CAPE FEAR PLANT IMPINGEMENT MORTALITY AND ENTRAINMENT CHARACTERIZATION STUDY SEPTEMBER 2005 - AUGUST 2006

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Environmental, Health & Safety Services Section
PROGRESS ENERGY CAROLINAS, INC.
Raleigh, North Carolina

Preface

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Metric-English Conversion and Units of Measure

Length

1 micron (Φm) = 4.0 x 10^{-5} inch
1 millimeter (mm) = 1000 Φm = 0.04 inch
1 centimeter (cm) = 10 mm = 0.4 inch
1 meter (m) = 100 cm = 3.28 feet
1 kilometer (km) = 1000 m = 0.62 mile

Area

1 square meter (m^2) = 10.76 square feet
1 hectare (ha) = 10,000 m^2 = 2.47 acres

Volume

1 milliliter (ml) = 0.034 fluid ounce
1 liter = 1000 ml = 0.26 gallon
1 cubic meter = 35.3 cubic feet

Weight

1 microgram (Φg) = 10^{-3} mg or
10^{-6} g = 3.5 x 10^{-8} ounce
1 milligram (mg) = 3.5 x 10^{-5} ounce
1 gram (g) = 1000 mg = 0.035 ounce
1 kilogram (kg) = 1000 g = 2.2 pounds
1 metric ton = 1000 kg = 1.1 tons
1 kg/hectare = 0.89 pound/acre

Temperature

Degrees Celsius (EC) = 5/9 (EF-32)

Specific Conductance

ΦS/cm = Microsiemens/centimeter

Turbidity

NTU = Nephelometric Turbidity Unit

Executive Summary

An Impingement Mortality and Entrainment Characterization Study was conducted during 2005 -2006 at the Cape Fear Plant. The purposes of the study were to provide information to support the development of a calculation baseline and to characterize the current impingement mortality and entrainment. The Study is a component of a Comprehensive Demonstration Study.

No threatened or endangered species were collected with impingement or entrainment sampling during the study period. Impingement mortality studies during the study period demonstrated extremely low impingement rates representing 29 species of fish and shellfish. Five species dominated impingement samples. These species were threadfin shad, gizzard shad, bluegill, channel catfish, and white perch. Of these species, only gizzard shad, bluegill, and white perch were native to the Cape Fear River drainage. The maximum number of fish impinged during a 24-hour period occurred during January 2006 when certain numbers of cold-shocked threadfin and gizzard shad were collected. Bluegill and white perch were also collected in highest numbers during the winter months.

Entrainment sampling indicated relatively low numbers of taxa potentially at risk of being entrained. Some invertebrate taxa such as the non-native asiatic clam were entrained. However, nearly all of the organisms entrained consisted of seasonally present shad larvae and eggs with the exception of a number of fingernail clams collected only on one occasion during August.

Five species and 2 taxa groups were chosen as representative species and taxa groups. These species were threadfin shad, gizzard shad, bluegill, channel catfish, and white perch. The 2-taxa groups included fish eggs and fish larvae.

The calculated annual baseline estimate of the total number of all organisms impinged was 157,378, most of which were shad. The calculated baseline annual estimate of the total number of fish larvae entrained for design flow approached 28 million, the majority of which were also shad.

An important point to consider is the risk of impingement even for the representative species is relatively low during the majority of the year. Impingement rates (density) increase only during periods of environmental extremes in water temperature. Nearly all of the fish species entrained or impinged were younger, non-reproducing life stages, especially for gizzard shad and channel catfish. This is important since cooling water withdrawal did not significantly affect the spawning-aged individuals required for future generations of fish. In addition, Progress Energy Carolinas, Inc biologist observed very healthy and abundant shad, sunfish, and catfish populations while conducting electrofishing sampling just downstream in the vicinity of Buckhorn Dam.

CAPE FEAR PLANT IMPINGEMENT AND ENTRAINMENT REPORT SEPTEMBER 2005 - AUGUST 2006

1.0 INTRODUCTION

Progress Energy Carolinas, Inc. (PEC) owns and operates the Cape Fear Power Plant located on the Cape Fear River in Moncure, Chatham County, North Carolina. The Cape Fear plant is subject to the Phase II rule published on July 9, 2004 by the U.S. Environmental Protection Agency (USEPA) to implement Section 316(b) of the Clean Water Act. The Phase II rule establishes performance standards for certain existing power generation facilities to reduce rates of impingement mortality (and entrainment, where applicable) due to the operation of cooling water intakes structures (CWIS). A Proposal for Information Collection (PIC) that included an impingement mortality and entrainment sampling plan was submitted to the DWQ to satisfy the requirements of §125.95(b)(1), and to facilitate the compliance process by describing PEC's proposed approach to meet the requirements of the Phase II rule. This report constitutes the Impingement Mortality and Entrainment Characterization Study and provides for the development of a calculation baseline and characterizes current impingement mortality and entrainment resulting from the 12 month sampling period of September 2005 to August 2006.

1.1 Power plant and site description

The Cape Fear Power Plant is located in the town of Moncure which is located in Chatham County, North Carolina (Figure 1). The facility operates a cooling water intake structure and discharges heated cooling water back to the Cape Fear River under NPDES permit NC0003433.

The facility has four operational units, two oil-fired combined cycle combustion turbines (Units 1 and 2,) and two coal-fired steam electric generation turbines (Units 5 and 6). Units 1 and 2 became operational in 1969, while Units 5 and 6 were placed in service between 1956 and 1958. Units 5 and 6 at the Cape Fear facility are operated as baseload units while Units 1 and 2 are operated during periods of peak energy demand. Appendix 1 provides a monthly summary of plant intake flow volumes for the study period during 2005 and 2006.

The facility withdraws cooling water from the Cape Fear River just downstream of the confluence of the Haw River and the Deep River. The Buckhorn dam, a decommissioned hydropower generation facility, is located approximately 5.5 miles downriver of the facility and creates a backwater pool that extends upriver of the facility. As a result, the river elevation at the intake remains fairly constant at approximately 158.5 feet.

2.0 Objectives and Methods

2.1 Sampling

Impingement mortality and entrainment sampling were conducted biweekly (every two weeks) for a 12-month period beginning September 13, 2005. The objective was to characterize species composition, life stage, temporal and spatial variability and numbers and weights of fish and shellfish impinged and entrained at the Cape Fear Plant. Both day and night samples were collected to assess diel variations. Operational data for the cooling water pumps were recorded during each sampling event for later use in estimating rates for the calculation baseline. A sampling event consisted of 24-hour monitoring of impingement mortality and entrainment at the intake screens for Cape Fear Units 5 and 6.

2.2 Impingement mortality sampling

Impinged organisms were collected in a basket placed in the debris return trough. The basket was open on one end. The remaining surfaces were composed of 3/8-inch opening wire mesh sides and bottom. To ensure a continuous sample, a second basket was available to be put into service should the first basket need to be removed due to debris or organism loading.

For impingement mortality sampling, the screens were rotated and cleaned prior to the beginning of the 24-hour sampling event. During the 24-hour sampling event the screens were fixed for a period of 6 hours then rotated with debris and aquatic organisms being washed into the sluiceway. Sampling from the sluiceway occurred at 6-hour intervals such that 2 samples each were collected during the day and night. If the debris load was heavy, screens were rotated as needed and any organisms washed off were retained for the sample.

Particular care was to be given to any threatened or endangered species should they be collected in order to minimize the chance of mortality. Taxonomic identification was verified and photographs taken prior to release.

Immediate mortality was noted and recorded. Organisms were counted, identified, measured and weighed, and surviving fish that could be identified in the field were released downstream of the intake. Representative specimens of taxonomically vague species were identified to the lowest practical taxon and preserved for more thorough identification in the laboratory. Length and weight measurements were randomly recorded for at least 30 individuals of a species from each 6 hour sample. Extremely large samples were subsampled.

2.3 Entrainment Sampling

Entrainment samples were collected in the intake forebay in front of the bar racks that service Units 5 and 6 traveling screens. Sampling events were coordinated with plant operations to ensure the sample was collected in front of a bar rack with at least one operating condenser pump. The sample was collected with a half-meter 505 micron mesh plankton net fished below the water surface.

Rapid mixing of the water column in the forebay ensured a homogenous distribution of organisms in the water column.

Collections were initially preserved in 10% formalin solution. In the laboratory, samples were transferred to Petri dishes for examination under a dissection microscope. All organisms were identified to the lowest practical taxon. Measurements appropriate for the life stage were recorded as well as physical characteristics relevant to life stage.

Ten percent of all samples were randomly chosen for review by a second qualified taxonomist to ensure consistency in identifications. Should there be disagreement between the two taxonomists; supporting confirmation from outside experts were sought. Ichthyoplankton sorted from the entrainment samples were stored in a 3% buffered formalin solution. All entrainment samples including residue will be retained until regulatory agencies have accepted the results of the Comprehensive Demonstration Study. Samples of all taxonomically vague specimens were delivered to independent experts for identification and verification. Two day and night samples each were collected to assess potential diel variations.

2.4 Data Analysis

Results were standardized to indicate density in numbers of organisms per unit volume of water. For impingement samples, density was calculated for each sample by dividing the total number of each species collected by the volume of cooling water pumped by the plant during the duration of the sample event. Biomass per unit volume was calculated in a similar fashion using the total weight collected for each sample and species. Units were expressed in number or weight per million gallons of cooling water pumped by the plant. The density of organisms entrained for each sample was calculated by dividing the total number of each species collected by the volume of water filtered by the plankton net during each sample. Units were standardized to number per million gallons of cooling water pumped by the plant. Treating the data in this fashion allowed for comparisons of mean density by photoperiod and sampling trip for both impingement and entrainment data. Annual mean densities were calculated and compared to annual cooling water flow to obtain estimates of annual numbers of organisms entrained and impinged.

2.5 Physical Data

Measurements of water quality parameters (water temperature, dissolved oxygen, pH, conductivity, and turbidity) were taken at the intake forebay before each sampling event. Measurements were taken just below the water surface using a YSI multiparameter instrument. Results are reported in Appendix 2.

3.0 Results

3.1 Impingement mortality sampling

- Twenty nine fish species representing 10 families were collected during impingement sampling at the Cape Fear Plant (Table 1). Dominant families represented in impingement sampling included the herrings, sunfishes, and bullhead catfishes. These

same families dominated the biomass collected with the addition of the temperate basses (primarily white perch).

- No threatened or endangered fish species were collected during the study period. The only known populations of a threatened or endangered fish species is the Cape Fear shiner, *Notropis mekistocholas.* The closest known population is located approximately 4 miles upstream of the gaging station in the Deep River and its tributary the Rocky River. It is unlikely that localized individuals of this species were ever to be impinged due to the specific habitat requirements of this species. Agreement was obtained from Mr. Pete Benjamin of the U. S. Fish and Wildlife Service (USFWS) during November 2005 with the stipulation that PEC notify the USFWS should one be collected.

- Five species comprised over 98% of the total number of fish collected with impingement sampling during the study period (Figure 2). These species included threadfin shad, gizzard shad, bluegill, channel catfish, and white perch. These same species also dominated approximately 94% of the fish biomass collected with bluegill becoming the second most abundant species behind threadfin shad. Two of the dominant fish species collected are not native to the Cape Fear River drainage. Both channel catfish and threadfin shad have been widely introduced throughout the Eastern United States since the 1960's and late 1970's. These two species together comprised approximately 89% of the total number and 54% of the total biomass collected during the study period.

- Immediate mortality of the five numerically dominant fish species collected ranged from a low of 18% for bluegill, a native recreational species, to a high of 84% for a non-native, forage species, threadfin shad (Table 2.). Zero mortality was recorded for six additional species but sample size was relatively low. No latent mortality studies were conducted. A meaningful assessment of latent mortality using values from other sites reported in the literature was not possible since impinged organisms were exposed to as much as a 12^0C increase in water temperature upon being washed from the traveling screens. This resulted from the location of the screen-wash pumps on the discharge side of the condensers.

- The greatest impingement rates for all organisms occurred during January 2006 and coincided with cooler winter water temperatures (Table 3 and Figure 3). Dominant species impinged at this time due to cold stress were threadfin and gizzard shad.

- Greater numbers and biomass were collected during night compared to day sampling for all fish species collected (Figure 4).

- Several invertebrate species were incidentally collected with impingement sampling (Table 4). Asiatic clam accounted for approximately 92% of the total number of invertebrates and 76% of the total biomass collected during the study period. During most sampling trips, the densities of impinged shellfish were greater at night than during the day except for one trip during June (Figure 5).

- No consistent temporal pattern was observed for the impingement of invertebrates (Table 5). The greatest number collected occurred during the June 2006 sampling event.

3.2 Entrainment sampling

- Five taxa comprised approximately 92% of the total number of organisms collected with entrainment sampling (Table 6). Dominant taxa entrained in order of abundance were asiatic clam, fingernail clam, *Dorosoma* spp. larvae, and unidentified fish eggs.

- No threatened or endangered species were collected with entrainment sampling during the study period.

- The greatest daily entrainment rates generally occurred during May and June (Table 7). This corresponded to periods when a larger number of shad eggs and larvae plus unidentified fish eggs were present in the water column.

- No temporal pattern was evident for the daily entrainment rates of asiatic clam. However the greatest numbers of fingernail clam appeared to be entrained during August 2006 when plant flow rates were the greatest (Table 6 and Appendix 1).

3.3 Representative species

- Representative species were selected based upon several criteria:
  - Relatively high abundance in impingement or entrainment samples
  - Species representing native forage, commercial, or recreational species
  - Species representing special concern, threatened, or endangered species of which none were collected
  - Species considered at greater risk of impingement or entrainment due to life history considerations such as natant juveniles and adults or planktonic larvae.

- The following representative species and taxonomic groups were selected based upon the above criteria:
  - Threadfin shad
  - Gizzard shad
  - Bluegill
  - Channel catfish
  - White perch
  - Fish eggs and larvae

- Threadfin and gizzard shad were free-swimming (natant), forage fish abundant in impingement samples. The eggs and larvae (*Dorosoma* spp.) of these species also

comprised a significant component of the fish eggs and larvae entrained (Figure 6). Bluegill was an important native, recreational fish abundant in impingement samples. This species is also considered as forage for important game fish such as largemouth bass. Although non-native, channel catfish and white perch were recreational species abundant in impingement samples that have become widely distributed throughout the Southeast. A few channel catfish juveniles were also entrained. However, no white perch or other *Morone* spp. larvae or juveniles were collected with entrainment sampling.

- The numerically dominant shellfish (asiatic and fingernail clam) impinged and entrained were not considered representative species. Collections were considered incidental since juveniles and adults are demersal. Although the asiatic clam has a planktonic larval form, this species is non-native and considered a nuisance invader. There is no planktonic larval form for the fingernail clam. The larvae are incubated in the gill marsupium of the parent until expelled at which time they crawl away from the adult.

- Threadfin shad were impinged in greater numbers during the winter with peak density and biomass occurring during January (Figure 7). The majority of the fish impinged were 70-90 mm indicating that most were sexually mature adults (Figure 8). Gizzard shad were also impinged in greater numbers during winter with peak densities and biomass occurring during January (Figure 9). Most of the gizzard shad impinged were between 95-135 mm indicating that the majority of the fish impinged were sexually immature juveniles (Figure 8)

- Bluegill was also impinged in greater density and biomass during the winter months (Figure 10). Multiple size classes were impinged indicating both sexually immature and mature bluegill was impinged.

- The density and biomass of white perch impinged was greatest during winter followed by a secondary peak during late summer (Figure 12). All white perch collected with impingement samples were greater than 100 mm indicating that all were sexually mature fish (Figure 11)

- Channel catfish were collected sporadically and in low number during most of the year (Table 3 and Figure 12). The greatest density and biomass of channel catfish was impinged during August 2006. Heat stress may have resulted in more catfish being impinged that month. Evidence for this was that water temperature was the highest recorded for the entire study period (Appendix 2). The majority of channel catfish were young-of-year (Figure 13). Very few sexually mature channel catfish were collected.

- Fish eggs were collected in entrainment samples from April through June (Table 7). The greatest density of identifiable *Dorosoma* spp. eggs occurred during early May at which time a little over 129 thousand eggs were entrained during 24 hours. (Table 7 and Figure 15). The peak density of unidentified fish eggs occurred during the last

week of May. The majority of these eggs were probably *Dorosoma* spp. that could not be identified to genus due to developmental stage. Evidence for this was the major peak observed for the density of *Dorosoma* spp. larvae entrained 4 weeks later during June (Figure 16). The mean density entrained per sampling trip for total fish larvae tracked that observed for *Dorosoma* spp. larvae since *Dorosoma* spp. larvae comprised the majority of fish larvae entrained. A departure from this pattern was observed during August when the mean density of juvenile channel catfish peaked (Figure 17).

- *Lepomis* spp. larvae (sunfishes including bluegill) were present in low densities for a short period during June.

3.4 Annual estimates and calculated baseline

- The annual mean number of representative organisms impinged and entrained per million gallons of water was used to calculate the annual number impinged and entrained with respect to actual and design cooling water flow. The calculated baseline estimates were obtained using the design intake flow with all cooling water pumps in continuous operation. Detailed information regarding number, weight, and density collected at the sample level used to make these calculations can be found in appendices 3-14.

- The annual estimate of the total number of all organisms impinged under actual operation was 103,649 (Table 8). The calculated baseline annual estimate of the total number of all organisms impinged for design flow was 157,378.

- Calculated baseline estimates for the annual number of representative species impinged ranged from 1,249 for white perch to 122,405 for threadfin shad.

- The annual estimate of the total number of fish larvae entrained under actual operation was approximately 18 million (Table 9). The calculated baseline annual estimate of the total number of fish larvae entrained for design flow approached 28 million.

- Calculated baseline estimates for the annual number of representative species entrained ranged from 403,437 for *Lepomis* spp. to 16,455,970 for unidentified fish eggs.

3.5 Comparison to historic studies

- Historic studies conducted during 1976-1977 demonstrated extremely low impingement rates representing 21 species (CP&L 1977). The maximum number of fish impinged during a 24-hour period occurred during February 1977 when 53.3 individuals representing 2 species (gizzard shad and bluegill) were collected. This event (as well as two others yielding the next highest impingement rates) occurred during a period of extreme cold weather and cold shock was a primary reason for the

increased numbers of fish observed during this period. Entrainment sampling methods near the plant indicated low larval densities. Nearly all of the larval fish collected either in the intake or from the river near the plant consisted of gizzard shad.

- Results of the current impingement and entrainment studies were similar to those for the 1976-1977 studies except for the addition of threadfin shad and white perch. Both species were introduced to the area since the original studies were conducted.

4.0 Conclusions

No threatened or endangered species were collected with impingement or entrainment sampling during the study period. No major changes in species composition entrained or impinged was evident compared to historical studies except for the appearance of threadfin shad and white perch. Impingement mortality studies during 2005 and 2006 demonstrated relatively low impingement rates representing 29 species. Five species dominated impingement samples. These species were threadfin shad, gizzard shad, bluegill, channel catfish, and white perch. Of these species, only gizzard shad, bluegill, and white perch were native to the Cape Fear River drainage. Immediate impingement mortality of the five numerically dominant fish species collected ranged from a low of 18% for bluegill, a native recreational species, to a high of 84% for a non-native, forage species, threadfin shad.

Entrainment sampling indicated relatively low numbers of taxa potentially at risk of being entrained. Some invertebrate taxa such as the non-native asiatic clam were entrained. However, nearly all of the organisms entrained consisted of seasonally abundant shad larvae and eggs with the exception of a number of fingernail clams collected only on one occasion during August.

Five species and 2 taxa groups were chosen as representative species and taxa groups based upon several criteria including abundance in entrainment and impingement samples, commercial or recreational importance, trophic level, and species-groups considered at more risk due to life history considerations such as planktonic larvae or swimming behavior. These species were threadfin shad, gizzard shad, bluegill, channel catfish, and white perch. The 2-taxa groups included fish eggs and fish larvae.

An important point to consider is the risk of impingement even for the representative species is relatively low during the majority of the year. Impingement rates (density) increase only during periods of environmental extremes in water temperature. The maximum number of fish impinged during a 24-hour period occurred during January 2006 when relatively large numbers of cold-shocked threadfin and gizzard shad were collected. Bluegill and white perch were also collected in highest numbers during the winter months. Conversely, the higher density of channel catfish occurring during August 2006 appeared to be correlated with elevated temperature extremes.

The calculated annual baseline estimate of the total number of all organisms impinged was 157,378, most of which were shad. The calculated baseline annual estimate of the total number of fish larvae entrained for design flow approached 28 million, the majority of which were also shad.

Nearly all of the fish species entrained or impinged were younger, non-reproducing life stages, especially for gizzard shad and channel catfish. This is an important point to consider in any assessment of the overall possible adverse effects of entrainment and impingement on the fish populations in the area. Cooling water withdrawal did not significantly affect the spawning-aged

individuals required for future generations of fish. In addition, Progress Energy Carolinas, Inc biologist were required to collect fish tissue samples just downstream in the vicinity of the Buckhorn Dam as part of the Harris Nuclear Plant technical specification requirements. Observation while conducting the sampling indicated very healthy and abundant shad, sunfish, and catfish populations.

5.0 References

CP&L. 1977. Cape Fear Steam Electric Generating Plant 316(b) demonstration. Carolina Power & Light Company, Raleigh, NC.

Pennak, R. W. 1989. The freshwater invertebrates of the United States, protozoa to molluska, 3rd ed. John Wiley and Sons, Inc. New York, NY.

Robins, R. C., R. M. Bailey, E. E. Bond, J. R. Brooker, E. A. Lachner, R. N. Lea, and W. B. Scott. 1991. Common and scientific names of fishes from the United States and Canada. American Fisheries Society Publication No. 20, Bethesda, MD.

Table 1. Fish species collected in impingement samples from the Cape Fear Plant intake screens, September 2005-August 2006.

Scientific Name+	Common Name	Total number	Total weight (g)	Day total number	Day total weight (g)	Night total number	Night total weight (g)
Anguillidae	**Freshwater Eels**						
Anguilla rostrata	American eel	3	1,174	1	554	2	620
Clupeidae	**Herrings**						
Dorosoma cepedianum	Gizzard shad	347	7,607	153	3,314	194	4,293
*D. petenense**	Threadfin shad	6,056	23,692	1,772	6,893	4,284	16,799
Cyprinidae	**Carps and Minnows**						
Nocomis leptocephalus	Bluehead chub	2	18	1	7	1	11
Notemigonus crysoleucas	Golden shiner	3	7	2	3	1	4
Notropis amoenus	Comely shiner	5	12	4	7	1	5
N. petersoni	Coastal shiner	1	1	1	1	0	0
N. scepticus	Sandbar shiner	6	10	2	4	4	6
Ictaluridae	**Bullhead catfishes**						
Ameiurus brunneus	Snail bullhead	1	27	0	0	1	27
A. catus	White catfish	8	562	4	314	4	248
*Ictalurus punctatus**	Channel catfish	183	1,626	47	614	136	1,012
*Pylodictis olivaris**	Flathead catfish	21	132	9	38	12	94
Esocidae	**Pikes**						
Esox americanus americanus	Redfin pickerel	1	55	1	55	0	0
Umbridae	**Mudminnows**						
Umbra pygmaea	Eastern mudminnow	2	13	0	0	2	13
Aphredoderidae	**Pirate perches**						
Aphredoderus sayanus	Pirate perch	4	35	1	7	3	28
Percichthyidae	**Temperate basses**						
Morone americana	White perch	40	2,492	13	808	27	1,684
M. saxatilis	Striped bass	2	93	1	13	1	80

Table 1. (continued)

Scientific Name[+]	Common Name	Total number	Total weight (g)	Day total number	Day total weight (g)	Night total number	Night total weight (g)
Centrarchidae	**Sunfishes**						
Acantharchus pomotis	Mud sunfish	1	12	0	0	1	12
Centrarchus macropterus	Flier	2	45	0	0	2	45
Enneacanthus gloriosus	Bluespotted sunfish	5	16	5	16	0	0
Lepomis auritus	Redbreast sunfish	3	41	3	41	0	0
L. cyanellus	Green sunfish	3	32	0	0	3	32
L. gibbosus	Pumpkinseed	1	26	0	0	1	26
L. gulosus	Warmouth	9	177	2	7	7	170
L. macrochirus	Bluegill	308	8,934	110	2,706	198	6,228
Micropterus salmoides	Largemouth bass	2	9	1	5	4	4
Pomoxis nigromaculatus	Black crappie	7	259	2	128	5	131
Percidae	**Perches**						
Etheostoma olmstedi	Tessellated darter	7	13	5	9	2	4
Perca flavescens	Yellow perch	3	84	0	0	3	84
Total		**7,036**	**47,204**	**2140**	**15,544**	**4,896**	**31,660**

[+]Taxonomic nomenclature follows Robins et al. (1991).

*Considered non-native to the Cape Fear River watershed.

