphery, while juveniles were more abundant near the shore (Table 9). Distributional patterns were characterized by Table 8 transect-diel period interactions. During the day, high densities of protolarval and mesolarval drum were collected at the eddy periphery, while at night high numbers of metalarvae and juveniles were captured near the shoreline (Table 9).

90. River carpsucker was statistically more abundant near the eddy periphery during both diel periods (Table 8). Minnows were more abundant nocturnally, and catch data indicated movement between the eddy periphery diurnally and the shoreline nocturnally (Table 8).

Table 8

Means of Larval fish Abundance (No./100 m^3) within the White Castle Eddy Relative to Depth and Distance from Shore, 17-18 July 1985 (Trip 5)

Group or Species	Diel Period	Depth*			Transect**		
		S	M	B	1	2	3
Freshwater Drum	Day	49.7	10.8	3.6	14.5	9.5	45.0
	Night	5.4	1.7	0.0	8.5	1.8	1.9
	Mean Total	27.6	6.2	1.8	11.5	5.7	23.4
River Carpsucker	Day	3.9	3.9	2.6	1.8	0.7	7.0
	Night	4.9	4.6	2.6	0.0	4.4	5.2
	Mean Total	4.4	4.3	2.6	0.9	2.6	6.1
Minnows	Day	1.5	1.2	0.0	0.0	0.5	1.8
	Night	4.7	2.2	2.8	7.6	2.0	3.5
	Mean Total	3.1	1.7	1.4	3.8	1.2	2.7
Total Number	Day	57.8	17.7	7.5	19.0	11.2	57.1
	Night	19.9	12.2	7.3	22.5	10.7	14.6
	Mean Total	38.9	14.9	7.4	20.7	11.0	35.8

* S = Surface; M = Middepth; B = Bottom.
** 1 = Nearshore; 2 = Middle; 3 = Outer edge.

Table 9

Means of Development Stages (No./100 m^3) of Freshwater Drum within the White Castle Eddy Relative to Depth and Distance from Shore, 17-18 July 1985 (Trip 5)

Developmental Stage	Diel Period	Depth*			Transect**		
		S	M	B	1	2	3
Protolarvae	Day	16.5	4.4	1.8	2.6	2.8	17.0
	Night	0.0	0.0	0.0	0.0	0.0	0.0
	Mean Total	8.3	2.2	0.9	1.3	1.4	8.5
Mesolarvae	Day	21.0	2.9	1.8	11.9	3.3	16.9
	Night	2.0	0.4	0.0	0.0	1.3	1.0
	Mean Total	11.5	1.7	0.9	5.9	2.3	8.9
Metalarvae	Day	12.2	1.2	0.0	0.0	2.2	10.8
	Night	1.8	1.2	0.0	3.6	0.5	0.9
	Mean Total	7.0	1.2	0.0	1.8	1.4	5.8
Juveniles	Day	0.0	2.2	0.0	0.0	1.2	0.3
	Night	1.7	0.0	0.0	5.0	0.0	0.0
	Mean Total	0.8	1.1	0.0	2.5	0.6	0.2

* S = Surface; M = Middepth; B = Bottom.
** 1 = Nearshore; 2 = Middle; 3 = Outer edge.

Port Sulphur

91. Total catch and number of taxa were lower at Port Sulphur than at any other location. Freshwater drum and shad were the predominant taxa, similar to Natchez and White Castle sites during this time period. There were no differences associated with microhabitat for total catch, drum, or shad (Table 6). Samples were not taken at night.

Natchez

92. A total of 584 larvae were collected at Natchez on 8 June 1985. Seventy-seven percent of the larvae were freshwater drum, followed by river carpsucker, shad, and silver chub. Shad exhibited significantly higher densities in the mainstream microhabitat (Table 6).

PART IV: DISCUSSION

Current Speed and Direction

93. the eddy at White Castle was a persistent feature during all sampling periods. Upstream currents were always present at one or more nearshore stations, and variation in current velocity and direction was most prevalent at stations near the periphery of the eddy. Even so, the eddy's configuration changed considerably as the river stage dropped from 25 feet (Donaldsonville) in April to 6 feet in July. In late June (river stage 13 ft) mean current speeds in the eddy were no longer significantly different from those in the mainstream, and upstream flow in the eddy was greatly reduced. The eddy at Port Sulphur was small and poorly defined, with little variation in current direction; upstream currents were observed at only two stations. At Natchez, currents were highly variable and mean current speeds in the eddy were significantly less than those in the mainstream. However, the downstream boundary of the eddy was not well defined.

Water Quality

94. Differences in water quality variables among eddy and mainstream stations were usually small due to the high discharge and turbulent mixing of the Mississippi River. Dissolved oxygen levels were consistently higher in the mainstream, though differences in magnitude were probably biologically insignificant. As expected, the oxygen level was highest when water temperature was lowest. At the White Castle site, water temperatures were significantly lower in the mainstream during April, as warm atmospheric temperatures were apparently able to heat the slower moving water mass circulating in the eddy. As the summer progressed, water temperatures were no longer significantly different between microhabitats, except at Port Sulphur, where higher temperatures were recorded within the relatively slack waters of the eddy. Differences in conductivity and pH relative to microhabitat were minimal or inconsistent.

Solids and Total Organic Carbon

95. The amount of suspended solids depends in part on streamflow and turbulence (Wells 1980). As a consequence, it was anticipated that suspended solid concentrations would decrease as river stage declined. The cause of increased suspended solid concentrations from Trip 1 to Trip 3 is unknown, but may be related to fluctuations in river stage during the sampling periods. Statistical analyses of suspended sediment concentrations revealed no significant differences between eddy and mainstream stations. Although Wells (1980) found higher concentrations of suspended sediment near the bottom, samples collected during this study revealed similar levels at both depths. Sampling techniques were not outlined in Wells (1980) but could account for the discrepancies in results between the two studies. Concentrations of dissolved solids were low during peak discharge (the result of dilution), decreasing as river stage declined. Dissolved and total solids were higher in the mainstream during early June, but spatial trends were not evident. Similarly, concentrations of total organic carbon were not related to microhabitat or depth differences.

Benthic Macroinvertebrates

96. Benthic communities in large rivers are influenced by substrate type and stability, channel morphology, and current velocity (Wells and Demas 1979; Beckett et al. 1983; Hynes 1970). Depositional substrates (soft mud, silt-clay) are available in areas of low-current velocity. These substrates are more stable than erosional substrates and are relatively higher in organic matter. Many species of burrowing chironomids, mayflies, and especially tubificid worms, are abundant in softer substrates. Sand (erosional) substrates in lotic systems provide relatively poor habitat for invertebrate organisms; sand is less stable and lower in detrital matter. Chironomids, such as *Robackia claviger* and *Chernovskiia orbicus*, mollusks, and mayflies reside in the erosional substrates of high-current habitats. Caddisflies tend to dominate macroinvertebrate communities on rocky substrates, the latter typically providing more complex habitat and supporting a more diverse invertebrate fauna.

97. Much of the substrate at stations within the eddies was composed of revetment material, with little overlying sediment. Although ACM provides habitat for numerous invertebrates (Sanders, Bingham, and Beckett 1986), resident organisms were not obtainable with the benthic grab. Discussion of macroinvertebrate distribution patterns must therefore be limited to stations that had sediment deposits. However, even with this limitation, variable current regimes within the eddies resulted in substrates ranging from silt to gravel. Because of this diversity of current and substrate types in the eddies, one would expect to find greater diversity of benthos compared with mainstream stations. Several trends consistent with this hypothesis were observed from the limited number of grab samples obtained from the White Castle, Natchez, and Port Sulphur eddies.

98. Within the eddies, low current areas with their associated silt-clay substrates were typically colonized by high densities of oligochaetes, particularly Limnodrilus, tubificids, and larval dipterans. These taxa were also reported from other low-current, nearshore habitats in the lower Mississippi River (Wells and Demas 1979). In a study of macroinvertebrate communities in several Mississippi River habitats, Beckett et al. (1983) found species of Limnodrilus and Chaoborus to be characteristic of low current habitats in an abandoned channel and in dike fields at low river stage (approximately RM 486 to 546). Similarly, Seagle, Hutton, and Lubinski (1982) examined benthic communities in the Illinois and Mississippi Rivers, and reported that a greater abundance of Illinois River oligochaetes (83 percent) and chironomids were associated with reduced current levels and mud or silt-clay substrates.

99. In areas subject to higher current velocities, sand deposition resulted in colonization by pelecypods and ephemeropterans. Distribution of Corbicula in coarser sediments in the central channel of the Mississippi River (RM 10 to 266) was also reported by Wells and Demas (1979). Beckett et al. (1983) found Chernovskiia orbicus and Robackia claviger (Chironomidae) and Corbicula to predominate in sand substrates in a secondary channel and in dike fields at high river stage. These species were also found in sand substrates in revetment eddies. However, due to the small number of grab samples, it was difficult to determine the extent of chronomid-substrate specificity, as chironomid species were present in most substrate types sampled.

100. Similar to the findings of Beckett et al. (1983), densities of macroinvertebrates susceptible to the benthic grab were quite low at eddy stations subject to high current velocities. Out of a total of 30 grab samples at mainstream locations at the three sampling sites, only three stations had overlying sediment (10 percent), and benthic organisms were present in only one sample (3 percent). In contrast, out of 50 grab samples within the eddy, 22 had overlying sediment (44 percent), all of which contained benthic invertebrates. It would appear that compared to revetted banks along the mainstem of the river, revetment eddies have increased sediment deposition, which in turn leads to patches of various substrates and associated benthic organisms. However, the relative macroinvertebrate productivity between mainstream and eddy revetments could not be assessed with the gear used in this study.

101. In the White Castle eddy, only one station yielded sediment on all sampling dates. It is likely that invertebrate communities in revetment eddies are characterized by rapidly colonizing taxa, or by those organisms that proliferate in a variety of habitat types. Natchez and White Castle eddies were particularly dynamic with respect to variability in current direction and velocity. As a result, scouring by water currents probably greatly reduced sediment deposition and the longevity of sediment patches. If eddies were larger, sediment deposition in the middle of the eddy might increase, resulting in a greater abundance and diversity of benthos, and perhaps a more stable invertebrate community. In any event, Mississippi River revetment eddies provide habitat types that are conducive to the production of sediment-dwelling aquatic invertebrates.

Drifting Macroinvertebrates

102. The distribution of drifting invertebrates at White Castle was similar to that described by Obi (1978) and Bingham, Cobb, and Magoun (1980). Diptera, Ephemeroptera, and Trichoptera were the predominate insect orders. Dipterans were more abundant in late April than during any other month. Mayflies and caddisflies were abundant in June. Hemipterans, uncharacteristically numerous in the river, were also prevalent during June. River shrimp were common throughout the study, while mysid shrimp were most abundant during Trip 3 (5-6 June).

103. Considering eddy and mainstream environments together, several patterns of abundance fluctuations by diel period were evident. Three insect orders, Ephemeroptera, Hemiptera, and Diptera, were significantly more abundant nocturnally. Seagle, Hutton, and Lubinski (1982) and Obi (1978) also reported higher nocturnal densities of mayflies. Obi (1978) found greater nocturnal densities of hemipterans, but numbers were very low during both diel periods. Dipterans, particularly _Chaoborus_ spp., were significantly more abundant nocturnally during Trips 3 and 5, but abundance did not fluctuate on a diel basis during Trip 4. Obi (1978) found no difference between diurnal and nocturnal densities of _Chaoborus_ spp., but Seagle, Hutton, and Lubinski (1982) noted higher nocturnal densities in the Illinois River. Chironomids have been reported to exhibit little propensity to drift with diel periodicity (Waters 1972), but at White Castle, nocturnal densities were significantly higher during Trip 4. Obi (1978) reported similar findings in the river near St. Francisville, Louisiana.

104. Among insect orders, only Trichoptera failed to exhibit nocturnal peaks in abundance, as caddisflies were evenly distributed across both diel periods. Obi (1978) recorded similar findings in his surveys of the Mississippi River, but other researchers have concluded that caddisflies are day-active (Waters 1972; Seagle, Hutton, and Lubinski 1982). Mysid and decapod shrimp were nocturnally more abundant in the drift.

105. At White Castle, diel differences in the abundance of drifting invertebrates were most evident after May. In fact, mysid shrimp were the only organisms to exhibit higher nocturnal densities prior to June. Similarly, Obi (1978) found that pronounced diel differences in macroinvertebrates drift were largely confined to June and August; invertebrate responses to fluctuations in light intensity were diminished during high-water months, when currents were fastest. Conner and Bryan (1976) suggested that the magnitude of diel abundance fluctuations was inversely related to turbulence (as reflected by current speeds). Indeed, river stage and current speeds at White Castle were highest during April and May, when organisms were evenly distributed during both diel periods.

106. Obi (1978) also observed that diel fluctuations in abundance were greatest at a nearshore station with reduced current. The relationship between the magnitude of diel periodicity, and current or turbulence with respect to eddy (low currents) and mainstream (high currents) stations was

inconsistent. During Trip 1, total catch nearly doubled in the mainstream after dark, but remained constant in the eddy. In June, nocturnal densities were greater in both microhabitats, but the increase in total catch was larger in the eddy.

107. Dipterans were more abundant in the mainstream during April and May, but during early June the trend was reversed; dipteran (particularly *Chaoborus*) abundance and total catch were significantly higher in the eddy. Hemipterans, caddisflies, and mayflies were also more abundant at certain low-current stations within the White Castle eddy. Distributional patterns at Natchez were similar, as invertebrate densities were negatively correlated with flow rate during June. Obi (1978) noted that catches (primarily Diptera) were slightly higher in midstream during high water (April and May), but were greater (Ephemeroptera and Trichoptera) in low currents near the shore during June. During April and May the disproportionate number of dipterans in the mainstream may have been the result of catastrophic drift caused by physical disturbance of the bottom fauna by high current velocities and consequent bottom scouring (Waters 1972), while the distribution of invertebrates in eddies during low water may have been characteristic of localized drift. Perhaps dipterans (primarily *Chaoborus*), mayflies, and caddisflies were more abundant in eddies during early June because they were able to colonize substrates during periods of lower current speeds.

108. Utilization of eddies by macroinvertebrates appeared to depend on their ability to resist currents. This was evidenced by comparisons of the drift patterns of decapod and mysid shrimp. *Taphromysis louisianae*, an opossum shrimp, was evenly distributed across both eddy and mainstream microhabitats. Similarly, the sample variance in the mainstream equaled that in the eddy (evidence suggesting little patchiness). Conversely, the river shrimp (larger, more mobile, probably a stronger swimmer) was more abundant in the eddy. Variation in abundance was always higher (patchiness quite evident) between eddy samples; in fact, variation was so high as to negate statistical associations with microhabitat during Trip 2 when 95 percent of all river shrimp were caught within the eddy. Patchiness of distribution was apparently related to specific physical requirements. River shrimp were consistently more abundant at nearshore eddy stations with flow rates of 0.5 m/sec, and with the exception of Trip 2, they were usually more abundant at night.

Presumably, the area provided cover (riprap) and food; persistent upstream currents may have served to sweep small organisms from the riprap.

Zooplankton

109. In a study of crustacean zooplankton in the Atchafalaya River of southern Louisiana, Binford (1978) noticed that most taxa peaked in abundance during periods of high discharge in late winter or early spring. Nauplii and copepodites were abundant in lotic waters during April, and *Bosmina longirostris* was prevalent at mainstream stations during May. Furthermore, the abundance of species collected in the river varied inversely with conductivity, implying a direct relationship with discharge. Apparently, microorganisms were flushed into the river from nearby swamps and backwater habitats during rising water (Sager and Bryan 1981; Holland, Bryan, and Newman 1983).

110. Abundance patterns of microcrustaceans in eddy and river microhabitats were similar to those outlined by Binford (1978). Crustacean zooplankton and rotifers were very abundant at White Castle during April (peak stage, lowest mean conductivity) but declined in abundance thereafter. Zooplankton abundance in the Mississippi River appears to be largely dependent upon flushing from inundated floodplains. Lotic habitats are not suitable for maintenance of zooplankton populations and their abundance in running waters is inversely related to current velocity (Hynes 1970). Novotny and Hoyt (1983) found a gradual reduction of microcrustacean densities with increased distance in the tailwaters of a flood control reservoir. They concluded that zooplankton densities were reduced by physical destruction and fragmentation during downstream transport. Holland, Bryan, and Newman (1983) showed that abundance and diversity of rotifers increased with distance from mainstem waters of the Atchafalaya River to the overflow habitats in adjacent swamps. Sabol, Winfield, and Toczydlowski (1984), in their comparison of habitats on the lower Mississippi River, collected the highest number of zooplankton in an abandoned channel with reduced current (0.0-0.1 m/sec). Abundance in the main channel (1.4-1.5 m/sec) was lower by an order of magnitude. Densities in a dike field were similar to those in the mainstream during periods of high flow, but during low flow, dike-field densities greatly increased.

