# Seasonal Abundance, GSI, and Age Structure of Gizzard Shad (*Dorosoma cepedianum*) in the Upper Barataria Estuary

A Thesis

Submitted to the Graduate Faculty of
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In partial fulfillment of the requirements for the degree of
Master of Science
in
Marine and Environmental Biology

by
Jacques F. Fontenot
B.S., Louisiana State University, 2004

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# CERTIFICATE

This is to certify that the thesis entitled “Seasonal abundance, GSI, and age structure of gizzard shad (*Dorosoma cepedianum*) in the upper Barataria Estuary” submitted for the award of Master of Science to the Nicholls State University is a record of authentic, original research conducted by Mr. Jacques F Fontenot under our supervision and guidance and that no part of this thesis has been submitted for the award of any other degree, diploma, fellowship, or other similar titles.

| APPROVED: | SIGNATURE: | DATE: |
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# ABSTRACT

The Barataria Estuary was historically part of the Mississippi River's active floodplain but has since been disconnected from the floodplain due to closing off of distributaries and construction of flood protection levees. Today, nutrient rich Mississippi River water flows directly to the Gulf of Mexico, rather than through the Barataria Estuary. Bayou Chevreuil is the main water body draining the upper northwest portion of the Barataria Estuary into Lac des Allemands, and provides access to the system's upper-most backwater habitats. This area is now deprived of an annual flood pulse, which is one of the most important hydrologic features that govern year to year production and diversity in large river floodplain ecosystems. Gizzard shad are common in most southeastern United State's lakes and reservoirs and typically account for the majority of fish biomass in these systems. Gizzard shad are important as nutrient cyclers, and are an important prey species in aquatic environments. This study was developed to understand gizzard shad dynamics in the upper Barataria Estuary. The relative abundance and spawning period of gizzard shad was assessed by sampling with monofilament gillnets. Four sites (3 nets/site) were sampled biweekly from November 2005 to September 2006. Dissolved oxygen (mg/l), temperature (°C), salinity (ppt), and Secchi disk depth (cm) were assessed at each site for each sample date, using a handheld oxygen-conductivity-salinity-temperature meter and Secchi disc. There was no significant difference in water quality parameters among sample sites. The gonadosomatic index (GSI) was used to determine spawning period and sagittal otoliths were used to determine the age structure of the population. Gizzard shad relative abundance in Bayou Chevreuil began to increase in January 2006, and remained relatively high until late April 2006. GSI values indicate that gizzard shad begin spawning in late March and continue to spawn through July in the upper Barataria Estuary. Female gizzard shad were significantly larger than males at ages 3 and 4, and catch rates were highest for age 3 fish. Gizzard shad exhibited faster growth rates when compared to other studies and our catch was made up of larger fish. Based on their abundance, growth rates, and ability to cycle nutrients, gizzard shad may be integral part of the upper Barataria Estuary.

# ACKNOWLEDGEMENTS

I would like to extend my sincere appreciation to my major professor Dr. Quenton Fontenot. The guidance, patience, expertise, and time that he has put into this project has been essential, and I am truly grateful. He has been a great mentor, and an even greater friend. I would also like to thank Dr. Allyse Ferrara and Dr. Gary LaFleur for serving on my committee, reviewing my thesis, and providing valuable advice throughout this project.

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Perhaps the greatest thanks should be extended to my parents. Their undying love and support through life and through my academic career, even when the road was bumpy, has shaped me into the person that I have become. I am truly grateful for all that they have done. I would also like to extend my thanks to Shelly Liles for her understanding and patience throughout my graduate studies.

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# INTRODUCTION

The Barataria Estuary, located in southeast Louisiana, is a diverse ecosystem ranging from cypress swamps to marshes to barrier islands along a salinity and elevation gradient. As part of the Mississippi River's active floodplain, river water historically flowed throughout the Barataria Estuary through distributaries (USACE 2004). The amount of water flowing through the Barataria Estuary was proportional to the Mississippi River's water level. However, closing off of distributaries and construction of flood protection levees has disconnected the Barataria Estuary from the Mississippi River's floodwaters (USACE 2004). Because Mississippi River floodwaters no longer flow through the upper Barataria Estuary, the hydrology of the area has been severely altered. Also, sediment and nutrient rich Mississippi River water flows directly to the Gulf of Mexico, rather than through the Barataria Estuary. Channelization of the Mississippi River has contributed to the loss of 526,000 ha of coastal land in Louisiana (LA) since 1930 (Barras et al. 2003; Barras et al. 1994; Dunbar et al. 1992).

The upper Barataria Estuary is composed of lakes, bayous, canals, and seasonally inundated wetlands. Bayou Chevreuil is the main water body draining the upper northwest portion of the Barataria Estuary into Lac des Allemands, and provides access to the systems upper-most backwater habitats. A patchwork of bottomland hardwood forests and cypress-tupelo swamps surround Bayou Chevreuil and become inundated during periods of high water (Sklar and Conner 1979). When the upper Barataria Estuary waterways were connected to the Mississippi River, the surrounding swamps and bottomlands would typically flood with river water in the spring and remain relatively dry in the fall. Today the only time the surrounding swamp and bottomlands are inundated is during periods of heavy local rainfall (Sklar and Conner 1979).

Severing of the connection between the mainstem river and floodplain is not unique to south Louisiana as human activities have altered most of the 79 large river floodplain ecosystems in the world (Welcomme 1985). The Mississippi River has been leveed and separated from its 98,000 $km^2$ floodplain from the mouth of the Ohio River to the Gulf of Mexico (Sparks 1995). However, the importance of active floodplains has been recognized, and floodplains have been preserved north of St. Louis along the upper Mississippi River as part of the National Fish and Wildlife Refuge System (NRC 1992).

To alleviate saltwater encroachment and land loss along the Louisiana coast, some of the Mississippi River is diverted through the Davis pond (Barataria Estuary) and Caernarvon (Breton Sound) freshwater diversion projects (Swenson et al. 2006). Mississippi River diversions were designed to provide a pulsed flow of freshwater and nutrients from the Mississippi River into target areas of degraded coastal marsh (Swenson et al. 2006). The Davis pond freshwater diversion was completed in 2001, and aims to preserve 13,354 ha of wetlands in the Barataria Basin, and the Caernarvon freshwater diversion is intended to preserve 6,474 ha of wetlands in the Breton Sound Basin (Hill and Green 2005). The Caernarvon freshwater diversion is capable of diverting 225 $m^3s^{-1}$ of Mississippi River water through the Breton Sound and the Davis Pond freshwater diversion is capable of diverting 300 $m^3s^{-1}$ of Mississippi River water through the Barataria Estuary (Swenson et al. 2006). Plans are being developed to increase the amount of Mississippi River water that flows into Bayou Lafourche (LDNR 2005).

The connection between large rivers and adjacent floodplains is manifested through predictable seasonal variation in water level. For the Mississippi River, water level is usually greatest in April and lowest in September, but the timing and duration of high water level can vary from year to year (Bonvillain 2006). Floodplains facilitate sediment transport and deposition, nutrient cycling, food availability, and influence the distribution of species within large river systems (Ward 1989). A characteristic of large river floodplains is a littoral zone that changes according to water level (Larson et al. 1981; Hall and Lambou 1990). The moving littoral zone in floodplains allows for rapid cycling of nutrients from terrestrial organic matter to the water column resulting in high primary productivity. Vegetation and organic matter accumulate on the terrestrial portion of the floodplain when water levels are low. During the high water period, the inundated terrestrial vegetation and organic matter are decomposed, releasing nutrients to the water column (Junk et al. 1989). Decomposition rates can increase with temperature to the point that water column dissolved oxygen (DO) levels become reduced to hypoxic levels (DO $\leq$ 2.0 mg/l; Rutherford et al. 2001; Fontenot et al. 2001). When water levels recede, nutrients in the water column become concentrated in main channels and stimulate primary production (Junk et al. 1989).

Fishery production in large river systems is strongly influenced by the predictable annual pulsing of the river discharge (Junk et al. 1989). Primary production in the main channel is often inhibited by water depth, high suspended load, strong turbulence, and current. However, aquatic primary production on larger river floodplains can be extremely high (Bayley 1995; Robertson et al. 1999; Junk et al. 1989). Average primary production per unit area in main river channels is a small fraction of aquatic primary production in their floodplains (Junk et al. 1989). The high level of production on large river floodplains is tied to lateral exchange between the floodplain and river channel, and nutrient cycling within the floodplain. The highest yields of large river fisheries are associated with adjoining floodplains (Richardson 1921; Lowe-McConnel 1964; Petrere 1983) with most of their production being derived from floodplain habitats (Welcome 1979; Bayley 1983). The annual flood pulse is one of the most important hydrologic features that govern year to year production and diversity in large river floodplain ecosystems (Junk et al. 1989; Ward 1989).