Table 2. **Percentage of alive and dead plus size ranges (total length, mm) of fish species collected in impingement samples from the Cape Fear Plant intake screens, September 2005-August 2006.**

Scientific Name[+]	Common Name	Percent alive	Percent dead	Length range
Anguilla rostrata	American eel	33	67	478-650
Dorosoma cepedianum	Gizzard shad	50	50	69-335
*D. petenense**	Threadfin shad	16	84	28-137
Cyprinidae	Shiner family	12	88	40-100
Ameiurus brunneus	Snail bullhead	100	0	140
A. catus	White catfish	35	65	57-232
*Ictalurus punctatus**	Channel catfish	33	67	40-267
*Pylodictis olivaris**	Flathead catfish	90	10	47-148
Esox americanus americanus	Redfin pickerel	100	0	206
Umbra pygmaea	Eastern mudminnow	100	0	82-85
Aphredoderus sayanus	Pirate perch	100	0	63-92
Morone americana	White perch	38	62	110-225
M. saxatilis	Striped bass	50	50	117-200
Centrachidae	Sunfish family	67	33	47-118
Lepomis gulosus	Warmouth	78	22	47-185
L. macrochirus	Bluegill	82	18	50-212
Micropterus salmoides	Largemouth bass	100	0	73
Pomoxis nigromaculatus	Black crappie	29	71	56-222
Etheostoma olmstedi	Tessellated darter	100	0	48-65
Perca flavescens	Yellow perch	33	67	107-162

Table 3. Number and weight (g) of the dominant fish species[+] collected by sampling trip from the Cape Fear Plant intake screens, September 2005-August 2006.

Sample Date	Threadfin shad		Gizzard shad		Bluegill		Channel catfish		White perch		Other fish		Total	
	Num.	Wt.	Num.	Wt.	Num.	Wt.	Num.	Wt.	Num.	Wt.	Num.	Wt.	Num.	Wt.
SEP 13-14/2005	42	82	6	164	1	29	7	130	6	263	1	3	63	671
SEP 27-28/2005	4	19	6	110	1	17	3	19	0	0	0	0	14	165
OCT 10-11/2005	2	13	4	22	2	6	9	42	0	0	5	20	22	103
OCT 24-25/2005	3	22	2	72	0	0	0	0	0	0	1	13	6	107
NOV 07-08/2005	0	0	6	724	0	0	1	10	0	0	2	178	9	912
NOV 21-22/2005	0	0	3	122	0	0	1	5	0	0	1	6	5	133
DEC 05-06/2005	95	497	8	276	56	1,867	8	39	6	266	4	29	177	2,974
DEC 19-20/2005	347	1,595	65	1,221	37	1,825	2	12	18	1,193	8	308	477	6,154
JAN 03-04/2006	345	1,704	61	1,297	7	178	1	4	0	0	1	1	415	3,184
JAN 16-17/2006	1,049	4,509	80	1,424	2	47	0	0	0	0	2	9	1,133	5,989
JAN 30-31/2006	2,065	8,265	32	412	3	98	1	2	0	0	1	95	2,102	8,872
FEB 13-14/2006	299	1,314	30	441	88	3,463	0	0	0	0	4	482	421	5,700
FEB 27-28/2006	159	679	15	568	6	161	1	105	0	0	4	40	185	1,553
MAR 13-14/2006	567	2,083	12	345	6	198	10	31	0	0	6	18	601	2,675
MAR 27-28/2006	444	1,575	3	24	2	100	4	14	0	0	4	35	457	1,748
APR 10-11-2006	125	581	6	99	7	21	10	177	0	0	4	214	152	1,092
MAY 01-02/2006	0	0	1	12	29	144	1	4	0	0	14	143	45	303
MAY 08-09/2006	2	12	0	0	21	143	2	36	0	0	9	51	34	242
MAY 22-23/2006	9	57	0	0	5	54	7	65	0	0	6	35	27	211
JUN 05-06/2006	10	75	3	32	4	17	2	30	1	58	3	29	23	241
JUN 19-20/2006	3	21	0	0	14	282	1	3	0	0	4	79	22	385
JUL 05-06/2006	5	4	0	0	3	35	1	45	0	0	2	119	11	203
JUL 18-19/2006	167	169	0	0	3	20	7	9	2	140	6	363	185	701
AUG 01-02/2006	259	310	1	49	4	69	4	118	2	133	2	2	272	681
AUG 14-15/2006	17	19	0	0	2	39	13	85	4	340	5	23	41	506
AUG 29-30/2006	38	87	3	193	5	121	87	641	1	99	3	558	137	1,699
TOTAL	6,056	23,692	347	7,607	308	8,934	183	1,626	40	2,492	102	2,853	7,036	47,204

[+]The five species of fish listed in this appendix which accounted for 98.6% of the total number and 94.0% of the total weight of fish impinged.

Table 4. Invertebrate taxa collected in impingement samples from the Cape Fear Plant intake screens, September 2005-August 2006.

Scientific Name[+]	Common Name	Total number	Total weight (g)	Day total number	Day total weight (g)	Night total number	Night total weight (g)
Cambaridae	**Crayfish**						
Cambarus spp.	N/A	21	143	12	77	9	66
Procambarus spp.	N/A	27	356	7	86	20	270
Unidentified Cambaridae	Unidentified crayfish	7	31	4	18	3	13
Palaemonidae	**Grass Shrimps**						
Palemonetes spp.	Grass shrimp	2	2	0	0	2	2
Unionidae	**Mussels**						
Utterbackia imbecilis	Paper pondshell	2	22	1	10	1	12
Unidentified mussel	Unidentified mussel	1	16	0	0	1	16
Corbiculidae	**Asiatic clams**						
*Corbicula fluminea**	Asiatic clam	734	1,856	343	853	391	1003
Total		794	2,426	367	1044	427	1382

[+]Taxonomic nomenclature follows Pennak (1989).

*Considered non-native to the Cape Fear River watershed.

Table 5. Number and weight (g) of the dominant shellfish taxa[+] collected by sampling trip from the Cape Fear Plant intake screens, September 2005-August 2006.

Sample Date	*Corbicula fluminea*		*Procambarus* spp.		*Cambarus* spp.		Other shellfish		Total	
	Number	Weight	Number	Weight	Number	Weight	Number	Weight	Number	Weight
SEP 13-14/2005	0	0	1	2	0	0	1	10	2	12
SEP 27-28/2005	0	0	0	0	0	0	0	0	0	0
OCT 10-11/2005	2	16	1	6	0	0	0	0	3	22
OCT 24-25/2005	2	4	4	74	0	0	0	0	6	78
NOV 07-08/2005	143	367	0	0	0	0	1	12	144	379
NOV 21-22/2005	16	34	0	0	0	0	0	0	16	34
DEC 05-06/2005	4	6	0	0	0	0	2	12	6	18
DEC 19-20/2005	0	0	0	0	0	0	2	9	2	9
JAN 03-04/2006	0	0	0	0	0	0	0	0	0	0
JAN 16-17/2006	0	0	0	0	0	0	0	0	0	0
JAN 30-31/2006	0	0	1	9	0	0	0	0	1	9
FEB 13-14/2006	0	0	0	0	1	8	0	0	1	8
FEB 27-28/2006	0	0	1	16	2	19	0	0	3	35
MAR 13-14/2006	8	14	4	44	0	0	0	0	12	58
MAR 27-28/2006	21	34	1	3	0	0	0	0	22	37
APR 10-11/2006	27	45	1	10	2	7	0	0	30	62
MAY 01-02/2006	20	34	4	45	0	0	0	0	24	79
MAY 08-09/2006	10	19	3	34	0	0	2	8	15	61
MAY 22-23/2006	3	8	0	0	0	0	0	0	3	8
JUN 05-06/2006	68	150	1	13	3	18	1	16	73	197
JUN 19-20/2006	221	539	2	39	3	21	0	0	226	599
JUL 05-06/2006	1	7	1	27	1	5	3	4	6	43
JUL 18-19/2006	1	8	0	0	3	19	0	0	4	27
AUG 01-02/2006	8	44	2	34	0	0	0	0	10	78
AUG 14-15/2006	125	378	0	0	1	9	0	0	126	387
AUG 29-30/2006	54	149	0	0	5	37	0	0	59	186
TOTAL	734	1,856	27	356	21	143	12	71	794	2,426

[+]The three species of shellfish listed in this appendix accounted for 98.5% of the total number and 97.1% of the weight of fish impinged.

Table 6. Fish and shellfish taxa collected in entrainment samples from the Cape Fear Plant intake, September 2005-August 2006.

Scientific name[+#]	Common name	Total number	Day total number	Night total number
Sphaeriidae	**Fingernail clams**			
Unidentified Sphaeriidae	Unidentified Sphaeriidae	42	29	13
Eupera cubensis	Fingernail clam	443	285	158
Corbiculidae	**Asiatic clams**			
*Corbicula fluminea**	Asiatic clam	690	171	519
Osteichthyes	**Boney Fishes**			
Unidentified fish egg	Unidentified fish egg	258	99	159
Clupeidae	**Herrings**			
*Dorosoma petenense**	Threadfin shad	9	0	9
D. spp.	Unidentified *Dorosoma*	320	73	247
D. egg	Unidentified *Dorosoma* egg	52	38	14
Cyprinidae	**Carps and Minnows**			
Cyprinus carpio	Common carp	5	2	3
Notropis spp.	Unidentified shiner	1	0	1
Catostomidae	**Suckers**			
Catostomidae	Unidentified sucker	1	1	0
Ictaluridae	**Bullhead catfishes**			
*Ictalurus punctatus**	Channel catfish	14	0	14
*Pylodictis olivaris**	Flathead catfish	4	0	4
Aphredoderidae	**Pirate perches**			
Aphredoderus sayanus	Pirate perch	2	0	2
Poecilidae	**Livebearers**			
Gambusia holbrooki	Eastern mosquitofish	1	0	1
Centrarchidae	**Sunfishes**			
Centrarchidae	Unidentified sunfish	1	0	1
Lepomis macrochirus	Bluegill	1	0	1
L. spp.	Unidentified *Lepomis*	5	0	5
Micropterus salmoides	Largemouth bass	1	1	0
Pomoxis nigromaculatus	Black crappie	8	7	1
Percidae	**Perches**			
Perca flavescens	Yellow perch	16	7	9
Etheostoma spp.	Unidentified darter	7	2	5
Total		1,881	715	1,166

[+]Taxonomic nomenclature for fish taxa follows Robins et al. (1991).

[#]Taxonomic nomenclature for shellfish follows Pennak (1989).

*Considered non-native to the Cape Fear River watershed.

Table 7 . Number of dominant organisms[+] collected in entrainment samples by sampling trip from the Cape Fear Plant, September 2005-August 2006.

Sample date	*Corbicula fluminea*		*Eupera cubensis*		*Dorosoma* spp.		Unidentified fish egg		*Dorosoma* spp. egg		Other organisms		Total	
	Num	Num/ day	Num	Num/ day	Num	Num/ day	Num	Num/ day	Num	Num/ day	Num	Num/ day	Num	Num/ day
SEP 13-14/2005	55	162,681	4	11,831	0	0	0	0	0	0	5	14,789	64	189,301
SEP 27-28/2005	10	33,709	0	0	0	0	0	0	0	0	14	47,193	24	80,902
OCT 10-11/2005	29	123,259	3	12,751	0	0	0	0	0	0	2	8,501	34	144,510
OCT 24-25/2005	29	130,247	1	4,491	0	0	0	0	0	0	3	13,474	33	148,212
NOV 07-08/2005	0	0	2	9,360	0	0	0	0	0	0	0	0	2	9,360
NOV 21-22/2005	1	3,329	0	0	0	0	0	0	0	0	0	0	1	3,329
DEC 05-06/2005	90	301,369	0	0	0	0	0	0	0	0	0	0	90	301,369
DEC 19-20/2005	1	4,014	4	16,056	0	0	0	0	0	0	2	8,028	7	28,097
JAN 03-04/2006	2	8,346	0	0	0	0	0	0	0	0	1	4,173	3	12,519
JAN 16-17/2006	1	4,249	3	12,748	0	0	0	0	0	0	3	12,748	7	29,746
JAN 30-31/2006	2	8,065	4	16,131	0	0	0	0	0	0	0	0	6	24,196
FEB 13-14/2006	0	0	1	3,177	0	0	0	0	0	0	0	0	1	3,177
FEB 27-28/2006	7	22,780	19	61,830	0	0	0	0	0	0	0	0	26	84,610
MAR 13-14/2006	30	82,824	6	16,565	0	0	0	0	0	0	1	2,761	37	102,149
MAR 27-28/2006	14	48,458	2	6,923	0	0	0	0	0	0	4	13,845	20	69,226
APR 10-11/2006	8	23,723	3	8,896	2	5,931	0	0	0	0	5	14,827	18	53,376
APR 24-25/2006	7	15,970	0	0	1	2,281	6	13,688	0	0	13	29,658	27	61,597
MAY 01-02/2006	18	78,444	0	0	67	262,526	4	15,673	0	0	10	39,183	99	387,911
MAY 08-09/2006	84	320,146	0	0	21	80,037	29	110,527	34	129,583	1	3,811	169	644,104
MAY 22-23/2006	123	421040	0	0	16	54769	155	530578	17	58192	3	10269	314	1,074,849
JUN 05-06/2006	18	55651	0	0	50	154586	60	185504	1	3092	7	21642	136	420,475
JUN 19-20/2006	17	69617	0	0	120	475275	4	15843	0	0	8	31685	149	590,133
JUL 05-06/2006	10	35571	2	7114	22	78257	0	0	0	0	4	14228	38	135,170
JUL 18-19/2006	32	92028	17	48890	21	60394	0	0	0	0	8	23007	78	224,319
AUG 01-02/2006	81	260594	42	135123	0	0	0	0	0	0	14	45041	137	440758
AUG 14-15/2006	9	26020	9	26020	0	0	0	0	0	0	5	14456	23	66496
AUG 29-30/2006	12	36451	321	975061	0	0	0	0	0	0	5	15188	338	1026700
TOTAL	690		443		320		258		52		118		1881	

Table 8. Estimates of the annual number and biomass of total organisms[+] and representative species impinged at the Cape Fear Plant under actual and design intake flow, September 2005–August 2006.

	Total organisms	Threadfin shad	Gizzard shad	Bluegill	Channel catfish	White perch
Annual mean density (number per million gallons)	1.26	0.98	0.06	0.05	0.03	0.01
Annual mean biomass (grams per million gallons)	7.85	3.85	1.23	1.36	0.24	0.39
Actual flow[•]						
Annual number	103,649	80,616	4,936	4,113	2,468	823
Annual biomass (kg)	645.8	316.7	101.2	111.9	19.7	32.1
Design flow[£]						
Annual number	157,378	122,405	7,494	6,245	3,747	1,249
Annual biomass (kg)	980.5	480.9	153.6	169.9	30.0	48.7

[+]Total organisms include total fish and shellfish
[•]Actual annual intake volume = 82,261.5 million gallons
[£]Design annual intake volume = 124,903 million gallons (Pumps 1E, 1W, 2E, 2W, 5A, 5B, 6A, and 6B)

Table 9. Estimates of the annual number of total fish eggs, total fish larvae, and larvae of representative species entrained at the Cape Fear Plant under actual and design intake flow, September 2005–August 2006.

	Total fish	Unidentified fish eggs	*Dorosoma* spp. eggs	*Dorosoma* spp.	Channel catfish	*Lepomis* spp.
Annual mean density (number per million gallons)	224.14	131.75	27.79	179.24	5.92	3.23
Actual flow[+]						
Annual number	18, 438, 093	10,837,953	2,286,047	14,744,551	486,988	265,705
Design flow[•]						
Annual number	27,995,758	16,455,970	3,471,054	22,387,614	739,426	403,437

[+]Actual annual intake volume = 82,261.5 million gallons
[•]Design annual intake volume = 124,903 million gallons (Pumps 1E, 1W, 2E, 2W, 5A, 5B, 6A, and 6B)

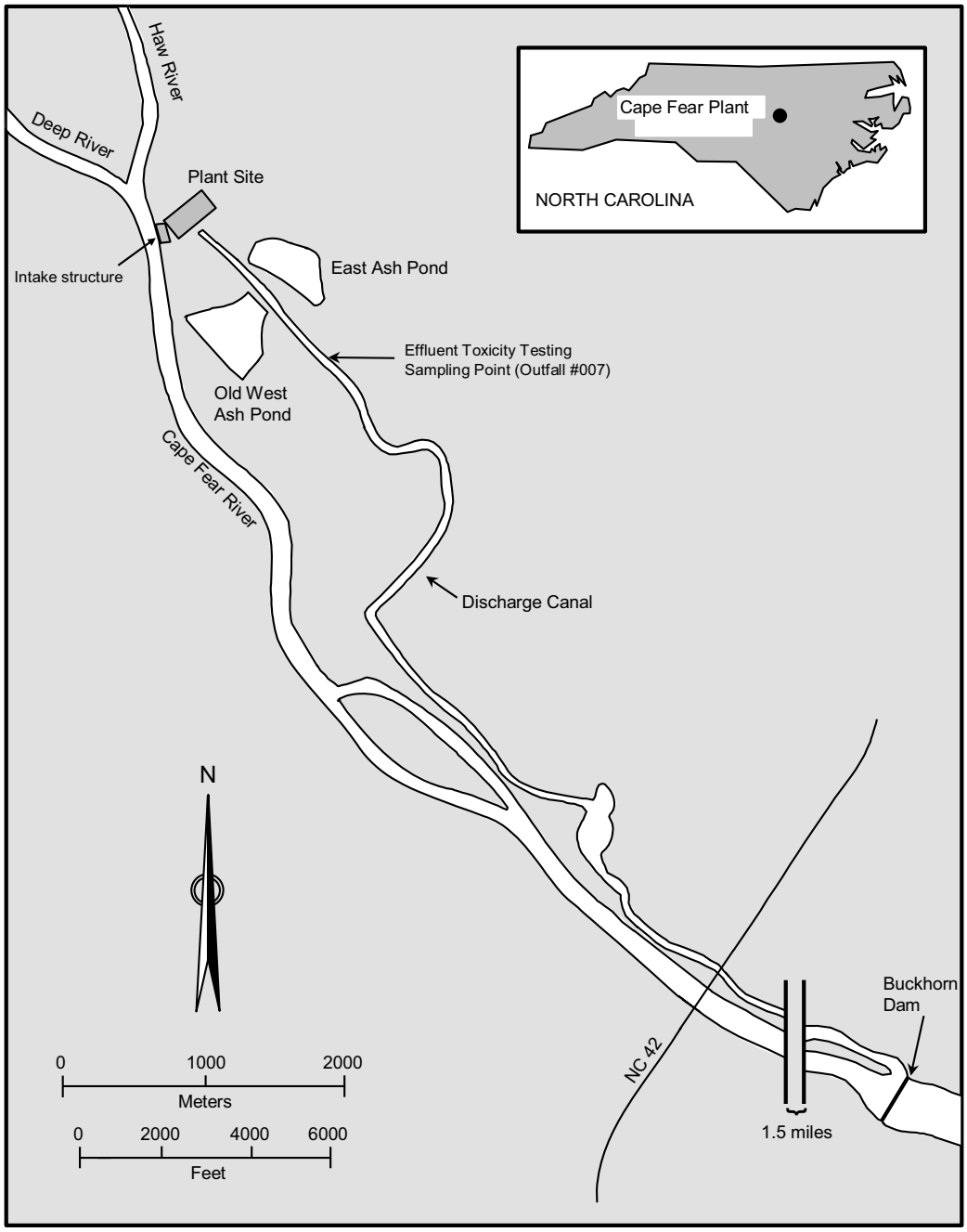

Figure 1. Location of the Cape Fear Plant on the Cape Fear River just below the confluence of the Haw and Deep rivers.

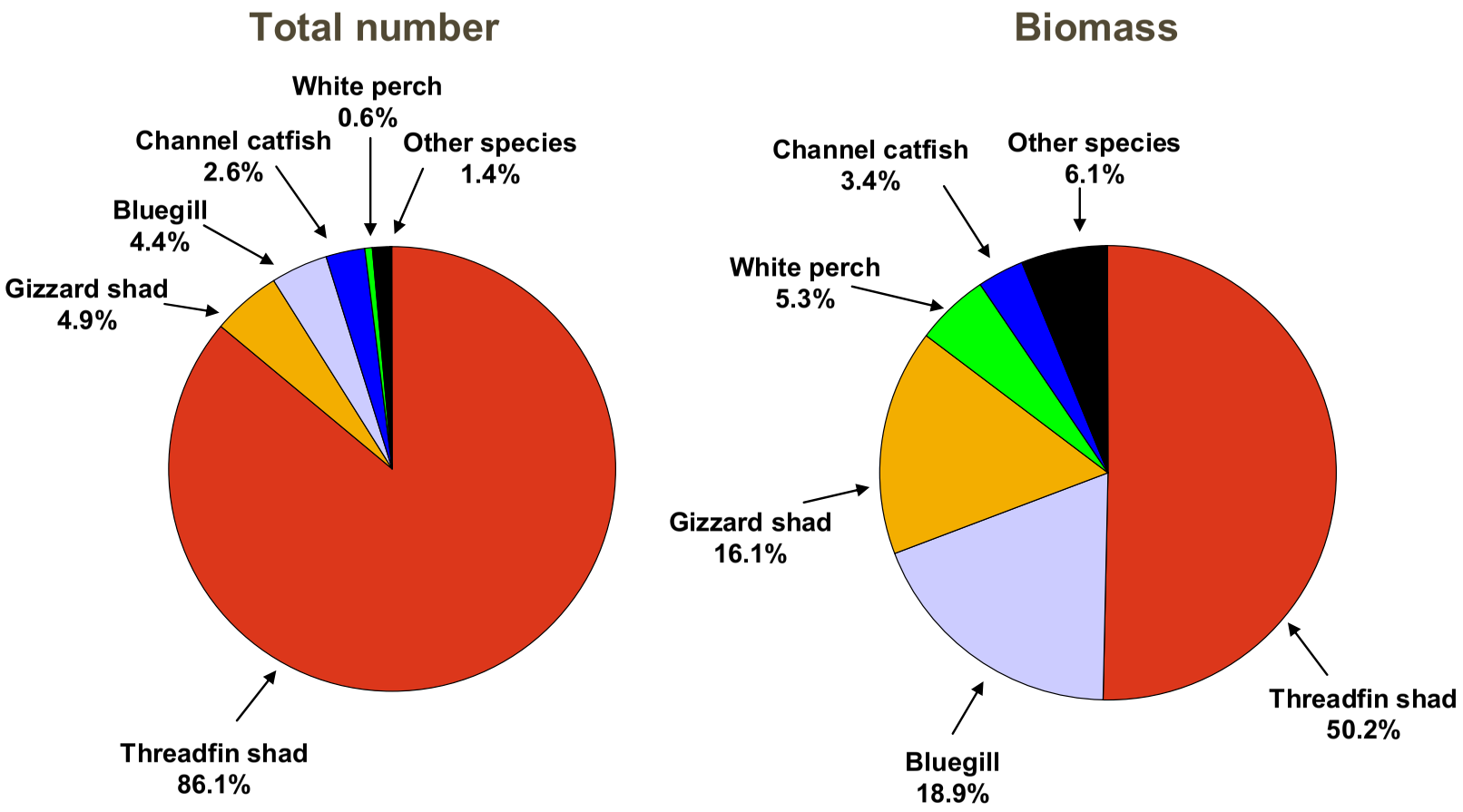

Figure 2. **Percent total number and biomass of organisms collected with impingement sampling at the Cape Fear Plant, September 2005- August 2006**

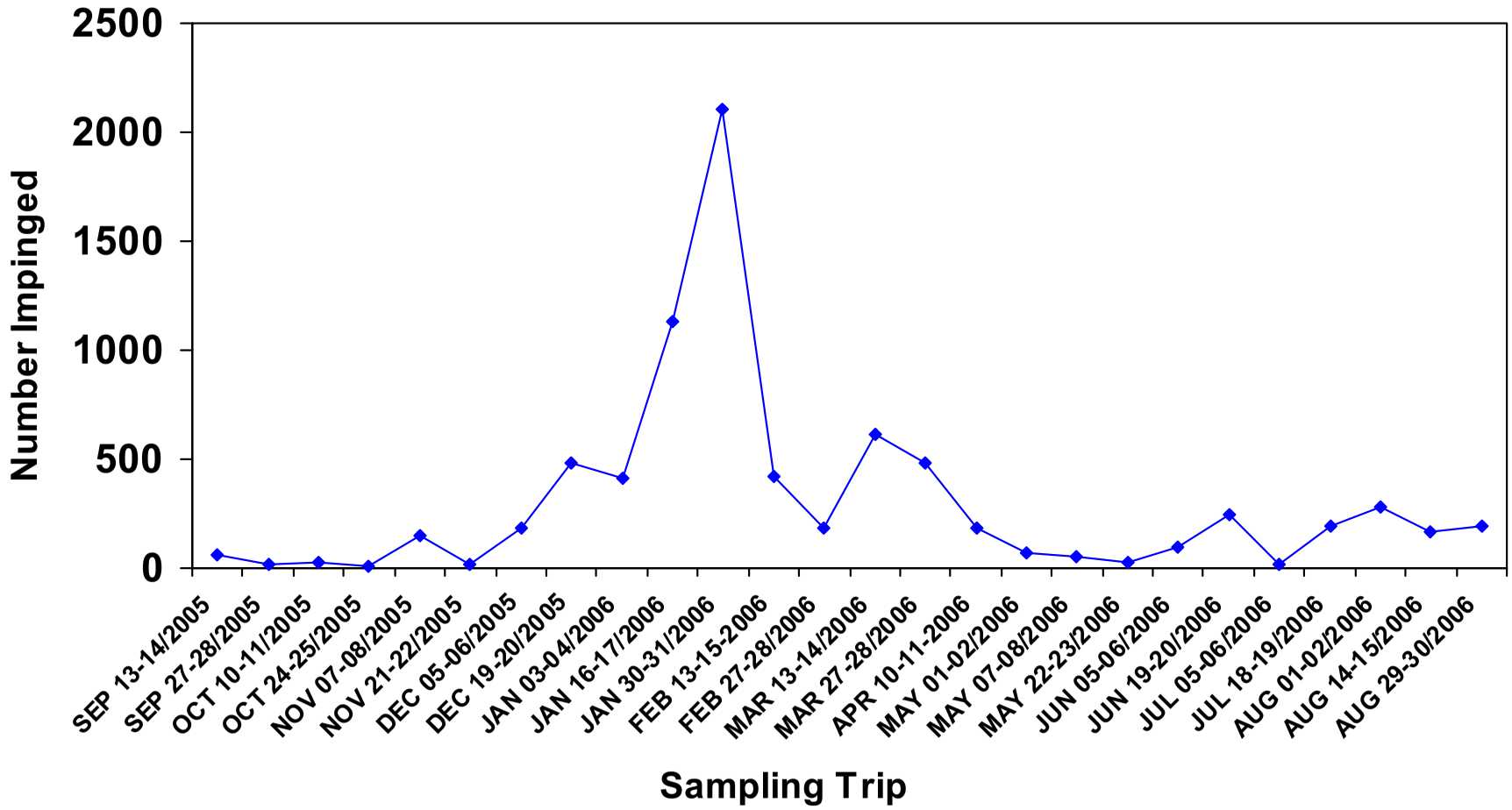

Figure 3. **Total number of organisms impinged per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