111. Zooplankton abundance was inversely related to current speed at White Castle during Trips 1 and 3. Furthermore, copepods and rotifers were significantly more abundant in the eddy during early June when current speeds at nearshore eddy stations were among the lowest recorded (0.2 m/sec). This low current area may have provided a more suitable physical habitat for drifting zooplankters, coincidentally serving to concentrate zooplankton prey for eddy-dwelling larval fishes. Still, it is unlikely that eddies provided sufficient habitat for maintaining reproducing zooplankton populations over an extended period of time.

112. Nocturnal zooplankton densities were significantly higher in the eddy during Trip 1; at the same time, mean numbers of most taxa decreased in the mainstream. The results were inconclusive (e.g., several night stations were dropped from the analyses because of suspect volume estimates during Trip 1), but observed trends, though not always significant, were consistent from April through July. Vertical migration as a mechanism for increasing tropic and energetic efficiency while avoiding predation is an integral part of the life histories of many lentic microcrustaceans (Begg 1976, Enright 1977, Calaban and Makarewicz 1982). Vertical migration may have occurred at night in slow eddy currents, as evidenced by higher nocturnal densities and the depth distribution of cladocerans during Trip 5. However, it is unlikely that reduced currents in the eddy were sufficient to maintain distinct zooplankton communities during spring and summer months due to distinct changes in river stage and the size, shape, and current regime at all eddy sites.

Ichthyoplankton

113. Temporal distribution of larval fishes at White Castle was similar to that reported from other locations on the Lower Mississippi River (Gallagher and Conner 1980, Zimpfer 1983). Spring spawners included shads (probably gizzard shad), grass carp, common carp, buffalos, crappies, and percids, while summer spawners included shads (probably threadfin shad), grass carp, chubs, minnows, river carpsucker, and freshwater drum. Representatives of Sciaenidae, Clupeidae, Catostomidae, and Cyprinidae comprised the bulk of the catch.

114. Cyprinids (grass carp, common carp, minnows, and chubs) were more abundant nocturnally in samples from the White Castle site. Boyer (1983)

reported similar findings for grass carp, chubs, and minnows in the Mississippi River near St. Francisville, Louisiana. While most researchers have also observed higher nocturnal densities of river carpsucker (Catostomidae) (Gallagher and Conner 1980, Boyer 1983, Schramm and Pennington 1980), this species was diurnally more abundant at the White Castle eddy (25-26 June). Similarly, larval temperate basses (Percichthyidae) have been reported to exhibit nocturnal abundance peaks (Boyer 1983, Schramm and Pennington 1980), but were more abundant diurnally at the White Castle eddy (14-15 May).

115. Larval shads and freshwater drum exhibited diurnal peaks in abundance, which appear to be characteristic for those species (Boyer 1983). Schramm and Pennington (1980) found that in late June, clupeids were more abundant during the day, but drum were more abundant at night. The discrepancies in diel abundance patterns for drum could be related to differences in larval development. Gallagher and Conner (1980 and 1983) found that older freshwater drum were more abundant in night collections, a trend noted at White Castle during Trip 3 (early June). It is apparent that the interrelationship of diurnal abundance, and seasonal variation, species identity, and degree of larval development is an area of larval fish ecology requiring further investigation.

116. Several researchers have reported differences in diversity and abundance of larval fishes among river microhabitats. Boyer (1983) noticed that floodplain larval fish collections resulted in consistently higher abundance estimates than comparable main-channel collections. Conner, Pennington, and Bosley (1983) reported that shads and sunfishes dominated the larval fish community in an abandoned Mississippi River channel. Species composition was similar between floodplain habitats and the mainstem during high water, while at low water, riverine species (freshwater drum, river carpsucker, and minnows) dominated main channel collections and shads and sunfishes dominated floodplain habitats. Dike fields were characterized by two distinct ichthyoplankton communities during low water. Larval shads and sunfishes were found along the inside of the middle bar near the shoreline, while riverine species were found along the river side of the bar in an open pool.

117. Larval fishes collected during this investigation did not exhibit consistent differences in abundance between microhabitats, even though some stations in the eddies were characterized by significantly reduced current velocities during much of the study. Larval fish abundance was significantly

different between microhabitats at White Castle only once, at which time freshwater drum were more abundant in the mainstream (Trip 4, late June). Also, there were few changes in microhabitat selection at different diel periods. During Trip 2 (mid-May), grass carp were more abundant in the eddy during the day, but were more abundant in the mainstream at night. Discrepancies between previous reports and the current study could have been due to the smaller scale of the eddy microhabitats. Dynamic current profiles in eddies made microhabitat identification difficult, and differences between mainstream and eddy stations as they impacted larval fish distribution may have been less significant than in previous studies (e.g., Conner, Pennington, and Bosley 1983).

118. Differences in microhabitat selection among developmental stages of drum were evident during the study. During Trip 3, older drum were nocturnally more abundant in the eddy. Protolarval (yolk-sac) drum were always more abundant diurnally, and except for Trip 4 when they were significantly more abundant in the mainstream, they exhibited no significant preference for either microhabitat. Gallagher (1979) found greater densities of younger fish in fast currents during the day and greater densities of older larvae and juveniles in slower currents at night. In his study of floodplain ichthyoplankton, Boyer (1983) found that protolarvae were much more pelagic, while older larvae tended to concentrate in the littoral zone. Boyer concluded that distributions of recently hatched protolarvae, older larvae, and juveniles suggested a complex pattern of microhabitat association in relation to developmental stage.

119. Locomotion is limited by a lack of fin rays and the absence of notochordal flexure. As a result, one would expect that recently hatched protolarvae would be more evenly distributed with respect to current velocity. Variance of samples (an estimate of patchiness) in the mainstream equaled that in the eddy, further suggesting that protolarvae were fairly uniformly distributed. conversely, metalarvae and juveniles (no yolk, developed fin rays) exhibited much more patchiness of distribution as evidenced by variance in abundance estimates (to be expected when fishes become more mobile and dependent upon exogeneous feeding). Extremely high numbers of metalarvae and juveniles at two eddy stations in early June provided further evidence of distributional patchiness of older larvae.

120. Depth, transect, and diel period distribution fluctuations of drum in mid-July provided additional evidence of microhabitat partitioning by developmental stages. Protolarvae were more diurnally abundant in surface samples at the outer periphery of the eddy. Metalarvae and juveniles were more abundant nocturnally at nearshore eddy stations away from high velocity currents. Bosley et al. (1986) found more drum at the surface in their study and attributed the difference in distribution to the semibuoyant morphology of early drum.

PART V: CONCLUSIONS

121. The eddy at White Castle was better defined than eddies at Natchez and Port Sulphur. However, by late June (Trip 4) the White Castle eddy was rather poorly defined; downstream flow was pervasive and differences in eddy and mainstream currents were insignificant.

122. Water quality was generally unaffected by differences in microhabitat. Although dissolved oxygen levels at White Castle were consistently higher in the mainstream, the biological significance of the differences is questionable.

123. The deposition of sediment was more prevalent in the eddies compared to mainstream stations. Diversity and abundance of sediment-dwelling benthic invertebrates were thus greater within the eddy on all occasions. However, samples of macroinvertebrates inhabiting ACM were not collected, and while mainstream ACM and eddy sediments probably supported distinctly different macroinvertebrate assemblages, the relative quality of the two microhabitats could not be determined. Even with the reduced currents in the eddies. ACM revetment was the principal substrate type in the Natchez and White Castle eddies.

124. Results of the study suggest that some eddies on ACM revetment in the Lower Mississippi River provide a microhabitat that is beneficial to riverine species that require areas of reduced current velocity. These sites may be characterized by sediment deposition with accompanying benthic colonization and production. Eddies support diverse assemblages of zooplankton, macroinvertebrates, and ichthyoplankton that can differ quantitatively and qualitatively from biota collected in more riverine habitats. While statistical comparisons of eddy versus mainstream data revealed few differences between microhabitats, lack of statistical significance usually reflected extremely high variation between samples rather than similarities in mean values. High between-station variation in abundances of macroinvertebrates and larval fishes in eddies may reflect patchy distribution by organisms that are able to congregate relative to other variables (e.g., light, dissolved oxygen, prey distribution, etc.) at lower flow rates. Consequently, standing stock estimates may not truly reflect colonization and use of the eddy by riverine biota. More importantly, our density estimates reflect standing stocks, not

productivity, which would be much higher in eddies if organisms were able to grow and reproduce there.

125. Although the effects of eddies on fisheries production in the river are unknown, beneficial impacts of habitat diversity and current refugia on aquatic productivity are well documented. It is concluded that eddy development improves the habitat quality of ACM revetment, although the degree of habitat improvement will depend on many factors, including the geographical location of the eddy and the types of riparian habitat available. It is further concluded that if bank stability, environmental, and economic considerations indicate that incorporation of an eddy into the design of a particular ACM revetment is worthwhile, the eddy should be made large enough to persist at low river stages. Eddies at Port Sulphur and Natchez were small, variable, or ephemeral compared to the White Castle eddy. Even so, by late June the White Castle eddy was poorly defined. In order to attain maximum impact on biotic production in the river, slack-water habitats that are seasonally important for many invertebrate taxa and later stages of larval fishes must be maintained at lower river stages when access to floodplains is limited. Providing revetment eddies could thus effectively increase nursery habitat and fisheries productivity in the mainstem of the Lower Mississippi River.

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APPENDIX A: PHYSICAL AND CHEMICAL DATA FROM THE WHITE CASTLE, PORT SULPHUR, AND NATCHEZ EDDIES, APRIL THROUGH JULY, 1985

Table A1

Physical and Chemical Data from White Castle Eddy

(Trip 1), 23 April 1985

		Current					Day			
Station	Depth (m)	Velocity[1]	Direction[2]	TOC[3]	DS[4]	SS[5]	DO[6]	Temp[7]	Cond[8]	pH
A01	1	0.8	55	4.2	78	215	7.9	16.7	303	7.4
A02	1	0.7	45				8.1	16.8	300	7.5
A03	1	0.9	45	4.3	79	230	7.9	16.7	305	7.3
	3	0.9	45				8.0	16.7	306	7.3
	5	1.1	45				8.1	16.7	307	7.3
	7	0.8	45	4.5	71	227				
B01	1	0.4	235	4.3	82	235	7.3	16.9	306	7.8
	3	0.4	235				7.5	16.9	305	7.5
B02	1	0.2	15				7.8	16.9	289	7.7
	3	0.4	285				7.9	16.9	291	7.6
	5	0.3	30				7.5	16.9	291	7.5
	7	0.2	338				7.9	16.8	292	7.5
	9	0.4	330				7.7	16.8	292	7.4
B03	1	1.0	45	4.3	81	211	7.8	16.8	293	7.5
	3	1.1	45				8.0	16.7	294	7.5
	5	1.2	40				8.1	16.7	294	7.5
	7	1.2	45				8.1	16.7	295	7.5
	9	0.9	30							
	11	1.0	40							
	13	0.8	15							
	15	0.5	45							
	17	0.3	340	4.2	87	234				
C01	1	0.3	215				7.8	16.9	304	7.9
	3	0.3	280							
C02	1	0.4	230				7.6	16.9	298	7.5
	3	0.5	220				7.8	16.8	299	7.5
	5	0.4	230				7.8	16.8	299	7.5
	7	0.3	220				7.9	16.8	299	7.5
	9	0.3	230				7.9	16.8	300	7.4

(Continued)

* Flow Rate (m/sec)
** Direction (°)
Total Organic Carbon (ppm)
Dissolved Solids (mg/l)
Suspended Solids (mg/l)
Dissolved Oxygen (mg/l)
Temperature (°C)
Conductivity (umhos/cm)

Table A1 (Concluded)

Station	Depth (m)	Current Velocity[1]	Current Direction[2]	TOC[3]	DS[4]	SS[5]	Day DO[6]	Day Temp[7]	Day Cond[8]	Day pH
C03	1	0.7	225	4.5	77	216	7.8	16.9	303	7.5
	3	0.5	240				7.9	16.8	303	7.5
	5	0.5	242				7.8	16.8	304	7.5
	7	0.5	220				7.9	16.8	304	7.5
	9	0.5	230	4.4	65	213	7.9	16.8	304	7.4
C04	1	0.3	175				8.0	16.8	297	7.6
	3	0.4	50				8.0	16.8	297	7.5
	5	0.3	120				8.0	16.8	297	7.5
	7	0.8	60				7.9	16.8	295	7.5
	9	0.1	135				8.0	16.8	295	7.5
	11	0.6	100				7.9	16.7	295	7.4
	13	0.7	85							
D01	1	0.5	220	4.0	97	212	7.9	16.9	300	7.4
D02	1	0.6	200				7.9	16.8	305	7.4
	3	0.7	205				7.9	16.8	307	7.4
D03	1	0.1	175	5.2	83	224	7.7	16.8	311	7.3
	3	0.1	90				7.6	16.8	311	7.3
	5	0.6	90				7.7	16.8	311	7.3
	7	0.5	85				7.8	16.8	311	7.3
	9	0.5	90				7.8	16.8	311	7.3
	11	0.4	135	4.7	82	249	7.8	16.8	311	7.3
E01	1	0.4	25	4.1	82	250	7.8	16.8	306	7.4
E02	1	0.8	45				7.8	16.7	308	7.3
	3	0.7	45				7.9	16.7	308	7.3
E03	1	0.8	60	4.5	106	244	7.8	16.8	309	7.3
	3	0.9	45				7.9	16.7	310	7.3
	5	0.8	30	4.3	82	230	8.0	16.7	310	7.3

Table A2

Physical and Chemical Data from White Castle Eddy

(Trip 2), 14-15 May 1985

Sta- tion	Depth (m)	Current		Day				Night			
		Velocity	Direction	DO	Temp	Cond	pH	DO	Temp	Cond	pH
A01	1	0.6	60	6.6	22.2	357	7.6	6.4	22.1	347	7.3
A02	1	0.6	60	6.4	22.2	360	7.6	6.4	22.5	356	7.3
	3	0.6	45	6.5	22.1	360	7.5	6.4	22.5	356	7.2
	5	0.5	45	6.5	22.1	360	7.5	6.5	22.1	356	7.2
A03	1	0.7	45	6.3	22.1	365	7.6	6.6	22.1	361	7.2
	3	0.7	50	6.3	22.1	365	7.6	6.6	22.1	361	7.2
	5	0.8	45	6.4	22.1	365	7.5	6.7	22.1	361	7.2
	7	0.9	60								
B01	1	0.2	280	6.3	22.2	367	7.4	6.6	22.1	356	7.2
B02	1	0.1	315	6.2	22.2	374	7.4	6.7	22.1	355	7.2
	3	0.2	280	6.1	22.2	371	7.3	6.7	22.1	355	7.2
	5	0.3	290	6.0	22.1	371	7.3	6.6	22.1	356	7.2
	7	0.3	300								
B03	1	0.6	30	6.3	22.1	371	7.3	6.8	22.0	353	7.2
	3	0.3	310	6.3	22.1	372	7.3	6.7	22.1	354	7.2
	5	0.5	350	6.3	22.1	372	7.3	6.5	22.0	355	7.2
	7	0.4	325	6.4	22.1	372	7.3	6.4	22.0	355	7.2
	9	0.4	290					6.4	22.0	356	7.2
	11	0.4	310								
C01	1	0.4	215	6.1	22.1	373	7.3	6.9	22.0	313	7.1
C02	1	0.2	205	6.1	22.1	374	7.3	6.8	22.0	318	7.2
	3	0.3	195	6.0	22.1	373	7.3	6.4	22.0	318	7.1
	5	0.3	225	6.2	22.1	374	7.3	6.1	22.0	319	7.2
C03	1	0.3	200	6.1	22.1	375	7.3	6.9	22.0	325	7.2
	3	0.3	205	6.2	22.1	375	7.3	6.5	22.0	326	7.2
	5	0.2	200	6.3	22.1	375	7.3	6.3	22.0	328	7.2
	7	0.2	190	6.3	22.1	375	7.3	6.1	22.0	328	7.1
	9	0.2	195								
C04	1	0.7	40	6.3	22.2	363	7.5	6.8	22.0	331	7.2
	3	0.3	35	6.4	22.2	364	7.5	6.3	22.0	333	7.2
	5	0.4	30	6.6	22.2	365	7.5	6.1	22.0	333	7.2
	7	0.2	45	6.4	22.2	365	7.4	6.0	22.0	334	7.1
	9	0.2	35	6.6	22.2	366	7.4	6.1	22.0	334	7.1
	11	0.1	290	6.5	22.2	366	7.4	6.2	22.0	334	7.1
	13	0.1	65								
	15	0.2	95								
D01	1	0.5	205	6.4	22.2	369	7.6	6.8	22.0	326	7.2