Gizzard shad belong to the herring family Clupeidae and are common in most southeastern United States (US) lakes and reservoirs (Noble 1981), and are also abundant in the Atchafalaya River Basin, LA (Fontenot et al. 2001; Rutherford et al. 2001; Bonvillain 2006). Gizzard shad are highly fecund, can mature within one year, and typically account for the majority of fish biomass in many lakes and reservoirs (Noble 1981). As primary consumers, gizzard shad contribute to ecosystem health as an important prey species (Noble 1981; Storck 1986; Johnson et al. 1988). As the abundance of a preferred prey species increases, predator growth can increase as well (Forney 1977; Fox 1989). Piscivore growth rates have been shown to increase as gizzard shad abundance increases (Ney et al. 1990). The largemouth bass *Micropterus salmoides*, a popular freshwater sportfish, is an abundant predator in southern reservoirs (Jenkins 1975; Miranda 1984), and gizzard shad make up a large proportion of its diet (Storck 1986).

Gizzard shad are the only clupeid that rely on sediment detritus as a food source (Vanni et al. 2005). At sizes >35mm standard length (SL) gizzard shad feed primarily on sediment associated organic detritus (Pierce et al. 1981; Mundahl and Wissing, 1987), and are important for nutrient transport from sediments to the water column by excreting nitrogen and phosphorus (Vanni 1996). Primary productivity can be increased by nutrients released from lake sediments (Nowlin et al. 2005) and gizzard shad can facilitate high primary productivity in aquatic systems by excreting a steady source of detritus based nutrients (Kitchell et al. 1975; Vanni 1996).

Gizzard shad abundance increases with ecosystem productivity (Vanni et al. 2005; Bachmann et al. 1996; DiCenzo et al. 1996; Michaletz 1997; Bremigan and Stein 2001). Because gizzard shad are highly fecund, their population size can rapidly increase in newly colonized areas (Stein et al. 1995). Due to their rapid growth rate, resulting from omnivory or facultative detritivory, young-of-the-year (YOY) gizzard shad may outgrow many predators and become abundant in eutrophic ecosystems (Stein et al. 1995). The timing of nutrient and detritus input into water bodies is mediated by watershed features, and can affect population dynamics of gizzard shad by promoting juvenile gizzard shad success. Agricultural watersheds promote the success of detritivorous life stages of gizzard shad by exporting greater quantities of particulate matter than do forested and urban watersheds (Vanni et al. 2005).

Gizzard shad population dynamics differ throughout their geographical range. Gizzard shad often obtain a higher biomass in southern US reservoirs than northern US reservoirs, and can negatively impact other fish species by competing for space or through larval food competition when they reach sizes that make them unavailable to predators (Noble 1981). In most US habitats, gizzard shad attain greatest abundance in late summer and early fall due to the recruitment of YOY. They also accumulate in shallow waters just before and during their spawning season in late spring, when mature shad gather to spawn (Bodola 1964).

Environmental cues, such as photoperiod and temperature, influence reproductive cycles of fishes by stimulating sense organs or glands to produce gonad development hormones. Gonad development hormones can then induce physiological or behavioral responses within the fish (Moyle and Cech 1982). The hypothalamus induces gonadotropin production and release by the anterior pituitary, which in turn stimulates hormone release by the gonads (Jameson 1988). Vitellogenin (Vtg), is a precursor to yolk protein (Pan et al. 1969; Kunkel and Nordin, 1985; Selman and Wallace, 1989), and is synthesized in the liver of oviparous vertebrates after hormonal (estrogen) induction. Vtg is then transported by the bloodstream to the gonads and is sequestered by developing oocytes, which leads to growth of the ovary (Flickinger and Rounds, 1956; Wallace and Jared, 1969). The gonadosomatic index (GSI; gonad weight/total body weight*100) is a reflection of gonad size, thus GSI values for fish are generally highest immediately prior to spawning. A rise in GSI is observed in the two months prior to spawning, and the pattern of a gradual rise and fall in GSI has been used to determine spawning period of gizzard shad (Bodola 1964; Baglin and Kilambi 1968).

Gizzard shad are an abundant species in Louisiana large river ecosystems (Fontenot et al. 2001; Rutherford et al. 2001; Bonvillain 2006). This study was developed to understand gizzard shad dynamics in the upper Barataria Estuary. The specific objectives of my study were to:

1. Determine the biweekly relative abundance of gizzard shad at four sites within Bayou Chevreuil between November 2005 and September 2006.

2. Determine the age structure of the gizzard shad population in Bayou Chevreuil.
3. Determine the bimonthly, sex-specific GSI for gizzard shad in Bayou Chevreuil between November 2005 and September 2006.
4. Document the water quality of each sample site by assessing dissolved oxygen (DO; mg/L), temperature (°C), salinity (ppt), conductivity (uS), and Secchi disc depth (cm).

# METHODS

## Seasonal Abundance

Gizzard shad were collected biweekly, at four locations in Bayou Chevreuil (Figure 1), between 22 November 2005, until 6 September 2006 with monofilament gill nets. Access to site 4 was not possible until 3 February 2006 due to low water levels and an abundance of submerged aquatic vegetation (*Hydrilla verticillata, Ceratophyllum demersum*). Three nets were set at each site between 800 and 1300 hours. Two identical nets (23m long, 1.8m depth, 38mm bar mesh) and a single 23m dual mesh net (first section: 11.5m long, 1.8m depth, 38mm bar mesh; second section: 11.5m long, 1.8m depth, 25.4mm bar mesh) were used at each site. A concrete weight was tethered to the lead line at both ends of the net and the top was suspended by a single float at each end of the float line. The dual mesh net and one of the uniform mesh nets were set along the opposite bank of the bayou of the other uniform mesh net. Nets were deployed approximately 2m from the bank and stretched out towards the center of the Bayou at approximately 45° towards the East to allow for passage of boat traffic. Nets remained deployed for approximately 2 hr except for 27 May 2006, when nets were deployed for approximately 7 hr. Catch per unit effort (CPUE) for each net was determined by the number of gizzard shad caught per hour. CPUE for each site, on each sample date, was determined as the mean CPUE of the three nets at each site. All fish collected were identified and enumerated.

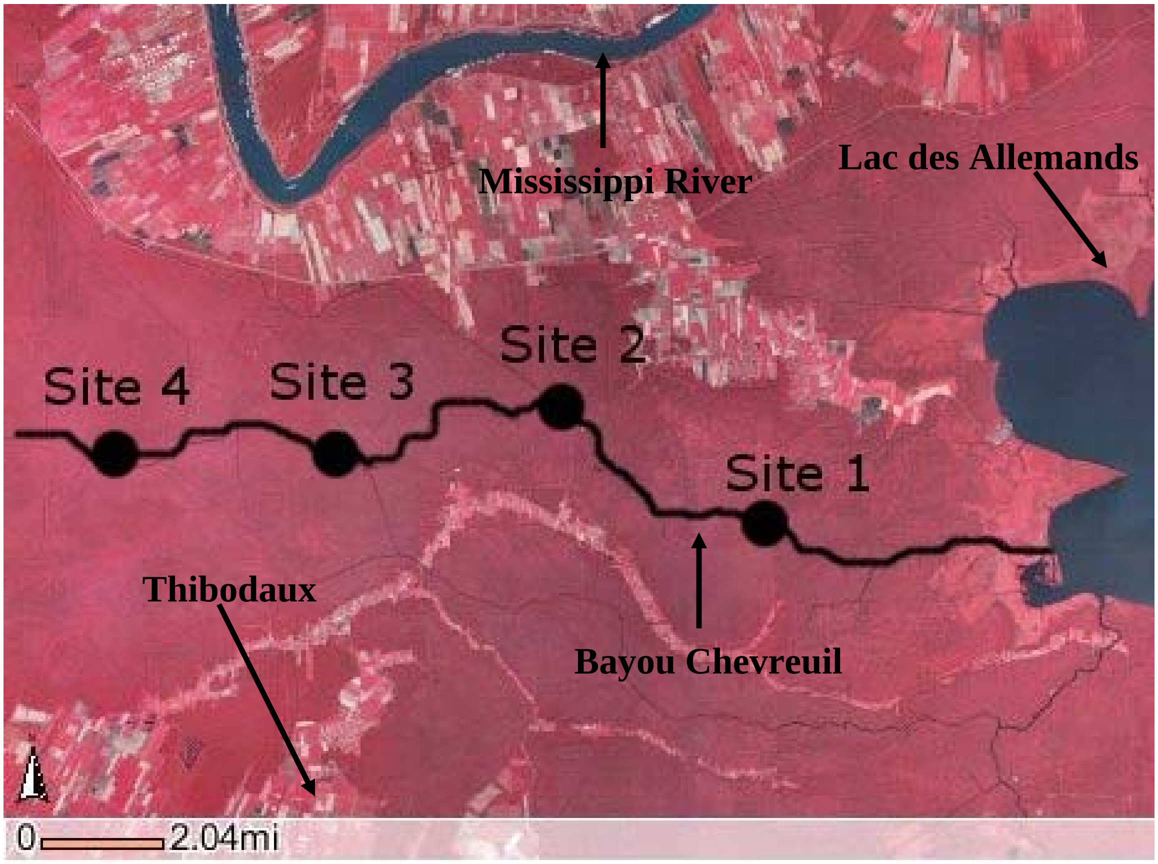

**Figure 1.** Location of the four study sites located on Bayou Chevreuil. GPS coordinates for each site are. Site 1; 29°54’01.72”N, 90°41’30.74”W: Site 2; 29°55’44.95”N, 90°44’45.11”W: Site 3; 29°54’49.55”N, 90°47’55.45”W: Site 4; 29°55’26.35”N, 90°49’13.49”W.