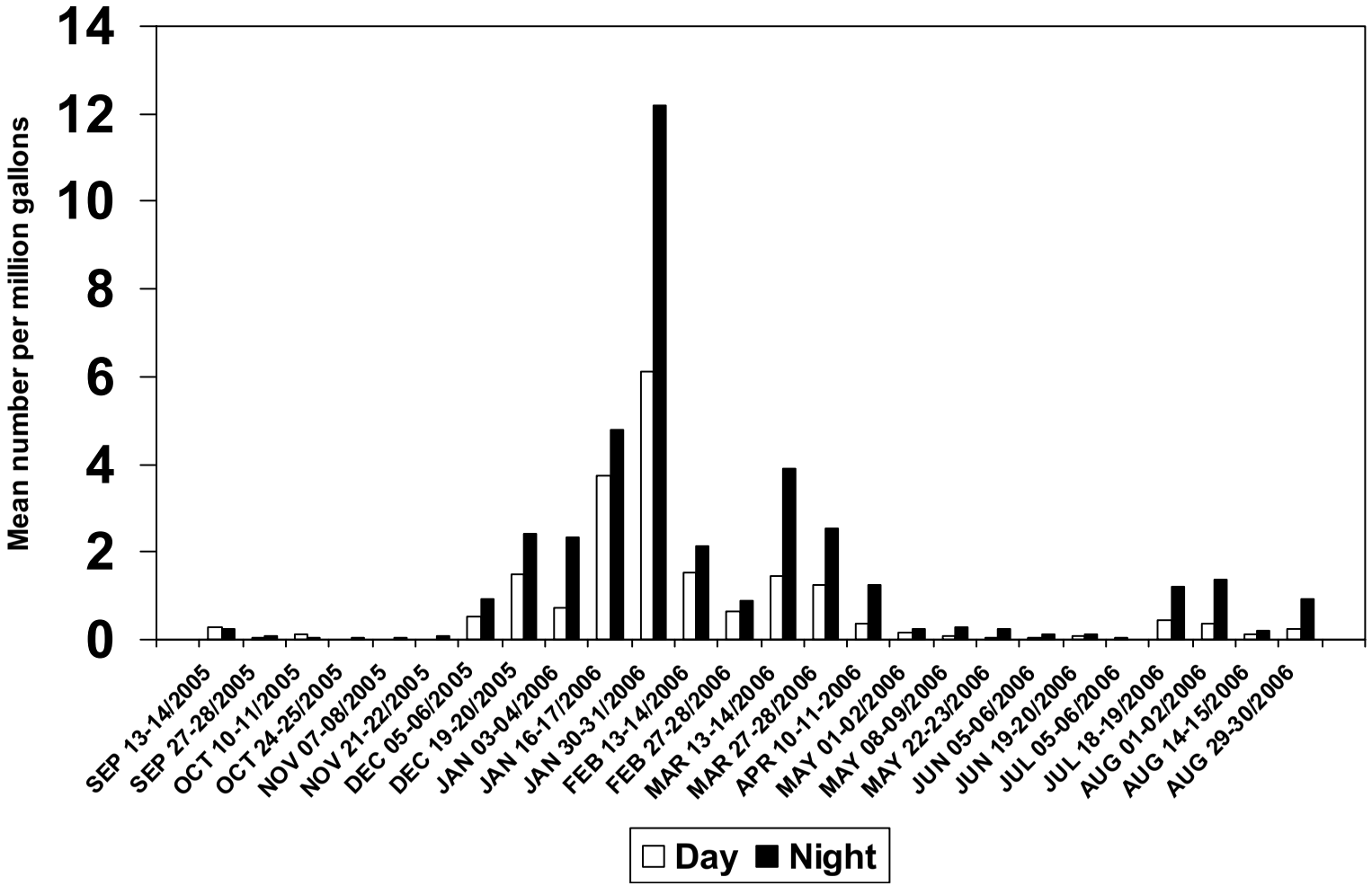

Figure 4. **Mean density (number per million gallons of cooling water) of fish impinged by photoperiod per 24-hour sampling trip at the Cape Fear Plant, September 2005- August 2006**

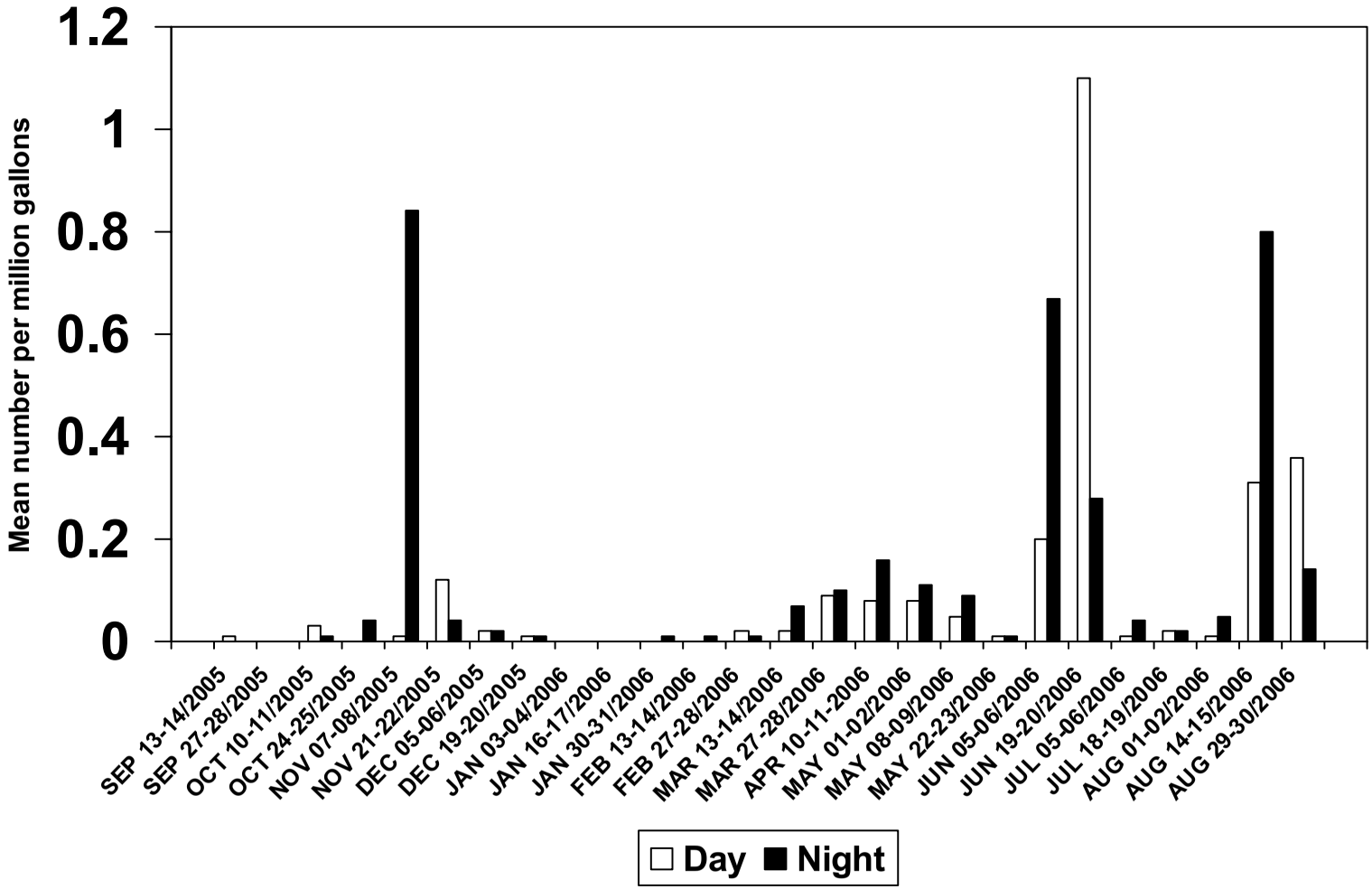

Figure 5. **Mean density (number per million gallons of cooling water) of shellfish impinged by photoperiod per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

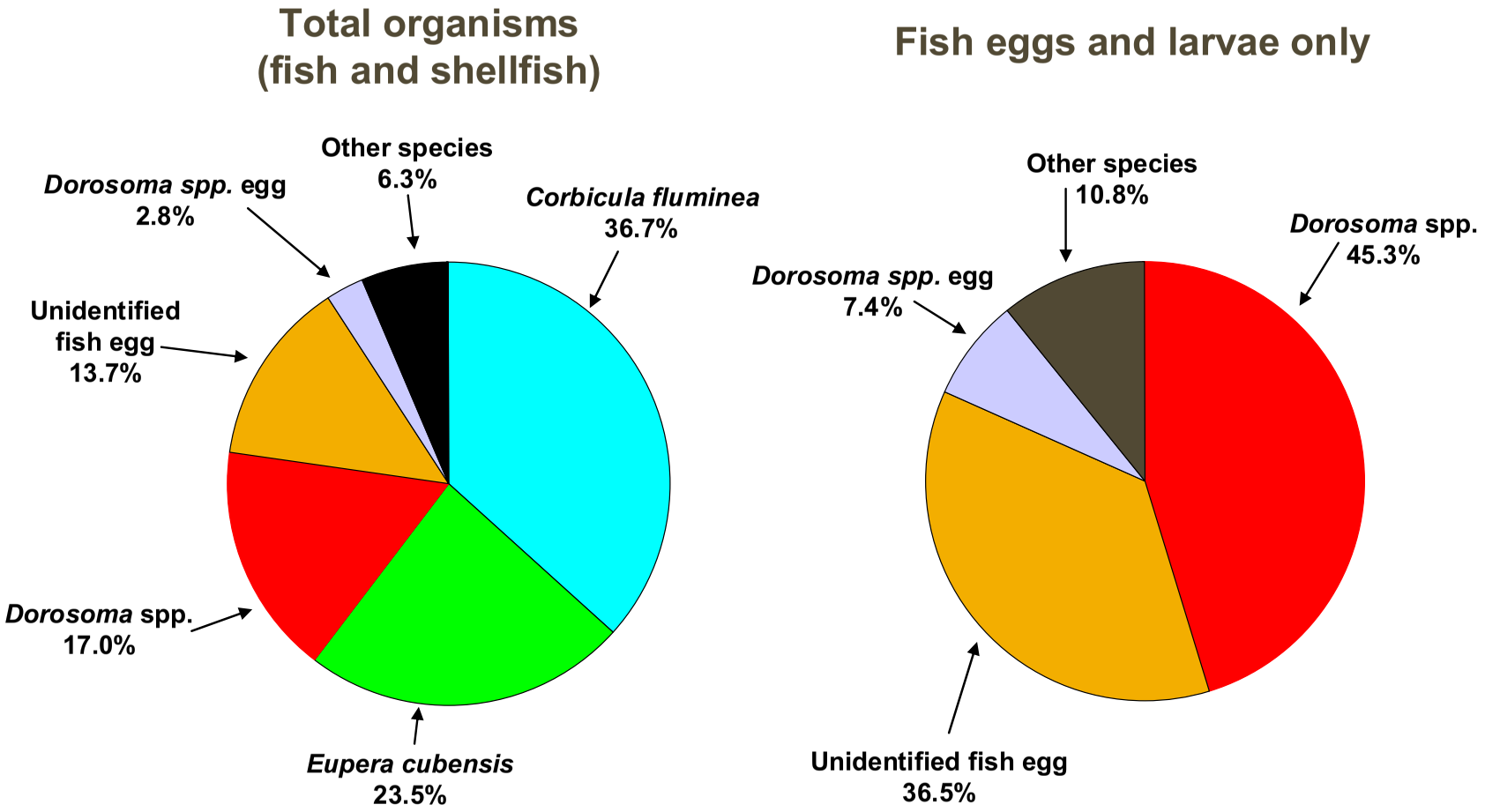

Figure 6. **Percent total number of organisms collected with entrainment sampling at the Cape Fear Plant, September 2005-August 2006**

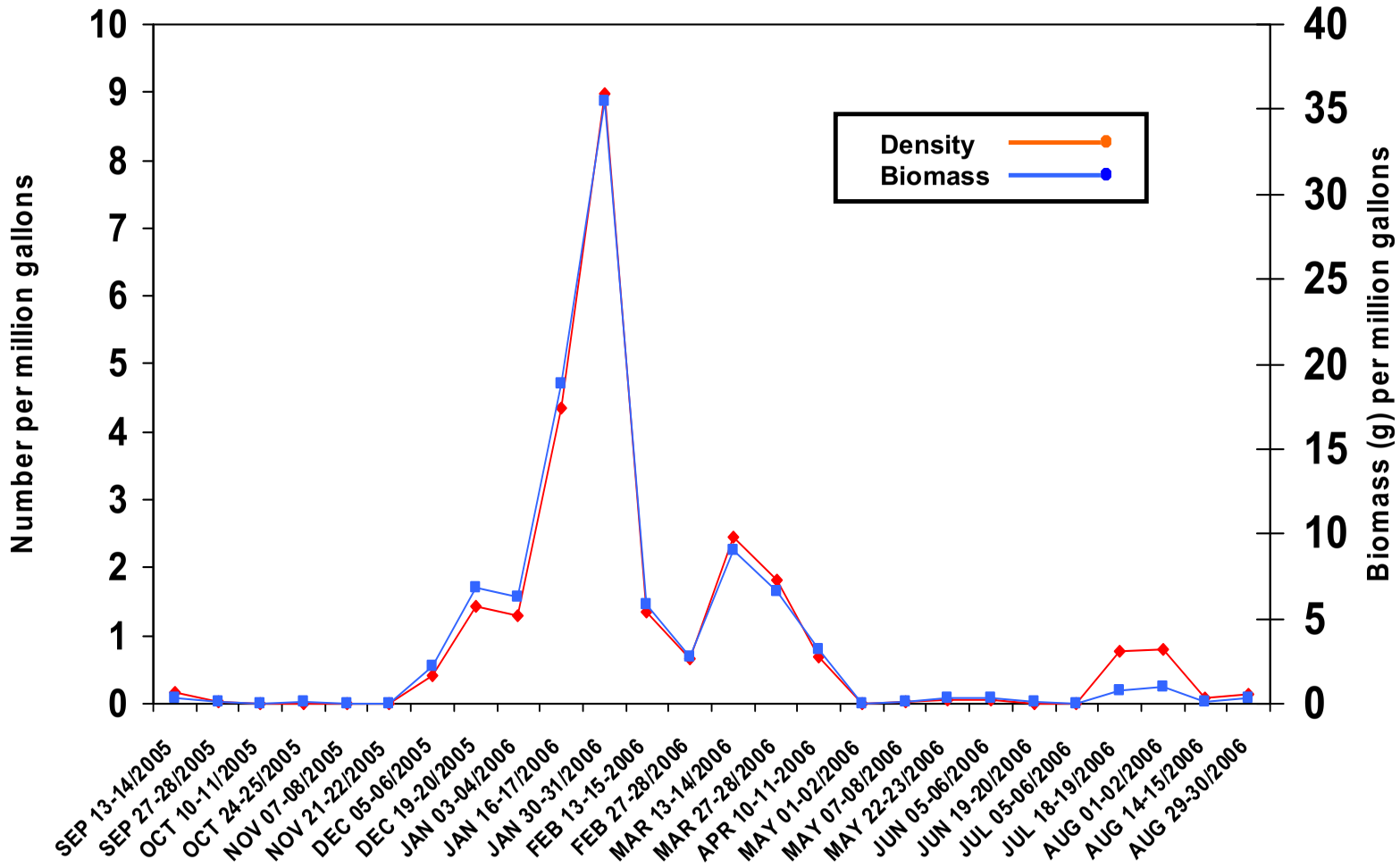

Figure 7. **Mean density (number per million gallons of cooling water) and biomass of threadfin shad impinged per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

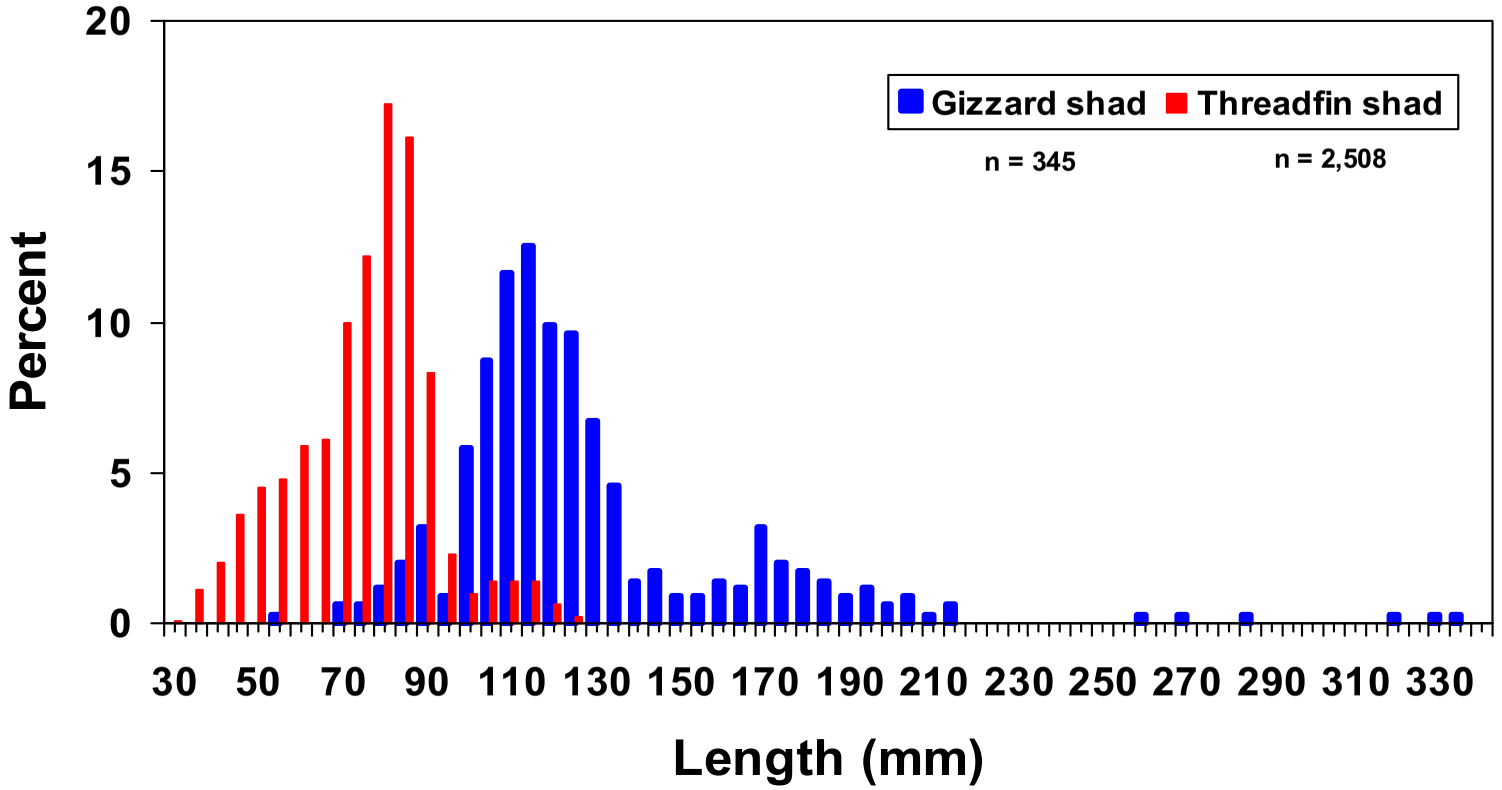

Figure 8. Length-frequency distributions of threadfin and gizzard shad collected during impingement sampling at the Cape Fear Plant, September 2005- August 2006

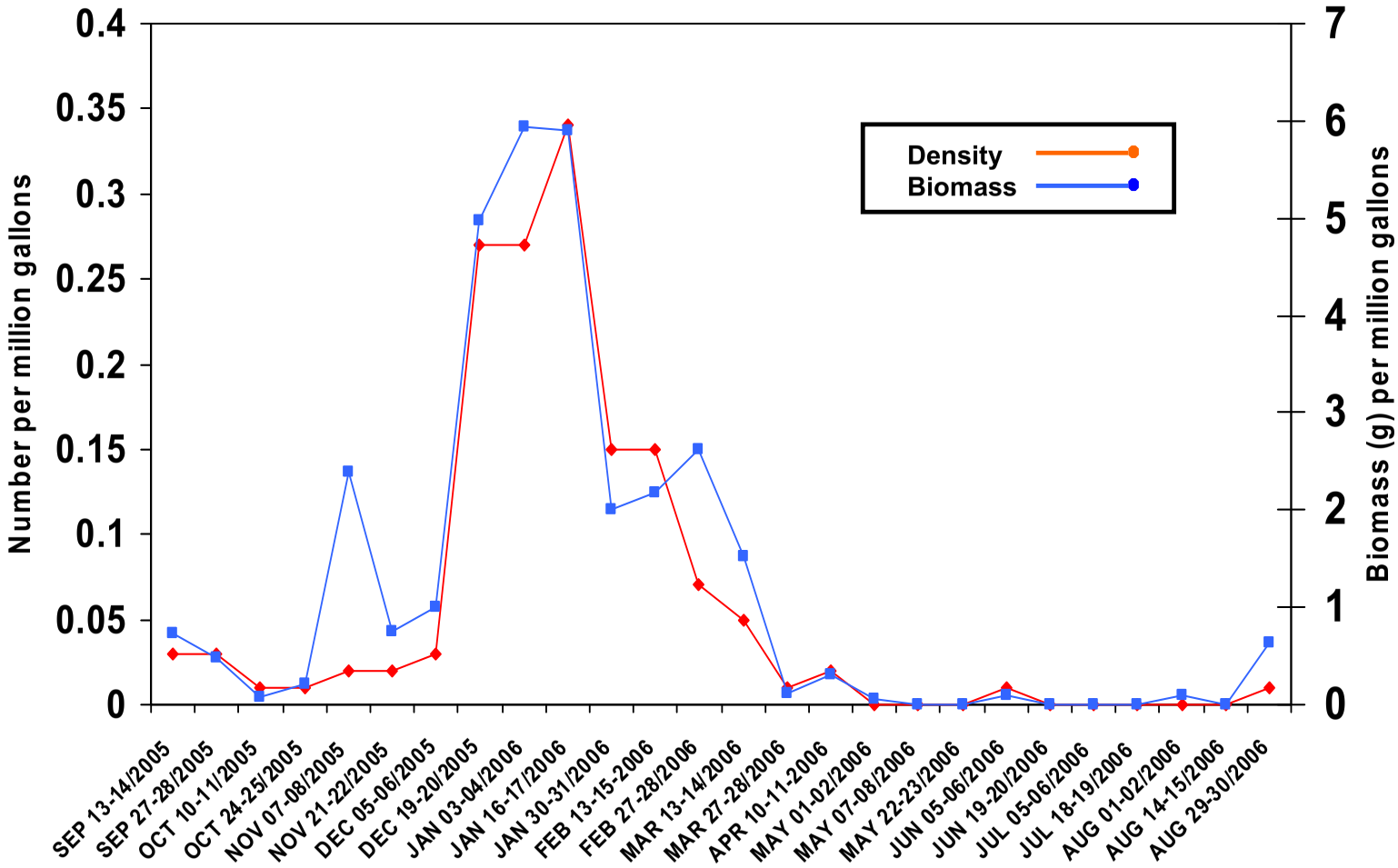

Figure 9. **Mean density (number per million gallons of cooling water) and biomass of gizzard shad impinged per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