(Continued)

Table A2 (Concluded)

Station	Depth (m)	Current		Day				Night			
		Velocity	Direction	DO	Temp	Cond	pH	DO	Temp	Cond	pH
D02	1	0.3	175	6.2	22.2	371	7.5	6.7	22.0	324	7.2
	3	0.3	190	6.4	22.2	370	7.5	6.5	22.0	326	7.2
D03	1	0.4	115	6.2	22.2	373	7.5	6.8	22.0	331	7.2
	3	0.3	200	6.4	22.2	372	7.5	6.7	22.0	331	7.2
	5	0.3	100	6.3	22.2	374	7.5	6.4	22.0	332	7.1
	7	0.6	95	6.4	22.2	374	7.5	6.4	22.0	333	7.1
	9	0.2	55	6.4	22.2	373	7.4	6.5	22.0	333	7.1
	11	0.7	85								
E01	1	0.2	35	6.3	22.3	375	7.4	6.9	22.0	334	7.2
E02	1	0.7	50	6.2	22.2	376	7.5	6.8	22.0	338	7.2
	3	0.6	50	6.3	22.2	376	7.5	6.7	21.9	339	7.2
	5	0.6	50	6.4	22.2	376	7.5	6.6	22.0	339	7.2
E03	1	1.0	50	6.4	22.2	378	7.5	6.7	21.9	340	7.2
	3	1.1	60	6.4	22.2	377	7.4	6.6	21.9	341	7.2
	5	0.9	60	6.5	22.2	377	7.4	6.5	21.9	341	7.2
	7	0.7	45	6.5	22.2	377	7.4	6.6	21.9	342	7.2
	9	0.7	60	6.5	22.2	377	7.4	6.6	21.9	342	7.1

Table A3

Physical and Chemical Data from Port Sulphur Eddy

(Trip 3), 29 May 1985

Station	Depth (m)	Current Velocity	Current Direction	TOC	DS	SS	Day DO	Day Temp	Day Cond	Day pH
A01	1	0.4	95	4.5	85	256	6.1	24.1	405	7.6
A02	1	0.5	85				6.3	24.0	416	7.5
	3	0.4	85				6.3	24.0	415	7.5
	5	0.5	85				6.2	23.9	415	7.4
	7	0.5	85				6.3	24.0	415	7.4
A03	1	0.4	60	4.8	83	283	6.1	23.9	420	7.4
	3	0.5	90				6.1	24.0	420	7.4
	5	0.6	90				6.3	23.9	420	7.4
	7	0.5	90				6.2	23.9	420	7.3
	9	0.5	90				6.4	23.9	420	7.3
	11	0.6	95				6.3	23.9	420	7.3
	13	0.6	100	4.9	92	274	6.4	23.9	420	7.3
B01	1	0.2	70	4.8	69	257	5.9	24.2	423	7.4
B02	1	0.2	45				6.0	24.0	424	7.5
	3	0.1	89				6.0	24.0	423	7.4
	5	0.1	310				6.2	24.0	423	7.4
	7	0.2	295				6.0	24.0	423	7.4
B03	1	0.3	80	5.1	88	335	6.1	24.0	423	7.4
	3	0.3	75				6.2	24.0	423	7.4
	5	0.4	85				6.2	24.0	423	7.4
	7	0.4	80				6.3	24.0	423	7.3
	9	0.4	75				6.2	24.0	423	7.3
	11	0.4	90				6.1	24.0	423	7.3
	13	0.3	85	4.6	89	285	6.0	24.0	423	7.3
C01	1	0.2	300				6.2	24.0	434	7.7
C02	1	0.1	85				6.2	24.2	430	7.5
	3	0.2	90				6.7	24.0	430	7.4
	5	0.3	90				6.4	24.0	429	7.4
C03	1	0.3	75	4.5	76	266	6.2	24.0	431	7.4
	3	0.3	90				6.1	24.0	430	7.4
	5	0.3	195				6.2	24.0	430	7.4
	7	0.5	80				6.2	24.0	430	7.3
	9	0.4	90				6.3	24.0	430	7.3
	11	0.5	90				6.6	24.0	430	7.3
	13	0.4	90	4.9	85	265				

(Continued)

Table A3 (Concluded)

Station	Depth (m)	Current		TOC	DS	SS	Day			
		Velocity	Direction				DO	Temp	Cond	pH
C04	1	0.4	80				6.1	23.9	430	7.4
	3	0.5	85				6.3	24.0	431	7.4
	5	0.6	70				6.3	24.0	431	7.4
	7	0.5	80				6.3	24.0	431	7.3
	9	0.5	75				6.2	24.0	431	7.3
	11	0.4	80							
	13	0.4	70							
D01	1	0.2	230	4.5	94	257	6.2	24.0	431	7.4
D02	1	0.1	135				6.1	24.0	430	7.4
	3	0.2	120				6.3	24.0	431	7.4
	5	0.2	90							
	7	0.1	75							
D03	1	0.5	75	4.6	84	271	6.1	24.0	431	7.5
	3	0.5	80				6.1	24.0	431	7.4
	5	0.5	75				6.1	24.0	431	7.4
	7	0.4	60				6.1	24.0	431	7.3
	9	0.4	75							
	11	0.4	75	4.4	134	261				
E01	1	0.4	75	4.5	82	258	6.1	24.1	431	7.3
	3	0.4	80				6.3	24.0	431	7.4
	5	0.4	90				6.3	24.0	431	7.4
	7	0.4	90				6.3	24.0	431	7.4
	9	0.3	100							
	11	0.2	90	4.5	81	262				
E02	1	0.5	75				6.0	24.0	431	7.6
	3	0.5	90				6.1	24.0	431	7.5
	5	0.5	85				6.2	23.9	431	7.5
	7	0.4	90				6.1	23.9	431	7.4
	9	0.4	100				6.1	23.9	431	7.4
	11	0.3	90				6.3	23.9	431	7.4
	13	0.4	90				6.3	23.9	431	7.3
E03	1	0.5	90	4.4	85	281	6.3	23.9	431	7.4
	3	0.6	90				6.4	23.9	431	7.4
	5	0.6	80				6.3	23.9	431	7.4
	7	0.6	90				6.3	23.9	432	7.4
	9	0.6	100				6.4	23.9	432	7.4
	11	0.6	85				6.4	23.9	431	7.3
	13	0.5	80				6.4	23.9	431	7.3
	15	0.5	80							
	17	0.4	105	4.7	87	275				

Table A4

Physical and Chemical Data From Natchez Eddy

(Trip 3), 2 June 1985

Station	Depth (m)	Current Velocity	Current Direction	TOC	DS	SS	Day DO	Day Temp	Day Cond	Day pH
A01	1	0.7	150	4.9	143	319	7.4	24.8	401	7.2
A02	1	0.9	150				6.7	24.4	396	7.4
	3	0.9	150				6.8	24.3	396	7.4
	5	0.7	150				7.0	24.3	397	7.4
A03	1	1.0	160	4.6	121	335	7.1	24.3	396	7.4
	3	1.0	165				7.1	24.3	397	7.4
	5	1.0	160				7.1	24.3	397	7.4
	7	1.0	165				7.2	24.3	397	7.4
	9	0.9	150				7.3	24.3	397	7.4
	11	0.8	165	4.9	129	354	7.3	24.3	397	7.4
B01	1	0.4	7	3.5	120	332	6.7	24.3	396	7.3
B02	1	0.3	45				6.8	24.4	397	7.3
	3	0.4	45				6.9	24.3	396	7.3
	5	0.3	40				6.8	24.3	397	7.3
	7	0.3	40				6.9	24.3	396	7.3
B03	1	0.3	135	4.8	125	385	6.9	24.3	396	7.3
	3	0.3	170				7.1	24.2	396	7.3
	5	0.4	150				7.0	24.3	396	7.3
	7	0.5	140				7.3	24.3	396	7.3
	9	0.7	150							
	11	0.4	150							
	13	0.8	150							
	15	0.9	180							
	17	0.7	150							
	19	0.7	150							
	21	0.6	150							
	23	0.8	150							
	25	0.8	160							
	27	0.8	160	4.6	139	258				
C01	1	0.6	290				6.8	24.3	397	7.3
C02	1	0.1	310				7.0	24.3	396	7.3
	3	0.4	300				6.9	24.3	396	7.3
	5	0.4	290				7.2	24.3	397	7.3
	7	0.4	0				7.2	24.3	397	7.3
	9	0.4	325				7.3	24.3	397	7.3

(Continued)

Table A4 (Continued)

Station	Depth (m)	Current Velocity	Current Direction	TOC	DS	SS	Day DO	Day Temp	Day Cond	Day pH
C03	1	0.2	300	4.8	118	334	7.1	24.3	397	7.3
	3	0.1	45				6.9	24.3	397	7.3
	5	0.1	45				7.1	24.3	397	7.3
	7	0.2	315				7.1	24.3	397	7.3
	9	0.1	300				7.0	24.3	397	7.3
	11	0.2	300				7.2	24.2	395	7.3
	13	0.1	315				7.2	24.2	395	7.4
	15	0.1	315				7.2	24.2	397	7.4
	17	0.2	255							
	19	0.1	255	4.8	126	316				
C04	1	0.4	160				7.1	24.3	396	7.4
	3	0.5	160				7.1	24.3	396	7.4
	5	0.5	145				7.1	24.3	396	7.4
	7	1.1	180				7.2	24.3	396	7.4
	9	0.9	170				7.3	24.3	396	7.4
	11	0.8	195				7.3	24.2	397	7.4
	13	0.9	195				7.3	24.3	396	7.4
	15	0.8	150				7.4	24.2	397	7.4
	17	0.6	170				7.4	24.2	396	7.4
	19	1.0	150				7.4	24.2	396	7.4
	21	0.7	150				7.4	24.2	396	7.4
	23	1.0	165				7.2	24.2	396	7.2
	25	0.1	170				7.4	24.2	396	7.4
	27	0.1	165							
	29	0.5	165							
	31	0.2	170							
D01	1	0.3	170	4.6	104	323	6.4	24.5	397	7.3
D02	1	0.5	120				6.5	24.5	397	7.3
	3	0.4	135				6.6	24.5	397	7.3
	5	0.4	200				6.9	24.4	398	7.3
	7	0.4	165				6.9	24.4	398	7.3
D03	1	0.7	75	4.3	132	334	7.0	24.4	397	7.3
	3	0.6	70				7.0	24.3	398	7.3
	5	0.8	60				7.2	24.4	397	7.3
	7	0.8	40				7.3	24.3	398	7.3
	9	0.8	15	4.7	128	399	7.3	24.4	398	7.3
E01	1	0.2	330	5.0	131	344	6.0	24.4	398	7.4
E02	1	0.2	75				6.7	24.4	397	7.4
	3	0.1	75				6.8	24.3	398	7.4
	5	0.1	75				6.9	24.3	398	7.4
	7	0.1	75				6.8	24.3	398	7.4
	9	0.1	60				6.8	24.3	398	7.3

(Continued)

Table A4 (Concluded)

Station	Depth (m)	Current Velocity	Current Direction	TOC	DS	SS	Day DO	Day Temp	Day Cond	Day pH
E03	1	1.3	160	4.6	116	367	6.7	24.3	396	7.4
	3	1.3	165				6.9	24.3	397	7.4
	5	1.5	160				7.0	24.3	397	7.4
	7	0.9	165				7.2	24.3	397	7.4
	9	1.1	180				7.2	24.3	397	7.4
	11	0.8	165				7.3	24.4	397	7.4
	13	0.8	165				7.3	24.4	398	7.4
	15	0.7	185				7.3	24.4	397	7.4
	17	0.6	160				7.3	24.4	397	7.4
	19	0.4	165				7.3	24.4	397	7.4
	21	1.1	165	4.9	124	319	7.3	24.3	397	7.4

Table A5

Physical and Chemical Data from White Castle Eddy (Trip 3), 6-7 June 1985

Station	Depth (m)	Current Velocity	Current Direction	TOC	DS	SS	Day DO	Day Temp	Day Cond	Day pH	Night DO	Night Temp	Night Cond	Night pH
A01	1	0.3	260	5.1	142	298	6.7	26.4	381	7.6	6.8	26.0	413	7.2
A02	1	0.7	55				6.8	26.3	385	7.6	6.9	26.0	413	7.2
	3	0.7	25				6.7	26.2	386	7.6	6.6	26.0	416	7.2
A03	1	0.6	50	5.2	137	291	6.8	26.2	388	7.9	6.7	26.0	415	7.2
	3	0.6	50	5.3	140	265	6.9	26.1	388	7.9	6.7	26.0	415	7.2
B01	1	0.2	260	5.3	142	265	6.9	26.2	389	7.9	6.7	26.0	415	7.2
B02	1	0.4	5				6.4	26.1	393	7.8	6.7	26.0	415	7.2
	3	0.4	45				6.6	26.1	393	7.8	7.8	26.0	417	7.2
	5	0.4	260				6.6	26.1	393	7.7	6.8	26.0	417	7.2
B03	1	0.6	30	5.1	136	273	6.8	26.1	390	8.0	6.7	26.0	415	7.2
	3	0.6	15				6.9	26.1	391	7.8	6.6	26.0	417	7.2
	5	0.5	15				6.6	26.1	391	7.8	6.8	26.0	417	7.2
	7	0.4	315				6.7	26.2	391	7.8	6.8	26.0	417	7.2
	9	0.4	280				6.5	26.1	392	7.8	6.7	26.0	418	7.2
	11	0.2	265	5.3	129	254	6.5	26.2	391	7.8	6.6	26.0	418	7.2
C01	1	0.2	200				6.7	26.1	394	7.5	7.0	25.9	413	7.2
	3	0.1	215				6.7	26.1	395	7.5	6.4	26.0	415	7.2
C02	1	0.3	220				6.6	26.1	392	7.5	6.9	26.0	414	7.2
	3	0.4	210				6.7	26.1	398	7.5	6.6	26.0	415	7.2
C03	1	0.6	45	4.6	132	279	6.9	26.1	395	7.4	6.9	26.0	417	7.2
	3	0.5	45				6.6	26.1	395	7.4	6.6	26.0	417	7.2
	5	0.5	40				6.7	26.1	395	7.4	6.6	26.0	417	7.2
	7	0.6	45				6.5	26.1	396	7.4	6.2	26.0	417	7.2
	9	0.6	60				6.6	26.1	396	7.4	6.4	26.0	418	7.2
	11	0.5	60				6.5	26.1	396	7.4	5.8	26.0	418	7.2
	13	0.4	105				6.3	26.1	396	7.4	5.8	26.0	418	7.2
	15	0.5	100											
	17	0.1	115	5.1	142	267								

(Continued)

Table A5 (Concluded)

	Depth	Current					Day				Night			
Station	(m)	Velocity	Direction	TOC	DS	SS	DO	Temp	Cond	pH	DO	Temp	Cond	pH
C04	1	0.6	75				7.0	26.1	397	7.4	6.6	26.0	415	7.2
	3	0.6	75				6.9	26.1	397	7.4	6.4	26.0	416	7.2
	5	0.6	65				6.5	26.1	397	7.4	6.3	26.0	417	7.2
	7	0.6	55				6.5	26.1	397	7.4	6.5	26.0	417	7.2
	9	0.5	75				6.5	26.1	397	7.3	6.5	26.0	418	7.2
	11	0.6	75				6.5	26.1	397	7.3	6.5	26.0	418	7.2
	13	0.4	55				6.5	26.1	397	7.3	6.4	26.0	418	7.2
	15	0.5	85				6.4	26.1	397	7.3	6.5	26.0	418	7.2
	17	0.4	30											
D01	1	0.2	180	5.6	135	249	7.0	26.1	396	7.3	6.8	25.9	412	7.2
D02	1	0.1	150				6.7	26.1	397	7.4	6.7	25.9	412	7.2
	3	0.1	195				6.8	26.1	398	7.4	6.5	26.0	414	7.2
	5	0.1	180											
D03	1	0.3	135	4.9	141	272	6.6	26.1	398	7.4	6.9	26.0	414	7.2
	3	0.3	120				6.7	26.1	398	7.3	6.3	26.0	415	7.2
	5	0.1	90				6.7	26.1	398	7.3	6.6	26.0	415	7.2
	7	0.2	80				6.6	26.1	399	7.3	6.6	26.0	415	7.2
	9	0.2	60	4.9	127	279								
E01	1	0.5	35	5.7	151	277	6.8	26.1	398	7.4	6.9	26.0	412	7.3
E02	1	0.5	45				7.0	26.0	397	7.4	6.9	26.0	414	7.3
	3	0.5	35				6.9	26.1	398	7.3	6.9	26.0	414	7.3
	5	0.4	35				6.8	26.1	398	7.3	6.8	26.0	414	7.2
E03	1	0.5	60	5.3	149	270	6.7	26.1	400	7.4	6.9	26.0	415	7.3
	3	0.4	40				6.8	26.1	399	7.3	6.7	26.0	415	7.3
	5	0.4	30				6.7	26.1	399	7.3	6.7	26.0	415	7.3
	7	0.4	45	5.5	142	262	6.8	26.1	399	7.3	6.7	26.0	415	7.2