## Gonadosomatic Index

All gizzard shad collected were sorted by site and net, placed on ice, and transported back to the Nicholls State University Bayousphere Research Laboratory (www.nicholls.edu/bayousphere), where they were sexed, weighed (g), and measured (mm; total length). Gonads were then removed and weighed (g) to calculate the gonadosomatic index [GSI; (gonad weight/total body weight)*100]. There was no difference (analysis of variance; alpha = 0.05; SAS 2003) among sites for GSI for each sample day; therefore, values for each site were pooled to calculate a mean GSI value for each sample week for male and female gizzard shad in Bayou Chevreuil.

## Age Structure

To age the fish, sagittal otoliths were removed and stored in individual 2.0ml, plastic, micro-centrifuge tubes until processed. Fish were separated into 25mm total length (TL) groups and up to 5 fish per group per sample date were aged (N=243). Otoliths were analyzed in whole view at 40x magnification using a compound microscope. In addition, some otoliths were sectioned with a scalpel at the core, polished on 600 grit sandpaper, and observed at 40x magnification using a dissecting microscope as described in Clayton and Maceina (1999). Analysis of variance (alpha = 0.05) was used to compare age specific size differences between sexes (SAS 2003). A von Bertlanffy growth curve was used to describe growth for males and females separately (FAST 2.0; Slipke and Maceina 2001).

## Water Quality

Dissolved oxygen (DO; mg/L), temperature (°C), specific conductance (µS), and salinity (ppt) were assessed 0.6m below the surface at each site for each sample date, using a handheld oxygen-conductivity-salinity-temperature meter (Yellow Springs Instruments, Yellow Springs, Ohio). Secchi disc depth (cm) was also recorded. A malfunction in the handheld oxygen-conductivity-salinity-temperature meter did not allow for dissolved oxygen assessment at any site on 27 May 2006. Mean monthly rainfall data (mm) for January 2002-September 2006, was calculated from daily rainfall data obtained from USGS gage #07380401 located SW of Donaldsonville, Louisiana. Monthly photoperiod, data for the 15th of months January-July, was obtained from the United States Naval Observatory (http://aa.usno.navy.mil/) for Cleveland, Ohio; Wichita, Kansas; Little Rock, Arkansas; and Thibodaux, Louisiana.

# RESULTS

A total of 947 fish (14 species) were collected with gill nets during this study (Table 1). Gizzard shad and spotted gar *Lepisosteus oculatus* were the two most common species collected (Table 1). For gizzard shad, a total of 239 females (332 ±49.5mm TL; 400 ±160.9g; mean ± SD) and 276 males (311mm ±37.1 TL; 305 ±85.0g) were collected (Figure 2). Gizzard shad weight (W) increased exponentially with total length (TL) for both males ($W=-5.27TL^{3.1}$; Figure 3), and females ($W=-5.56TL^{3.2}$; Figure 4). With the exception of five males collected in mid November 2005 (305 ±25.3mm TL), small gizzard shad dominated the catch until the beginning of February and the size remained fairly constant throughout the rest of the study (Figure 5).

Sagittal otoliths were removed from 244 of the 515 collected gizzard shad from 25mm size groups as previously described. Ages ranged from 1-5 with age 3 being the most abundant year class (Figure 6). There was no difference in size between males and females for ages 1 and 2, but females were larger than males for ages 3 ($P<0.0001$) and 4 ($P=0.0029$). No five year old males were collected. Using the von Bertlanffy growth equation, maximum size ($L_\infty$) for females was 452mm and maximum size ($L_\infty$) for males was 352mm. The longest female collected was 426mm and the longest male collected was 362mm. The von Bertlanffy growth equation for females was $L_t=452(1-e^{-.433(t+0.258)})$ and for males was $L_t=352(1-e^{-.935(t-.145)}$; Figure 7). Temperature, salinity, specific conductance, and Secchi disc depth did not differ among sites; therefore, water quality data among sites were pooled for each sample date.

**Table 1.** Total number of each fish species collected between 22 November 2005, and 6 September 2006, from four sites in Bayou Chevreuil with 25.4 and 38 mm bar mesh monofilament gill nets.

| Species | Common Name | Number |
|---|---|---|
| *Dorosoma cepedianum* | Gizzard Shad | 677 |
| *Lepisosteus oculatus* | Spotted Gar | 105 |
| *Amia calva* | Bowfin | 37 |
| *Ictaluris punctatus* | Channel Catfish | 36 |
| *Mugil cephalus* | Striped Mullet | 28 |
| *Morone mississippiensis* | Yellow Bass | 24 |
| *Ictalurus furcatus* | Blue Catfish | 19 |
| *Dorosoma pentenese* | Threadfin Shad | 9 |
| *Lepomis macrochirus* | Bluegill | 4 |
| *Pomoxis nigromaculatus* | Black Crappie | 3 |
| *Cyprinus carpio* | Common Carp | 2 |
| *Micropterus salmoides* | Largemouth Bass | 2 |
| *Aplodinotus grunniens* | Freshwater Drum | 1 |

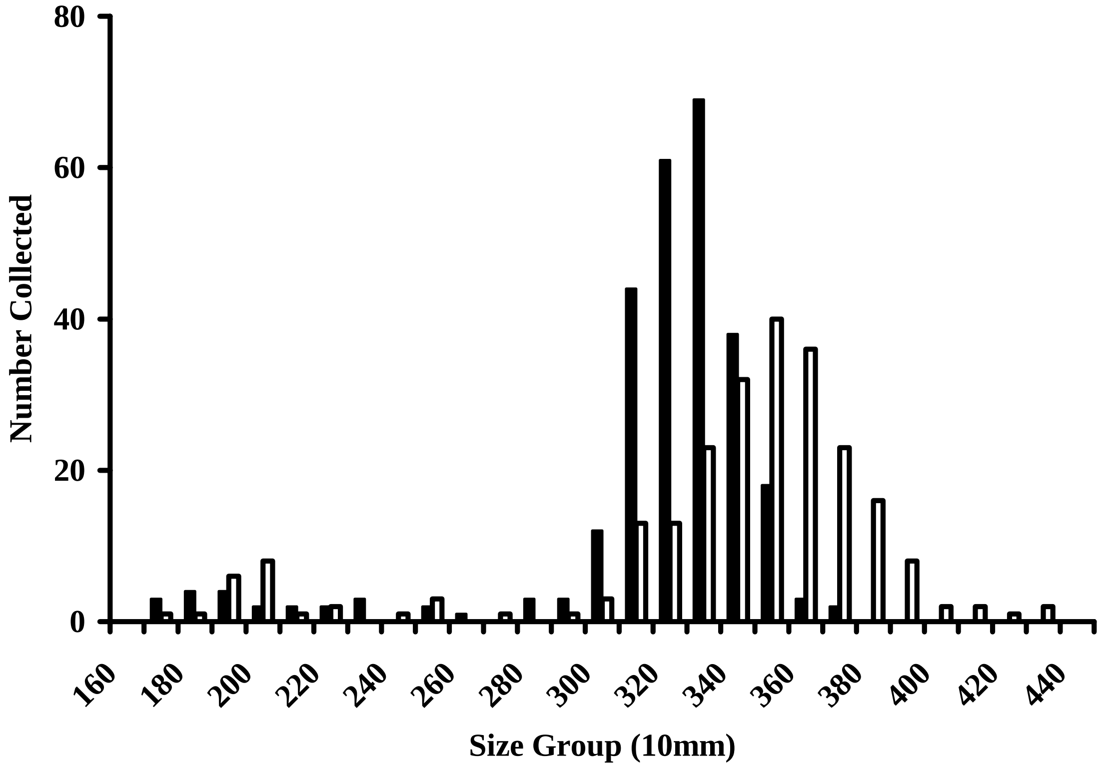

**Figure 2.** Size structure of female (N=239; open bars) and male (N=276; solid bars) gizzard shad collected from all four sites in Bayou Chevreuil with 25.4 and 38 mm bar mesh monofilament gill nets from 22 November 2005, to 6 September 2006.