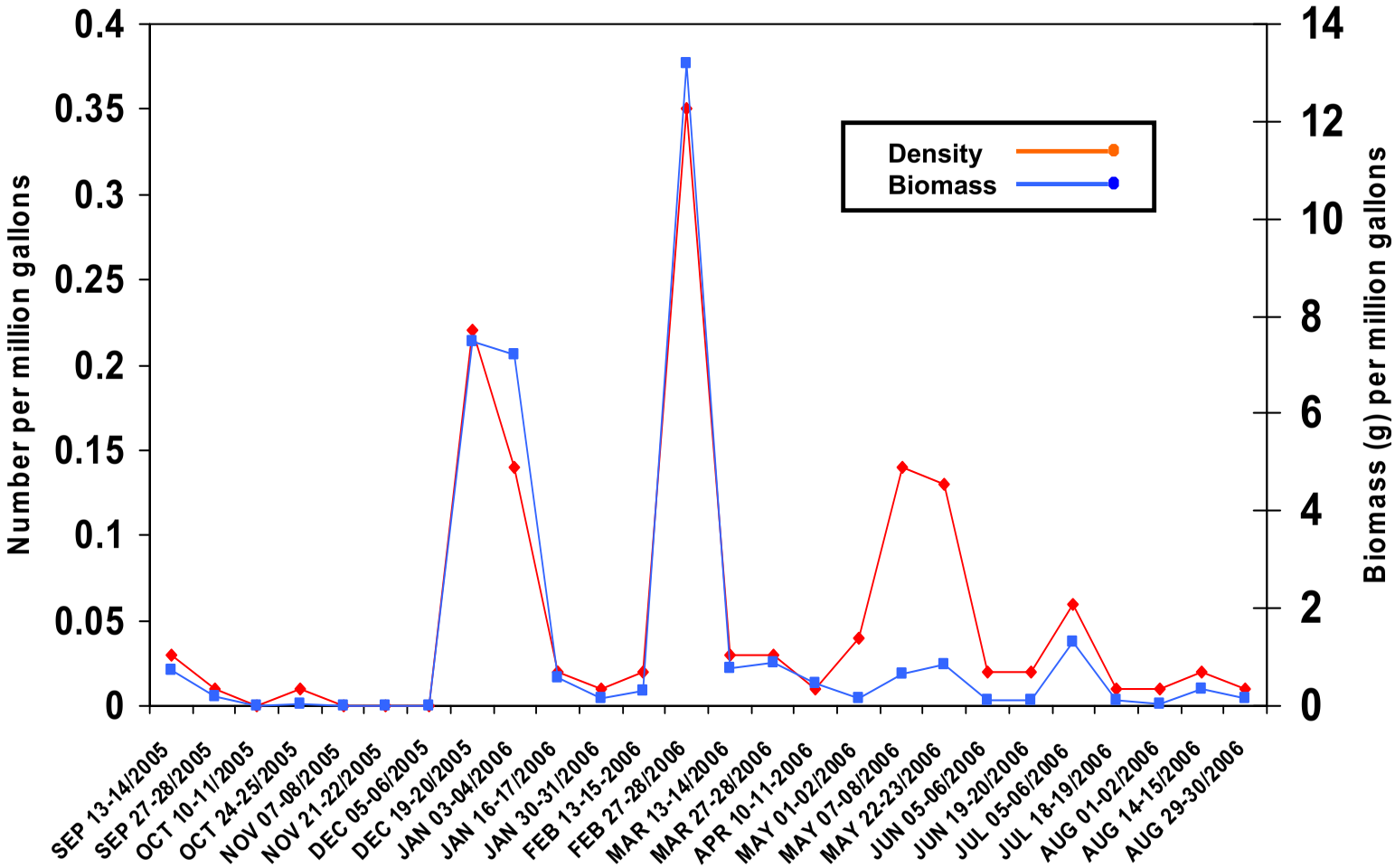

Figure 10. **Mean density (number per million gallons of cooling water) and biomass of bluegill impinged per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

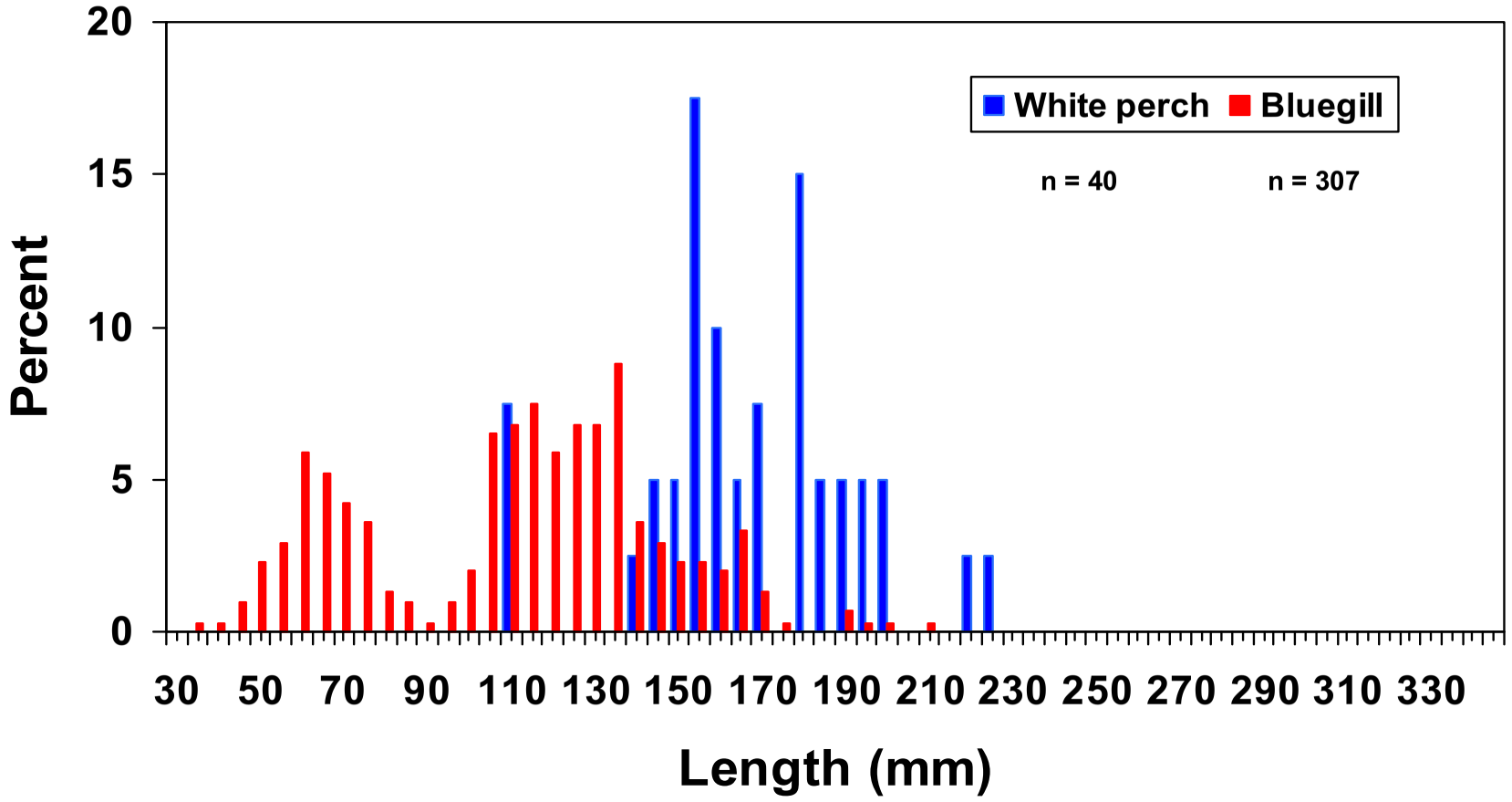

Figure 11. Length-frequency distributions of bluegill and white perch collected during impingement sampling at the Cape Fear Plant, September 2005- August 2006

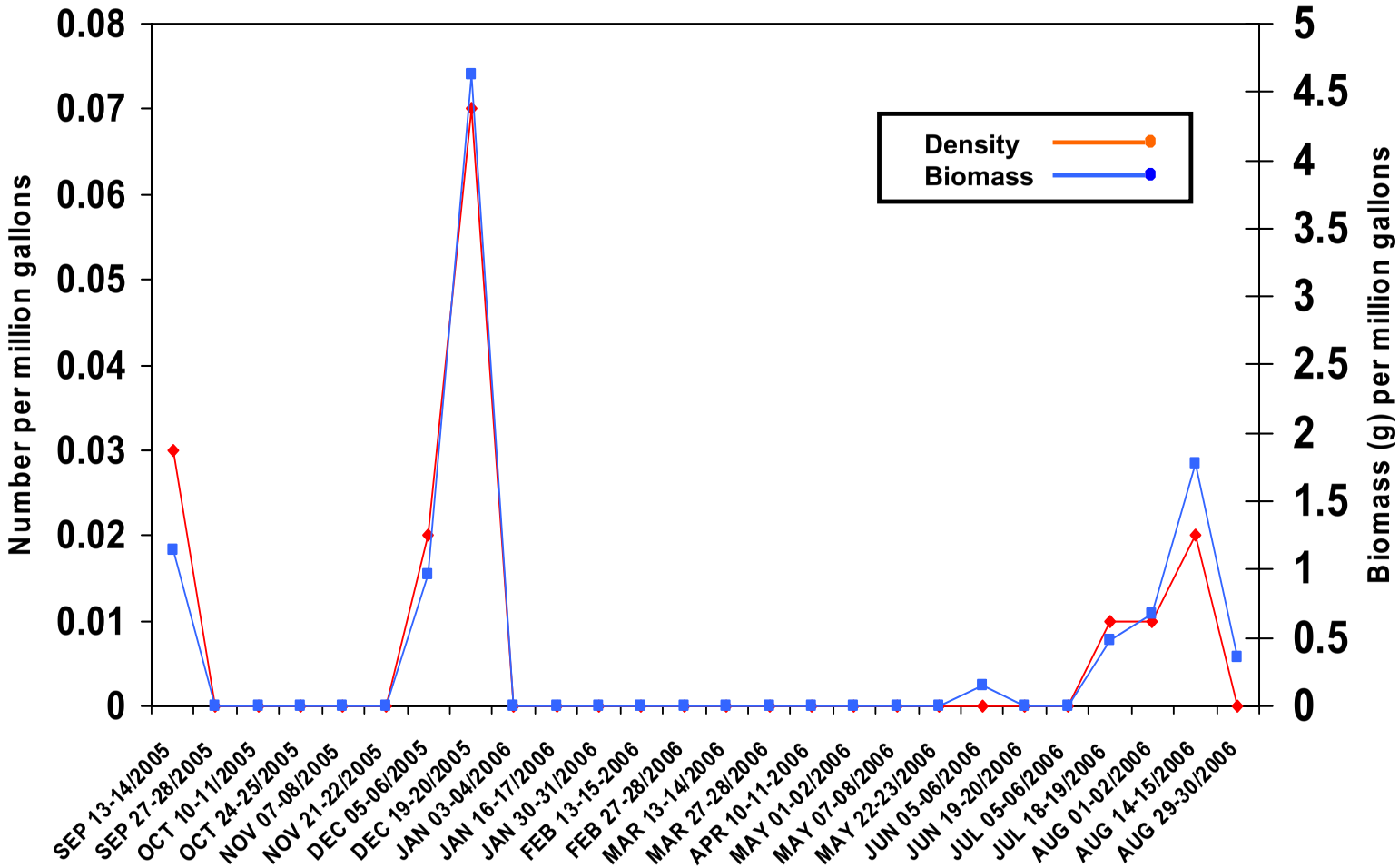

Figure 12. **Mean density (number per million gallons of cooling water) and biomass of white perch impinged per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

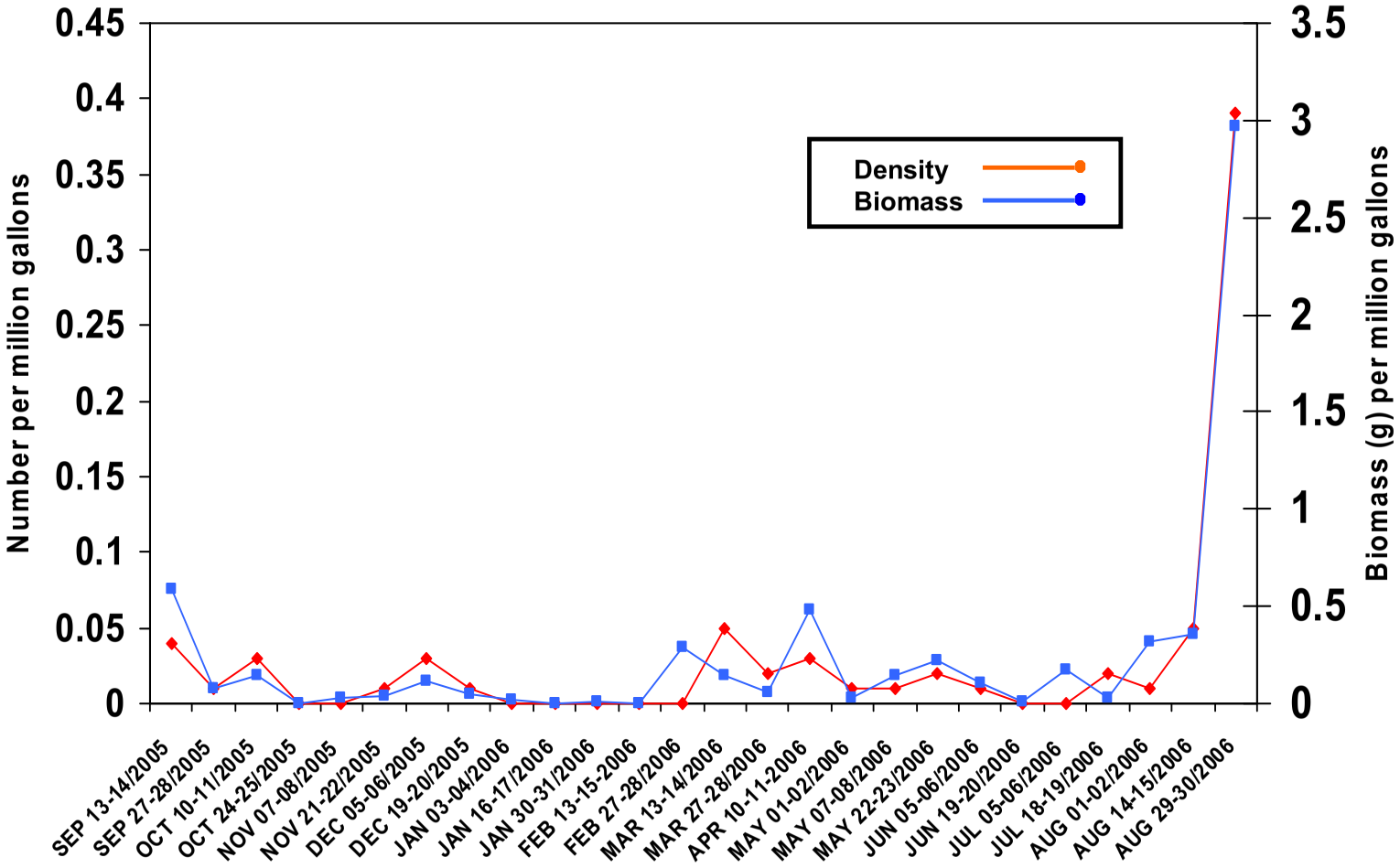

Figure 13. **Mean density (number per million gallons of cooling water) and biomass of channel catfish impinged per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

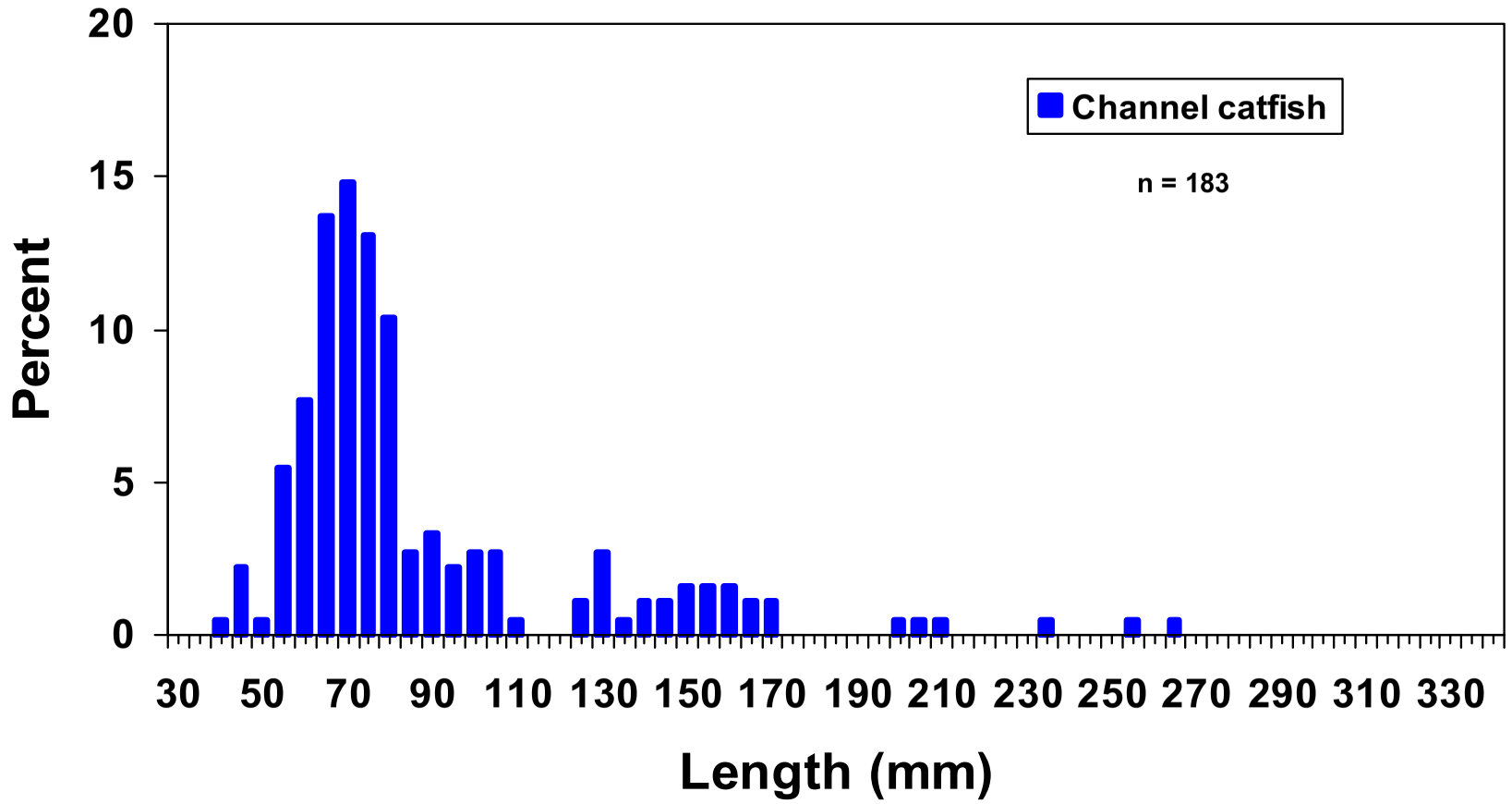

Figure 14. Length-frequency distributions of channel catfish collected during impingement sampling at the Cape Fear Plant, September 2005- August 2006

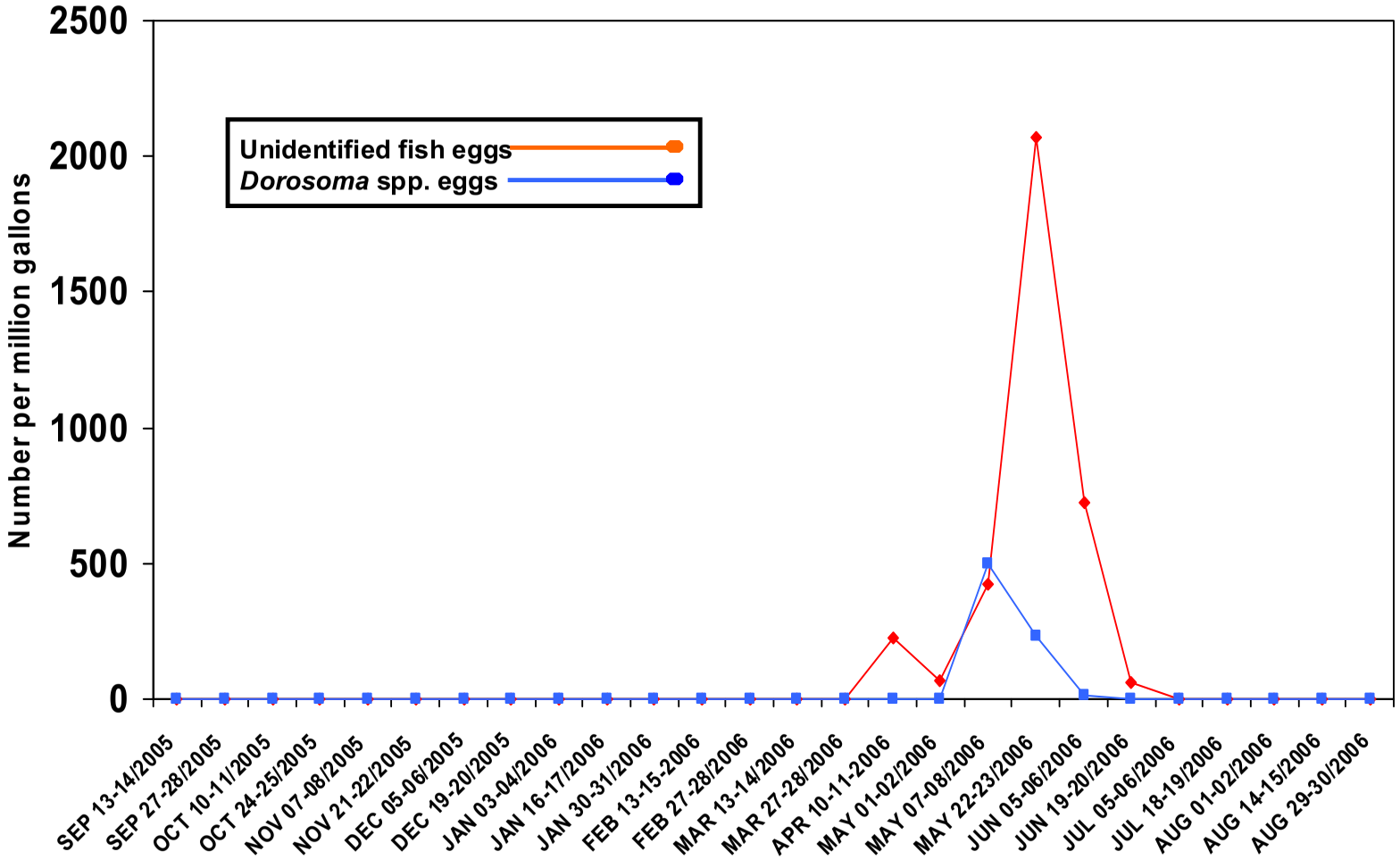

Figure 15. **Mean density (number per million gallons of cooling water) of unidentified fish and *Dorosoma* spp. eggs entrained per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

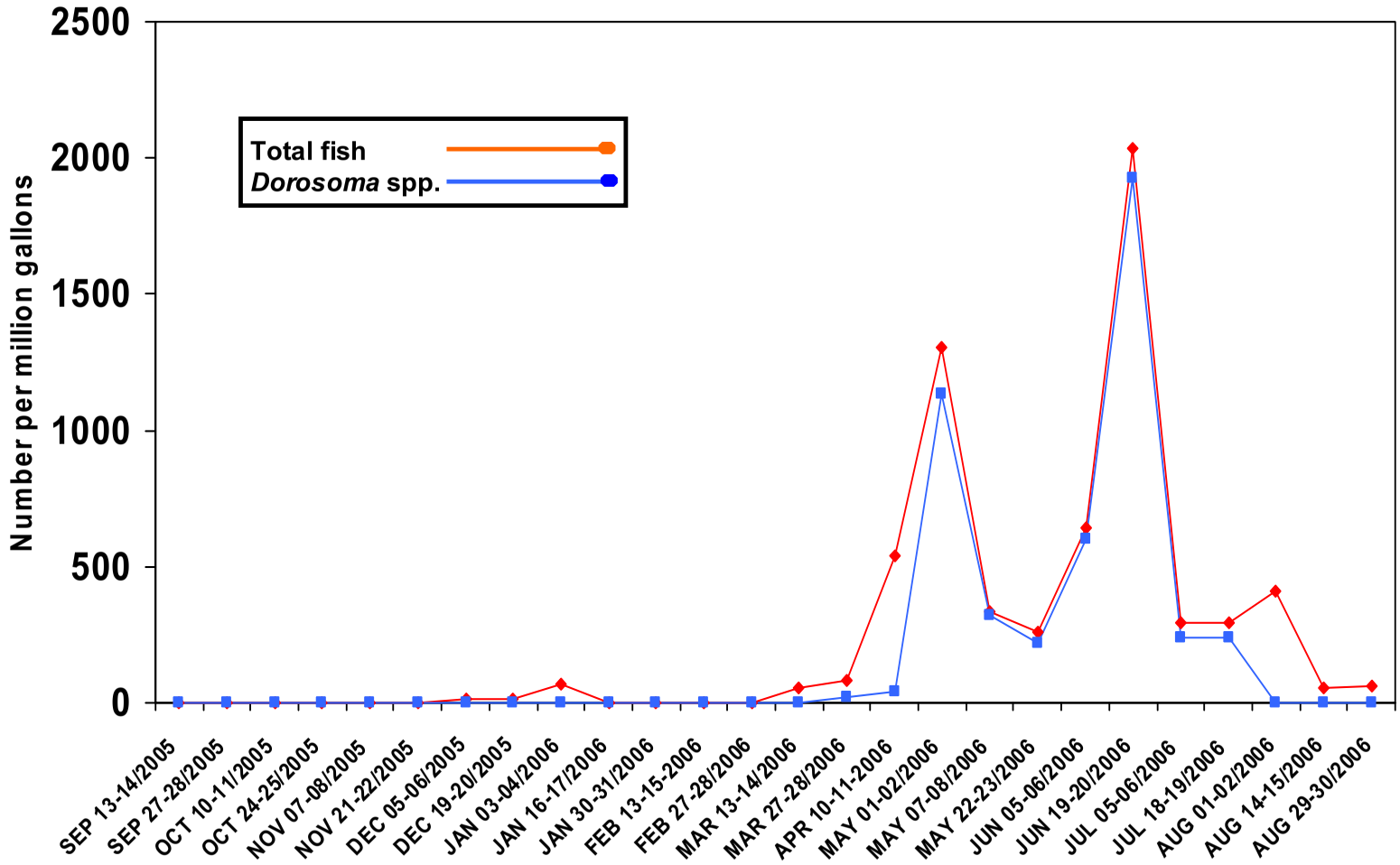

Figure 16. **Mean density (number per million gallons of cooling water) of total fish and *Dorosoma* spp. larvae entrained per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006.**