Table A6

Physical and Chemical Data from White Castle Eddy

(Trip 4), 25-26 June 1985

Station	Depth (m)	Current		Day				Night			
		Velocity	Direction	DO	Temp	Cond	pH	DO	Temp	Cond	pH
A01	1	0.3	45	6.7	26.6	413	7.8	7.0	26.5	400	7.8
A02	1	0.3	45	6.6	26.6	412	7.8	7.3	26.4	400	7.9
A03	1	0.3	40	6.5	26.6	410	7.8	7.4	26.5	403	7.8
	3	0.3	25	6.4	26.6	410	7.8	7.2	26.5	407	7.7
	5	0.3	30	6.6	26.6	405	7.8	7.2	26.5	402	7.5
B01	1	0.1	5	6.5	26.6	408	7.8	7.0	26.4	400	7.6
B02	1	0.7	30	6.8	26.6	410	7.8	7.2	26.5	402	7.7
	3	0.7	15	6.5	26.6	410	7.8	7.3	26.5	403	7.6
	5	0.2	170	6.9	26.6	410	7.7	7.2	26.5	401	7.5
	7	0.3	190	6.6	26.6	410	7.7	7.3	26.5	405	7.5
	9	0.2	90	6.8	26.6	405	7.8	7.2	26.5	403	7.5
B03	1	0.8	30	6.9	26.6	412	7.9	7.5	26.5	405	7.6
	3	0.8	20	6.9	26.6	412	7.9	7.4	26.5	402	7.7
	5	0.6	30	6.9	26.6	412	7.8	7.2	26.5	404	7.6
	7	0.8	15	6.9	26.6	412	7.8	7.2	26.5	400	7.5
	9	0.8	40	7.0	26.5	415	7.9	7.2	26.5	400	7.5
	11	0.6	30								
	13	0.6	25								
	15	0.4	20								
	17	0.3	10								
C01	1	0.5	150	6.4	26.6	405	7.8	7.0	26.4	403	7.8
C02	1	0.4	45	6.8	26.6	410	7.8	7.4	26.5	403	7.8
	3	0.3	140	6.8	26.6	409	7.8	7.2	26.5	402	7.8
	5	0.3	75	6.5	26.6	409	7.8				
C03	1	0.2	105	6.6	26.6	408	7.8	6.9	26.5	405	7.8
	3	0.2	165	6.6	26.6	410	7.8	7.1	26.5	404	7.7
	5	0.2	150	6.4	26.6	408	7.7	7.3	26.5	402	7.7
	7	0.3	165	6.6	26.6	409	7.7				
C04	1	0.3	90	6.8	26.6	400	7.8	7.5	26.5	402	7.7
	3	0.5	50	6.6	26.6	405	7.8	7.3	26.5	401	7.7
	5	0.5	75	6.6	26.6	410	7.7	7.2	26.5	401	7.7
	7	0.5	75	6.6	26.6	410	7.7	7.3	26.5	402	7.6
	9	0.5	40	6.7	26.6	410	7.8	7.2	26.5	405	7.6
	11	0.5	50								
	13	0.4	70								
D01	1	0.3	175	6.8	26.7	360	7.9	7.3	26.5	404	7.7
D02	1	0.3	145	6.8	26.6	405	7.8	6.9	26.5	402	7.8
	3	0.3	180	6.5	26.6	408	7.8	7.1	26.5	403	7.7

(Continued)

Table A6 (Concluded)

Station	Depth (m)	Current		Day				Night			
		Velocity	Direction	DO	Temp	Cond	pH	DO	Temp	Cond	pH
D03	1	0.3	75	6.5	26.6	410	7.8	7.4	26.5	400	7.7
	3	0.3	75	6.5	26.6	410	7.7	7.2	26.5	400	7.7
	5	0.3	75	6.7	26.6	410	7.7	7.0	26.5	400	7.6
	7	0.3	105	6.5	26.6	410	7.7	6.9	26.5	400	7.5
	9	0.2	75	6.7	26.5	410	7.8	6.9	26.5	400	7.6
E01	1	0.4	40	6.7	26.7	400	7.7	7.3	26.5	400	7.8
E02	1	0.5	45	6.9	26.7	402	7.8	7.5	26.5	400	7.7
	3	0.5	30	6.6	26.7	398	7.8	7.4	26.5	400	7.7
	5	0.5	45	6.7	26.7	415	7.7	7.1	26.5	400	7.6
E03	1	0.7	45	6.9	26.7	410	7.9	7.5	26.5	400	7.8
	3	0.7	45	6.5	26.7	410	7.8	7.5	26.5	402	7.8
	5	0.6	30	6.7	26.6	410	7.7	7.4	26.5	405	7.7
	7	0.5	45	6.5	26.6	410	7.7	7.5	26.5	403	7.7

Table A7

Physical and Chemical Data from White Castle Eddy (Trip 5), 17-18 July 1985

	Depth	Current					Day				Night			
Station	(m)	Velocity	Direction	TOC	DS	SS	DO	Temp	Cond	pH	DO	Temp	Cond	pH
A01	1	0.5	40	4.8	95	263	6.6	28.8	431	7.5	7.3	28.9	427	7.4
A02	1	0.5	30				7.5	28.8	432	7.5	7.4	28.8	426	7.4
	3	0.5	25											
A03	1	0.5	45	4.9	75	197	7.3	28.8	432	7.5	7.4	28.8	428	7.4
	3	0.5	50	4.3	146	263	7.4	28.8	433	7.6	6.9	28.9	427	7.5
B01	1	0.0		5.5	233	260	7.3	28.8	432	7.5	7.0	28.8	428	7.4
B02	1	0.5	15				7.4	28.8	432	7.5	7.0	28.8	428	7.4
	3	0.3	35				6.7	28.8	432	7.6	6.9	28.8	427	7.5
	5	0.4	292				6.8	28.8	433	7.6	6.8	28.9	427	7.5
B03	1	0.3	15	4.6	131	268	6.8	28.8	425	7.4	7.2	28.8	426	7.4
	3	0.2	300				7.0	28.8	426	7.5	6.9	28.9	426	7.5
	5	0.3	300				7.1	28.8	426	7.5	6.7	28.9	427	7.5
	7	0.2	265				7.3	28.8	426	7.6	6.6	28.9	426	7.6
	9	0.3	300	4.8	114	262	7.4	28.8	427	7.6	6.4	28.8	428	7.6
C01	1	0.1	225				7.1	28.8	425	7.4	6.9	28.8	429	7.4
C02	1	0.2	225				7.2	28.8	430	7.4	7.0	28.8	427	7.4
C03	1	0.2	290	4.4	136	293	7.3	28.8	425	7.4	7.2	28.8	425	7.4
	3	0.2	255				7.3	28.8	426	7.5	6.9	28.8	428	7.5
	5	0.2	300				7.3	28.8	427	7.5	6.8	28.7	428	7.5
	7	0.2	315				7.3	28.8	428	7.6	6.6	28.8	425	7.6
	9	0.2	315				7.3	28.8	427	7.6	6.6	28.9	425	7.6
	11	0.2	335	4.4	138	256								

(Continued)

Table A7 (Concluded)

Station	Depth (m)	Current		TOC	DS	SS	Day				Night			
		Velocity	Direction				DO	Temp	Cond	pH	DO	Temp	Cond	pH
C04	1	0.3	220				7.5	28.8	425	7.4	7.0	28.8	428	7.4
	3	0.3	35				7.1	28.8	425	7.5	6.9	28.8	427	7.4
	5	0.2	40				7.0	28.8	425	7.5	6.9	28.8	424	7.5
	7	0.2	15				7.2	28.8	426	7.5	6.7	28.8	426	7.5
	9	0.2	70				7.0	28.8	427	7.5	6.6	28.8	427	7.5
	11	0.2	30											
	13	0.3	30											
	15	0.4	75											
D01	1	0.2	30	4.4	142	293	7.0	28.8	430	7.4	7.2	28.8	427	7.4
D02	1	0.2	150				6.9	28.8	425	7.4	7.1	28.8	424	7.3
	3	0.2	210				6.9	28.8	426	7.5	6.9	28.8	425	7.4
D03	1	0.2	90	4.8	142	264	6.9	28.8	425	7.4	7.1	28.8	427	7.4
	3	0.2	340				7.1	28.8	426	7.5	6.8	28.8	425	7.4
	5	0.2	225	4.3	150	265	7.1	28.8	427	7.5	6.8	28.9	426	7.5
E01	1	0.4	45	4.4	134	265	7.1	28.8	427	7.4	7.0	28.8	428	7.4
E02	1	0.7	45				7.1	28.8	427	7.4	7.3	28.8	426	7.3
E03	1	0.8	40	4.5	138	272	7.2	28.8	424	7.5	7.1	28.9	430	7.4
	3	0.7	40				7.2	28.8	425	7.6	6.9	28.8	427	7.4
	5	0.7	15	4.7	138	263	7.3	28.8	425	7.6	6.9	28.8	428	7.4

APPENDIX B: PERCENT COMPOSITION OF BOTTOM SUBSTRATES AT WHITE CASTLE, NATCHEZ, AND PORT SULPHUR EDDIES, APRIL THROUGH JULY, 1985

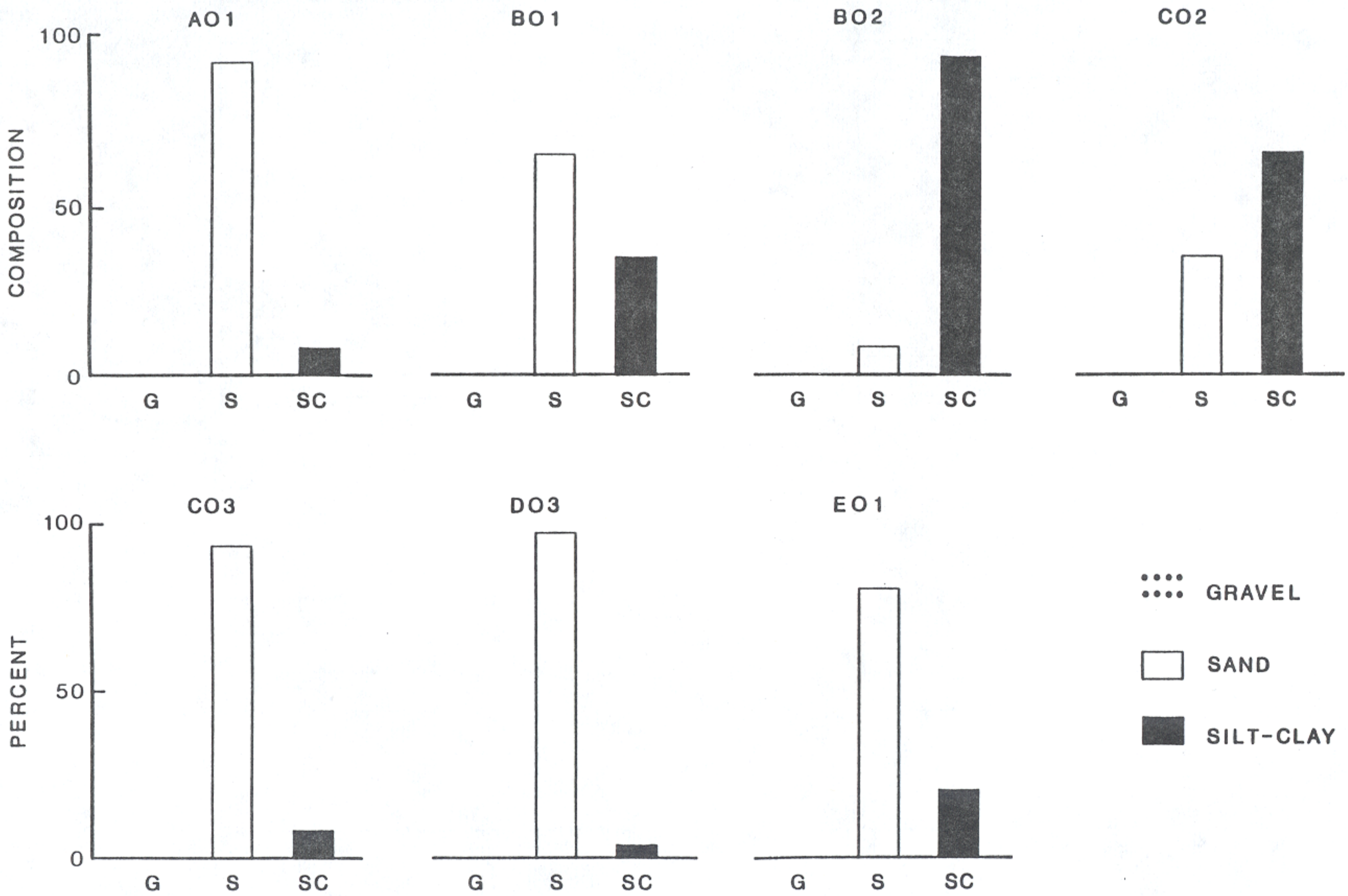


Figure B1. Sediment composition at stations near White Castle (Trip 1), 23 April 1985