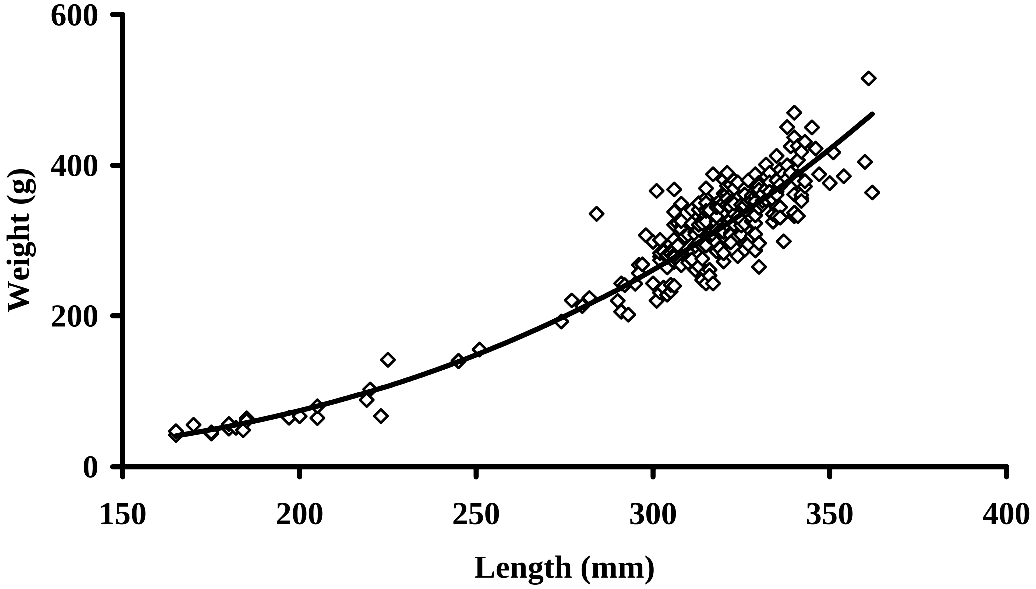

**Figure 3.** Weight-length relationship for male gizzard shad (N=275; $r^2$=0.94; P<0.0001) collected with 25.4 and 38 mm bar mesh monofilament gill nets from 22 November 2005 to 6 September 2006. The line denotes predicted weight while markers denote observed weight.

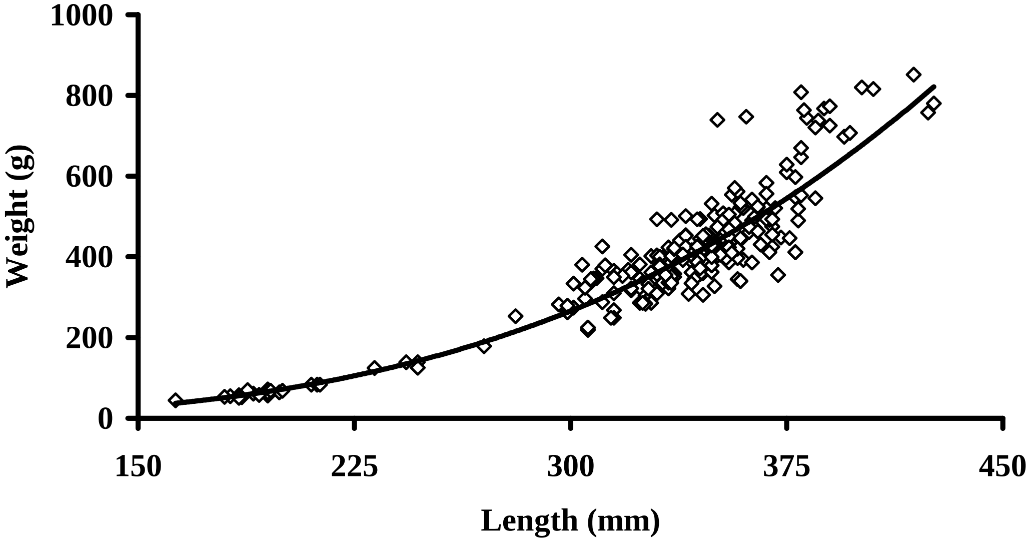

**Figure 4.** Weight-length relationship for female gizzard shad (N=239; $r^2$=0.94; P<0.0001) collected with 25.4 and 38 mm bar mesh monofilament gill nets from 22 November 2005, to 6 September 2006. The line denotes predicted weight while markers denote observed weight.

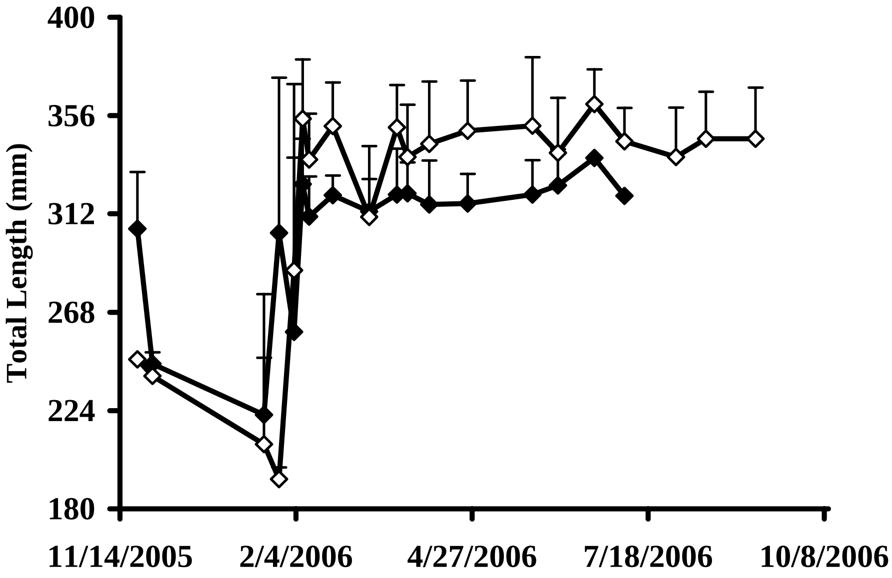

**Figure 5.** Mean (±SD) total length (mm) for male (closed diamond) and female gizzard shad (open diamond) collected with 25.4 and 38 mm bar mesh monofilament gill nets for all sites combined for each sample date.

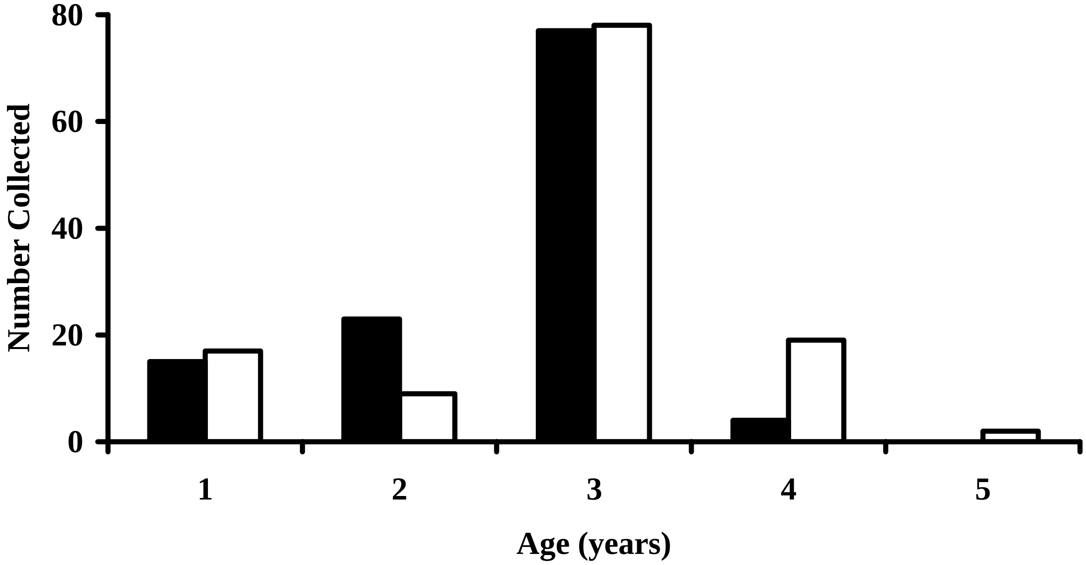

**Figure 6.** Age structure for male (N=119; solid bars) and female (N=125; open bars) gizzard shad collected with 25.4 and 38 mm bar mesh monofilament gill nets from 22 November 2005 to 6 September 2006.

**Figure 7** von Bertlanffy growth curve for male (solid line) and female (dashed line) gizzard shad collected with 25.4 and 38 mm bar mesh monofilament gill nets from 22 November 2005 to 6 September 2006**.** Lines denote predicted total length at age while markers denote mean observed total length at age.

Mean water temperature (all four sites combined) in Bayou Chevreuil ranged from 13.8˚C on 20 January 2006, to 31.1˚C on 31 July 2006 (Figure 8). Mean DO for all sites combined was lowest on 14 August 2006 (0.74 mg/l) and was highest on 25 April 2006 (6.92 mg/l; Figure 9). Mean salinity was highest (0.55 ppt) on 23 June 2006, and remained between 0.1 ppt and 0.3ppt for all other sample dates (Figure 10). Specific conductance steadily increased from 3 February 2006, to 25 April 2006 (Figure 11). A decrease in specific conductance was observed from 25 April 2006, through 6 June 2006, followed by a peak on 23 June 2006. Secchi disc depth remained relatively constant throughout the sampling period with a peak on 31 July 2006, and a low on 14 August 2006 (Figure 12). There was no clear seasonal trend for mean monthly rainfall (Figure 13). Photoperiod was similar among all four locations in March, but was longer for the northern locations in June (Figure 14).