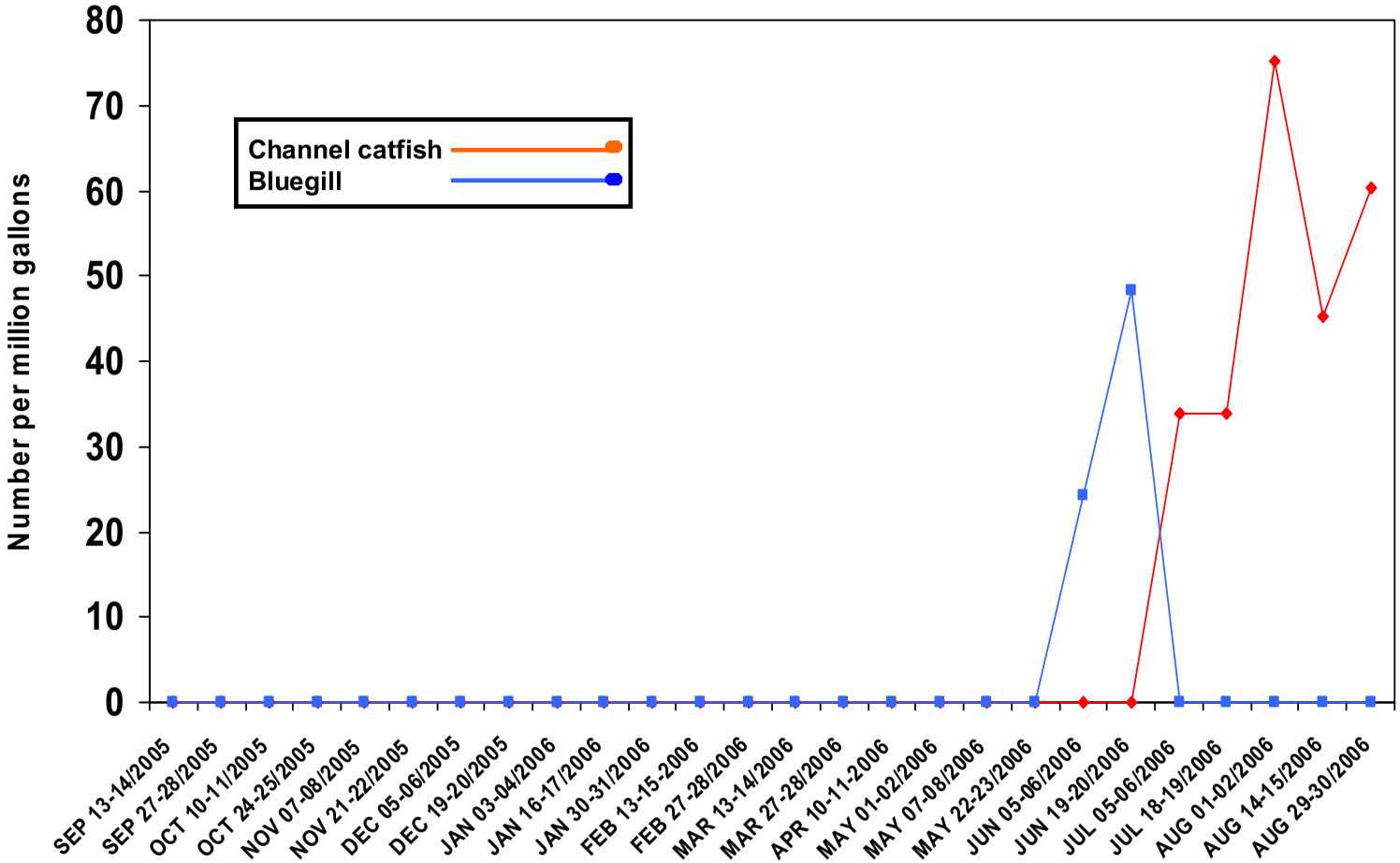

Figure 17. **Mean density (number per million gallons of cooling water) of channel catfish and bluegill larvae entrained per 24-hour sampling trip at the Cape Fear Plant, September 2005-August 2006**

Appendix 1. Monthly volume of cooling water (million gallons) pumped by the Cape Fear Plant, September 2005-August 2006.

Month	Volume
September 2005	7,674.0
October 2005	7,791.6
November 2005	6,159.8
December 2005	6,616.9
January 2006	6,024.6
February 2006	5,602.7
March 2006	6,342.2
April 2006	4,714.7
May 2006	7,459.4
June 2006	7,556.4
July 2006	7,871.0
August 2006	8,448.2
Total	82,261.5

Appendix 2. Water quality parameters measured at the Cape Fear Plant, September 2005–August 2006.

Date	Time[+]	Temperature (EC)	Conductivity (ΦS/cm)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)
09/13/2005	0920	26.1	210	6.2	7.7	32.0
09/13/2005	1502	26.3	205	6.6	7.6	15.0
09/13/2005	1930	26.1	212	6.4	7.6	16.0
09/14/2005	0253	26.2	208	6.5	7.8	13.0
09/14/2005	0700	26.1	206	6.4	7.8	14.0
09/27/2005	0947	26.0	212	6.2	7.7	7.2
09/27/2005	1347	26.1	213	6.3	7.5	6.4
09/27/2005	1600	26.6	215	6.8	7.6	5.4
09/27/2005	1931	26.5	218	6.8	7.6	5.5
09/27/2005	2108	26.1	217	6.7	7.5	5.8
09/28/2005	0335	26.1	218	6.3	7.6	5.4
09/28/2005	0720	26.1	217	6.4	7.7	6.3
09/28/2005	0947	26.1	214	6.6	7.6	6.0
10/10/2005	1012	23.3	242	6.5	7.9	27.0
10/10/2005	1500	23.0	202	6.7	7.6	44.0
10/10/2005	1846	22.7	190	6.8	7.6	53.0
10/10/2005	2102	22.6	191	6.8	7.5	50.0
10/11/2005	0244	22.5	196	6.9	7.6	37.0
10/11/2005	0721	22.4	196	6.9	7.4	30.0
10/24/2005	0928	20.1	329	7.0	7.9	17.0
10/24/2055	1524	20.1	326	7.1	7.8	17.0
10/24/2005	1912	20.0	304	7.2	7.7	14.0
10/24/2005	2130	19.7	315	7.0	8.0	16.0
10/25/2005	0308	19.3	320	6.8	7.9	15.0
10/25/2005	0740	19.1	313	6.9	8.2	14.0
11/07/2005	0929	15.9	274	9.5	7.7	9.1
11/07/2005	1357	17.0	270	9.3	7.8	8.4
11/07/2005	1459	16.0	272	9.7	7.8	9.1
11/07/2005	1715	17.2	267	9.3	8.1	8.5
11/07/2005	2100	16.0	270	9.3	7.7	8.7
11/08/2005	0255	15.8	271	8.9	7.9	8.7
11/08/2005	0700	15.6	273	8.8	7.9	8.6
11/21/2005	0901	13.5	275	9.6	8.3	11.0
11/21/2005	1507	13.6	272	9.4	7.9	11.0
11/21/2005	1710	13.6	272	9.4	8.0	11.0
11/21/2005	2100	13.6	271	9.5	7.9	11.0
11/22/2005	0252	13.4	273	9.4	7.9	11.0
11/22/2005	0655	13.4	271	9.2	7.7	10.0
12/05/2005	0907	10.3	199	10.6	7.8	28.0
12/05/2005	1343	10.6	197	10.3	7.4	26.0

Date	Time+	Temperature (EC)	Conductivity (ΦS/cm)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)
12/05/2005	1707	10.7	199	10.2	7.5	26.0
12/05/2005	2104	10.2	191	10.3	7.8	26.0
12/06/2005	0312	9.4	165	10.5	7.5	53.0
12/06/2005	0815	9.2	158	10.7	7.1	107.0
12/19/2005	0912	5.2	129	14.2	7.6	46.0
12/19/2005	1356	6.3	131	13.0	7.0	46.0
12/19/2005	1722	6.1	132	12.8	7.1	46.0
12/19/2005	2104	5.6	136	13.0	7.2	42.0
12/20/2005	0255	5.5	138	13.0	7.3	41.0
12/20/2005	0804	5.5	139	13.0	7.3	38.0
01/03/2006	0914	6.8	148	12.3	7.4	15.0
01/03/2006	1344	6.8	155	12.4	7.5	16.0
01/03/2006	1735	6.9	154	12.4	7.5	16.0
01/03/2006	2105	6.9	153	12.3	7.5	16.0
01/04/2006	0257	7.0	156	12.3	7.6	15.0
01/04/2006	0737	7.0	152	12.2	7.4	15.0
01/16/2006	0950	8.0	254	11.7	7.9	48.0
01/16/2006	1511	8.3	296	11.9	7.3	23.0
01/16/2006	1749	8.5	306	11.8	7.0	23.0
01/16/2006	2111	8.4	282	11.8	7.4	23.0
01/17/2006	0307	8.2	222	11.6	7.5	22.0
01/17/2006	0748	8.3	223	11.5	7.4	20.0
01/30/2006	0903	7.9	172	12.1	7.8	9.9
01/30/2006	1500	8.3	175	12.1	7.8	10.0
01/30/2006	1800	8.4	172	12.1	7.8	9.7
01/30/2006	2100	8.3	163	12.1	7.7	9.3
01/31/2006	0251	8.4	164	12.2	7.8	8.6
01/31/2006	0730	8.3	175	12.0	7.4	8.9
02/13/2006	0937	6.5	182	12.6	8.3	18.0
02/13/2006	1505	6.9	184	12.5	7.8	15.0
02/13/2006	1812	6.7	181	12.3	7.6	18.0
02/13/2006	2110	6.4	181	12.3	7.8	19.0
02/14/2006	0458	6.3	177	12.9	8.0	32.0
02/14/2006	0723	6.3	178	12.8	8.0	15.0
02/27/2006	0920	8.3	204	12.2	7.0	12.0
02/27/2006	1510	8.7	212	12.6	7.0	11.0
02/27/2006	1813	8.7	210	12.7	7.2	11.0
02/27/2006	2110	8.4	188	12.6	7.2	12.0
02/28/2006	0255	8.7	194	12.6	7.3	12.0
02/28/2006	0651	8.8	211	12.5	7.3	11.0
03/13/2006	0918	13.9	216	10.5	8.3	16.0
03/13/2006	1510	15.3	206	10.4	7.0	15.0
03/13/2006	1830	14.6	209	10.4	6.3	15.0
03/13/2006	2100	14.9	204	11.1	6.7	13.0

Date	Time+	Temperature (EC)	Conductivity (ΦS/cm)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)
03/14/2006	0242	14.4	208	10.9	7.0	14.0
03/14/2006	0620	14.6	204	11.4	7.3	14.0
03/27/2006	0910	11.0	219	11.8	9.0	25.0
03/27/2006	1459	11.3	225	11.9	7.8	30.0
03/27/2006	1834	12.1	223	11.9	7.6	18.0
03/27/2006	2100	12.0	219	12.0	7.7	16.0
03/28/2006	0252	11.2	213	11.8	7.8	16.0
03/28/2006	0559	11.0	214	11.9	7.9	34.0
04/10/2006	1010	14.4	228	9.8	7.2	18.0
04/10/2006	1602	15.1	227	10.3	6.9	17.0
04/10/2006	1950	15.3	229	10.1	6.7	16.0
04/10/2006	2105	15.3	224	9.9	7.1	16.0
04/11/2006	0404	15.0	219	9.5	7.1	16.0
04/11/2006	0655	14.8	220	9.2	7.4	16.0
04/24/2006	1010	19.9	173	8.5	8.6	81.0
04/24/2006	1602	20.2	184	8.3	7.6	54.0
04/24/2006	2000	20.2	203	8.4	6.7	43.0
04/24/2006	2205	20.1	201	8.2	7.3	32.0
05/01/2006	1002	17.1	167	9.2	8.2	16.0
05/01/2006	1600	17.4	150	9.3	8.1	16.0
05/01/2006	1954	17.7	145	9.3	7.7	17.0
05/01/2006	2201	17.7	153	9.2	7.8	16.0
05/02/2006	0352	17.7	183	9.0	7.7	12.0
05/02/2006	0628	17.7	187	9.0	7.8	11.0
05/08/2006	1017	17.7	208	7.8	7.1	23.0
05/08/2006	1556	17.8	189	7.9	7.2	25.0
05/08/2006	2000	17.5	188	7.9	7.1	28.0
05/08/2006	2151	17.5	185	8.1	7.2	28.0
05/09/2006	0346	17.6	179	8.1	7.2	27.0
05/09/2006	0620	17.7	179	8.2	7.2	33.0
05/22/2006	1005	19.9	221	7.9	7.1	17.0
05/22/2006	1559	19.3	221	7.5	7.2	14.0
05/22/2006	2030	19.6	221	7.6	7.2	14.0
05/22/2006	2200	19.6	219	7.6	7.2	13.0
05/23/2006	0350	19.5	219	7.7	7.2	14.0
05/23/2006	0600	19.2	219	7.8	7.2	14.0
06/05/2006	1007	21.7	208	7.2	7.1	5.0
06/05/2006	1558	21.3	208	7.3	7.0	5.0
06/05/2006	2028	20.9	203	7.2	7.1	4.0
06/05/2006	2157	21.0	208	7.4	7.1	4.0
06/06/2006	0358	21.1	208	6.9	7.1	5.0
06/06/2006	0558	20.9	208	6.9	7.1	5.0
06/19/2006	1008	23.3	225	8.1	7.1	62.0
06/19/2006	1556	23.9	222	8.2	7.2	66.0

Date	Time[+]	Temperature (EC)	Conductivity (ΦS/cm)	Dissolved oxygen (mg/L)	pH (units)	Turbidity (NTU)
06/19/2006	2026	23.6	226	8.0	7.2	24.0
06/19/2006	2159	23.4	217	7.9	7.2	32.0
06/20/2006	0356	23.5	213	7.9	7.4	26.0
06/20/2006	0600	23.6	214	7.8	7.5	29.0
07/05/2006	1005	24.8	160	6.8	7.2	12.0
07/05/2006	1548	25.9	163	6.8	7.1	12.0
07/05/2006	2035	25.5	163	6.6	7.3	11.0
07/05/2006	2200	25.2	164	6.5	7.2	11.0
07/06/2006	0400	24.9	165	6.5	7.2	9.6
07/06/2006	0607	24.9	167	6.5	7.2	11.0
07/18/2006	1013	25.8	170	5.6	6.8	20.0
07/18/2006	1550	25.8	171	6.4	6.8	20.0
07/18/2006	2040	26.1	171	5.8	6.7	21.0
07/18/2006	2208	26.2	169	5.9	6.8	24.0
07/19/2006	0400	26.3	166	5.5	7.0	19.0
07/19/2006	0600	26.2	165	5.5	7.0	19.0
08/01/2006	1015	26.6	162	6.2	7.1	7.8
08/01/2006	1600	27.4	161	6.2	7.0	7.2
08/01/2006	2035	27.9	161	6.0	6.9	8.3
08/01/2006	2205	28.0	161	5.8	7.0	5.7
08/02/2006	0404	27.6	159	5.6	7.0	5.6
08/02/2006	0621	27.3	158	5.6	7.0	5.8
08/14/2006	1016	25.7	230	4.5	7.0	8.2
08/14/2006	1559	27.0	185	5.5	7.1	7.1
08/14/2006	2006	27.0	176	6.1	7.0	6.6
08/14/2006	2155	26.8	175	5.6	7.0	6.2
08/15/2006	0400	26.3	176	4.8	7.0	6.4
08/15/2006	0633	26.2	178	4.2	6.9	6.8
08/29/2006	1012	28.4	181	6.1	7.4	5.1
08/29/2006	1640	29.4	181	7.8	7.6	4.8
08/29/2006	2005	29.1	182	7.0	7.5	4.2
08/29/2006	2156	29.0	181	6.9	7.4	3.9
08/30/2006	0438	28.7	181	6.1	7.3	4.0
08/30/2006	0646	28.7	181	6.2	7.3	4.0
09/11/2006	1003	26.6	190	6.3	7.3	7.5
09/11/2006	1613	26.9	194	6.5	7.4	7.0
09/11/2006	1929	26.6	191	6.2	7.5	8.3
09/11/2006	2042	26.5	183	6.0	7.3	8.9
09/11/2006	2202	26.4	179	6.0	7.4	9.2
09/12/2006	0358	26.4	184	6.3	7.4	7.5
09/12/2006	0655	26.2	183	6.3	7.4	7.9

[+]Time on a twenty-four hour clock.

Appendix 3. Total number, total weight, density, and biomass of all organisms collected per sample with impingement sampling at the Cape Fear Plant, September 2005–August 2006.

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
SEP 13-14/2005	1	13	66	2.73	29.13	D	0.45	2.27
	2	19	101	5.58	59.51	D	0.32	1.70
	3	5	83	4.13	44.05	D	0.11	1.88
	4	8	113	1.82	19.36	N	0.41	5.84
	5	10	187	5.88	62.70	N	0.16	2.98
	6	10	133	3.87	41.21	N	0.24	3.23
SEP 27-28/2005	12	2	10	2.85	30.38	D	0.07	0.33
	13	1	5	2.70	28.78	D	0.03	0.17
	14	1	6	3.73	39.79	D	0.03	0.15
	15	4	43	2.18	23.27	N	0.17	1.85
	16	1	45	6.02	64.13	N	0.02	0.70
	17	3	31	3.83	40.86	N	0.07	0.76
	18	2	25	2.25	23.98	D	0.08	1.04
OCT 10-11/2005	23	4	12	1.77	18.83	D	0.21	0.64
	24	7	27	6.00	63.95	D	0.11	0.42
	25	4	31	3.68	39.26	D	0.10	0.79
	26	0	0	2.65	28.24	N	0.00	0.00
	27	4	17	5.57	59.33	N	0.07	0.29
	28	6	38	4.37	46.54	N	0.13	0.82
OCT 24-25/2005	37	0	0	2.05	21.85	D	0.00	0.00
	38	1	13	6.00	63.95	D	0.02	0.20
	39	0	0	2.92	31.09	D	0.00	0.00
	40	2	15	3.32	35.35	N	0.06	0.42
	41	7	153	5.45	58.09	N	0.12	2.63
	42	2	4	4.23	45.12	N	0.04	0.09
NOV 07-08/2005	47	0	0	3.05	32.51	D	0.00	0.00
	48	3	303	4.22	44.94	D	0.07	6.74
	49	0	0	3.42	36.41	D	0.00	0.00
	50	0	0	3.90	41.57	N	0.00	0.00
	51	131	882	5.83	62.17	N	2.11	14.19
	52	19	106	3.10	33.04	N	0.58	3.21
NOV 21-22/2005	57	0	0	2.05	11.80	D	0.00	0.00
	58	13	28	6.12	35.22	D	0.37	0.80
	59	0	0	1.97	11.32	D	0.00	0.00
	60	3	48	3.90	22.46	N	0.13	2.14
	61	1	60	5.87	33.78	N	0.03	1.78
	62	4	31	4.05	23.32	N	0.17	1.33
DEC 05-06/2005	67	10	90	1.47	15.63	D	0.64	5.76
	68	17	201	4.93	52.58	D	0.32	3.82
	69	23	476	3.42	36.41	D	0.63	13.07
	70	33	594	4.22	44.94	N	0.73	13.22
	71	32	428	5.35	57.02	N	0.56	7.51
	72	68	1203	4.02	42.81	N	1.59	28.10
DEC 19-20/2005	77	54	369	1.98	21.14	D	2.55	17.46

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
	78	35	435	4.43	47.25	D	0.74	9.21
	79	42	1197	3.37	35.88	D	1.17	33.36
	80	181	2334	4.10	43.70	N	4.14	53.41
	81	90	1128	4.80	51.16	N	1.76	22.05
	82	77	700	5.32	56.67	N	1.36	12.35
JAN 03-04/2006	87	38	380	4.65	49.56	D	0.77	7.67
	88	28	226	3.78	40.32	D	0.69	5.61
	89	179	1414	3.93	41.92	N	4.27	33.73
	90	103	666	5.92	63.06	N	1.63	10.56
	91	50	297	4.27	45.47	N	1.10	6.53
	92	17	201	1.45	15.45	D	1.10	13.01
JAN 16-17/2006	97	185	960	2.25	23.98	D	7.71	40.03
	98	198	1296	4.83	51.51	D	3.84	25.16
	99	75	484	3.02	32.15	D	2.33	15.05
	100	319	1594	3.90	41.57	N	7.67	38.34
	101	204	904	5.92	63.06	N	3.24	14.34
	102	152	751	4.13	44.05	N	3.45	17.05
JAN 30-31/2006	107	181	797	1.95	20.78	D	8.71	38.35
	108	211	877	5.85	62.35	D	3.38	14.07
	109	161	717	2.40	25.58	D	6.29	28.03
	110	1212	4820	3.73	39.79	N	30.46	121.14
	111	224	1184	5.83	62.17	N	3.60	19.04
	112	114	486	4.23	45.12	N	2.53	10.77
FEB 13-14/2006	117	69	553	2.53	27.00	D	2.56	20.48
	118	30	417	4.85	51.69	D	0.58	8.07
	119	55	564	3.50	37.30	D	1.47	15.12
	120	173	2092	3.32	35.35	N	4.89	59.18
	121	79	1912	7.18	76.56	N	1.03	24.97
	122	16	170	2.65	28.24	N	0.57	6.02
FEB 27-28/2006	127	23	169	2.75	29.31	D	0.78	5.77
	128	25	218	5.70	60.75	D	0.41	3.59
	129	25	174	2.95	31.44	D	0.80	5.53
	130	37	573	3.17	33.75	N	1.10	16.98
	131	40	286	5.63	60.04	N	0.67	4.76
	132	38	168	3.83	40.86	N	0.93	4.11
MAR 13-14/2006	137	42	155	3.07	25.17	D	1.67	6.16
	138	40	168	5.85	62.35	D	0.64	2.69
	139	66	441	3.03	32.33	D	2.04	13.64
	140	100	399	2.67	28.42	N	3.52	14.04
	141	157	708	6.00	63.95	N	2.46	11.07
	142	208	862	3.30	35.17	N	5.91	24.51
MAR 27-28/2006	147	76	349	2.92	31.09	D	2.44	11.23
	148	46	83	5.78	61.64	D	0.75	1.35
	149	30	126	3.70	39.43	D	0.76	3.20
	150	74	286	2.33	24.87	N	2.98	11.50
	151	181	676	5.88	62.70	N	2.89	10.78
	152	72	265	3.37	35.88	N	2.01	7.39
APR 10-11-2006	157	23	79	3.53	37.66	D	0.61	2.10
	158	33	146	5.78	61.64	D	0.54	2.37

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
	159	8	16	3.58	38.19	D	0.21	0.42
	160	34	366	1.45	15.45	N	2.20	23.68
	161	45	365	7.08	75.49	N	0.60	4.83
	162	39	182	2.63	28.07	N	1.39	6.48
MAY 01-02/2006	175	14	173	3.88	41.39	D	0.34	4.18
	176	5	13	5.78	61.64	D	0.08	0.21
	177	13	41	3.92	41.74	D	0.31	0.98
	178	16	76	2.12	22.56	N	0.71	3.37
	179	17	70	5.98	63.77	N	0.27	1.10
	180	4	9	2.40	25.58	N	0.16	0.35
MAY 08-09/2006	185	7	22	4.25	45.30	D	0.15	0.49
	186	8	49	5.53	58.97	D	0.14	0.83
	187	7	64	4.05	43.16	D	0.16	1.48
	188	16	114	1.97	20.96	N	0.76	5.44
	189	3	18	5.87	62.53	N	0.05	0.29
	190	8	36	2.37	25.22	N	0.32	1.43
MAY 22-23/2006	195	3	48	4.18	44.59	D	0.07	1.08
	196	2	35	5.80	61.82	D	0.03	0.57
	197	2	15	4.40	46.90	D	0.04	0.32
	198	5	28	1.63	17.41	N	0.29	1.61
	199	14	69	5.88	62.70	N	0.22	1.10
	200	4	24	1.98	21.14	N	0.19	1.14
JUN 05-06/2006	205	21	86	4.47	47.61	D	0.44	1.81
	206	11	29	5.67	60.40	D	0.18	0.48
	207	8	49	4.33	46.18	D	0.17	1.06
	208	12	45	1.62	17.23	N	0.70	2.61
	209	15	166	6.08	64.84	N	0.23	2.56
	210	29	63	1.80	19.18	N	1.51	3.28
JUN 19-20/2006	215	14	27	4.43	47.25	D	0.30	0.57
	216	107	332	5.57	59.33	D	1.80	5.60
	217	61	192	3.98	42.45	D	1.44	4.52
	218	3	50	1.65	17.59	N	0.17	2.84
	219	60	332	6.47	68.92	N	0.87	4.82
	220	3	51	1.90	20.25	N	0.15	2.52
JUL 05-06/2006	225	3	164	4.15	44.23	D	0.07	3.71
	226	3	8	5.53	58.97	D	0.05	0.14
	227	4	20	4.78	50.98	D	0.08	0.39
	228	1	27	1.42	15.10	N	0.07	1.79
	229	6	27	6.00	63.95	N	0.09	0.42
	230	0	0	2.12	22.56	N	0.00	0.00
JUL 18-19/2006	235	39	144	4.05	43.16	D	0.90	3.34
	236	8	61	5.70	60.75	D	0.13	1.00
	237	18	150	4.50	47.96	D	0.38	3.13
	238	11	14	1.77	18.83	N	0.58	0.74
	239	78	332	5.92	63.06	N	1.24	5.26
	240	35	27	1.82	19.36	N	1.81	1.39
AUG 01-02/2006	245	43	44	3.92	55.84	D	0.77	0.79
	246	19	23	5.75	81.98	D	0.23	0.28
	247	5	67	4.50	64.16	D	0.08	1.04

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
	248	26	140	1.63	23.29	N	1.12	6.01
	249	147	379	5.97	85.07	N	1.73	4.46
	250	42	106	2.17	30.89	N	1.36	3.43
AUG 14-15/2006	255	42	121	3.83	40.86	D	1.03	2.96
	256	11	25	5.50	58.62	D	0.19	0.43
	257	7	176	4.17	44.41	D	0.16	3.96
	258	26	214	2.05	21.85	N	1.19	9.79
	259	60	280	6.08	64.84	N	0.93	4.32
	260	21	77	2.28	24.34	N	0.86	3.16
AUG 29-30/2006	265	31	274	3.57	38.01	D	0.82	7.21
	266	17	689	5.45	58.09	D	0.29	11.86
	267	33	373	4.25	45.30	D	0.73	8.23
	268	28	181	2.10	22.38	N	1.25	8.09
	269	55	275	5.48	58.44	N	0.94	4.71
	270	32	93	3.12	33.22	N	0.96	2.80

Appendix 4. Total number, total weight, density, and biomass of threadfin shad collected per sample with impingement sampling at the Cape Fear Plant, September 2005–August 2006.