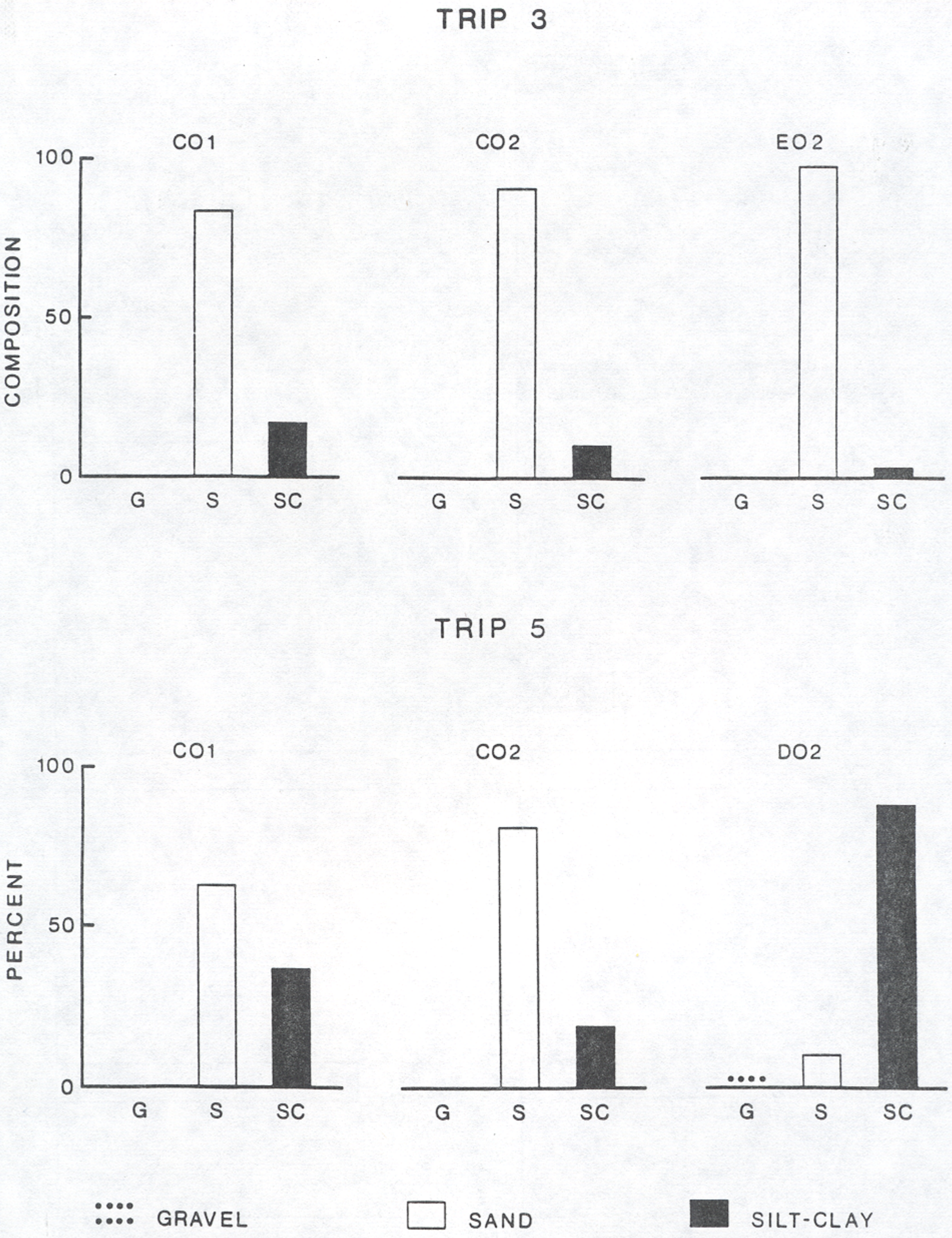
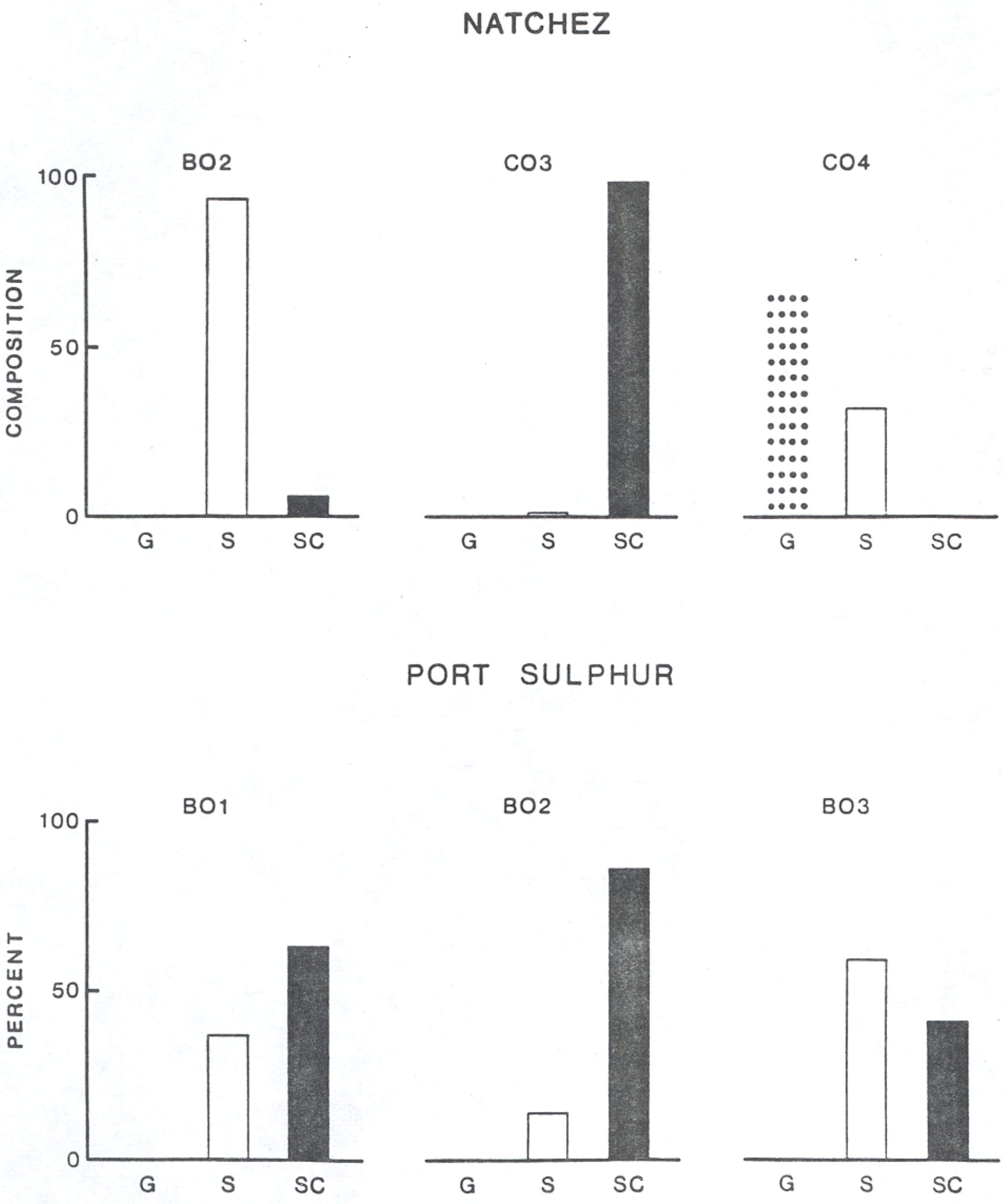


Figure B2. Sediment composition at stations near White Castle (Trips 3 and 5), 7 June and 19 July, 1985



(CONTINUED)

Figure B3. Sediment composition at stations near Natchez and Port Sulphur (Trip 3), 2 June and 29 May, 1985

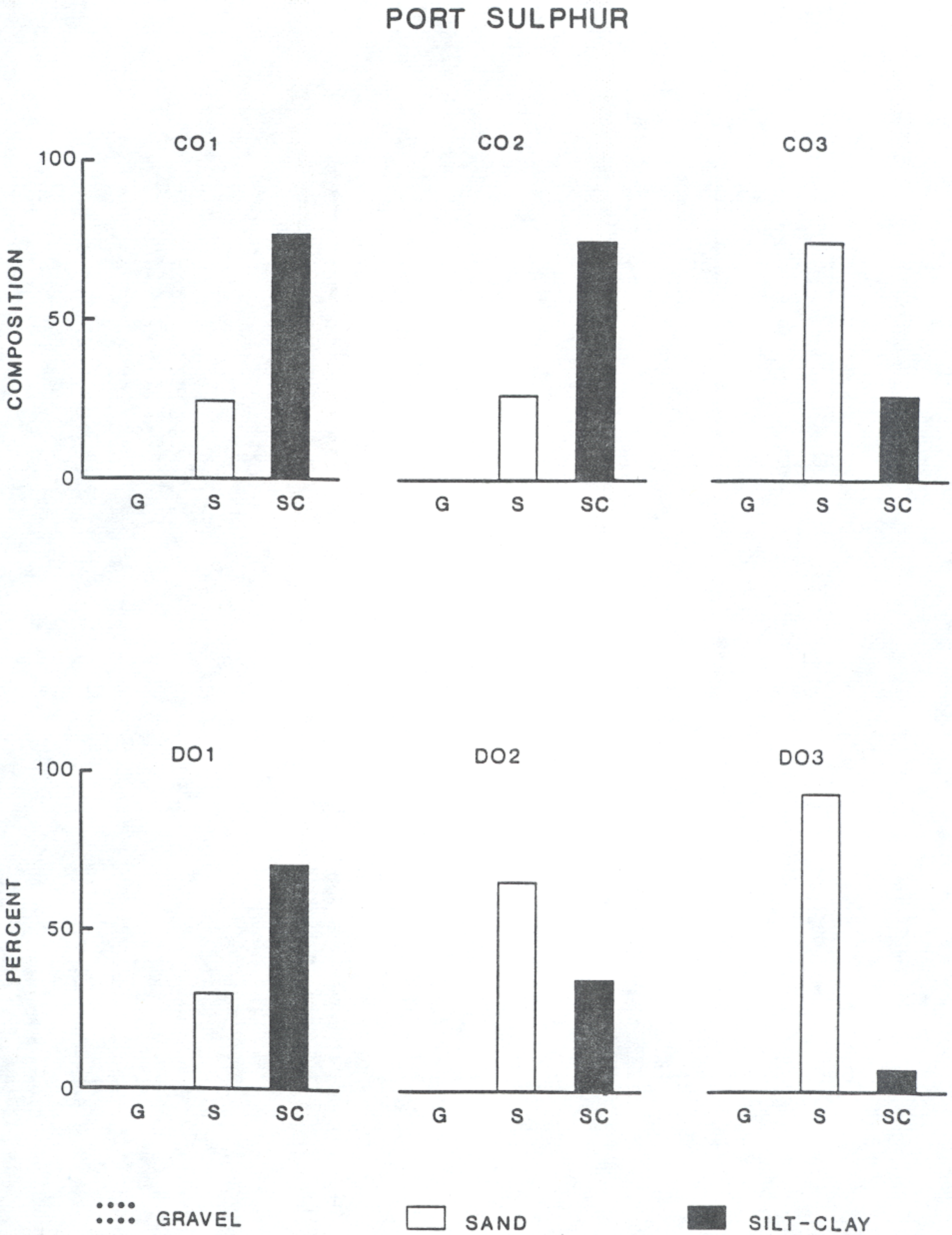


Figure B3. (Concluded)

APPENDIX C: ABUNDANCE (No./m^2) OF BENTHIC MACROINVERTEBRATES COLLECTED FROM THE WHITE CASTLE, PORT SULPHUR, AND NATCHEZ EDDIES, APRIL THROUGH JULY, 1985

Table C1

Abundance (No./m^2) of Benthic Macroinvertebrates Collected from White Castle Eddy, April Through July, 1985

Taxonomic Classification	Trip 1 (23 April)							Trip 3 (7 June)			Trip 5 (19 July)		
	A01*	B01	B02	C02	C03	D03	E01*	C01	C02	E02	C01	C02	D02
Annelida													
Oligochaeta													
Limnodrilus hoffmeisteri													50
Limnodrilus maumeensis			525	150	150	3300		25	25		50	100	650
Tubificidae (no capilliform)		25	550	75	125	9400		225	100	25	50	100	200
Insecta													
Ephemeroptera													
Pentagenia vittigera												50	
Trichoptera													
Hydropsyche orris											25	25	
Diptera													
Chernovskiia orbicus		75		25						25			
Cryptochironomus						200							
Paratendipes (n.r. Connectens)													
Rheotanytarsus			50										
Robackia claviger		25											
Diptera pupa						25							
Mollusca													
Pelecypoda		25			25	75		25		25			
Corbicula fluminea					25								
Gastropoda										25			
Mesogastropoda								25					

* no organisms

Table C2

Abundance (No./m^2) of Benthic Macroinvertebrates Collected from Port Sulphur and Natchez Eddies, 29 May and 2 June, 1985

Taxonomic Classification	Port Sulphur									Natchez		
	B01	B02	B03	C01	C02	C03	D01	D02	D03	B02	C03	C04
Annelida												
Oligochaeta												
Aulodrilus pigueti				25		25	50					
Branchiura sowerbyi										25		
Limnodrilus cervix						25						
Limnodrilus claparedianus/cervix											50	
Limnodrilus hoffmeisteri				50	25		100	25				
Limnodrilus maumeensis				25						50		
Limnodrilus udekemeanus	25										100	
Tubificidae (no capilliform)	50	200	25	625	125	125	1550	150	50	250	800	
Crustacea												
Amphipoda												
Gammarus fasciatus												50
Insecta												
Ephemeroptera												
Hexagenia						25						
Pentagenia vittigera			125			50			25			
Trichoptera												
Potamyia flava												25
Diptera												
Bezzia		25										
Chaoborus								25	25			
Cryptochironomus			25			25		25			25	
Harnischia curtilamellata	125	25		25				75				
Polypedilum convictum												25
Polypedilum halterale gr.		75				100						
Robackia claviger												25
Diptera pupa				25		25	25		25			25

(Continued)

Table C2 (Concluded)

Taxonomic Classification	Port Sulphur								Natchez			
	B01	B02	B03	C01	C02	C03	D01	D02	D03	B02	C03	C04
Mollusca												
Pelecypoda						50						
Corbicula fluminea												50
Lampsilis												25

APPENDIX D: ABUNDANCE (No./100 m^3) OF DRIFTING INVERTEBRATES COLLECTED FROM THE WHITE CASTLE, PORT SULPHUR, AND NATCHEZ EDDIES, APRIL THROUGH JULY, 1985

Table D1

Abundance (No./100 m^3) of Drifting Macroinvertebrates Collected from White Castle Eddy (1 Day), 24 April 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Coelenterata**																
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hydra	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nematoda							1.3									
Oligochaeta																
Enchytraeidae							1.3									
Bratislavia unidentitata												1.1				
Pristina longiseta longiseta	1.4	1.7	3.2		2.0											
Nais alpina								1.0								1.3
Nais communis					2.0			1.9				1.1	1.3			
Nais variabilis					2.0											
Stylaria lacustris								2.7	1.5		1.5	1.1	1.5			3.5
Dero abranchiata													1.5			
Dero furcata		3.3						0.8								
Crustacea																
Ostracoda		1.7	1.0	6.0	4.0	1.0		1.7				1.1	1.5		1.3	1.3
Mysidacea																
Taphromysis louisianae	1.4			1.3	2.0	2.1	8.6		4.2		1.5		5.7	1.9	1.2	1.2
Isopoda																
Asellus sp. 1									7.4				5.9			3.7
Lirceus		2.0					1.3	1.6	2.9			2.2				1.3

(Continued)

* Station was dropped from all analyses.
** Coelenterates, when present, are marked with an X.

Table D1 (Continued)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Amphipoda																
Gammarus								0.8						1.9		
Crangonyx			2.1		2.0	2.2										
Crangonyx floridanus							1.3	0.8							1.2	
Crangonyx obliquus-richmondensis		1.6								12.5		1.1			2.5	
Dacapoda										12.5						
Macrobrachium ohione				2.6	7.0		2.6		1.5	12.5		4.3			1.3	
Arachnida																
Hydracarina		1.6		1.3	2.9			1.7				1.1	1.5			1.2
Insecta																
Collembola																
Isotomurus					1.5											
Entomobryidae									1.5							
Plecoptera							1.3									
Perlesta																
Perlesta placida nymph	1.4													1.7		1.3
Isoperla					2.0			1.0	1.5		2.5					2.4
Ephemeroptera	1.4							1.7								
Stenonema sp.												1.1				
Stenonema integrum		2.0	1.0	6.0	4.0		2.3	1.7	1.3	12.5		1.1	1.5		2.4	4.7
Heptagenia marginalis			1.0			1.0							1.3			1.3
Heptageniidae			1.0													
Baetis								1.0								
Caenis nymph								0.8								
Hexagenia								1.0								
Baetidae												1.1				
Odonata													1.3			
Ischnura							2.3									
Hemiptera	2.9	1.6		6.0				2.7				1.1	1.5			
Corixidae			1.0		4.0			1.0								

(Continued)

Table D1 (Continued)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Trichoptera													1.3			1.2
Hydropsyche orris			2.1					2.5	1.5	10.0			1.3	1.7		
Hydropsychidae					2.0				1.5							
Potamyia flava													2.6			
Lepidoptera													1.5			
Coleoptera	1.4												2.9			
Coptotomus					2.0											1.3
Dineutus	1.4															
Gyrinidae larvae			1.0	1.3								1.1			1.3	
Hydroporus					2.0			1.7				2.2			1.2	1.3
Dytiscidae												2.1				
Elmidae																1.2
Copelatus								1.6				1.1	1.5			
Coleoptera larva	1.4															
Staphylinidae															1.2	2.3
Chryosomelidae																1.2
Diptera																
Bezzia	1.4					1.1		0.8								
Chaoborus	5.7		2.1		4.0	2.2	8.3	3.3	2.9	20.0	2.5	2.1	5.5	1.7	3.7	2.5
Chironomus sp.	1.4								1.5							
Chernovskiia orbicus	2.9		1.0					1.0								1.3
Cricotopus sylvestris	1.4		1.0						1.3		2.5		1.3			4.7
Chironomidae adult		9.8														
Chironomidae pupa		12.5	7.4		10.0	1.0		10.4				1.1	10.1		3.6	3.5
Endochironomus nigricans		1.6														
Nanocladius distinctus			1.0		2.0											
Nanocladius								0.8								
Parachironomus carinatus								0.8								
Parachironomus					2.0											
Polypedilum convictum							1.3		1.3							

(Continued)

Table D1 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Polypedilum illinoense	2.7	3.3	2.1	6.0	2.0		41.1	3.8	5.9		7.7	4.3	16.7		1.2	19.7
Glyptotendipes								1.0				1.1				
Rheotanytarsus								2.5	1.5							
Dicrotendipes neomodestus								1.0								
Dicrotendipes nervosus type 1													1.5			
Ablabesmyia annulata								0.8								1.2
Ablabesmyia parajanta										12.5						
Diptera imago	4.3	11.6	8.4	6.6	19.5	1.0		12.3		10.0	2.5	6.5	20.5	3.8	3.6	13.9
Diptera pupa	1.4				1.5		3.9		1.5			4.2			2.6	
Hymenoptera																
Hymenoptera imago	5.7							1.9			2.5		7.3		2.4	1.2
Formicidae												1.1				
Thysanoptera			1.0		4.0		1.3	4.4				1.1	1.5			5.0
Mollusca																
Pelecypoda						1.0			1.5				1.5			

Table D2

Abundance (No./100 m^3) of Drifting Macroinvertebrates Collected from White Castle Eddy (1-Night), 24-25 April 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Coelenterata**																
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hydra	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Oligochaeta																
Nais communis	2.4			1.5												
Stylaria lacustris			1.2									1.3				
Crustacea																
Ostracoda				3.0		0.9				1.1	1.2		5.6			
Mysidacea																
Taphromysis louisianae	3.8	2.6	6.2	4.6	4.6	0.9	4.6				9.5	4.1	2.1	2.0	6.0	9.1
Isopoda																
Asellus sp.*																1.6
Lirceus																0.8
Probopyrus											2.4					
Amphipoda																1.0
Hyalella azteca	1.3															0.8
Gammarus																
Gammarus fasciatus				1.5												
Crangonyx	1.2															
Crangoryx floridanus			1.3			1.8										1.6
Crangonyx obliquus-richmondensis			1.2	1.5		0.9								2.0		
Decapoda																
Macrobrachium ohione				12.2	1.8			5.6			141	1.4	1.7	4.2		

(Continued)

* Station was dropped from all analyses.