Gizzard shad CPUE in Bayou Chevreuil began to increase in January 2006, and remained high until late April 2006 (Figure 15). Catch per unit effort for all sites ranged from 0 to 15.83 for the duration of the study. The most gizzard shad collected on one date at one site was 95. Site 1 gizzard shad CPUE was highest on 7 April 2006 (N=23; CPUE=3.83), and declined until the end of the sample period (Figure 16). It should be noted that CPUE for site 1 was zero on 10 March 2006 when all three other sites recorded their highest mean CPUE (Figure 15). Site 2 gizzard shad CPUE began to increase in late January and remained high until early April (Figure 17).

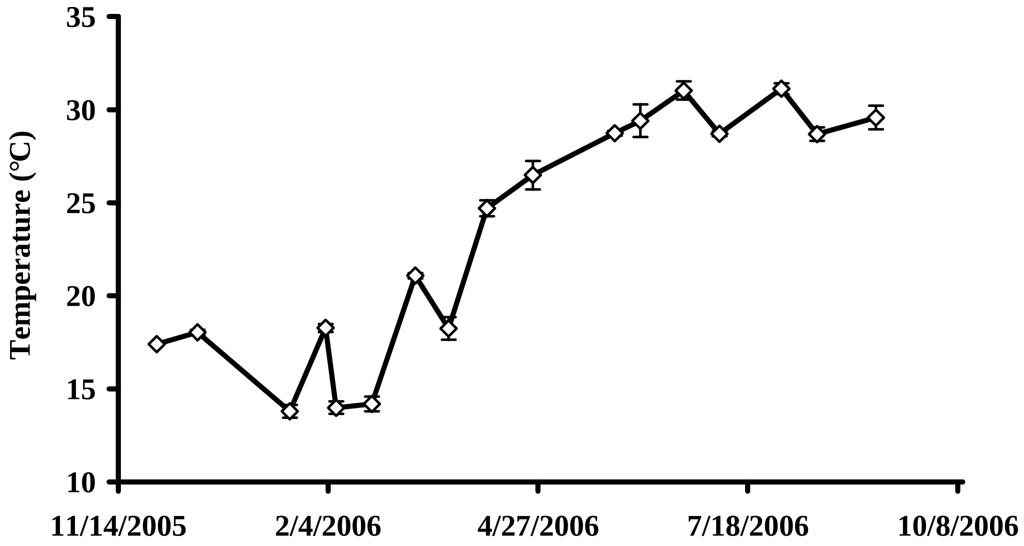

**Figure 8.** Mean (±SD) temperature for all sites combined on Bayou Chevreuil for each sample date.

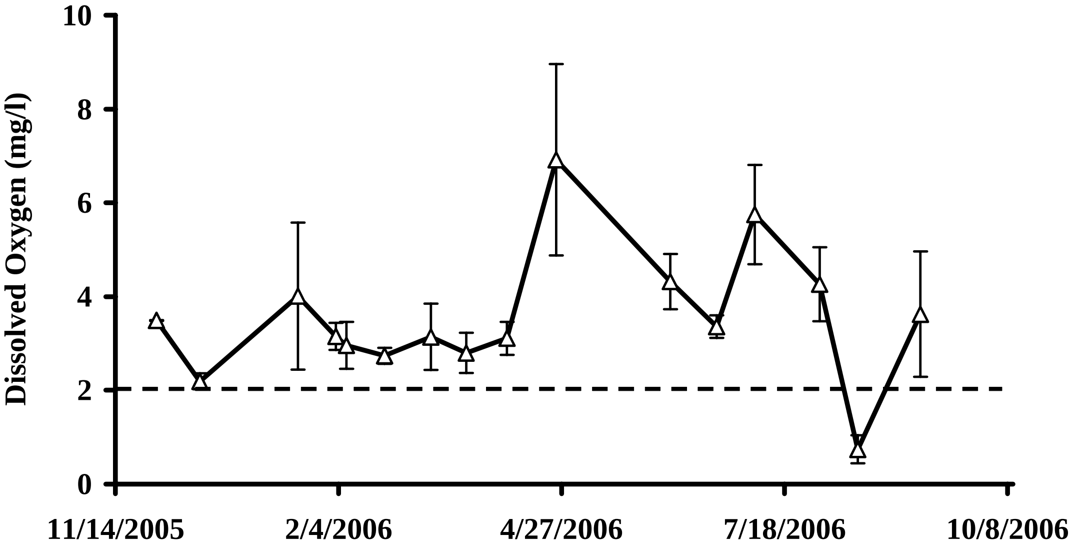

**Figure 9.** Mean (±SD) dissolved oxygen (mg/l) for all four sites combined in Bayou Chevreuil for each sample date. The dashed line marks 2.0 mg/l.