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
SEP 13-14/2005	1	11	20	2.73	29.13	D	0.38	0.69
	2	16	23	5.58	59.51	D	0.27	0.39
	3	4	13	4.13	44.05	D	0.09	0.30
	4	2	4	1.82	19.36	N	0.10	0.21
	5	4	11	5.88	62.70	N	0.06	0.18
	6	5	11	3.87	41.21	N	0.12	0.27
SEP 27-28/2005	12	1	5	2.85	30.38	D	0.03	0.16
	13	0	0	2.70	28.78	D	0.00	0.00
	14	1	6	3.73	39.79	D	0.03	0.15
	15	1	5	2.18	23.27	N	0.04	0.21
	16	0	0	6.02	64.13	N	0.02	0.05
	17	0	0	3.83	40.86	N	0.00	0.00
	18	1	3	2.25	23.98	D	0.04	0.13
OCT 10-11/2005	23	0	0	1.77	18.83	D	0.00	0.00
	24	2	13	6.00	63.95	D	0.03	0.20
	25	0	0	3.68	39.26	D	0.00	0.00
	26	0	0	2.65	28.24	N	0.00	0.00
	27	0	0	5.57	59.33	N	0.00	0.00
	28	0	0	4.37	46.54	N	0.00	0.00
OCT 24-25/2005	37	0	0	2.05	21.85	D	0.00	0.00
	38	0	0	6.00	63.95	D	0.00	0.00
	39	0	0	2.92	31.09	D	0.00	0.00
	40	2	15	3.32	35.35	N	0.06	0.42
	41	1	7	5.45	58.09	N	0.02	0.12
	42	0	0	4.23	45.12	N	0.00	0.00
NOV 07-08/2005	47	0	0	3.05	32.51	D	0.00	0.00
	48	0	0	4.22	44.94	D	0.00	0.00
	49	0	0	3.42	36.41	D	0.00	0.00
	50	0	0	3.90	41.57	N	0.00	0.00
	51	0	0	5.83	62.17	N	0.00	0.00
	52	0	0	3.10	33.04	N	0.00	0.00
NOV 21-22/2005	57	0	0	2.05	11.80	D	0.00	0.00
	58	0	0	6.12	35.22	D	0.00	0.00
	59	0	0	1.97	11.32	D	0.00	0.00
	60	0	0	3.90	22.46	N	0.00	0.00
	61	0	0	5.87	33.78	N	0.00	0.00
	62	0	0	4.05	23.32	N	0.00	0.00
DEC 05-06/2005	67	9	47	1.47	15.63	D	0.58	3.01
	68	9	50	4.93	52.58	D	0.17	0.95
	69	8	46	3.42	36.41	D	0.22	1.26
	70	15	71	4.22	44.94	N	0.33	1.58
	71	15	84	5.35	57.02	N	0.26	1.47
	72	39	199	4.02	42.81	N	0.91	4.65
DEC 19-20/2005	77	47	234	1.98	21.14	D	2.22	11.07

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
	78	20	123	4.43	47.25	D	0.42	2.60
	79	16	124	3.37	35.88	D	0.45	3.46
	80	137	592	4.10	43.70	N	3.14	13.55
	81	70	328	4.80	51.16	N	1.37	6.41
	82	57	237	5.32	56.67	N	1.01	4.18
JAN 03-04/2006	87	31	186	4.65	49.56	D	0.63	3.75
	88	20	119	3.78	40.32	D	0.50	2.95
	89	146	699	3.93	41.92	N	3.48	16.67
	90	92	444	5.92	63.06	N	1.46	7.04
	91	45	211	4.27	45.47	N	0.99	4.64
	92	11	45	1.45	15.45	D	0.71	2.91
JAN 16-17/2006	97	169	771	2.25	23.98	D	7.05	32.15
	98	171	741	4.83	51.51	D	3.32	14.39
	99	67	292	3.02	32.15	D	2.08	9.08
	100	303	1292	3.90	41.57	N	7.29	31.08
	101	195	796	5.92	63.06	N	3.09	12.62
	102	144	617	4.13	44.05	N	3.27	14.01
JAN 30-31/2006	107	173	632	1.95	20.78	D	8.33	30.41
	108	206	822	5.85	62.35	D	3.30	13.18
	109	158	651	2.40	25.58	D	6.18	25.45
	110	1196	4622	3.73	39.79	N	30.06	116.16
	111	220	1075	5.83	62.17	N	3.54	17.29
	112	112	463	4.23	45.12	N	2.48	10.26
FEB 13-14/2006	117	50	222	2.53	27.00	D	1.85	8.22
	118	20	85	4.85	51.69	D	0.39	1.64
	119	39	168	3.50	37.30	D	1.05	4.50
	120	131	579	3.32	35.35	N	3.71	16.38
	121	46	215	7.18	76.56	N	0.60	2.81
	122	13	45	2.65	28.24	N	0.46	1.59
FEB 27-28/2006	127	18	74	2.75	29.31	D	0.61	2.52
	128	22	101	5.70	60.75	D	0.36	1.66
	129	22	99	2.95	31.44	D	0.70	3.15
	130	27	120	3.17	33.75	N	0.80	3.56
	131	35	144	5.63	60.04	N	0.58	2.40
	132	35	141	3.83	40.86	N	0.86	3.45
MAR 13-14/2006	137	39	118	3.07	25.17	D	1.55	4.69
	138	34	124	5.85	62.35	D	0.55	1.99
	139	48	166	3.03	32.33	D	1.48	5.13
	140	91	340	2.67	28.42	N	3.20	11.96
	141	145	538	6.00	63.95	N	2.27	8.41
	142	200	784	3.30	35.17	N	5.69	22.29
MAR 27-28/2006	147	70	273	2.92	31.09	D	2.25	8.78
	148	42	69	5.78	61.64	D	0.68	1.12
	149	25	103	3.70	39.43	D	0.63	2.61
	150	69	268	2.33	24.87	N	2.77	10.78
	151	172	627	5.88	62.70	N	2.74	10.00
	152	66	235	3.37	35.88	N	1.84	6.55
APR 10-11-2006	157	16	67	3.53	37.66	D	0.42	1.78
	158	26	108	5.78	61.64	D	0.42	1.75

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
	159	4	8	3.58	38.19	D	0.10	0.21
	160	26	136	1.45	15.45	N	1.68	8.80
	161	21	118	7.08	75.49	N	0.28	1.56
	162	32	144	2.63	28.07	N	1.14	5.13
MAY 01-02/2006	175	0	0	3.88	41.39	D	0.00	0.00
	176	0	0	5.78	61.64	D	0.00	0.00
	177	0	0	3.92	41.74	D	0.00	0.00
	178	0	0	2.12	22.56	N	0.00	0.00
	179	0	0	5.98	63.77	N	0.00	0.00
	180	0	0	2.40	25.58	N	0.00	0.00
MAY 08-09/2006	185	0	0	4.25	45.30	D	0.00	0.00
	186	0	0	5.53	58.97	D	0.00	0.00
	187	1	6	4.05	43.16	D	0.02	0.14
	188	0	0	1.97	20.96	N	0.05	0.29
	189	0	0	5.87	62.53	N	0.00	0.00
	190	1	6	2.37	25.22	N	0.04	0.24
MAY 22-23/2006	195	0	0	4.18	44.59	D	0.00	0.00
	196	0	0	5.80	61.82	D	0.00	0.00
	197	0	0	4.40	46.90	D	0.00	0.00
	198	2	14	1.63	17.41	N	0.11	0.80
	199	5	33	5.88	62.70	N	0.08	0.53
	200	2	10	1.98	21.14	N	0.09	0.47
JUN 05-06/2006	205	1	8	4.47	47.61	D	0.02	0.17
	206	0	0	5.67	60.40	D	0.00	0.00
	207	1	12	4.33	46.18	D	0.02	0.26
	208	2	18	1.62	17.23	N	0.12	1.04
	209	5	33	6.08	64.84	N	0.08	0.51
	210	1	4	1.80	19.18	N	0.05	0.21
JUN 19-20/2006	215	2	7	4.43	47.25	D	0.04	0.15
	216	0	0	5.57	59.33	D	0.00	0.00
	217	1	14	3.98	42.45	D	0.02	0.33
	218	0	0	1.65	17.59	N	0.00	0.00
	219	0	0	6.47	68.92	N	0.00	0.00
	220	0	0	1.90	20.25	N	0.00	0.00
JUL 05-06/2006	225	0	0	4.15	44.23	D	0.00	0.00
	226	2	1	5.53	58.97	D	0.03	0.02
	227	1	1	4.78	50.98	D	0.02	0.02
	228	0	0	1.42	15.10	N	0.00	0.00
	229	2	2	6.00	63.95	N	0.03	0.03
	230	0	0	2.12	22.56	N	0.00	0.00
JUL 18-19/2006	235	35	43	4.05	43.16	D	0.81	1.00
	236	6	4	5.70	60.75	D	0.10	0.07
	237	15	10	4.50	47.96	D	0.31	0.21
	238	10	8	1.77	18.83	N	0.53	0.42
	239	66	77	5.92	63.06	N	1.05	1.22
	240	35	27	1.82	19.36	N	1.81	1.39
AUG 01-02/2006	245	43	44	3.92	55.84	D	0.77	0.79
	246	17	17	5.75	81.98	D	0.21	0.21
	247	2	1	4.50	64.16	D	0.03	0.02

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
	248	21	30	1.63	23.29	N	0.90	1.29
	249	134	164	5.97	85.07	N	1.58	1.93
	250	40	53	2.17	30.89	N	1.29	1.72
AUG 14-15/2006	255	9	11	3.83	40.86	D	0.22	0.27
	256	1	2	5.50	58.62	D	0.02	0.03
	257	0	0	4.17	44.41	D	0.00	0.00
	258	0	0	2.05	21.85	N	0.00	0.00
	259	5	5	6.08	64.84	N	0.08	0.08
	260	2	1	2.28	24.34	N	0.08	0.04
AUG 29-30/2006	265	0	0	3.57	38.01	D	0.00	0.00
	266	0	0	5.45	58.09	D	0.00	0.00
	267	0	0	4.25	45.30	D	0.00	0.00
	268	2	3	2.10	22.38	N	0.09	0.13
	269	21	49	5.48	58.44	N	0.36	0.84
	270	15	35	3.12	33.22	N	0.45	1.05

Appendix 5. Total number, total weight, density and biomass of gizzard shad collected per sample with impingement sampling at the Cape Fear Plant, September 2005–August 2006.

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
SEP 13-14/2005	1	0	0	2.73	29.13	D	0.00	0.00
	2	0	0	5.58	59.51	D	0.00	0.00
	3	1	70	4.13	44.05	D	0.02	1.59
	4	1	31	1.82	19.36	N	0.05	1.60
	5	2	32	5.88	62.70	N	0.03	0.51
	6	2	31	3.87	41.21	N	0.05	0.75
SEP 27-28/2005	12	1	5	2.85	30.38	D	0.03	0.16
	13	1	5	2.70	28.78	D	0.03	0.17
	14	0	0	3.73	39.79	D	0.00	0.00
	15	2	33	2.18	23.27	N	0.09	1.42
	16	1	45	6.02	64.13	N	0.02	0.70
	17	0	0	3.83	40.86	N	0.00	0.00
	18	1	22	2.25	23.98	D	0.04	0.92
OCT 10-11/2005	23	0	0	1.77	18.83	D	0.00	0.00
	24	0	0	6.00	63.95	D	0.00	0.00
	25	0	0	3.68	39.26	D	0.00	0.00
	26	0	0	2.65	28.24	N	0.00	0.00
	27	2	6	5.57	59.33	N	0.03	0.10
	28	2	16	4.37	46.54	N	0.04	0.34
OCT 24-25/2005	37	0	0	2.05	21.85	D	0.00	0.00
	38	0	0	6.00	63.95	D	0.00	0.00
	39	0	0	2.92	31.09	D	0.00	0.00
	40	0	0	3.32	35.35	N	0.00	0.00
	41	2	72	5.45	58.09	N	0.03	1.24
	42	0	0	4.23	45.12	N	0.00	0.00
NOV 07-08/2005	47	0	0	3.05	32.51	D	0.00	0.00
	48	1	297	4.22	44.94	D	0.02	6.61
	49	0	0	3.42	36.41	D	0.00	0.00
	50	0	0	3.90	41.57	N	0.00	0.00
	51	2	362	5.83	62.17	N	0.03	5.82
	52	3	65	3.10	33.04	N	0.09	1.97
NOV 21-22/2005	57	0	0	2.05	11.80	D	0.00	0.00
	58	0	0	6.12	35.22	D	0.00	0.00
	59	0	0	1.97	11.32	D	0.00	0.00
	60	1	37	3.90	22.46	N	0.04	1.65
	61	1	60	5.87	33.78	N	0.03	1.78
	62	1	25	4.05	23.32	N	0.04	1.07
DEC 05-06/2005	67	0	0	1.47	15.63	D	0.00	0.00
	68	2	75	4.93	52.58	D	0.04	1.43
	69	2	56	3.42	36.41	D	0.05	1.54
	70	2	46	4.22	44.94	N	0.04	1.02
	71	1	51	5.35	57.02	N	0.02	0.89
	72	1	48	4.02	42.81	N	0.02	1.12

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
DEC 19-20/2005	77	7	135	1.98	21.14	D	0.33	6.39
	78	9	144	4.43	47.25	D	0.19	3.05
	79	10	148	3.37	35.88	D	0.28	4.12
	80	18	337	4.10	43.70	N	0.41	7.71
	81	9	240	4.80	51.16	N	0.18	4.69
	82	12	217	5.32	56.67	N	0.21	3.83
JAN 03-04/2006	87	7	194	4.65	49.56	D	0.14	3.91
	88	7	106	3.78	40.32	D	0.17	2.63
	89	29	636	3.93	41.92	N	0.69	15.17
	90	7	119	5.92	63.06	N	0.11	1.89
	91	5	86	4.27	45.47	N	0.11	1.89
	92	6	156	1.45	15.45	D	0.39	10.10
JAN 16-17/2006	97	16	189	2.25	23.98	D	0.67	7.88
	98	26	536	4.83	51.51	D	0.50	10.41
	99	8	192	3.02	32.15	D	0.25	5.97
	100	15	300	3.90	41.57	N	0.36	7.22
	101	8	101	5.92	63.06	N	0.13	1.60
	102	7	106	4.13	44.05	N	0.16	2.41
JAN 30-31/2006	107	7	70	1.95	20.78	D	0.34	3.37
	108	5	55	5.85	62.35	D	0.08	0.88
	109	1	56	2.40	25.58	D	0.04	2.19
	110	16	198	3.73	39.79	N	0.40	4.98
	111	1	10	5.83	62.17	N	0.02	0.16
	112	2	23	4.23	45.12	N	0.04	0.51
FEB 13-14/2006	117	16	242	2.53	27.00	D	0.59	8.96
	118	1	19	4.85	51.69	D	0.02	0.37
	119	3	50	3.50	37.30	D	0.08	1.34
	120	4	43	3.32	35.35	N	0.11	1.22
	121	6	87	7.18	76.56	N	0.08	1.14
	122	0	0	2.65	28.24	N	0.00	0.00
FEB 27-28/2006	127	2	42	2.75	29.31	D	0.07	1.43
	128	0	0	5.70	60.75	D	0.00	0.00
	129	1	36	2.95	31.44	D	0.03	1.14
	130	6	367	3.17	33.75	N	0.18	10.87
	131	3	96	5.63	60.04	N	0.05	1.60
	132	3	27	3.83	40.86	N	0.07	0.66
MAR 13-14/2006	137	0	0	3.07	25.17	D	0.00	0.00
	138	2	25	5.85	62.35	D	0.03	0.40
	139	1	163	3.03	32.33	D	0.03	5.04
	140	1	23	2.67	28.42	N	0.04	0.81
	141	4	73	6.00	63.95	N	0.06	1.14
	142	4	61	3.30	35.17	N	0.11	1.73
MAR 27-28/2006	147	0	0	2.92	31.09	D	0.00	0.00
	148	1	6	5.78	61.64	D	0.02	0.10
	149	1	9	3.70	39.43	D	0.03	0.23
	150	1	9	2.33	24.87	N	0.04	0.36
	151	0	0	5.88	62.70	N	0.00	0.00
	152	0	0	3.37	35.88	N	0.00	0.00
APR 10-11-2006	157	0	0	3.53	37.66	D	0.00	0.00

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
	158	1	23	5.78	61.64	D	0.02	0.37
	159	1	3	3.58	38.19	D	0.03	0.08
	160	0	0	1.45	15.45	N	0.00	0.00
	161	2	52	7.08	75.49	N	0.03	0.69
	162	2	21	2.63	28.07	N	0.07	0.75
MAY 01-02/2006	175	1	12	3.88	41.39	D	0.02	0.29
	176	0	0	5.78	61.64	D	0.00	0.00
	177	0	0	3.92	41.74	D	0.00	0.00
	178	0	0	2.12	22.56	N	0.00	0.00
	179	0	0	5.98	63.77	N	0.00	0.00
	180	0	0	2.40	25.58	N	0.00	0.00
MAY 08-09/2006	185	0	0	4.25	45.30	D	0.00	0.00
	186	0	0	5.53	58.97	D	0.00	0.00
	187	0	0	4.05	43.16	D	0.00	0.00
	188	0	0	1.97	20.96	N	0.00	0.00
	189	0	0	5.87	62.53	N	0.00	0.00
	190	0	0	2.37	25.22	N	0.00	0.00
MAY 22-23/2006	195	0	0	4.18	44.59	D	0.00	0.00
	196	0	0	5.80	61.82	D	0.00	0.00
	197	0	0	4.40	46.90	D	0.00	0.00
	198	0	0	1.63	17.41	N	0.00	0.00
	199	0	0	5.88	62.70	N	0.00	0.00
	200	0	0	1.98	21.14	N	0.00	0.00
JUN 05-06/2006	205	1	5	4.47	47.61	D	0.02	0.11
	206	0	0	5.67	60.40	D	0.00	0.00
	207	1	7	4.33	46.18	D	0.02	0.15
	208	0	0	1.62	17.23	N	0.00	0.00
	209	1	20	6.08	64.84	N	0.02	0.31
	210	0	0	1.80	19.18	N	0.00	0.00
JUN 19-20/2006	215	0	0	4.43	47.25	D	0.00	0.00
	216	0	0	5.57	59.33	D	0.00	0.00
	217	0	0	3.98	42.45	D	0.00	0.00
	218	0	0	1.65	17.59	N	0.00	0.00
	219	0	0	6.47	68.92	N	0.00	0.00
	220	0	0	1.90	20.25	N	0.00	0.00
JUL 05-06/2006	225	0	0	4.15	44.23	D	0.00	0.00
	226	0	0	5.53	58.97	D	0.00	0.00
	227	0	0	4.78	50.98	D	0.00	0.00
	228	0	0	1.42	15.10	N	0.00	0.00
	229	0	0	6.00	63.95	N	0.00	0.00
	230	0	0	2.12	22.56	N	0.00	0.00
JUL 18-19/2006	235	0	0	4.05	43.16	D	0.00	0.00
	236	0	0	5.70	60.75	D	0.00	0.00
	237	0	0	4.50	47.96	D	0.00	0.00
	238	0	0	1.77	18.83	N	0.00	0.00
	239	0	0	5.92	63.06	N	0.00	0.00
	240	0	0	1.82	19.36	N	0.00	0.00
AUG 01-02/2006	245	0	0	3.92	55.84	D	0.00	0.00
	246	0	0	5.75	81.98	D	0.00	0.00

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
	247	0	0	4.50	64.16	D	0.00	0.00
	248	0	0	1.63	23.29	N	0.00	0.00
	249	1	49	5.97	85.07	N	0.01	0.58
	250	0	0	2.17	30.89	N	0.00	0.00
AUG 14-15/2006	255	0	0	3.83	40.86	D	0.00	0.00
	256	0	0	5.50	58.62	D	0.00	0.00
	257	0	0	4.17	44.41	D	0.00	0.00
	258	0	0	2.05	21.85	N	0.00	0.00
	259	0	0	6.08	64.84	N	0.00	0.00
	260	0	0	2.28	24.34	N	0.00	0.00
AUG 29-30/2006	265	0	0	3.57	38.01	D	0.00	0.00
	266	1	69	5.45	58.09	D	0.02	1.19
	267	1	92	4.25	45.30	D	0.02	2.03
	268	0	0	2.10	22.38	N	0.00	0.00
	269	1	32	5.48	58.44	N	0.02	0.55
	270	0	0	3.12	33.22	N	0.00	0.00

Appendix 6. Total number, total weight, density and biomass of bluegill collected per sample with impingement sampling at the Cape Fear Plant, September 2005–August 2006.