Table D2 (Continued)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Arachnida																
Hydracarina		1.2	2.6		1.0							1.4				
Insecta																
Plecoptera																
Isoperla	2.5	1.2							3.8						1.2	
Ephemeroptera	1.2			1.5												
Stenonema integrum	3.7	1.2	6.1			1.9	5.2			15.2		4.2		2.0	3.6	7.8
Heptagenia marginalis										1.1	1.2		2.1		1.2	
Baetis			1.2													
Caenis nymph								0.9								
Hexagenia											1.2	1.4				
Odonata																
Coenagrionidae														2.2		
Hemiptera	1.3	2.3							1.8					2.0		1.0
Corixidae	3.6	4.7	3.7			0.9						1.3	1.7		1.2	0.8
Naucoridae																0.8
Trichoptera		1.2														1.0
Hydropsyche orris	1.3	1.3			0.9				2.0						1.2	
Potamyia flava					0.9											
Lepidoptera					0.9											
Coleoptera																
Gyrinidae larvae	1.2	2.3		1.5							4.8					
Hydrophilidae		1.3														
Hydroporus							2.2					2.7	2.1		1.2	
Copelatus	1.2			1.5						1.1						
Staphylinidae	1.2		1.2						1.8							
Dryopidea adult																0.8
Chrysomelidae					1.8					1.1	2.4				1.2	2.3
Diptera																
Chaoborus	2.4	3.6	3.7	3.0		2.8	3.0	2.8	2.0	1.1	2.4	4.1	3.8		3.6	3.9
Chernovskiia orbicus								1.0	2.0							

(Continued)

Table D2 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Cricotopus bicinctus										15.2						
Cricotopus sylvestris	1.2	2.3			0.9					15.2					1.2	1.6
Polypedilum convictum				1.5												
Polypedilum illinoense	26.4	19.0	24.0	1.5	1.8	1.9		0.9			2.4			2.0		19.6
Endochironomus nigricans												1.3				0.8
Chironomidae pupa	12.5	8.7	8.6		8.1	6.4	10.4	1.0	13.2	5.4		4.1	10.7		1.2	4.7
Glyptotendipes	1.2										1.2					
Rheotanytarsus		1.2			0.9											
Simuliidae	1.3															
Tanytarsini pupa												1.3	6.3		2.4	
Robackia claviger															1.2	
Orthocladiinae pupa															1.2	
Diptera imago	34.8	47.7	68.8	3.0	9.1	2.8	14.1	7.4	17.6	16.2		13.6	24.7	12.4	14.3	13.8
Diptera pupa								0.9				2.7				
Hymenoptera																
Hymenoptera imago		1.2	1.3					1.0			1.2		2.1			
Formicidae	8.5	3.5	10.2		1.8	1.9		1.0	2.0							1.0
Thysanoptera			1.3									2.8				
Mollusca																
Pellecypoda	1.2				1.0											
Gastropoda	1.2															
Physa		1.2													1.2	1.0

Table D3

Abundance (No./100m^3) of Drifting Macroinvertebrates Collected from White Castle Eddy (2-Day), 14 May 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Coelenterata*																
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Nematoda											1.3					
Oligochaeta																
Nais behningi														1.8		
Stylaria lacustris																1.2
Crustacea																
Ostracoda											44.3					4.8
Mysidacea															2.1	6.0
Taphromysis louisianae	2.2	1.8	5.4	1.3	2.7			1.3			2.5	1.8	3.4			
Amphipoda																
Crangonyx							1.3							1.4		
Grammarus									0.8	3.4			1.3		1.0	
Decapoda																
Macrobrachium ohione								2.6			188			1.8		
Palaemonetes														3.7		
Arachnida	1.0															
Insecta																
Collembola														1.4		
Plecoptera																
Perlesta				1.3			1.3			1.1						

(Continued)

* Coelenterates, when present, are marked with an X.

Table D3 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Ephemeroptera													2.0			2.4
Caenidae												0.9				
Heptageniidae						2.3								1.8		
Spinadis wallacei												0.9				
Stenonema sp.							1.3									
Stenonema integrum			1.1				1.3	2.6		2.3			0.7		1.0	1.2
Stenonema (Pulchellum gr.)		0.9		0.7						1.1		0.9				
Odonata																
Anisoptera nymph											1.2					
Coenagrionidae												0.9				
Trichoptera																
Neotrichia																2.4
Diptera																
Chaoborus	1.1	1.8	5.4	4.0	2.6					1.1	2.4	3.6	3.4	1.8	2.1	3.6
Chironomidae adult													5.4			
Chironomidae pupa	5.2	3.6	10.9	0.7	5.3		1.3		0.8	4.5	1.3		6.0			8.4
Chironomus sp. 2				0.7						1.2				1.4		1.2
Chernovskiia orbicus													0.7			
Glyptotendipes						2.1										
Nanocladius distinctus		1.9	2.2									0.9	0.7			3.6
Parachironomus frequens										1.1						
Polypedilum convictum			1.1								1.2					
Polypedilum illinoense	1.1		2.2										1.3			1.2
Diptera imago			3.3					2.3		3.3				1.8		2.4
Diptera pupa															1.0	
Megaloptera																
Chauliodes												0.9			1.0	

Table D4

Abundance (No./100m^3) of Drifting Macroinvertebrates Collected from White Castle Eddy (2-Night), 14-15 May 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Coelenterata*																
Cordylophora	X	X	X		X	X	X	X	X	X	X	X	X	X	X	X
Crustacea																
Ostracoda															4.3	
Mysidacea																
Taphromysis louisianae				5.6						1.4	4.4	3.2	0.8			2.4
Isopoda																
Lirceus									3.9							
Amphipoda																
Crangonyx						1.5				1.4			0.8		0.9	
Grammarus		1.9	1.0			1.6		1.2	4.1	3.4		1.6		2.9	2.6	
Decapoda																
Macrobrachium ohione		2.9		8.3			60.4	1.2	1.9		47.7		1.4			
Insecta																
Plecoptera																
Perlesta							1.1	1.1								
Perlesta placida nymph									2.1			0.8			0.9	
Ephemeroptera																
Caenis nyumph					4.3											
Stenonema sp.												0.8		1.4		
Stenonema integrum	1.3	1.0							1.9			4.0	3.0			3.5
Pentagenia vittigera					3.5											
Hexagenia	1.3		1.0											1.4		
Odonata																
Dromogomphus														1.4		
Hemiptera				2.8												
Corixidae								1.2	1.9	1.4	1.2					

(Continued)

* Coelenterates, when present, are marked with an X.

Table D4 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Coleoptera																
Dytiscidae adult								1.1								
Elmidae										1.4						
Diptera																
Chaoborus		1.0	1.0		4.3	1.5		1.2	4.0		1.0	3.2	2.8	5.9		3.4
Chironomidae adult		1.0	3.0								1.2		1.4		1.8	2.4
Chironomidae pupa	5.3	7.7	5.0	2.8		1.6	1.1	8.0	2.1	6.5		3.2	9.4	16.9	6.1	11.7
Chironomus sp. 2								1.1								
Coelotanypus		1.0								1.7						
Rheotanytarsus																1.2
Nanocladius distinctus															1.7	
Smittia								1.2								
Polypedilum convictum													0.8	1.4		
Polypedilum illinoense				2.8					3.9	7.7		4.8	1.4			2.4
Diptera imago						1.5				3.1				3.1		

Table D5

Abundance (No./100m^3) of Drifting Macroinvertebrates Collected from Port Sulphur Eddy (3-Day), 30-31 May 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01*	C02	C03	C04	D01*	D02	D03	E01	E02	E03
Coelenterata**																
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Crustacea																
Mysidacea																
Taphromysis louisianae	4.2	15.6	26.1	7.3	9.1	20.8	85.7	9.4	27.8	35.4	62.5	14.4	3.5	18.5	23.9	16.9
Amphipoda																
Crangonyx	2.8												1.2			
Gammarus															1.1	
Insecta																
Ephemeroptera																
Heptageniidae															1.1	1.1
Stenonema integrum									1.4	1.0						
Stenonema sp.								1.4					1.2	1.0	1.1	
Tortopus incertus														0.9		
Hemiptera											62.5					
Trichoptera																
Hydropsychidae											62.5					
Diptera																
Chaoborus	4.4	3.2	3.3		3.0	6.0	35.7	4.2	1.4	1.0	162	4.0	1.2	3.8	2.3	
Chironomidae pupa	1.4	2.1	2.2			3.1		5.5		2.9		11.8	5.9	1.9	1.1	4.5
Chironomus sp.**														0.9		
Nanocladius distinctus								1.3								
Diptera imago	1.4	1.1						1.4					3.5			6.8

* Station was dropped from all analyses.
** Coelenterates, when present, are marked with an X.

Table D6

Abundance (No./100m^3) of Drifting Macroinvertebrates Collected from Natchez Eddy (3-Day, 3 June 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01*	E02	E03
Coelenterata**																
Cordylophora					X	X	X	X	X	X	X	X		X	X	X
Hydra									X	X					X	
Crustacea																
Ostracoda													2.7			
Mysidacea																
Taphromysis louisianae	1.3	2.1	1.1	8.8		0.8	3.8		9.2	1.0	6.9	1.2	12.0	83.3	7.8	5.1
Isopoda																
Lirceus																1.0
Amphipoda																
Corophium		1.1										1.2				
Crangonyx			1.1													
Gammarus									5.0					83.3		
Arachnida													1.3		1.3	1.0
Insecta																
Collembola												1.2				
Plecoptera																
Perlesta placida									5.0							
Emphemeroptera																
Baetis			7.6		3.4	0.8	1.2	1.0	4.2	1.0		1.2	2.7			
Heptageniidae	1.8	1.1					1.2					1.2	1.3	83.3	2.8	
Hexagenia					3.4								1.3			1.0
Stenonema integrum		1.1			3.4											1.0

(Continued)

* Station was dropped from all analyses.
** Coelenterates, when present, are marked with an X.

Table D6 (Continued)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01*	D02	D03	E01	E02	E03
Stenonema (*Pulchellum* gr.)					1.8	0.8			4.2	1.0						
Stenonema sp.	1.3		1.1			0.8				1.0	2.4					
Tortopus incertus									5.0	1.0			2.7			
Odonata																
Gomphus						0.8										
Hemiptera																
Corixidae									5.0							
Trichoptera																
Hydropsyche orris	21.3	3.2	2.2	2.5	3.5	2.4	1.2	1.0	4.2	2.0	16.4	8.4	4.0	292	4.3	7.2
Hydropsychidae	14.1	9.6	4.3	3.7	1.8	3.3	2.5	7.0	46.1	2.0	30.3	8.4	6.7		2.8	2.0
Hydroptilidae											2.3					
Neurelipsis crepuscularis	1.3	1.1														
Potamyia flava		2.1			3.5			1.0		1.0		3.6	4.0			2.1
Trichoptera adult			1.1			2.4										
Lepidoptera	1.3															
Coleoptera																
Staphylinidae larva									5.0							
Diptera																
Chaoborus	18.1	2.2	6.5	7.6	24.0	7.3	7.5	10.0	90.7	10.1	30.5	26.3	18.7	958	28.6	34.9
Chernovskiia orbicus															1.3	
Chironomidae pupa	5.7	3.2	6.5	3.8	5.1	0.8	5.0	3.0	10.1	10.1	2.4	7.2	2.7		5.7	9.3
Coelotanypus									4.2				1.3			
Ablabesmyia annulata				1.2												
Paratanytarsus																1.0
Polypedilum convictum										1.0	2.3	2.4				
Polypedilum illinoense											2.3					

(Continued)

Table D6 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01*	D02	D03	E01	E02	E03
Polypedilum nr. *scalaenum*										1.0						
Procladius							1.2									
Rheotanytarsus												1.2	1.3			
Diptera imago		3.2								4.0	7.2	2.4			2.6	1.0

Table D7

Abundance (No./100m^3) of Drifting Macroinvertebrates Collected From White Castle Eddy (3-Day), 5-6 June 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Coelenterata*																
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hydra		X	X	X		X	X	X	X			X			X	X
Oligochaeta																
Nais behningi						1.3										
Nais variabilis													4.3			
Crustacea																
Mysidacea																
Taphromysis louisianae	3.2	15.7	1.3	15.9	20.4	26.9	4.5	10.9	17.8	7.7	8.5	9.8	23.0	11.3	12.7	25.5
Amphipoda																
Crangonyx floridanus															1.2	
Gammarus								2.1								
Gammarus fasciatus							2.1									
Hyalella azteca										1.5						
Decapoda																
Macrobrachium ohione			1.3													
Arachnida																
Hydracarina				9.9	2.0						6.8	0.7		17.2		

(Continued)

* Coelentrates, when present, are marked with an X.

Table D7 (Continued)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Insecta																
Ephemeroptera																
Baetis	1.5		2.7							1.5			4.3	3.4	1.2	2.1
Heptageniidae			2.7				2.1					1.7		1.7	2.3	2.0
Hexagenia												0.7				
Pentagenia vittigera															1.2	1.0
Stenonema integrum															1.2	
Tortopus incertus			2.7	1.4		1.3		2.2				2.4	5.6		1.2	1.0
Hemiptera																
Corixidae				0.7										1.7		
Pleidae				0.7												
Trichoptera																
Hydropsyche orris		6.6	2.6	2.5	2.0	1.3	27.9	12.8	1.7	4.6	1.5	4.9	5.6		6.9	2.1
Hydropsychidae		2.2	1.3	1.4		1.3	4.3		1.6	1.5		0.7	10.0	1.4	4.6	
Nectopsyche														1.7		
Neureclipsis				0.9												
Potamyia flava										1.5		1.0				
Trichoptera adult											1.5					
Coleoptera																
Chrysomelidae									1.7							
Dytiscidae adult									1.7							
Staphylinidae adult	1.5															

(Continued)

Table D7 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Diptera																
Ablabesmyia mallochi						1.3										
Chaoborus	1.5	10.9	4.0	1.8	4.0	3.8	15.4	10.9	8.2	10.7	1.5	15.7		2.9	3.5	6.1
Chernovskiia orbicus																1.0
Chironomidae pupa		2.2		0.9	2.0	1.3		4.4	1.6	4.6	1.5	6.3	10.0	4.9	5.8	5.1
Harnischia curtilamellata												0.7				
Polypedilum convictum												1.0				1.0
Polypedilum illinoense				4.8												
Diptera imago		2.2		17.5	4.2	1.5		2.1	1.7	1.5	6.6	1.7	25.5	9.8		
Diptera pupa	1.5	2.2					2.2									2.1
Odonata													5.6			
Hymenoptera																
Formicidae									1.7							
Hymenoptera imago	1.5			0.7								1.4		1.7	1.2	
Thysanoptera												1.0			1.2	
Mollusca																
Pelecypoda																1.0

Table D8

Abundance (No./100m^3) of Drifting Macroinvertebrates Collected from White Castle Eddy (3-Night), 5-6 June 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Coelenterata*																
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hydra	X		X	X	X	X	X	X		X	X			X		X
Oligochaeta																
Enchytraeidae												0.6				
Pristina longiseta longiseta														1.5		
Crustacea																
Mysidacea																
Taphromysis louisianae	23.9	15.7	22.3	57.6	57.4	34.5	9.2	30.5	4.4	20.8	10.4	7.3	6.0	14.1	28.4	11.6
Amphipoda																
Crangonyx floridanus	1.3															
Gammarus					1.2					2.7			6.1		1.2	1.0
Gammarus fasciatus						1.2								4.4		
Hyalella azteca			3.0		1.2	2.5					0.6			1.6		
Decapoda																
Macrobrachium ohione	1.3			0.9	2.4	1.2	0.7				20.2					
Arachnida																
Hydracarina				1.9												
Insecta																
Plecoptera																
Neoperla														1.6		
Perlesta	1.3															

(Continued)

* Coelentrates, when present, are marked with an X.