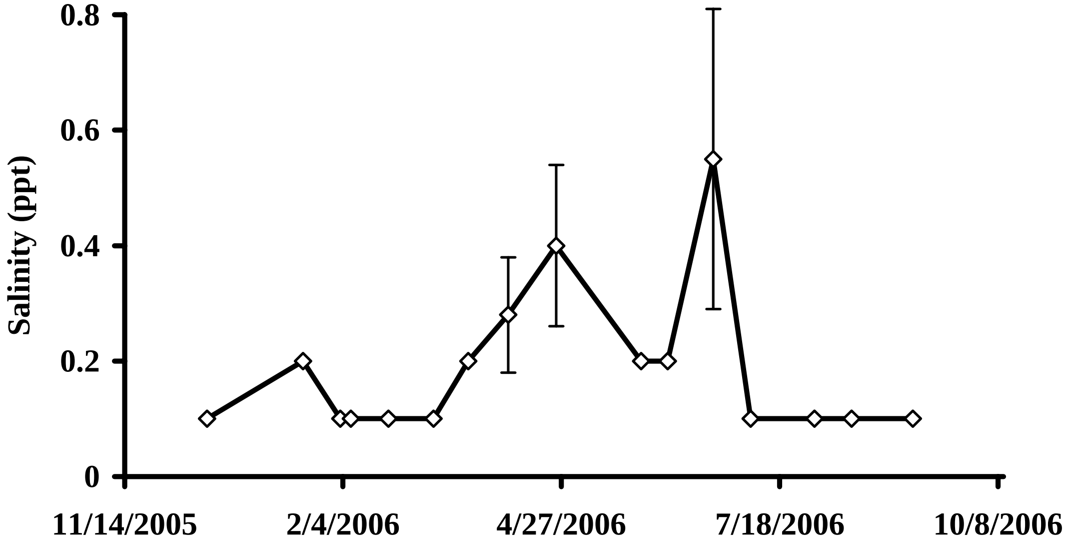

**Figure 10.** Mean (±SD) salinity (ppt) for all four sites combined in Bayou Chevreuil for each sample date.

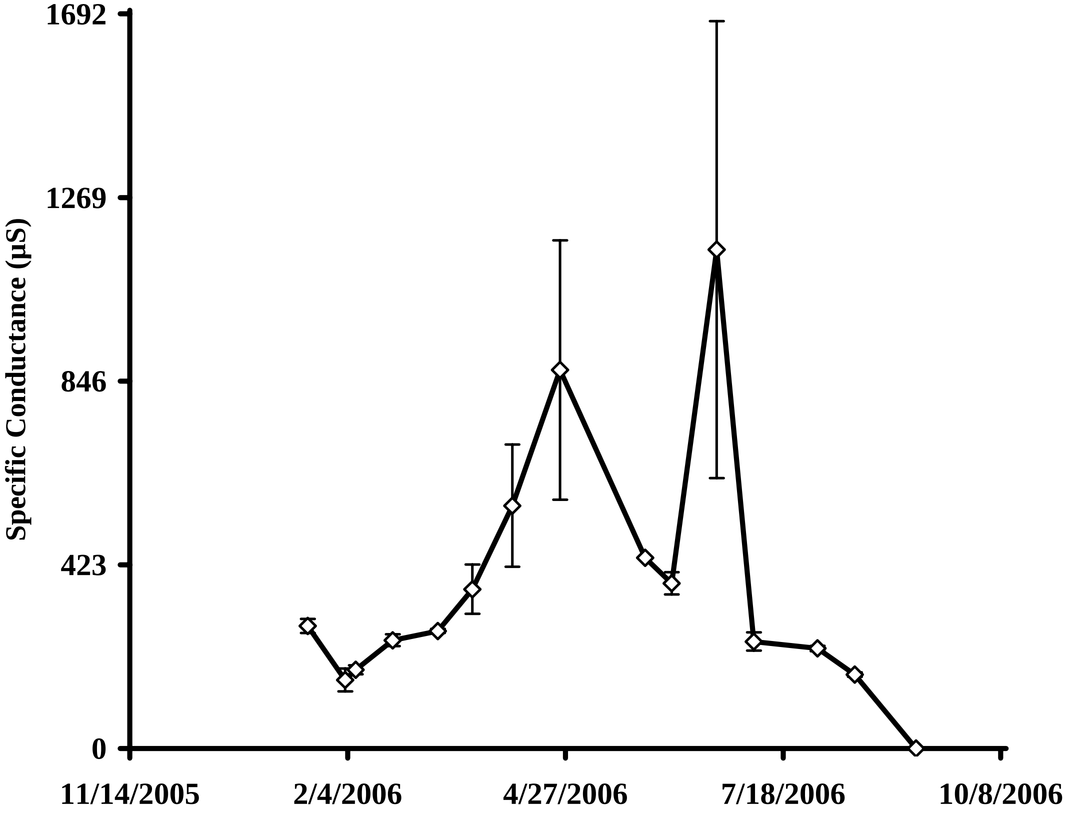

**Figure 11.** Mean (±SD) specific conductance (µS) for all four sites combined in Bayou Chevreuil for each sample date.

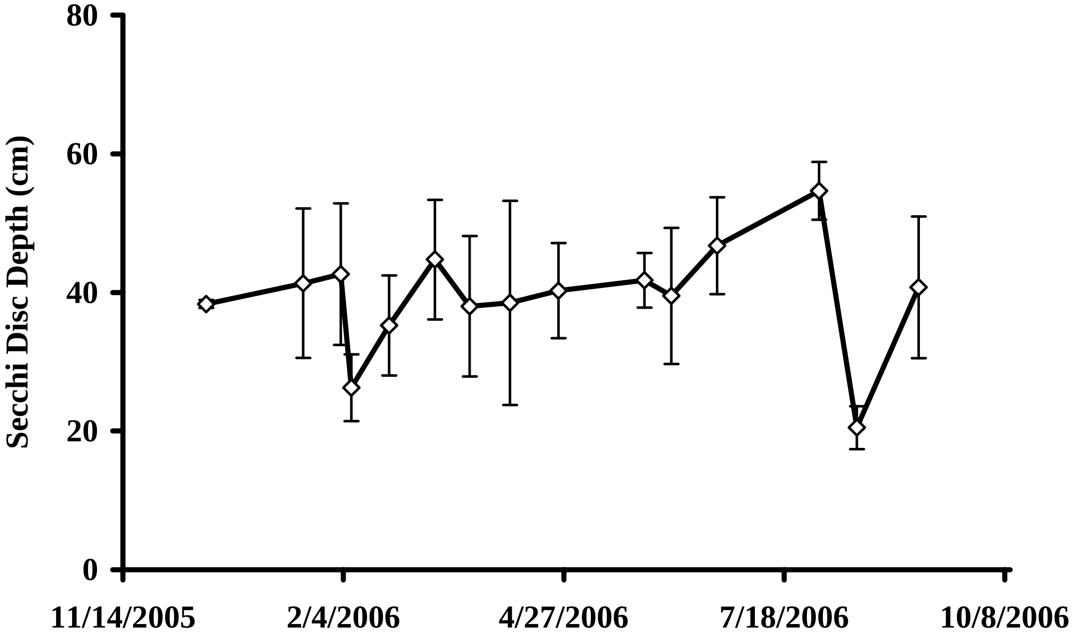

**Figure 12.** Mean (±SD) Secchi disc depth (cm) for all four sites combined in Bayou Chevreuil for each sample date.

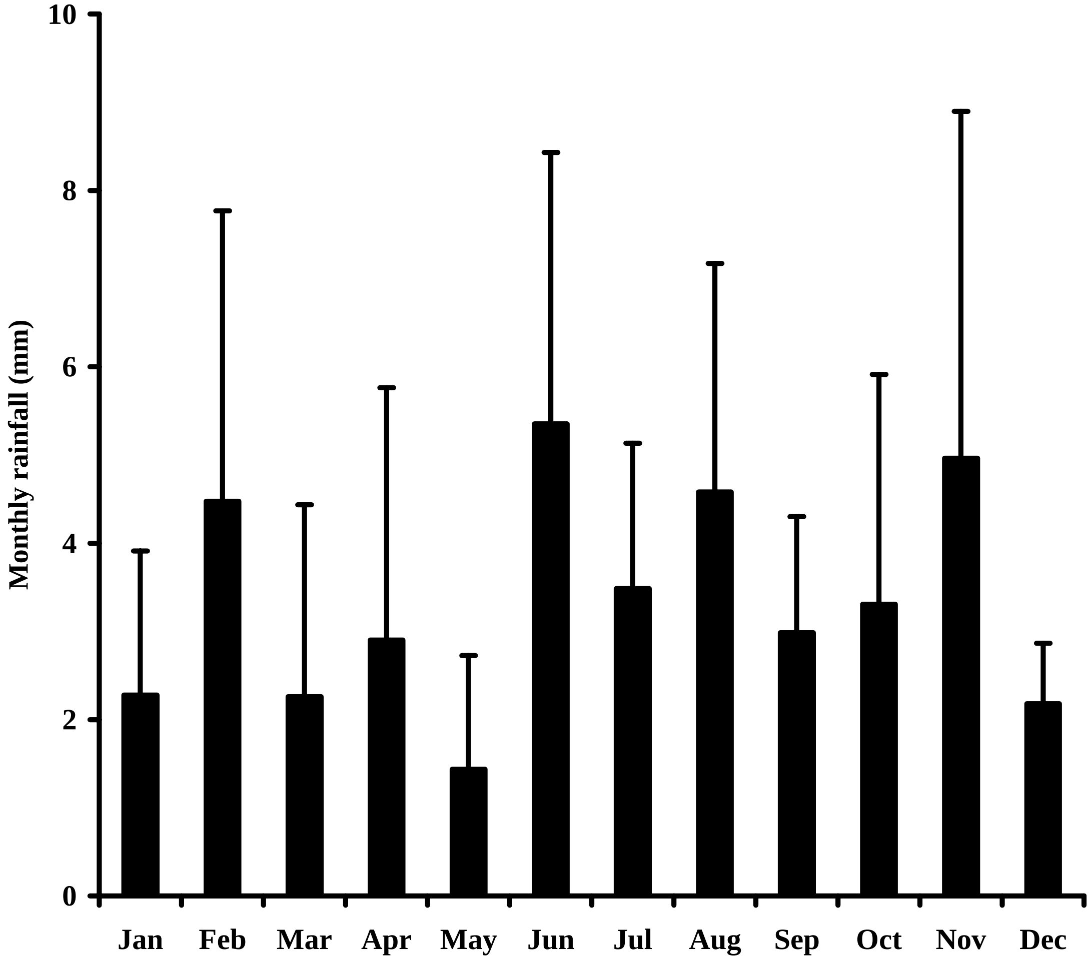

**Figure 13.** Mean (±SD) monthly rainfall for January 2000 to September 2006.

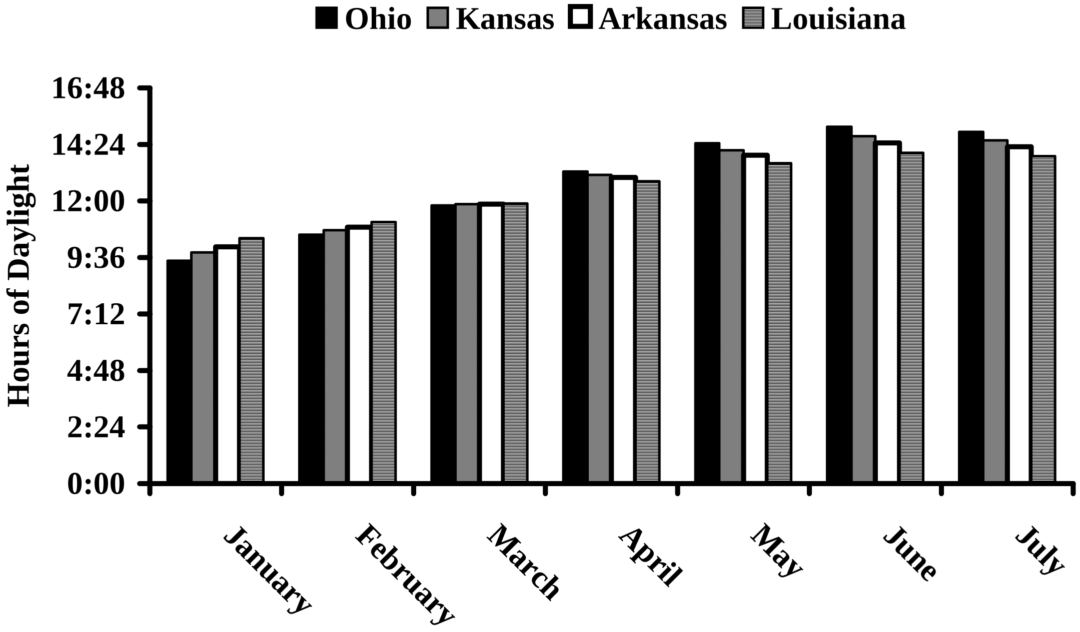

**Figure 14.** Photoperiod for the 15th of January-July 2006, for Ohio, Kansas, Arkansas, and Louisiana.

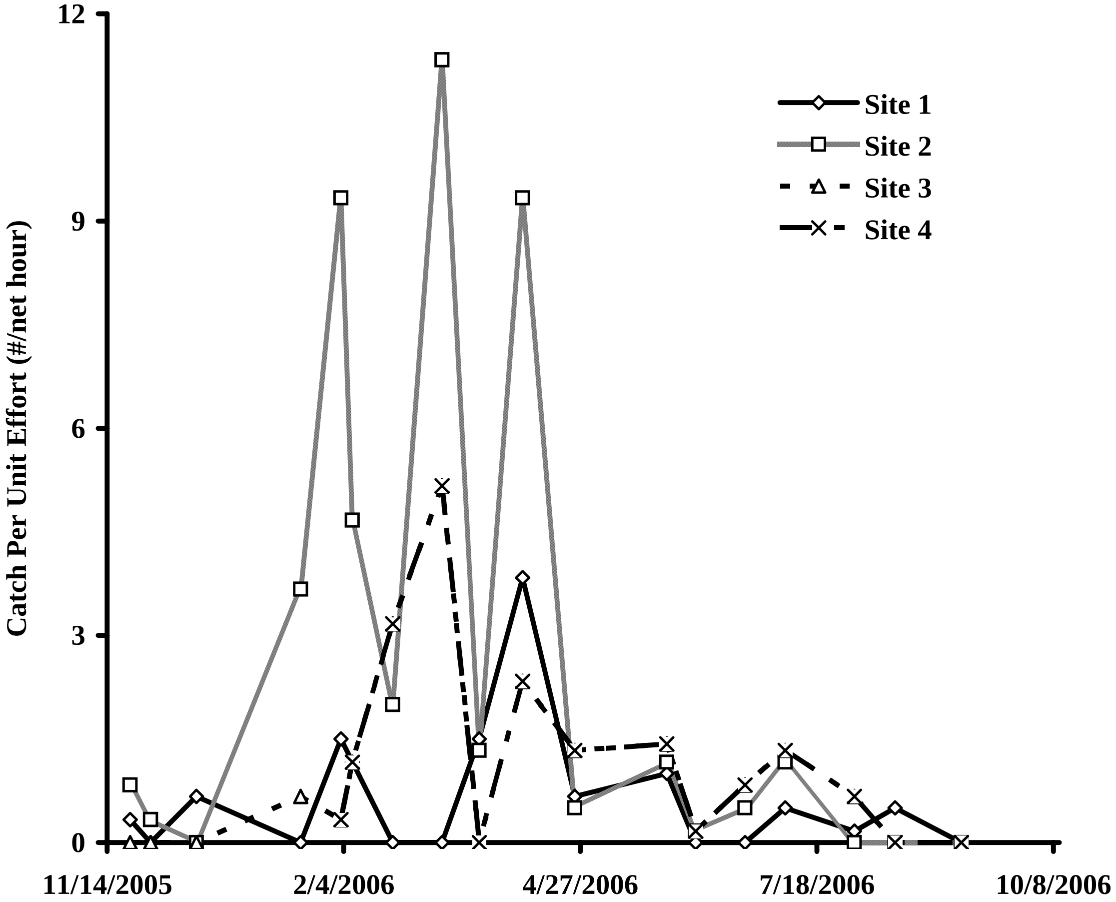

**Figure 15.** Mean gizzard shad catch per unit effort for each site on Bayou Chevreuil. Site 1 through 3 from 22 November 2005, to 6 September 2006; site 4 from 3 February 2006 to 6 September 2006.

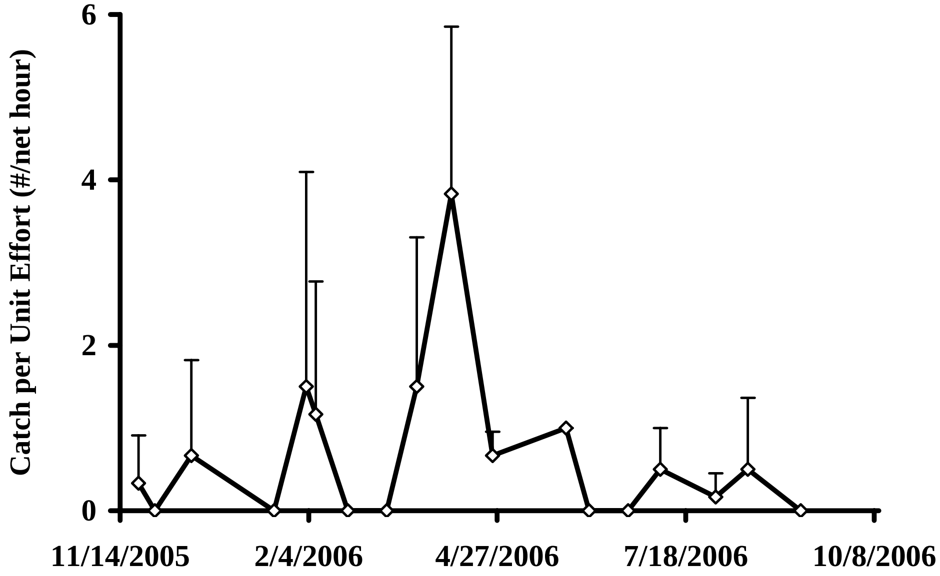

**Figure 16.** Mean (±SD) gizzard shad catch per unit effort for site 1 from 22 November 2005, to 6 September 2006.

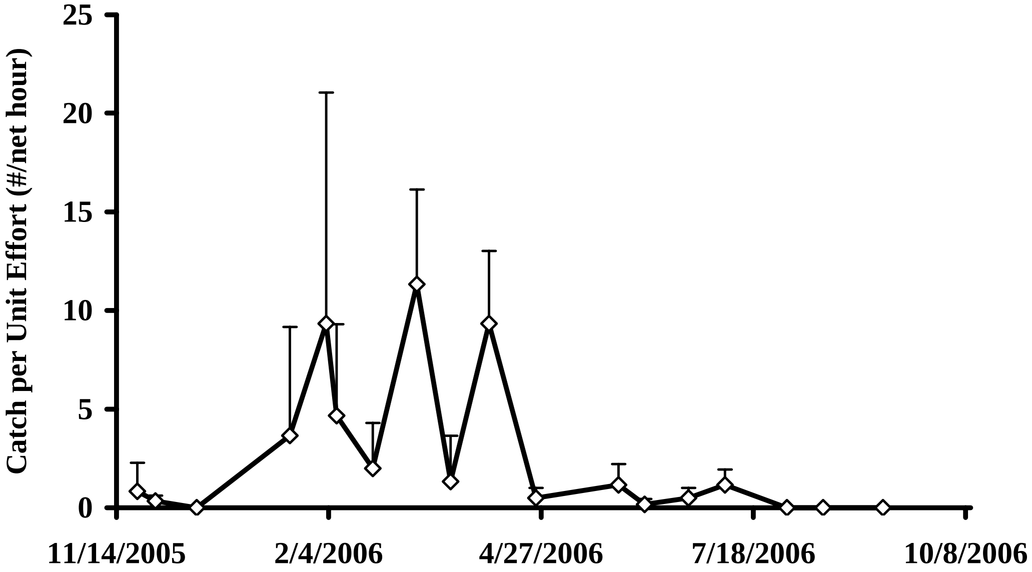