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
SEP 13-14/2005	1	1	29	2.73	29.13	D	0.03	1.00
	2	1	17	5.58	59.51	D	0.02	0.29
	3	0	0	4.13	44.05	D	0.00	0.00
	4	0	0	1.82	19.36	N	0.00	0.00
	5	0	0	5.88	62.70	N	0.00	0.00
	6	0	0	3.87	41.21	N	0.00	0.00
SEP 27-28/2005	12	0	0	2.85	30.38	D	0.00	0.00
	13	0	0	2.70	28.78	D	0.00	0.00
	14	0	0	3.73	39.79	D	0.00	0.00
	15	0	0	2.18	23.27	N	0.00	0.00
	16	0	0	6.02	64.13	N	0.00	0.00
	17	0	0	3.83	40.86	N	0.00	0.00
	18	0	0	2.25	23.98	D	0.00	0.00
OCT 10-11/2005	23	1	2	1.77	18.83	D	0.05	0.11
	24	0	0	6.00	63.95	D	0.00	0.00
	25	1	4	3.68	39.26	D	0.03	0.10
	26	0	0	2.65	28.24	N	0.00	0.00
	27	0	0	5.57	59.33	N	0.00	0.00
	28	0	0	4.37	46.54	N	0.00	0.00
OCT 24-25/2005	37	0	0	2.05	21.85	D	0.00	0.00
	38	0	0	6.00	63.95	D	0.00	0.00
	39	0	0	2.92	31.09	D	0.00	0.00
	40	0	0	3.32	35.35	N	0.00	0.00
	41	0	0	5.45	58.09	N	0.00	0.00
	42	0	0	4.23	45.12	N	0.00	0.00
NOV 07-08/2005	47	0	0	3.05	32.51	D	0.00	0.00
	48	0	0	4.22	44.94	D	0.00	0.00
	49	0	0	3.42	36.41	D	0.00	0.00
	50	0	0	3.90	41.57	N	0.00	0.00
	51	0	0	5.83	62.17	N	0.00	0.00
	52	0	0	3.10	33.04	N	0.00	0.00
NOV 21-22/2005	57	0	0	2.05	11.80	D	0.00	0.00
	58	0	0	6.12	35.22	D	0.00	0.00
	59	0	0	1.97	11.32	D	0.00	0.00
	60	0	0	3.90	22.46	N	0.00	0.00
	61	0	0	5.87	33.78	N	0.00	0.00
	62	0	0	4.05	23.32	N	0.00	0.00
DEC 05-06/2005	67	1	43	1.47	15.63	D	0.06	2.75
	68	3	73	4.93	52.58	D	0.06	1.39
	69	10	348	3.42	36.41	D	0.27	9.56
	70	13	456	4.22	44.94	N	0.29	10.15
	71	8	194	5.35	57.02	N	0.14	3.40
	72	21	753	4.02	42.81	N	0.49	17.59

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
DEC 19-20/2005	77	0	0	1.98	21.14	D	0.00	0.00
	78	3	104	4.43	47.25	D	0.06	2.20
	79	10	624	3.37	35.88	D	0.28	17.39
	80	15	712	4.10	43.70	N	0.34	16.29
	81	5	274	4.80	51.16	N	0.10	5.36
	82	4	111	5.32	56.67	N	0.07	1.96
JAN 03-04/2006	87	0	0	4.65	49.56	D	0.00	0.00
	88	0	0	3.78	40.32	D	0.00	0.00
	89	3	75	3.93	41.92	N	0.07	1.79
	90	4	103	5.92	63.06	N	0.06	1.63
	91	0	0	4.27	45.47	N	0.00	0.00
	92	0	0	1.45	15.45	D	0.00	0.00
JAN 16-17/2006	97	0	0	2.25	23.98	D	0.00	0.00
	98	1	19	4.83	51.51	D	0.02	0.37
	99	0	0	3.02	32.15	D	0.00	0.00
	100	0	0	3.90	41.57	N	0.00	0.00
	101	0	0	5.92	63.06	N	0.00	0.00
	102	1	28	4.13	44.05	N	0.02	0.64
JAN 30-31/2006	107	0	0	1.95	20.78	D	0.00	0.00
	108	0	0	5.85	62.35	D	0.00	0.00
	109	2	10	2.40	25.58	D	0.08	0.39
	110	0	0	3.73	39.79	N	0.00	0.00
	111	1	88	5.83	62.17	N	0.02	1.42
	112	0	0	4.23	45.12	N	0.00	0.00
FEB 13-14/2006	117	3	89	2.53	27.00	D	0.11	3.30
	118	9	313	4.85	51.69	D	0.17	6.06
	119	13	346	3.50	37.30	D	0.35	9.28
	120	38	1470	3.32	35.35	N	1.07	41.59
	121	23	1128	7.18	76.56	N	0.30	14.73
	122	2	117	2.65	28.24	N	0.07	4.14
FEB 27-28/2006	127	1	34	2.75	29.31	D	0.03	1.16
	128	0	0	5.70	60.75	D	0.00	0.00
	129	2	39	2.95	31.44	D	0.06	1.24
	130	2	52	3.17	33.75	N	0.06	1.54
	131	1	36	5.63	60.04	N	0.02	0.60
	132	0	0	3.83	40.86	N	0.00	0.00
MAR 13-14/2006	137	1	33	3.07	25.17	D	0.04	1.31
	138	0	0	5.85	62.35	D	0.00	0.00
	139	4	93	3.03	32.33	D	0.12	2.88
	140	0	0	2.67	28.42	N	0.00	0.00
	141	1	72	6.00	63.95	N	0.02	1.13
	142	0	0	3.30	35.17	N	0.00	0.00
MAR 27-28/2006	147	1	69	2.92	31.09	D	0.03	2.22
	148	0	0	5.78	61.64	D	0.00	0.00
	149	0	0	3.70	39.43	D	0.00	0.00
	150	0	0	2.33	24.87	N	0.00	0.00
	151	1	31	5.88	62.70	N	0.02	0.49
	152	0	0	3.37	35.88	N	0.00	0.00
APR 10-11-2006	157	0	0	3.53	37.66	D	0.00	0.00

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
	158	2	5	5.78	61.64	D	0.03	0.08
	159	2	2	3.58	38.19	D	0.05	0.05
	160	2	7	1.45	15.45	N	0.13	0.45
	161	0	0	7.08	75.49	N	0.00	0.00
	162	1	7	2.63	28.07	N	0.04	0.25
MAY 01-02/2006	175	3	52	3.88	41.39	D	0.07	1.26
	176	1	2	5.78	61.64	D	0.02	0.03
	177	8	26	3.92	41.74	D	0.19	0.62
	178	9	32	2.12	22.56	N	0.40	1.42
	179	7	30	5.98	63.77	N	0.11	0.47
	180	1	2	2.40	25.58	N	0.04	0.08
MAY 08-09/2006	185	1	6	4.25	45.30	D	0.02	0.13
	186	3	35	5.53	58.97	D	0.05	0.59
	187	3	13	4.05	43.16	D	0.07	0.30
	188	12	80	1.97	20.96	N	0.57	3.82
	189	1	6	5.87	62.53	N	0.02	0.10
	190	1	3	2.37	25.22	N	0.04	0.12
MAY 22-23/2006	195	0	0	4.18	44.59	D	0.00	0.00
	196	0	0	5.80	61.82	D	0.00	0.00
	197	1	8	4.40	46.90	D	0.02	0.17
	198	1	4	1.63	17.41	N	0.06	0.23
	199	1	4	5.88	62.70	N	0.02	0.06
	200	1	5	1.98	21.14	N	0.05	0.24
JUN 05-06/2006	205	1	2	4.47	47.61	D	0.02	0.04
	206	0	0	5.67	60.40	D	0.00	0.00
	207	2	9	4.33	46.18	D	0.04	0.19
	208	1	6	1.62	17.23	N	0.06	0.35
	209	0	0	6.08	64.84	N	0.00	0.00
	210	0	0	1.80	19.18	N	0.00	0.00
JUN 19-20/2006	215	0	0	4.43	47.25	D	0.00	0.00
	216	1	21	5.57	59.33	D	0.02	0.35
	217	6	57	3.98	42.45	D	0.14	1.34
	218	2	41	1.65	17.59	N	0.11	2.33
	219	4	118	6.47	68.92	N	0.06	1.71
	220	1	45	1.90	20.25	N	0.05	2.22
JUL 05-06/2006	225	0	0	4.15	44.23	D	0.00	0.00
	226	0	0	5.53	58.97	D	0.00	0.00
	227	2	14	4.78	50.98	D	0.04	0.27
	228	0	0	1.42	15.10	N	0.00	0.00
	229	1	21	6.00	63.95	N	0.02	0.33
	230	0	0	2.12	22.56	N	0.00	0.00
JUL 18-19/2006	235	0	0	4.05	43.16	D	0.00	0.00
	236	1	2	5.70	60.75	D	0.02	0.03
	237	0	0	4.50	47.96	D	0.00	0.00
	238	0	0	1.77	18.83	N	0.00	0.00
	239	2	18	5.92	63.06	N	0.03	0.29
	240	0	0	1.82	19.36	N	0.00	0.00
AUG 01-02/2006	245	0	0	3.92	55.84	D	0.00	0.00
	246	0	0	5.75	81.98	D	0.00	0.00

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
	247	0	0	4.50	64.16	D	0.00	0.00
	248	2	20	1.63	23.29	N	0.09	0.86
	249	1	17	5.97	85.07	N	0.01	0.20
	250	1	32	2.17	30.89	N	0.03	1.04
AUG 14-15/2006	255	1	8	3.83	40.86	D	0.02	0.20
	256	0	0	5.50	58.62	D	0.00	0.00
	257	1	31	4.17	44.41	D	0.02	0.70
	258	0	0	2.05	21.85	N	0.00	0.00
	259	0	0	6.08	64.84	N	0.00	0.00
	260	0	0	2.28	24.34	N	0.00	0.00
AUG 29-30/2006	265	1	36	3.57	38.01	D	0.03	0.95
	266	0	0	5.45	58.09	D	0.00	0.00
	267	2	72	4.25	45.30	D	0.04	1.59
	268	0	0	2.10	22.38	N	0.00	0.00
	269	2	13	5.48	58.44	N	0.03	0.22
	270	0	0	3.12	33.22	N	0.00	0.00

Appendix 7. Total number, total weight, density and biomass of channel catfish collected per sample with impingement sampling at the Cape Fear Plant, September 2005–August 2006.

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
SEP 13-14/2005	1	0	0	2.73	29.13	D	0.00	0.00
	2	0	0	5.58	59.51	D	0.00	0.00
	3	0	0	4.13	44.05	D	0.00	0.00
	4	3	30	1.82	19.36	N	0.15	1.55
	5	2	54	5.88	62.70	N	0.03	0.86
	6	2	46	3.87	41.21	N	0.05	1.12
SEP 27-28/2005	12	0	0	2.85	30.38	D	0.00	0.00
	13	0	0	2.70	28.78	D	0.00	0.00
	14	0	0	3.73	39.79	D	0.00	0.00
	15	1	5	2.18	23.27	N	0.04	0.21
	16	0	0	6.02	64.13	N	0.00	0.00
	17	2	14	3.83	40.86	N	0.05	0.34
	18	0	0	2.25	23.98	D	0.00	0.00
OCT 10-11/2005	23	0	0	1.77	18.83	D	0.00	0.00
	24	3	11	6.00	63.95	D	0.05	0.17
	25	1	6	3.68	39.26	D	0.03	0.15
	26	0	0	2.65	28.24	N	0.00	0.00
	27	2	11	5.57	59.33	N	0.03	0.19
	28	3	14	4.37	46.54	N	0.06	0.30
OCT 24-25/2005	37	0	0	2.05	21.85	D	0.00	0.00
	38	0	0	6.00	63.95	D	0.00	0.00
	39	0	0	2.92	31.09	D	0.00	0.00
	40	0	0	3.32	35.35	N	0.00	0.00
	41	0	0	5.45	58.09	N	0.00	0.00
	42	0	0	4.23	45.12	N	0.00	0.00
NOV 07-08/2005	47	0	0	3.05	32.51	D	0.00	0.00
	48	0	0	4.22	44.94	D	0.00	0.00
	49	0	0	3.42	36.41	D	0.00	0.00
	50	0	0	3.90	41.57	N	0.00	0.00
	51	1	10	5.83	62.17	N	0.02	0.16
	52	0	0	3.10	33.04	N	0.00	0.00
NOV 21-22/2005	57	0	0	2.05	11.80	D	0.00	0.00
	58	0	0	6.12	35.22	D	0.00	0.00
	59	0	0	1.97	11.32	D	0.00	0.00
	60	1	5	3.90	22.46	N	0.04	0.22
	61	0	0	5.87	33.78	N	0.00	0.00
	62	0	0	4.05	23.32	N	0.00	0.00
DEC 05-06/2005	67	0	0	1.47	15.63	D	0.00	0.00
	68	0	0	4.93	52.58	D	0.00	0.00
	69	0	0	3.42	36.41	D	0.00	0.00
	70	1	6	4.22	44.94	N	0.02	0.13
	71	6	31	5.35	57.02	N	0.11	0.54
	72	1	2	4.02	42.81	N	0.02	0.05

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
DEC 19-20/2005	77	0	0	1.98	21.14	D	0.00	0.00
	78	0	0	4.43	47.25	D	0.00	0.00
	79	1	4	3.37	35.88	D	0.03	0.11
	80	1	8	4.10	43.70	N	0.02	0.18
	81	0	0	4.80	51.16	N	0.00	0.00
	82	0	0	5.32	56.67	N	0.00	0.00
JAN 03-04/2006	87	0	0	4.65	49.56	D	0.00	0.00
	88	0	0	3.78	40.32	D	0.00	0.00
	89	1	4	3.93	41.92	N	0.02	0.10
	90	0	0	5.92	63.06	N	0.00	0.00
	91	0	0	4.27	45.47	N	0.00	0.00
	92	0	0	1.45	15.45	D	0.00	0.00
JAN 16-17/2006	97	0	0	2.25	23.98	D	0.00	0.00
	98	0	0	4.83	51.51	D	0.00	0.00
	99	0	0	3.02	32.15	D	0.00	0.00
	100	0	0	3.90	41.57	N	0.00	0.00
	101	0	0	5.92	63.06	N	0.00	0.00
	102	0	0	4.13	44.05	N	0.00	0.00
JAN 30-31/2006	107	0	0	1.95	20.78	D	0.00	0.00
	108	0	0	5.85	62.35	D	0.00	0.00
	109	0	0	2.40	25.58	D	0.00	0.00
	110	0	0	3.73	39.79	N	0.00	0.00
	111	1	2	5.83	62.17	N	0.02	0.03
	112	0	0	4.23	45.12	N	0.00	0.00
FEB 13-14/2006	117	0	0	2.53	27.00	D	0.00	0.00
	118	0	0	4.85	51.69	D	0.00	0.00
	119	0	0	3.50	37.30	D	0.00	0.00
	120	0	0	3.32	35.35	N	0.00	0.00
	121	0	0	7.18	76.56	N	0.00	0.00
	122	0	0	2.65	28.24	N	0.00	0.00
FEB 27-28/2006	127	0	0	2.75	29.31	D	0.00	0.00
	128	1	105	5.70	60.75	D	0.02	1.73
	129	0	0	2.95	31.44	D	0.00	0.00
	130	0	0	3.17	33.75	N	0.00	0.00
	131	0	0	5.63	60.04	N	0.00	0.00
	132	0	0	3.83	40.86	N	0.00	0.00
MAR 13-14/2006	137	0	0	3.07	25.17	D	0.00	0.00
	138	1	8	5.85	62.35	D	0.02	0.13
	139	1	3	3.03	32.33	D	0.03	0.09
	140	6	15	2.67	28.42	N	0.21	0.53
	141	2	5	6.00	63.95	N	0.03	0.08
	142	0	0	3.30	35.17	N	0.00	0.00
MAR 27-28/2006	147	0	0	2.92	31.09	D	0.00	0.00
	148	0	0	5.78	61.64	D	0.00	0.00
	149	0	0	3.70	39.43	D	0.00	0.00
	150	2	5	2.33	24.87	N	0.08	0.20
	151	2	9	5.88	62.70	N	0.03	0.14
	152	0	0	3.37	35.88	N	0.00	0.00
APR 10-11-2006	157	0	0	3.53	37.66	D	0.00	0.00

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
	158	0	0	5.78	61.64	D	0.00	0.00
	159	0	0	3.58	38.19	D	0.00	0.00
	160	1	9	1.45	15.45	N	0.06	0.58
	161	8	165	7.08	75.49	N	0.11	2.19
	162	1	3	2.63	28.07	N	0.04	0.11
MAY 01-02/2006	175	0	0	3.88	41.39	D	0.00	0.00
	176	0	0	5.78	61.64	D	0.00	0.00
	177	0	0	3.92	41.74	D	0.00	0.00
	178	0	0	2.12	22.56	N	0.00	0.00
	179	0	0	5.98	63.77	N	0.00	0.00
	180	1	4	2.40	25.58	N	0.04	0.16
MAY 08-09/2006	185	0	0	4.25	45.30	D	0.00	0.00
	186	0	0	5.53	58.97	D	0.00	0.00
	187	2	36	4.05	43.16	D	0.05	0.83
	188	0	0	1.97	20.96	N	0.00	0.00
	189	0	0	5.87	62.53	N	0.00	0.00
	190	0	0	2.37	25.22	N	0.00	0.00
MAY 22-23/2006	195	1	35	4.18	44.59	D	0.02	0.79
	196	0	0	5.80	61.82	D	0.00	0.00
	197	1	7	4.40	46.90	D	0.02	0.15
	198	0	0	1.63	17.41	N	0.00	0.00
	199	5	23	5.88	62.70	N	0.08	0.37
	200	0	0	1.98	21.14	N	0.00	0.00
JUN 05-06/2006	205	1	21	4.47	47.61	D	0.02	0.44
	206	0	0	5.67	60.40	D	0.00	0.00
	207	1	9	4.33	46.18	D	0.02	0.19
	208	0	0	1.62	17.23	N	0.00	0.00
	209	0	0	6.08	64.84	N	0.00	0.00
	210	0	0	1.80	19.18	N	0.00	0.00
JUN 19-20/2006	215	0	0	4.43	47.25	D	0.00	0.00
	216	0	0	5.57	59.33	D	0.00	0.00
	217	0	0	3.98	42.45	D	0.00	0.00
	218	0	0	1.65	17.59	N	0.00	0.00
	219	1	3	6.47	68.92	N	0.01	0.04
	220	0	0	1.90	20.25	N	0.00	0.00
JUL 05-06/2006	225	1	45	4.15	44.23	D	0.02	1.02
	226	0	0	5.53	58.97	D	0.00	0.00
	227	0	0	4.78	50.98	D	0.00	0.00
	228	0	0	1.42	15.10	N	0.00	0.00
	229	0	0	6.00	63.95	N	0.00	0.00
	230	0	0	2.12	22.56	N	0.00	0.00
JUL 18-19/2006	235	1	1	4.05	43.16	D	0.02	0.02
	236	0	0	5.70	60.75	D	0.00	0.00
	237	0	0	4.50	47.96	D	0.00	0.00
	238	0	0	1.77	18.83	N	0.00	0.00
	239	6	8	5.92	63.06	N	0.10	0.13
	240	0	0	1.82	19.36	N	0.00	0.00
AUG 01-02/2006	245	0	0	3.92	55.84	D	0.00	0.00
	246	0	0	5.75	81.98	D	0.00	0.00

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total weight Per MG
	247	1	32	4.50	64.16	D	0.02	0.50
	248	0	0	1.63	23.29	N	0.00	0.00
	249	2	65	5.97	85.07	N	0.02	0.76
	250	1	21	2.17	30.89	N	0.03	0.68
AUG 14-15/2006	255	1	12	3.83	40.86	D	0.02	0.29
	256	0	0	5.50	58.62	D	0.00	0.00
	257	2	5	4.17	44.41	D	0.05	0.11
	258	3	23	2.05	21.85	N	0.14	1.05
	259	7	45	6.08	64.84	N	0.11	0.69
	260	0	0	2.28	24.34	N	0.00	0.00
AUG 29-30/2006	265	9	170	3.57	38.01	D	0.24	4.47
	266	6	48	5.45	58.09	D	0.10	0.83
	267	12	56	4.25	45.30	D	0.26	1.24
	268	19	159	2.10	22.38	N	0.85	7.10
	269	28	161	5.48	58.44	N	0.48	2.75
	270	13	47	3.12	33.22	N	0.39	1.41

Appendix 8. Total number, total weight, density, and biomass of white perch collected per sample with impingement sampling at the Cape Fear Plant, September 2005–August 2006.

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
SEP 13-14/2005	1	1	36	2.73	29.13	D	0.03	1.24
	2	1	46	5.58	59.51	D	0.02	0.77
	3	0	0	4.13	44.05	D	0.00	0.00
	4	1	46	1.82	19.36	N	0.05	2.38
	5	2	90	5.88	62.70	N	0.03	1.44
	6	1	45	3.87	41.21	N	0.02	1.09
SEP 27-28/2005	12	0	0	2.85	30.38	D	0.00	0.00
	13	0	0	2.70	28.78	D	0.00	0.00
	14	0	0	3.73	39.79	D	0.00	0.00
	15	0	0	2.18	23.27	N	0.00	0.00
	16	0	0	6.02	64.13	N	0.00	0.00
	17	0	0	3.83	40.86	N	0.00	0.00
	18	0	0	2.25	23.98	D	0.00	0.00
OCT 10-11/2005	23	0	0	1.77	18.83	D	0.00	0.00
	24	0	0	6.00	63.95	D	0.00	0.00
	25	0	0	3.68	39.26	D	0.00	0.00
	26	0	0	2.65	28.24	N	0.00	0.00
	27	0	0	5.57	59.33	N	0.00	0.00
	28	0	0	4.37	46.54	N	0.00	0.00
OCT 24-25/2005	37	0	0	2.05	21.85	D	0.00	0.00
	38	0	0	6.00	63.95	D	0.00	0.00
	39	0	0	2.92	31.09	D	0.00	0.00
	40	0	0	3.32	35.35	N	0.00	0.00
	41	0	0	5.45	58.09	N	0.00	0.00
	42	0	0	4.23	45.12	N	0.00	0.00
NOV 07-08/2005	47	0	0	3.05	32.51	D	0.00	0.00
	48	0	0	4.22	44.94	D	0.00	0.00
	49	0	0	3.42	36.41	D	0.00	0.00
	50	0	0	3.90	41.57	N	0.00	0.00
	51	0	0	5.83	62.17	N	0.00	0.00
	52	0	0	3.10	33.04	N	0.00	0.00
NOV 21-22/2005	57	0	0	2.05	11.80	D	0.00	0.00
	58	0	0	6.12	35.22	D	0.00	0.00
	59	0	0	1.97	11.32	D	0.00	0.00
	60	0	0	3.90	22.46	N	0.00	0.00
	61	0	0	5.87	33.78	N	0.00	0.00
	62	0	0	4.05	23.32	N	0.00	0.00
DEC 05-06/2005	67	0	0	1.47	15.63	D	0.00	0.00
	68	0	0	4.93	52.58	D	0.00	0.00
	69	0	0	3.42	36.41	D	0.00	0.00
	70	0	0	4.22	44.94	N	0.00	0.00
	71	2	68	5.35	57.02	N	0.04	1.19
	72	4	198	4.02	42.81	N	0.09	4.63

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
DEC 19-20/2005	77	0	0	1.98	21.14	D	0.00	0.00
	78	2	61	4.43	47.25	D	0.04	1.29
	79	5	294	3.37	35.88	D	0.14	8.19
	80	8	622	4.10	43.70	N	0.18	14.23
	81	2	134	4.80	51.16	N	0.04	2.62
	82	1	82	5.32	56.67	N	0.02	1.45
JAN 03-04/2006	87	0	0	4.65	49.56	D	0.00	0.00
	88	0	0	3.78	40.32	D	0.00	0.00
	89	0	0	3.93	41.92	N	0.00	0.00
	90	0	0	5.92	63.06	N	0.00	0.00
	91	0	0	4.27	45.47	N	0.00	0.00
	92	0	0	1.45	15.45	D	0.00	0.00
JAN 16-17/2006	97	0	0	2.25	23.98	D	0.00	0.00
	98	0	0	4.83	51.51	D	0.00	0.00
	99	0	0	3.02	32.15	D	0.00	0.00
	100	0	0	3.90	41.57	N	0.00	0.00
	101	0	0	5.92	63.06	N	0.00	0.00
	102	0	0	4.13	44.05	N	0.00	0.00
JAN 30-31/2006	107	0	0	1.95	20.78	D	0.00	0.00
	108	0	0	5.85	62.35	D	0.00	0.00
	109	0	0	2.40	25.58	D	0.00	0.00
	110	0	0	3.73	39.79	N	0.00	0.00
	111	0	0	5.83	62.17	N	0.00	0.00
	112	0	0	4.23	45.12	N	0.00	0.00
FEB 13-14/2006	117	0	0	2.53	27.00	D	0.00	0.00
	118	0	0	4.85	51.69	D	0.00	0.00
	119	0	0	3.50	37.30	D	0.00	0.00
	120	0	0	3.32	35.35	N	0.00	0.00
	121	0	0	7.18	76.56	N	0.00	0.00
	122	0	0	2.65	28.24	N	0.00	0.00
FEB 27-28/2006	127	0	0	2.75	29.31	D	0.00	0.00
	128	0	0	5.70	60.75	D	0.00	0.00
	129	0	0	2.95	31.44	D	0.00	0.00
	130	0	0	3.17	33.75	N	0.00	0.00
	131	0	0	5.63	60.04	N	0.00	0.00
	132	0	0	3.83	40.86	N	0.00	0.00
MAR 13-14/2006	137	0	0	3.07	25.17	D	0.00	0.00
	138	0	0	5.85	62.35	D	0.00	0.00
	139	0	0	3.03	32.33	D	0.00	0.00
	140	0	0	2.67	28.42	N	0.00	0.00
	141	0	0	6.00	63.95	N	0.00	0.00
	142	0	0	3.30	35.17	N	0.00	0.00
MAR 27-28/2006	147	0	0	2.92	31.09	D	0.00	0.00
	148	0	0	5.78	61.64	D	0.00	0.00
	149	0	0	3.70	39.43	D	0.00	0.00
	150	0	0	2.33	24.87	N	0.00	0.00
	151	0	0	5.88	62.70	N	0.00	0.00
	152	0	0	3.37	35.88	N	0.00	0.00
APR 10-11-2006	157	0	0	3.53	37.66	D	0.00	0.00

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
	158	0	0	5.78	61.64	D	0.00	0.00
	159	0	0	3.58	38.19	D	0.00	0.00
	160	0	0	1.45	15.45	N	0.00	0.00
	161	0	0	7.08	75.49	N	0.00	0.00
	162	0	0	2.63	28.07	N	0.00	0.00
MAY 01-02/2006	175	0	0	3.88	41.39	D	0.00	0.00
	176	0	0	5.78	61.64	D	0.00	0.00
	177	0	0	3.92	41.74	D	0.00	0.00
	178	0	0	2.12	22.56	N	0.00	0.00
	179	0	0	5.98	63.77	N	0.00	0.00
	180	0	0	2.40	25.58	N	0.00	0.00
MAY 08-09/2006	185	0	0	4.25	45.30	D	0.00	0.00
	186	0	0	5.53	58.97	D	0.00	0.00
	187	0	0	4.05	43.16	D	0.00	0.00
	188	0	0	1.97	20.96	N	0.00	0.00
	189	0	0	5.87	62.53	N	0.00	0.00
	190	0	0	2.37	25.22	N	0.00	0.00
MAY 22-23/2006	195	0	0	4.18	44.59	D	0.00	0.00
	196	0	0	5.80	61.82	D	0.00	0.00
	197	0	0	4.40	46.90	D	0.00	0.00
	198	0	0	1.63	17.41	N	0.00	0.00
	199	0	0	5.88	62.70	N	0.00	0.00
	200	0	0	1.98	21.14	N	0.00	0.00
JUN 05-06/2006	205	0	0	4.47	47.61	D	0.00	0.00
	206	0	0	5.67	60.40	D	0.00	0.00
	207	0	0	4.33	46.18	D	0.00	0.00
	208	0	0	1.62	17.23	N	0.00	0.00
	209	1	58	6.08	64.84	N	0.02	0.89
	210	0	0	1.80	19.18	N	0.00	0.00
JUN 19-20/2006	215	0	0	4.43	47.25	D	0.00	0.00
	216	0	0	5.57	59.33	D	0.00	0.00
	217	0	0	3.98	42.45	D	0.00	0.00
	218	0	0	1.65	17.59	N	0.00	0.00
	219	0	0	6.47	68.92	N	0.00	0.00
	220	0	0	1.90	20.25	N	0.00	0.00
JUL 05-06/2006	225	0	0	4.15	44.23	D	0.00	0.00
	226	0	0	5.53	58.97	D	0.00	0.00
	227	0	0	4.78	50.98	D	0.00	0.00
	228	0	0	1.42	15.10	N	0.00	0.00
	229	0	0	6.00	63.95	N	0.00	0.00
	230	0	0	2.12	22.56	N	0.00	0.00
JUL 18-19/2006	235	1	85	4.05	43.16	D	0.02	1.97
	236	1	55	5.70	60.75	D	0.02	0.91
	237	0	0	4.50	47.96	D	0.00	0.00
	238	0	0	1.77	18.83	N	0.00	0.00
	239	0	0	5.92	63.06	N	0.00	0.00
	240	0	0	1.82	19.36	N	0.00	0.00
AUG 01-02/2006	245	0	0	3.92	55.84	D	0.00	0.00
	246	0	0	5.75	81.98	D	0.00	0.00

Sampling trip dates	Sample Number	Total Number	Total Weight	Duration	Volume (MG)	Period	Density (Num. Per MG)	Total Weight Per MG
	247	0	0	4.50	64.16	D	0.00	0.00
	248	1	79	1.63	23.29	N	0.04	3.39
	249	1	54	5.97	85.07	N	0.01	0.63
	250	0	0	2.17	30.89	N	0.00	0.00
AUG 14-15/2006	255	0	0	3.83	40.86	D	0.00	0.00
	256	0	0	5.50	58.62	D	0.00	0.00
	257	1	132	4.17	44.41	D	0.02	2.97
	258	2	148	2.05	21.85	N	0.09	6.77
	259	1	60	6.08	64.84	N	0.02	0.93
	260	0	0	2.28	24.34	N	0.00	0.00
AUG 29-30/2006	265	0	0	3.57	38.01	D	0.00	0.00
	266	0	0	5.45	58.09	D	0.00	0.00
	267	1	99	4.25	45.30	D	0.02	2.19
	268	0	0	2.10	22.38	N	0.00	0.00
	269	0	0	5.48	58.44	N	0.00	0.00
	270	0	0	3.12	33.22	N	0.00	0.00

Appendix 9. Total number and density of unidentified fish eggs collected per sample with entrainment sampling at the Cape Fear Plant, September 2005–August 2006.