Table D8 (Continued)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Ephemeroptera		1.8		1.9			1.4	6.8			3.2	1.7	12.2	1.5	3.5	
Ameletus							0.7									
Baetis	3.8					2.5		6.8		4.5	0.6	1.0	12.2			1.0
Baetidae			1.5				1.4	6.8								
Hetagenia marginalis				0.9		1.2	0.7					0.5				
Heptageniidae	5.0			0.9	1.2		1.4					1.6				
Hexagenia							0.7									
Pentagenia vittigera	1.3					1.2		8.5			0.8				1.2	
Stenonema integrum	2.5			2.9			0.7				0.6					
Stenonema sp.	2.5						0.7								1.2	
Tortopus incertus	3.8	3.5	3.0	1.9	1.2	2.5	6.3	15.2	2.3	9.9	3.4	2.7	18.1	1.5	5.9	3.9
Hemiptera		1.8														
Corixidae	17.6	7.0	8.9	119	99.7	6.2	1.4				11.8	0.5		23.8		2.9
Merragata												0.6				
Notonectidae				1.9												
Trichoptera	2.5			0.9	1.2											
Hydropsyche orris	7.5	1.8	3.0	2.8	8.1	2.5	7.1	15.2	8.5		3.7	1.5	12.1	2.9	4.7	4.8
Hydropsychidae	2.5	3.5		2.8	1.2	1.2	2.1	6.8			0.8		12.1	7.6		
Nectopsyche						1.2										
Neureclipsis crepuscularis														3.2		
Oecetis														1.5		
Potamyia flava			1.5						2.3							
Neuroptera																
Climacia					1.2							0.5	6.1			

(Continued)

Table D8 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Coleoptera	1.3															
Chrysomelidae											0.6					
Curculionidae		1.8					0.7				0.6					
Dytiscidae adult				5.8			0.7									
Staphylinidae adult	1.2															
Diptera																
Ablabesmyia mallochi												0.6				
Chaoborus	13.8	10.5	11.9	31.8	14.1	6.2	14.1	44.0	17.0	19.8	5.2	10.4	42.3	8.1	2.4	9.6
Chernovskiia orbicus				1.9					2.1							
Chironomidae pupa	17.6	7.0	10.4	5.8	5.9	8.6	4.2	30.5	4.7	14.4	4.2		6.0	4.6	7.1	3.9
Nanocladius distinctus	1.3						2.1					0.6				
Polypedilum convictum							1.4							3.1		1.0
Polypedilum illinoense					1.2	1.2										
Rheosmittia								6.8								
Rheotanytarsus																1.0
Diptera imago		1.7		5.7	3.5	11.1	0.7	8.5			0.8		18.1	2.9		1.0
Diptera pupa		5.2										2.8				
Hymenoptera																
Hymenoptera imago											0.6					
Formicidae	1.3	1.7		1.9												
MOLLUSCA																
Physa						1.2										

Table D9

Abundance (No./100m^3) of Drifting Macroinvertebrates Collected from White Castle Eddy (4-Day), 25 June 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Coelenterata**																
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hydra																X
Crustacea																
Mysidacea																
Taphromysis louisianae	1.3	1.9			3.0	4.0	1.4	1.8	0.9		0.9		1.0	6.1	1.2	1.2
Decapoda																
Macrobrachium ohione											0.9	2.3				
Amphipoda																
Gammarus		0.6							0.9			1.1				
Corophium																
Insecta																
Ephemeroptera																
Heptageniidae			0.5							1.0					1.2	1.2
Hexagenia															1.2	
Pentagenia vittigera		0.6								2.0				0.8		
Stenonema sp.									0.9							
Stenonema integrum	2.5	0.6				1.0								1.8		
Stenonema (Pulchellum gr.)													1.0			
Tortopus incertus		1.2	1.8			1.0	1.8	1.8	8.0	1.0		1.2	3.7	0.9	2.4	

(Continued)

* Station was dropped from all analyses.
** Coelenterates, when present, are marked with an X.

Table D9 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Odonata																
Zygoptera			0.5													
Hemiptera																
Corixidae					1.4					1.0						
Trichoptera																
Hydropsyche orris		0.6	0.9			1.0		1.8	0.9	1.0		4.6		0.9		1.2
Hydropsychidae	0.9	0.6	0.5													
Potamyia flava																
Diptera																
Chaoborus	2.5	8.0	2.8	15.6	8.4	5.9	1.4	14.4	9.8	2.9	3.5	11.2	15.0	5.1	10.7	3.7
Chernovskiia orbicus														0.8		
Chironomidae pupa	0.9	1.2	1.4	29.4	1.4	3.0		3.7	4.5	2.0	0.9		1.9	3.4	2.4	1.2
Polypedilum convictum			0.5							1.0						
Polypedilum illinoense										1.0				6.2		
Tabanus														0.9		
Diptera imago		1.2	1.8		1.4	1.0			0.9	2.0		2.2		1.7		

Table D10

Abundance (No./100m³) of Drifting Macroinvertebrates Collected from White Castle Eddy (4-Night), 25-26 June 1985

Taxonomic Classification	A01	A02	A03	B01*	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Coelenterata**																
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Oligochaeta																
Bratislavia unidentata															1.0	
Crustacea																
Mysidacea																
Taphromysis louisianae	0.9	0.8	0.5		2.4			1.2				1.1			1.0	1.3
Decapoda																
Macrobrachium ohione				250	4.7		149	97.0			23.9	1.2		1.3		
Amphipoda																
Gammarus	0.6	0.8			1.2							1.2				
Corophium														1.1		
Insecta																
Ephemeroptera																
Heptageniidae				250		0.9				1.7		1.1	6.5	1.1	1.0	
Hexagenia													3.2			
Pentagenia vittigera	0.6		0.5										3.2	1.1	1.0	
Stenonema sp.								1.2		1.8			2.0			
Stenonema integrum		1.6	0.5			0.9								1.1		
Stenonema (Pulchellum gr)													3.2			

* Station was dropped from all analyses.
** Coelenterates, when present, are marked with an X.

Table D10 (Concluded)

Taxonomic Classification	A01	A02	A03	B01*	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Tortopus incertus	0.6	1.6	5.4		2.5	2.8		1.2	5.3	5.1	0.8	1.1	7.2		6.2	3.8
Odonata																
Dromogomphus			0.5													
Trichoptera																
Hydropsyche orris			0.5		1.3	0.9				3.5		1.2	5.2		1.0	
Hydropsychidae					1.2			1.2	1.0	1.7					2.0	
Potamyia flava														1.1		
Diptera																
Chaoborus	5.3	9.6	2.7	312	9.8	3.7	1.9	3.5	8.4	15.8	1.6	7.8	45.9	2.4	1.0	17.8
Chernovskiia orbicus				250												
Chironomidae pupa	3.0	13.6	7.0	250	6.0	11.1	1.9	3.5	6.4	8.4	0.8	10.4	10.5	4.5	8.3	8.9
Polypedilum convictum																1.3
Diptera imago		1.6				2.8	1.9							1.3		

Table D11

Abundance (No./100m^3) of Drifting Macroinvertebrates Collected from White Castle Eddy (5-Day), 17 July 1985

Taxonomic Classification	A01	A02	A03	TS1	TS2	TM2	TB2	TS3	TM3	TB3	E01	E02	E03
Coelenterata*													
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X
Crustacea													
Mysidacea													
Taphromysis louisianae						2.0		1.1	0.5		1.5		1.5
Amphipoda													
Gammarus			4.8			1.4							
Gammarus fasciatus										2.0			
Decapoda													
Macrobrachium ohione							3.2						1.5
Insecta													
Ephemeroptera							1.7						
Baetis										2.0	1.5		
Heptageniidae				1.5				1.1				1.3	
Pentagenia vittigera						1.4				2.0			
Stenonema integrum					1.6	1.4			0.5				1.5
Tortopus incertus					1.5	15.8	1.7		4.3	10.8		1.3	1.5
Trichoptera													
Hydropsyche orris					1.5		1.6				1.9		
Potamyia flava						1.4	1.6		0.5				1.5
Diptera													
Chaoborus	22.2	21.1	23.0	6.2	14.3	8.2	9.7	3.4	1.4	9.1	10.7	4.0	3.0
Chironomidae pupa		4.8	4.8	0.9	1.6	8.3	1.7	1.1	4.9	1.0	3.9	1.3	2.9
Procladius							1.6						
Diptera imago			5.7	1.5				3.3	0.5	6.8	12.3		1.5
Diptera pupa				0.9									
Hymenoptera													
Hymenoptera imago												1.3	

* Coelenterates, when present, are marked with an X.

Table D12

Abundance (No./100^3) of Drifting Macroinvertebrates Collected from

White Castle Eddy (5-Night), 17-18 July 1985

Taxonomic Classification	A01	A02	A03	TS1	TS2	TM2	TB2	TS3	TM3	TB3	E01	E02	E03
Coelenterata*													
Cordylophora	X	X	X	X	X	X	X	X	X	X	X	X	X
Crustacea													
Mysidacea													
Taphromysis louisianae	1.9	3.8	4.2	1.2		1.6		1.8					1.5
Amphipoda													
Gammarus						1.6					3.4		
Gammarus fasciatus					2.4			1.0		1.9			
Decapoda													
Macrobrachium ohione				6.5	1.5	1.6		1.8					
Insecta													
Ephemeroptera													
Heptageniidae	1.9		4.2	2.7			2.0	3.2			1.7	1.5	1.5
Hexagenia				1.2						1.9			
Pentagenia vittigera				1.5			2.0					1.5	
Stenonema integrum				1.2	4.0		5.7			2.0			
Tortopus incertus		5.6	11.6	5.2	8.6	3.6	1.8	2.7	10.9	9.2	8.1	7.3	7.6
Hemiptera													
Corixidae	8.4	3.8		2.4									
Trichoptera													
Hydropsyche orris					1.3	1.6	2.0				1.7		
Nectopsyche													1.5
Diptera													
Chaoborus	26.8	31.9	62.5	14.0	9.7	26.5	11.8	20.6	8.4	14.2	22.9	5.9	6.1
Chironomidae pupa	24.0	14.9	22.0	11.5	8.1	15.7	17.0	17.0	13.5	11.0	15.8	17.6	15.2
Diptera imago	1.9	1.9		2.4			1.8	3.8		3.7			
Hymenoptera													
Hymenoptera imago	2.2							1.7					

* Coelenterates, when present, are marked with an X.

APPENDIX E: ABUNDANCE (No./m^3) OF ZOOPLANKTON COLLECTED FROM THE WHITE CASTLE EDDY, 24 APRIL THROUGH 18 JULY, 1985

Table E1

Abundance (No./m^3) of Zooplankton Collected from White Castle Eddy (Trip 1), 24-25 April 1985

Taxonomic Classification	A01	A03	B01*	B03	C03	D01	D03	E01*	E03
				DAY					
Cladocera									
Bosmina longirostris	3,739	2,996	3,889	2,528	6,029	2,338	4,142	10,300	3,937
Daphnia spp.	584	683	723	573	1,694	277	617	1,200	687
Ceriodaphnia quadrangula	493	381	445	223	731	308	400	600	156
Simocephalus spp.		72		51				100	
Diaphanosoma brachyurum				18					
Copepoda									
Nauplii	3,686	3,233	4,445	2,659	6,693	2,908	4,171	10,200	4,000
Copepodites	2,670	3,110	2,945	2,357	3,527	1,723	2,340	6,900	2,688
Cyclops spp.	870	671	833	780	980	400	714	1,100	875
Diaptomus spp.	919	811	722	396	2,488	308	405	1,200	875
Erytemora affinis	122	49	111	52	69	108	126		
Rotifera	16,728	21,628	26,127	13,914	27,218	11,185	28,691	43,300	28,126
Corbicula				51					
				NIGHT					
Cladocera									
Bosmina longirostris	3,529	4,813		1,952	8,322	12,222	3,834		3,754
Daphnia spp.	765	533		619	2,091	2,070	1,084		655
Ceriodaphnia quadrangula	324	399		476	671	570	459		389
Simocephalus spp.	59	33			273	125			
Copepoda									
Nauplii	4,471	3,515		2,333	10,154	9,709	6,000		4,824
Copepodites	3,147	3,149		1,190	9,413	7,070	3,958		3,405
Cyclops spp.	559	923		571	1,532	1,139	375		427
Diaptomus spp.	383	563		429	1,336	2,320	709		748
Erytemora affinis	147	235		190		111	42		35
Rotifera	21,794	19,325		19,048	64,685	25,334	54,264		25,688

* Night samples were dropped from analyses.

Table E2

Abundance (No./m^3) of Zooplankton Collected from White Castle Eddy (Trip 3), 5-6 June 1985

Taxonomic Classification	A01	A03	B01*	B03	C03	D01	D03	E01*	E03
DAY									
Cladocera									
Bosmina longirostris	16		40	53	30	60		59	55
Daphnia spp.	47	175	170	21	90	37	38	94	49
Ceriodaphnia quadrangula	50								14
Diaphanosoma brachyurum	54	56	50		15	46	33		27
Copepoda									
Nauplii	3,827	2,083	10,720	1,860	3,284	5,692	3,749	2,954	2,276
Copepodites	741	711	2,340	492	553	1,175	855	948	553
Cyclops spp.	66	54	430	193	149	290	322	199	55
Diaptomus spp.	995	551	1,470	440	359	1,004	586	632	482
Erytemora affinis	58	93	150	53	75	68	33	77	43
Rotifera	5,469	4,096	9,720	2,855	4,612	7,532	4,597	5,396	3,390
Corbicula	356	426	300	440	269	464	502	502	441
NIGHT									
Cladocera									
Bosmina longirostris	38	53	182	52	69	118	109		17
Daphnia spp.	151	21	182	43	52	118	100		43
Ceriodaphnia quadrangula									17
Diaphanosoma brachyurum	38	127		9	34		59	37	
Copepoda									
Nauplii	2,736	1,461	10,091	1,435	1,569	7,118	3,447	1,538	1,396
Copepodites	1,358	899	5,727	1,275	1,104	3,059	1,030	908	1,194
Cyclops spp.	132	11		20	121	294	59		
Diaptomus spp.	925	539	4,819	834	569	2,118	877	482	940
Erytemora affinis	208	53	637	20				56	76
Rotifera	5,868	3,436	11,455	3,079	4,207	13,529	6,080	3,648	4,465
Corbicula	170	222	455	252	242	883	588	333	182

Table E3

Abundance (No./m^3) of Zooplankton Collected from White Castle Eddy (Trip 5), 17-18 July 1985

Taxonomic Classification	A01*	A03	TS1	TM2	TM2	TB2	TS3	TM3	TB3	E01	E03
DAY											
Cladocera											
Bosmina longirostris	200			15	10			6	12		
Ceriodaphnia quadrangula					10						
Diaphanosoma brachyurum	1,000		36	26	30	49		16	7	49	
Moina kingi	1,000	15	20	18	13	28	5	30	60		65
Copepoda											
Nauplii	45,400	2,550	2,923	2,228	2,268	2,225	2,224	2,053	2,371	5,314	1,738
Copepodites	3,200	100	281	173	261	139	383	227	187	422	207
Cyclops spp.	200		29	21	45	30	44	23	44	118	
Diaptomus spp.	5,200	484	377	449	557	372	455	554	481	1,500	539
Erytemora affinis	1,200	134	72	156	116	61	63	74	105	285	110
Rotifera	31,600	2,350	2,699	1,631	2,060	1,973	1,835	2,009	2,471	4,441	2,277
Corbicula		67	44	25	55	29	35	30	15		14
NIGHT											
Cladocera											
Bosmina longirostris			22	18	6	11		42			12
Daphnia spp.		39	8			11				558	
Ceriodaphnia quadrangula			30								13
Simocephalus spp.										70	
Diaphanosoma brachyurum	500			9	21		61	31	18	39	
Moina kingi	2,500	100	153	95	33	50	28	75	55	85	10

(Continued)

* Station was dropped from analyses.