**Figure 17.** Mean (±SD) gizzard shad catch per unit effort for site 2 from 22 November 2005 to 6 September 2006.

CPUE was highest on 10 March 2006 (N= 68; CPUE= 7.00; Figure 17). CPUE for site 3 began to increase in early February and peaked in mid March (N=31; CPUE=5.17; Figure 18). Site 4 CPUE began to increase in late February and yielded the highest number of gizzard shad on a single sample date for all sites (N=95, CPUE=15.83) on 10 March 2006 (Figure 19). There was no difference in CPUE among sites for each sample date, so CPUE was pooled among sites for comparison to water quality parameters. There was no relationship between any water quality parameter and CPUE. However, it appears that temperature may have influenced CPUE in the spring, but I did not detect a significant correlation. Also, DO levels below 2.0 mg/l were only recorded once (Figure 20).

The highest mean GSI for male gizzard shad occurred when water temperature was approximately 21ºC (Figure 21), and GSI dropped steadily as water temperature increased above 24ºC (Figure 21). Female GSI began to increase when water temperature was approximately 15ºC and peaked at approximately 24ºC (Figure 22). Female GSI dropped steadily as water temperature increased above 24ºC (Figure 22). The first spent gizzard shad ovary was observed on 28 March 2006, and all ovaries were spent by 31 July 2006 (Figure 23). Based on GSI, it appears that gizzard shad begin spawning in late March and continue throughout July in the upper Barataria Estuary.