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
SEP 13-14/2005	7	0	0.10	79.6	0.0210	D	0.00
	8	0	0.10	87.8	0.0232	D	0.00
	9	0	0.10	82.8	0.0219	N	0.00
	10	0	0.10	80.3	0.0212	N	0.00
SEP 27-28/2005	19	0	0.10	71.6	0.0189	D	0.00
	20	0	0.10	65.3	0.0173	D	0.00
	21	0	0.10	70.6	0.0187	N	0.00
	22	0	0.10	76.0	0.0201	N	0.00
OCT 10-11/2005	29	0	0.10	54.5	0.0144	D	0.00
	30	0	0.10	55.9	0.0148	D	0.00
	31	0	0.10	57.8	0.0153	N	0.00
	32	0	0.10	57.2	0.0151	N	0.00
	33	0	0.10	46.4	0.0123	D	0.00
	34	0	0.10	49.7	0.0131	D	0.00
	35	0	0.10	54.5	0.0144	N	0.00
	36	0	0.10	55.1	0.0146	N	0.00
OCT 24-25/2005	43	0	0.10	47.2	0.0125	D	0.00
	44	0	0.10	51.6	0.0136	D	0.00
	45	0	0.10	50.6	0.0134	N	0.00
	46	0	0.10	49.8	0.0132	N	0.00
NOV 07-08/2005	53	0	0.10	42.8	0.0113	D	0.00
	54	0	0.10	40.1	0.0106	D	0.00
	55	0	0.10	39.2	0.0104	N	0.00
	56	0	0.10	37.1	0.0098	N	0.00
NOV 21-22/2005	63	0	0.10	69.8	0.0184	D	0.00
	64	0	0.10	72.4	0.0191	D	0.00
	65	0	0.10	72.0	0.0190	N	0.00
	66	0	0.10	64.8	0.0171	N	0.00
DEC 05-06/2005	73	0	0.10	60.8	0.0161	D	0.00
	74	0	0.10	60.2	0.0159	D	0.00
	75	0	0.10	59.4	0.0157	N	0.00
	76	0	0.10	60.8	0.0161	N	0.00
DEC 19-20/2005	83	0	0.10	59.4	0.0157	D	0.00
	84	0	0.10	57.9	0.0153	D	0.00
	85	0	0.10	56.5	0.0149	N	0.00
	86	0	0.10	58.2	0.0154	N	0.00
JAN 03-04/2006	93	0	0.10	64.4	0.0170	D	0.00
	94	0	0.10	55.1	0.0146	D	0.00
	95	0	0.10	53.6	0.0142	N	0.00
	96	0	0.10	57.3	0.0151	N	0.00
JAN 16-17/2006	103	0	0.10	56.4	0.0149	D	0.00
	104	0	0.10	58.9	0.0156	D	0.00
	105	0	0.10	58.9	0.0156	N	0.00
	106	0	0.10	61.2	0.0162	N	0.00

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
JAN 30-31/2006	113	0	0.10	76.3	0.0202	D	0.00
	114	0	0.10	76.8	0.0203	D	0.00
	115	0	0.10	74.5	0.0197	N	0.00
	116	0	0.10	74.2	0.0196	N	0.00
FEB 13-14/2006	123	0	0.10	69.7	0.0184	D	0.00
	124	0	0.10	74.9	0.0198	D	0.00
	125	0	0.10	77.0	0.0203	N	0.00
	126	0	0.10	75.4	0.0199	N	0.00
FEB 27-28/2006	133	0	0.10	60.9	0.0161	D	0.00
	134	0	0.10	89.1	0.0235	D	0.00
	135	0	0.10	87.2	0.0230	N	0.00
	136	0	0.10	77.6	0.0205	N	0.00
MAR 13-14/2006	143	0	0.10	70.0	0.0185	D	0.00
	144	0	0.10	69.9	0.0185	D	0.00
	145	0	0.10	70.2	0.0185	N	0.00
	146	0	0.10	69.1	0.0183	N	0.00
MAR 27-28/2006	153	0	0.10	79.3	0.0209	D	0.00
	154	0	0.10	89.2	0.0236	D	0.00
	155	0	0.10	79.5	0.0210	N	0.00
	156	0	0.10	86.8	0.0229	N	0.00
APR 10-11-2006	163	0	0.10	31.8	0.0084	D	0.00
	164	5	0.10	33.7	0.0089	D	561.64
	165	1	0.10	32.8	0.0087	N	115.41
MAY 01-02/2006	171	1	0.10	56.2	0.0148	D	67.36
	172	1	0.10	56.2	0.0148	D	67.36
	173	0	0.10	53.6	0.0142	N	0.00
	174	2	0.10	55.8	0.0147	N	135.68
MAY 08-09/2006	181	12	0.10	64.7	0.0171	D	702.09
	182	7	0.10	64.4	0.0170	D	411.46
	183	9	0.10	64.4	0.0170	N	529.02
	184	1	0.10	61.9	0.0164	N	61.15
MAY 22-23/2006	191	24	0.10	68.7	0.0181	D	1322.42
	192	18	0.10	69.3	0.0183	D	983.23
	193	19	0.10	68.8	0.0182	N	1045.40
	194	94	0.10	72.1	0.0190	N	4935.25
JUN 05-06/2006	201	19	0.10	77.9	0.0206	D	923.28
	202	12	0.10	79.9	0.0211	D	568.53
	203	10	0.10	77.4	0.0204	N	489.08
	204	19	0.10	78.0	0.0206	N	922.09
JUN 19-20/2006	211	0	0.10	60.4	0.0160	D	0.00
	212	0	0.10	61.4	0.0162	D	0.00
	213	3	0.10	59.0	0.0156	N	192.48
	214	1	0.10	58.8	0.0155	N	64.38
JUL 05-06/2006	221	0	0.10	68.0	0.0180	D	0.00
	222	0	0.10	68.0	0.0180	D	0.00
	223	0	0.10	68.7	0.0181	N	0.00
	224	0	0.10	67.0	0.0177	N	0.00
JUL 18-19/2006	231	0	0.10	81.5	0.0215	D	0.00
	232	0	0.10	81.2	0.0215	D	0.00

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
	233	0	0.10	83.8	0.0221	N	0.00
	234	0	0.10	84.2	0.0222	N	0.00
AUG 01-02/2006	241	0	0.10	97.6	0.0258	D	0.00
	242	0	0.10	98.5	0.0260	D	0.00
	243	0	0.10	99.7	0.0263	N	0.00
	244	0	0.10	101.4	0.0268	N	0.00
AUG 14-15/2006	251	0	0.10	82.8	0.0219	D	0.00
	252	0	0.10	83.2	0.0220	D	0.00
	253	0	0.10	83.5	0.0221	N	0.00
	254	0	0.10	83.5	0.0221	N	0.00
AUG 29-30/2006	261	0	0.10	80.6	0.0213	D	0.00
	262	0	0.10	77.0	0.0203	D	0.00
	263	0	0.10	78.5	0.0207	N	0.00
	264	0	0.10	78.5	0.0207	N	0.00

Appendix 10. Total number and density of *Dorosoma* spp. eggs collected per sample with entrainment sampling at the Cape Fear Plant, September 2005–August 2006[+].

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
MAY 01-02/2006	171	0	0.10	56.2	0.0148	D	0.00
	172	0	0.10	56.2	0.0148	D	0.00
	173	0	0.10	53.6	0.0142	N	0.00
	174	0	0.10	55.8	0.0147	N	0.00
MAY 08-09/2006	181	17	0.10	64.7	0.0171	D	994.63
	182	10	0.10	64.4	0.0170	D	587.80
	183	3	0.10	64.4	0.0170	N	176.34
	184	4	0.10	61.9	0.0164	N	244.62
MAY 22-23/2006	191	2	0.10	68.7	0.0181	D	110.20
	192	8	0.10	69.3	0.0183	D	436.99
	193	3	0.10	68.8	0.0182	N	165.06
	194	4	0.10	72.1	0.0190	N	210.01
JUN 05-06/2006	201	0	0.10	77.9	0.0206	D	0.00
	202	1	0.10	79.9	0.0211	D	47.38
	203	0	0.10	77.4	0.0204	N	0.00
	204	0	0.10	78.0	0.0206	N	0.00
JUN 19-20/2006	211	0	0.10	60.4	0.0160	D	0.00
	212	0	0.10	61.4	0.0162	D	0.00
	213	0	0.10	59.0	0.0156	N	0.00
	214	0	0.10	58.8	0.0155	N	0.00

[+]No *Dorosoma* spp. eggs were collected outside the range of sample numbers and dates presented in the body of the table.

Appendix 11. Total number and density of total fish larvae collected per sample with entrainment sampling at the Cape Fear Plant, September 2005–August 2006.

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
SEP 13-14/2005	7	0	0.10	79.6	0.0210	D	0.00
	8	0	0.10	87.8	0.0232	D	0.00
	9	0	0.10	82.8	0.0219	N	0.00
	10	0	0.10	80.3	0.0212	N	0.00
SEP 27-28/2005	19	0	0.10	71.6	0.0189	D	0.00
	20	0	0.10	65.3	0.0173	D	0.00
	21	0	0.10	70.6	0.0187	N	0.00
	22	0	0.10	76.0	0.0201	N	0.00
OCT 10-11/2005	29	0	0.10	54.5	0.0144	D	0.00
	30	0	0.10	55.9	0.0148	D	0.00
	31	0	0.10	57.8	0.0153	N	0.00
	32	0	0.10	57.2	0.0151	N	0.00
	33	0	0.10	46.4	0.0123	D	0.00
	34	0	0.10	49.7	0.0131	D	0.00
	35	0	0.10	54.5	0.0144	N	0.00
	36	0	0.10	55.1	0.0146	N	0.00
OCT 24-25/2005	43	0	0.10	47.2	0.0125	D	0.00
	44	0	0.10	51.6	0.0136	D	0.00
	45	0	0.10	50.6	0.0134	N	0.00
	46	0	0.10	49.8	0.0132	N	0.00
NOV 07-08/2005	53	0	0.10	42.8	0.0113	D	0.00
	54	0	0.10	40.1	0.0106	D	0.00
	55	0	0.10	39.2	0.0104	N	0.00
	56	0	0.10	37.1	0.0098	N	0.00
NOV 21-22/2005	63	0	0.10	69.8	0.0184	D	0.00
	64	0	0.10	72.4	0.0191	D	0.00
	65	0	0.10	72.0	0.0190	N	0.00
	66	0	0.10	64.8	0.0171	N	0.00
DEC 05-06/2005	73	0	0.10	60.8	0.0161	D	0.00
	74	0	0.10	60.2	0.0159	D	0.00
	75	0	0.10	59.4	0.0157	N	0.00
	76	1	0.10	60.8	0.0161	N	62.26
DEC 19-20/2005	83	0	0.10	59.4	0.0157	D	0.00
	84	0	0.10	57.9	0.0153	D	0.00
	85	0	0.10	56.5	0.0149	N	0.00
	86	1	0.10	58.2	0.0154	N	65.04
JAN 03-04/2006	93	0	0.10	64.4	0.0170	D	0.00
	94	0	0.10	55.1	0.0146	D	0.00
	95	1	0.10	53.6	0.0142	N	70.62
	96	0	0.10	57.3	0.0151	N	0.00
JAN 16-17/2006	103	0	0.10	56.4	0.0149	D	0.00
	104	0	0.10	58.9	0.0156	D	0.00
	105	0	0.10	58.9	0.0156	N	0.00
	106	0	0.10	61.2	0.0162	N	0.00

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
JAN 30-31/2006	113	0	0.10	76.3	0.0202	D	0.00
	114	0	0.10	76.8	0.0203	D	0.00
	115	0	0.10	74.5	0.0197	N	0.00
	116	0	0.10	74.2	0.0196	N	0.00
FEB 13-14/2006	123	0	0.10	69.7	0.0184	D	0.00
	124	0	0.10	74.9	0.0198	D	0.00
	125	0	0.10	77.0	0.0203	N	0.00
	126	0	0.10	75.4	0.0199	N	0.00
FEB 27-28/2006	133	0	0.10	60.9	0.0161	D	0.00
	134	0	0.10	89.1	0.0235	D	0.00
	135	0	0.10	87.2	0.0230	N	0.00
	136	0	0.10	77.6	0.0205	N	0.00
MAR 13-14/2006	143	2	0.10	70.0	0.0185	D	108.16
	144	0	0.10	69.9	0.0185	D	0.00
	145	2	0.10	70.2	0.0185	N	107.85
	146	0	0.10	69.1	0.0183	N	0.00
MAR 27-28/2006	153	0	0.10	79.3	0.0209	D	0.00
	154		0.10	89.2	0.0236	D	0.00
	155	4	0.10	79.5	0.0210	N	190.46
	156	3	0.10	86.8	0.0229	N	130.83
APR 10-11-2006	163	7	0.10	31.8	0.0084	D	833.27
	164	4	0.10	33.7	0.0089	D	449.31
	165	3	0.10	32.8	0.0087	N	346.23
MAY 01-02/2006	171	27	0.10	56.2	0.0148	D	1818.63
	172	21	0.10	56.2	0.0148	D	1414.49
	173	8	0.10	53.6	0.0142	N	564.99
	174	21	0.10	55.8	0.0147	N	1424.63
MAY 08-09/2006	181	1	0.10	64.7	0.0171	D	58.51
	182	0	0.10	64.4	0.0170	D	0.00
	183	3	0.10	64.4	0.0170	N	176.34
	184	18	0.10	61.9	0.0164	N	1100.77
MAY 22-23/2006	191	4	0.10	68.7	0.0181	D	220.40
	192	2	0.10	69.3	0.0183	D	109.25
	193	8	0.10	68.8	0.0182	N	440.17
	194	5	0.10	72.1	0.0190	N	262.51
JUN 05-06/2006	201	7	0.10	77.9	0.0206	D	340.16
	202	13	0.10	79.9	0.0211	D	615.90
	203	11	0.10	77.4	0.0204	N	537.98
	204	22	0.10	78.0	0.0206	N	1067.69
JUN 19-20/2006	211	2	0.10	60.4	0.0160	D	125.35
	212	3	0.10	61.4	0.0162	D	184.96
	213	105	0.10	59.0	0.0156	N	6736.80
	214	17	0.10	58.8	0.0155	N	1094.43
JUL 05-06/2006	221	0	0.10	68.0	0.0180	D	0.00
	222	0	0.10	68.0	0.0180	D	0.00
	223	18	0.10	68.7	0.0181	N	991.82
	224	5	0.10	67.0	0.0177	N	282.50
JUL 18-19/2006	231	0	0.10	81.5	0.0215	D	0.00
	232	0	0.10	81.2	0.0215	D	0.00

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
	233	12	0.10	83.8	0.0221	N	542.07
	234	14	0.10	84.2	0.0222	N	629.41
AUG 01-02/2006	241	0	0.10	97.6	0.0258	D	0.00
	242	0	0.10	98.5	0.0260	D	0.00
	243	2	0.10	99.7	0.0263	N	75.94
	244	9	0.10	101.4	0.0268	N	335.99
AUG 14-15/2006	251	0	0.10	82.8	0.0219	D	0.00
	252	0	0.10	83.2	0.0220	D	0.00
	253	3	0.10	83.5	0.0221	N	136.00
	254	2	0.10	83.5	0.0221	N	90.67
AUG 29-30/2006	261	0	0.10	80.6	0.0213	D	0.00
	262	0	0.10	77.0	0.0203	D	0.00
	263	1	0.10	78.5	0.0207	N	48.22
	264	4	0.10	78.5	0.0207	N	192.89

Appendix 12. Total number and density of *Dorosoma* spp. larvae collected per sample with entrainment sampling at the Cape Fear Plant, September 2005–August 2006[+].

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
MAR 13-14/2006	143	0	0.10	70.0	0.0185	D	0.00
	144	0	0.10	69.9	0.0185	D	0.00
	145	0	0.10	70.2	0.0185	N	0.00
	146	0	0.10	69.1	0.0183	N	0.00
MAR 27-28/2006	153	0	0.10	79.3	0.0209	D	0.00
	154	0	0.10	89.2	0.0236	D	0.00
	155	2	0.10	79.5	0.0210	N	95.23
	156	0	0.10	86.8	0.0229	N	0.00
APR 10-11-2006	163	1	0.10	31.8	0.0084	D	119.04
	164	0	0.10	33.7	0.0089	D	0.00
	165	0	0.10	32.8	0.0087	N	0.00
MAY 01-02/2006	171	23	0.10	56.2	0.0148	D	1549.20
	172	18	0.10	56.2	0.0148	D	1212.42
	173	8	0.10	53.6	0.0142	N	564.99
	174	18	0.10	55.8	0.0147	N	1221.11
MAY 08-09/2006	181	1	0.10	64.7	0.0171	D	58.51
	182	0	0.10	64.4	0.0170	D	0.00
	183	3	0.10	64.4	0.0170	N	176.34
	184	17	0.10	61.9	0.0164	N	1039.62
MAY 22-23/2006	191	4	0.10	68.7	0.0181	D	220.40
	192	2	0.10	69.3	0.0183	D	109.25
	193	5	0.10	68.8	0.0182	N	275.10
	194	5	0.10	72.1	0.0190	N	262.51
JUN 05-06/2006	201	7	0.10	77.9	0.0206	D	340.16
	202	13	0.10	79.9	0.0211	D	615.90
	203	10	0.10	77.4	0.0204	N	489.08
	204	20	0.10	78.0	0.0206	N	970.63
JUN 19-20/2006	211	2	0.10	60.4	0.0160	D	125.35
	212	2	0.10	61.4	0.0162	D	123.30
	213	104	0.10	59.0	0.0156	N	6672.64
	214	12	0.10	58.8	0.0155	N	772.54
JUL 05-06/2006	221	0	0.10	68.0	0.0180	D	0.00
	222	0	0.10	68.0	0.0180	D	0.00
	223	17	0.10	68.7	0.0181	N	936.72
	224	5	0.10	67.0	0.0177	N	282.50
JUL 18-19/2006	231	0	0.10	81.5	0.0215	D	0.00
	232	0	0.10	81.2	0.0215	D	0.00
	233	7	0.10	83.8	0.0221	N	316.21
	234	14	0.10	84.2	0.0222	N	629.41

[+]No *Dorosoma* spp. larvae were collected outside the range of sample numbers and dates presented in the body of the table.

Appendix 13. Total number and density of channel catfish larvae collected per sample with entrainment sampling at the Cape Fear Plant, September 2005–August 2006[+].

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
JUL 05-06/2006	221	0	0.10	68.0	0.0180	D	0.00
	222	0	0.10	68.0	0.0180	D	0.00
	223	0	0.10	68.7	0.0181	N	0.00
	224	0	0.10	67.0	0.0177	N	0.00
JUL 18-19/2006	231	0	0.10	81.5	0.0215	D	0.00
	232	0	0.10	81.2	0.0215	D	0.00
	233	3	0.10	83.8	0.0221	N	135.52
	234	0	0.10	84.2	0.0222	N	0.00
AUG 01-02/2006	241	0	0.10	97.6	0.0258	D	0.00
	242	0	0.10	98.5	0.0260	D	0.00
	243	1	0.10	99.7	0.0263	N	37.97
	244	1	0.10	101.4	0.0268	N	37.33
AUG 14-15/2006	251	0	0.10	82.8	0.0219	D	0.00
	252	0	0.10	83.2	0.0220	D	0.00
	253	3	0.10	83.5	0.0221	N	136.00
	254	1	0.10	83.5	0.0221	N	45.33
AUG 29-30/2006	261	0	0.10	80.6	0.0213	D	0.00
	262	0	0.10	77.0	0.0203	D	0.00
	263	1	0.10	78.5	0.0207	N	48.22
	264	4	0.10	78.5	0.0207	N	192.89

[+]No channel catfish larvae were collected outside the range of sample numbers and dates presented in the body of the table.

Appendix 14. Total number and density of bluegill larvae collected per sample with entrainment sampling at the Cape Fear Plant, September 2005–August 2006[+].

Sample trip dates	Sample number	Total number	Duration	Sample Volume (m^3)	Sample Volume (MG)	Period	Density (Num. per MG)
JUN 05-06/2006	201	0	0.10	77.9	0.0206	D	0.00
	202	0	0.10	79.9	0.0211	D	0.00
	203	0	0.10	77.4	0.0204	N	0.00
	204	2	0.10	78.0	0.0206	N	97.06
JUN 19-20/2006	211	0	0.10	60.4	0.0160	D	0.00
	212	0	0.10	61.4	0.0162	D	0.00
	213	1	0.10	59.0	0.0156	N	64.16
	214	2	0.10	58.8	0.0155	N	128.76
JUL 05-06/2006	221	0	0.10	68.0	0.0180	D	0.00
	222	0	0.10	68.0	0.0180	D	0.00
	223	1	0.10	68.7	0.0181	N	55.10
	224	0	0.10	67.0	0.0177	N	0.00
JUL 18-19/2006	231	0	0.10	81.5	0.0215	D	0.00
	232	0	0.10	81.2	0.0215	D	0.00
	233	0	0.10	83.8	0.0221	N	0.00
	234	0	0.10	84.2	0.0222	N	0.00
AUG 01-02/2006	241	0	0.10	97.6	0.0258	D	0.00
	242	0	0.10	98.5	0.0260	D	0.00
	243	0	0.10	99.7	0.0263	N	0.00
	244	0	0.10	101.4	0.0268	N	0.00
AUG 14-15/2006	251	0	0.10	82.8	0.0219	D	0.00
	252	0	0.10	83.2	0.0220	D	0.00
	253	0	0.10	83.5	0.0221	N	0.00
	254	0	0.10	83.5	0.0221	N	0.00
AUG 29-30/2006	261	0	0.10	80.6	0.0213	D	0.00
	262	0	0.10	77.0	0.0203	D	0.00
	263	0	0.10	78.5	0.0207	N	0.00
	264	0	0.10	78.5	0.0207	N	0.00

[+]No bluegill larvae were collected outside the range of sample numbers and dates presented in the body of the table.