Table E3 (Concluded)

Taxonomic Classification	A01*	A03	TS1	TM2	TM2	TB2	TS3	TM3	TB3	E01	E03
Copepoda											
Nauplii	28,000	5,369	2,681	2,450	2,250	2,021	1,771	1,539	1,685	2,702	1,813
Copepodites	3,000	1,369	389	428	230	194	235	200	269	1,127	263
Cyclops spp.			122	83	28	30	58	22	76	62	38
Diaptomus spp.	12,500	1,185	565	700	666	852	990	856	551	887	688
Erytemora affinis		554	128	116	167	146	304	252	223	148	138
Rotifera	47,000	9,116	3,747	4,121	3,876	4,035	3,106	2,847	3,257	2,818	2,875
Corbicula		200	56	7	70	22	36	7	61	31	25

APPENDIX F: ABUNDANCE (No./100 m^3) OF LARVAL FISH COLLECTED FROM THE WHITE CASTLE, PORT SULPHUR, AND NATCHEZ EDDIES, APRIL THROUGH JULY, 1985

Table F1

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (1-Day), 24 April 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Clupeidae																
Dorosoma spp.	14.0	20.1	12.6	7.4	9.0	10.7	10.5	15.0	7.9	10.0	17.3	6.4	7.0	20.4	11.0	21.8
Cyprinidae																
Cyprinus carpio	1.4			6.0		2.1	1.3						1.3	1.9		1.3
Notropis spp.						1.0										
Unidentified Cyprinidae			1.1													
Catostomidae																
Ictiobus spp.			1.1					0.8	1.3							
Aphredoderidae																
Apredoderus sayanus								0.8								
Atherinidae																
Menidia beryllina													1.3			1.2
Percichthyidae																
Morone spp.			1.1		2.0			1.0			2.5					
Centrarchidae																
Lepomis spp.												1.1				
Pomoxis annularis								0.8								
Pomoxis nigromaculatus			1.1													
Percidae																
Stizostedion canadense																1.3

(Continued)

* Station was dropped from analyses.

Table F1 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Sciaenidae																
Aplodinotus grunniens					2.0						1.5		1.5			
Damaged Fish						1.0										

Table F2

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (1-Night), 24-25 April 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Clupeidae																
Dorosoma spp.	16.2	10.2	8.8	7.6	15.5	9.2	17.0	4.7	5.8		17.9	11.0	10.1	10.2	18.0	11.3
Cyprinidae																
Ctenopharyngodon idella												1.3				
Cyprinus carpio		2.5	5.0					1.0			2.4			2.0	2.4	
Notropis spp.									2.0							
Catostomidae																
Ictiobus spp.		1.3				0.9	3.0						1.7	2.2		1.0
Ictiobus cyprinellus		1.2														
Aphredoderidae																
Aphredoderus sayanus			1.3					1.0								
Atherinidae																
Menidia beryllina					1.0											
Percichthyidae																
Morone spp.			1.3			0.9	3.0	0.9								0.8
Centrarchidae																
Pomoxis annularis			2.6		0.9		3.0								1.2	
Pomoxis nigromaculatus		1.2								1.1						

(Continued)

* Station was dropped from analyses.

Table F2 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04*	D01	D02	D03	E01	E02	E03
Percidae																
Etheostoma spp.			1.5	0.9											0.8	
Stizostedion canadense		1.3		1.5												0.8
Sciaenidae																
Aplodinotus grunniens	1.2															
Unidentified eggs		1.3														

Table F3

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (2-Day), 14 May 1985)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Clupeidae																
Dorosoma spp.	2.2	10.1	6.6	2.7	1.4	2.3	11.4		0.8	4.6	2.5	2.6	9.4		2.1	10.7
Dorosoma cepedianum				0.7												
Hiodontidae																
Hiodon alosoides								2.6								
Cyprinidae																
Ctenopharyngodon idella		1.9	2.2	8.0	2.7		5.2	1.3	1.7		1.2	2.7	2.7	4.2	1.0	
Cyprinus carpio					1.4											
Hybopsis storeriana	1.0		1.1		4.1							0.9		3.2		
Notropis spp.													0.7			
Catostomidae																
Carpiodes carpio	1.1		1.1	1.3	1.4		1.3	1.3					1.3			
Ictiobus spp.		0.9		0.7						1.2			0.7		1.0	1.2
Percichthyidae																
Morone spp.	2.1	4.5	4.4	2.7	1.3	8.7	5.1	1.3	0.8	3.5	1.3	4.4	4.0	1.4		6.0
Centrarchidae																
Centrarchus macropterus	1.0															
Lepomis spp.				1.3												
Pomoxis annularis					1.4											

(Continued)

Table F3 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Sciaenidae																
Aplodinotus grunniens	34.2	21.8	8.7	34.8	17.3	12.6	30.2	24.7	5.8	7.9	17.5	4.4	14.1	2.8	7.2	13.1
Unidentified fish eggs						2.1										

Table F4

Abundance (No./100 m^3) of Larval Fish Collected from White Castle Eddy (2-Night), 14-15 May 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Acipenseridae																
Scaphirhynchus platorynchus															0.9	
Clupeidae																
Dorosoma spp.	5.3	4.8	5.0	2.8	6.9	3.1	2.1			1.7	5.1	6.4	1.7	3.0	7.9	9.4
Hidontidae																
Hiodon alosoides								1.1								
Cyprinidae																
Ctenopharyngodon idella	5.3	3.9	4.0	2.8		6.0	4.2	1.1	2.1	7.4	1.2	1.6	1.4	5.9	2.6	4.7
Cyprinus carpio	1.3	1.0						1.2			1.0	4.0		1.6	0.9	1.2
Hybopsis storeriana		1.0		2.8		1.5		1.1		1.4				1.6	0.9	
Notropis spp.						1.5										
Pimephales virgilax	1.3															
Catostomidae																
Carpiodes carpio	1.3		2.0	2.8					2.1	1.4	1.0	2.4		1.4		1.2
Ictiobus spp.				2.8	4.3			1.1	1.9							1.2
Unidentified Catostomidae							1.1								0.9	
Atherinidae																
Menidia beryllina		1.0	1.0													

(Continued)

Table F4 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Percicthyidae																
Morone spp.	1.3					4.4		1.2			2.0	4.0	3.6		1.8	
Centrarchidae																
Lepomis spp.											1.2					1.2
Sciaenidae																
Aplodinotus grunniens		7.7	4.0	8.3	4.3	6.0	2.1	8.1	2.1	1.7	1.0	6.4	6.1	4.4	4.4	7.0
Fish pieces											3.0					

Table F5

Abundance (No./100 m^3) of Larval Fish Collected From Port Sulphur Eddy (3-Day), 30-31 May 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01*	C02	C03	C04	D01*	D02	D03	E01	E02	E03
Clupeidae																
Dorosoma spp.	2.8	1.1	1.1	10.6	8.3		171.4	5.3	1.4	2.0		1.3	1.2	4.7	2.3	2.3
Dorosoma petenense		2.1														
Cyprinidae																
Ctenopharyngodon idella						1.5						1.3				
Hybopsis storeriana		3.2	2.2							1.0		2.6	2.4		1.1	1.1
Catostomidae																
Carpiodes carpio				3.6						1.9		1.3				3.4
Percichthyidae																
Morone spp.		1.1							1.4	1.0				1.0		
Sciaenidae																
Aplodinotus grunniens		7.3	13.2		4.2	4.7		18.2	2.9	5.0		9.2	3.5	8.5	6.8	4.5
Engraulidae																
Anchoa mitchilli								1.4	1.4					1.0	1.1	2.3

Table F6

Abundance (No./100 m^3) of Larval Fish Collected From Natchez Eddy (3-Day), 3 June 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02*	E03
Clupeidae																
Dorosoma spp.	13.3	17.1		2.5	6.7	0.8	1.3		4.2					166.7	3.9	1.0
Dorosoma petenense		1.1														
Cyprinidae																
Hybopsis aestivalis		1.1	1.1			1.6										
Hybopsis storeriana	1.8	2.1	1.1	1.3		0.8			9.2	3.0	2.4		2.7			2.1
Notropis spp.					3.4	0.8										
Catostomidae																
Carpiodes carpio	1.3	4.3	3.3	1.2	7.1	9.8		3.0	5.1	9.0	2.4	4.8	12.0		8.4	9.2
Ictiobus spp.	1.8				3.4											
Unidentified Catostomidae							1.3		5.1		2.3					
Percichthyidae																
Morone spp.						0.8										1.0
Centrarchidae																
Lepomis spp.									5.1							1.0
Pomoxis annularis													1.3			
Sciaenidae																
Aplodinotus grunniens	1.3	33.1	96.5	20.2	20.3	78.3	15.0	21.0	35.1	53.3	25.9	26.5	21.4	333.3	40.5	36.8

* Station was dropped from analyses.

Table F7

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (3-Day), 5-6 June 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Clupeidae																
Dorosoma spp.	18.8	6.5	14.7	37.4	45.0	3.1	15.4	2.1	8.2	1.5	82.5	7.4	8.7	17.9	3.5	2.0
Dorosoma petenense					4.1	1.5										
Cyprinidae																
Hybopsis aestivalis			1.3													
Hybopsis storeriana				0.7		6.9			3.3	1.5		2.7		1.5		1.0
Notropis spp.	1.6			0.9								1.0			1.2	
Catostomidae																
Carpiodes carpio	6.2	4.5	1.3	7.1	6.1	1.3	4.3		3.3	3.1	10.8	1.5	4.3	4.6	3.5	1.0
Ictiobus spp.	3.2			0.7		1.3										
Percichthyidae																
Morone spp.			1.3	1.8								0.7		1.7	1.2	
Centrarchidae																
Lepomis spp.				0.9												
Lepomis cyanellus											1.7					
Scaenidae																
Aplodinotus grunniens	31.3	34.9	33.3	92.2	90.8	65.3	28.3	26.1	69.0	46.0	51.8	68.6	117.8	127.5	62.4	31.9
Unidentified fish eggs								2.2								

Table F8

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (3-Night), 5-6 June 1985

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Clupeidae																
Alosa spp.						1.2										
Dorosoma spp.	3.8	1.8	1.5	6.7	5.8	7.4		8.5		7.2	3.3	0.6	6.0	3.2	1.2	1.9
Dorosoma petenense					2.4						0.8					1.9
Cyprinidae																
Ctenopharyngodon idella																1.0
Hybopsis aestivalis															1.2	
Hybopsis storeriana	1.3	3.5	1.5	25.1	10.5	4.9				2.2	2.7	2.1	6.1	1.6	3.5	2.9
Notropis spp.					1.2	1.2		6.8		2.2						
Notropis atherinoides				0.9	2.4											
Catostomidae																
Carpiodes carpio	3.8	3.5		9.7	5.8	2.5	1.4		4.4	2.2	0.8	2.6		3.2	1.2	1.0
Ictiobus spp.				1.9												
Poeciliidae																
Gambusia affinis	1.3															
Atherinidae																
Menidia beryllina			1.5													
Percichthyidae																
Morone spp.	1.3	1.7		1.9	1.2											
Morone chrysops										2.2						

(Continued)

Table F8 (Concluded)

Taxonomic Classification	A01	A02	A03	B01	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Centrarchidae																
Lepomis spp.				3.8	2.4											1.0
Pomoxis annularis							0.7									
Sciaenidae																
Aplodinotus grunniens	70.4	35.0	32.7	196.5	290.0	70.6	15.5	27.0	19.4	46.8	70.1	25.4	18.1	34.2	49.6	46.3
Unidentified fish eggs														1.5		1.0

Table F9

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (4-Day), 25 June 1985

Taxonomic Classification	A01	A02	A03	B01*	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Clupeidae																
Dorosoma spp.	11.9	4.3	3.7	15.6	9.8	3.0	3.2		2.7	10.9	0.9	2.2	5.6	13.6		1.2
Dorosoma Petenense		0.6												0.9		
Cyprinidae																
Ctenopharyngodon idella	1.3	2.5	1.4		1.4		1.4	5.3	3.6	2.0	2.7	5.7	1.9	0.8		3.7
Hybopsis aestivalis		0.6							1.8	3.0				1.7		
Hybopsis storeriana		1.2	2.8				1.4			3.0	1.9	1.1	2.8	0.8	2.4	1.2
Notropis spp.	1.3	0.6	0.9	15.6	1.5	1.0				1.0				0.8		1.2
Unidentified Cyprinidae											1.8					
Catostomidae																
Carpiodes carpio	15.1	17.2	12.1		26.6	3.0	2.7	7.1	3.6	11.8	3.6	1.1	5.7	5.2	8.3	8.6
Unidentified Catostomidae					1.0											
Centrarchidae																
Lepomis spp.					1.5				0.9				0.9			1.2
Sciaenidae																
Aplodinotus grunniens	26.3	26.6	12.9	46.9	18.7	9.0	30.4	14.4	25.0	15.8	25.6	12.5	18.8	63.5	33.4	17.1
Unidentified fish eggs	0.9	0.6														

* Station was dropped from analyses.

Table F10

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (4-Night), 25-26 June 1985

Taxonomic Classification	A01	A02	A03	B01*	B02	B03	C01	C02	C03	C04	D01	D02	D03	E01	E02	E03
Clupeidae																
Dorosoma spp.	0.6	0.8	2.1		1.3	1.9		1.2	1.1				2.0	1.3		2.5
Dorosoma petenense														1.3		
Cyprinidae																
Ctenopharyngodon idella	2.1	3.2	2.7	62.5	3.6	5.5	9.7	1.2	3.2	3.4	1.5		9.7	4.8	4.2	1.3
Hybopsis aestivalis														1.3	1.0	
Hybopsis storeriana	1.2	3.2	1.1	62.5	1.3	0.9			3.2		0.8	2.2		1.3	2.1	
Notropis spp.						0.9										
Catostomidae																
Carpiodes carpio	5.3		1.6	312.5	3.6	2.8	7.6	1.2	3.2	6.9	4.7	3.5	11.7	2.4	4.2	8.9
Unidentified Catostomidae			0.5													
Centrarchidae																
Lepomis spp.	0.6								1.1							
Sciaenidae																
Aplodinotus grunniens	2.1	6.4	5.9		4.7	2.8	1.9	2.3	4.2	5.1	2.3	4.5	9.2	2.4	3.1	2.5

* Station was dropped from analyses.

Table F11

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (5-Day), 17 July 1985

Taxonomic Classification	A01	A02	A03	TS1	TS2	TM2	TB2	TS3	TM3	TB3	E01	E02	E03
Clupeidae													
Dorosoma spp.	7.5			1.8									
Dorosoma petenense											1.9		
Cyprinidae													
Ctenopharyngodon idella												1.3	
Hybopsis aestivalis		8.1		0.9				3.2	3.4		4.9	5.3	1.5
Hybopsis storeriana			2.9					2.2		1.0			
Notropis spp.	36.9		2.9			1.4		4.4	1.0		11.3	5.3	
Catostomidae													
Carpiodes carpio	7.5	3.2	2.9	1.8		2.0		9.8	5.9	5.2	3.0	1.3	1.5
Ictaluridae													
Ictalurus furcatus							1.6						
Sciaenidae													
Aplodinotus grunniens	59.0	4.9	37.4	14.5	17.8	7.4	3.2	116.8	14.2	3.9	44.9	74.4	23.8

Table F12

Abundance (No./100 m^3) of Larval Fish Collected From White Castle Eddy (5-Night), 18 July 1985

Taxonomic Classification	A01	A02	A03	TS1	TS2	TM2	TB2	TS3	TM3	TB3	E01	E02	E03
Clupeidae													
Dorosoma spp.				1.2				1.0					
Dorosoma petenense				1.2				1.1				1.5	
Cyprinidae													
Hybopsis aestivalis	5.9				1.3	3.9	2.0	3.9	0.8	1.7	1.5		4.5
Hybopsis storeriana	1.9	3.7		2.7					2.5		1.5		1.5
Notropis spp.	1.9	1.9	8.5	7.6	2.4	2.0	1.7	4.2	2.5	3.9			1.5
Catostomidae													
Carpiodes carpio	3.8				3.9	5.9	3.5	10.7	3.3	1.7	3.2	2.9	3.0
Ictaluridae													
Ictalurus furcatus								1.1					
Centrarchidae													
Lepomis megalotis				1.2									
Sciaenidae													
Aplodinotus grunniens	26.8	1.9		8.5	3.9	1.6		3.9	1.7		1.7		