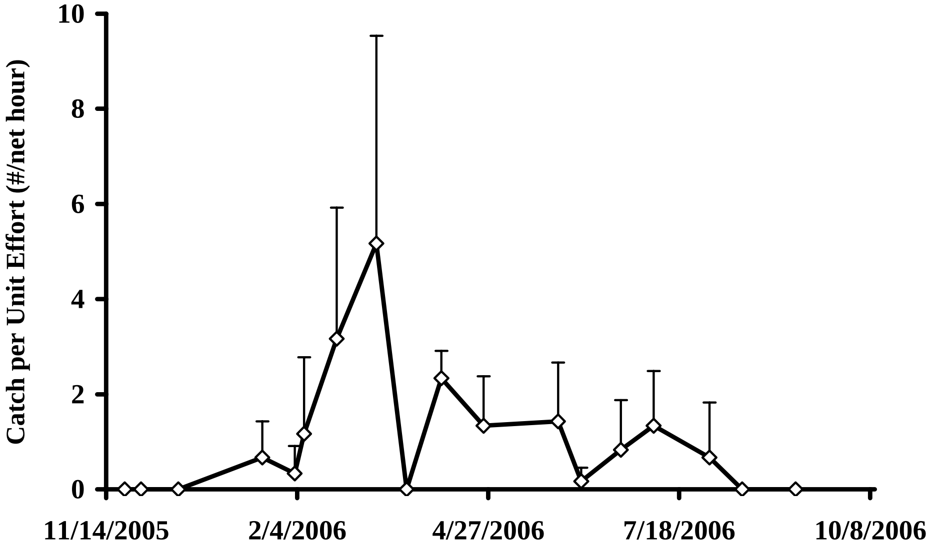

**Figure 18.** Mean (±SD) gizzard shad catch per unit effort (CPUE) for site 3 from 22 November 2005, to 6 September 2006.

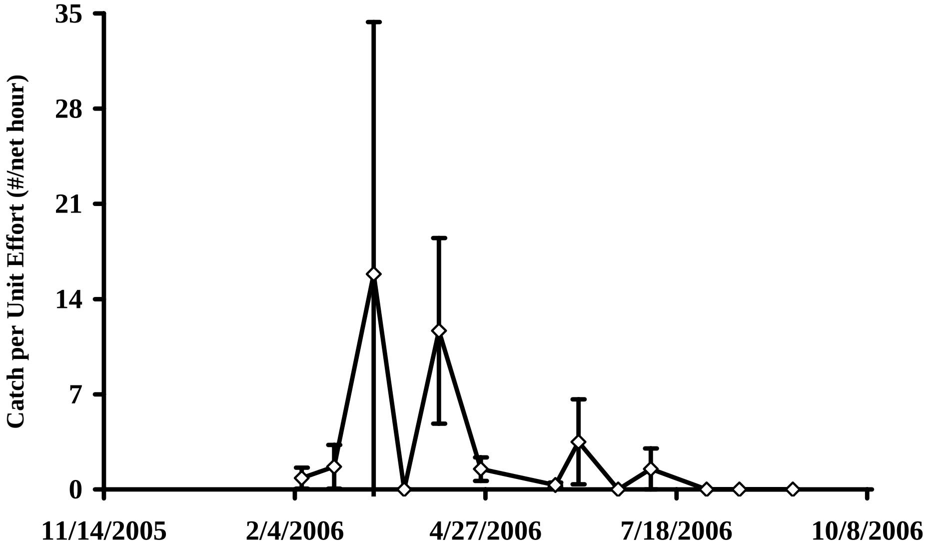

**Figure 19.** Mean (±SD) gizzard shad catch per unit effort for site 4 from 3 February 2006, to 6 September 2006.

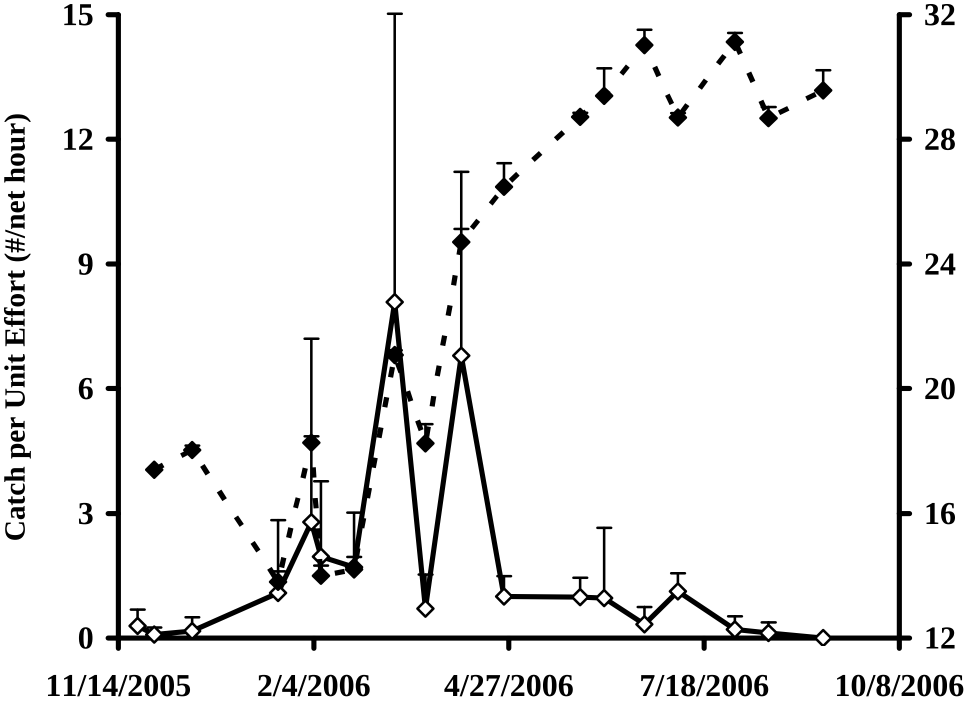

**Figure 20.** Mean (±SD) gizzard shad catch per unit effort (CPUE) for all sites combined and mean (±SD) temperature for all sites combined on Bayou Chevreuil for each sample date. CPUE is denoted by open diamonds and temperature is denoted by closed diamonds.

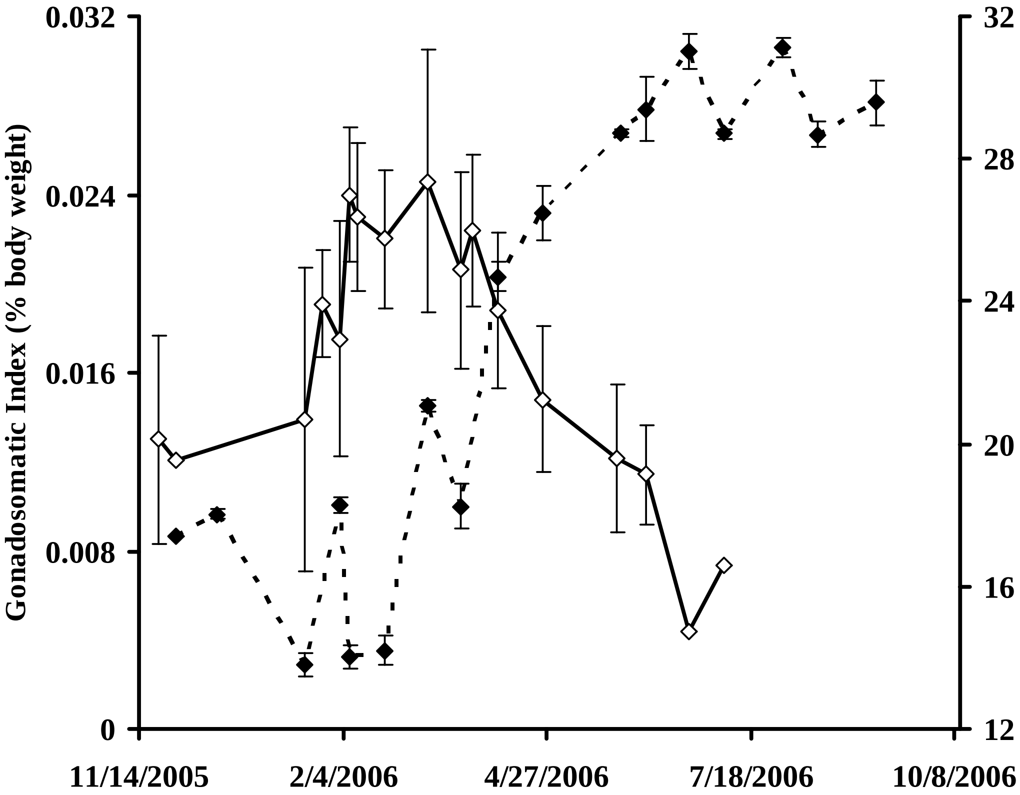

**Figure 21.** Mean (±SD) male (open diamonds) GSI and mean temperature (ºC; closed diamonds) for all four combined sites in Bayou Chevreuil.

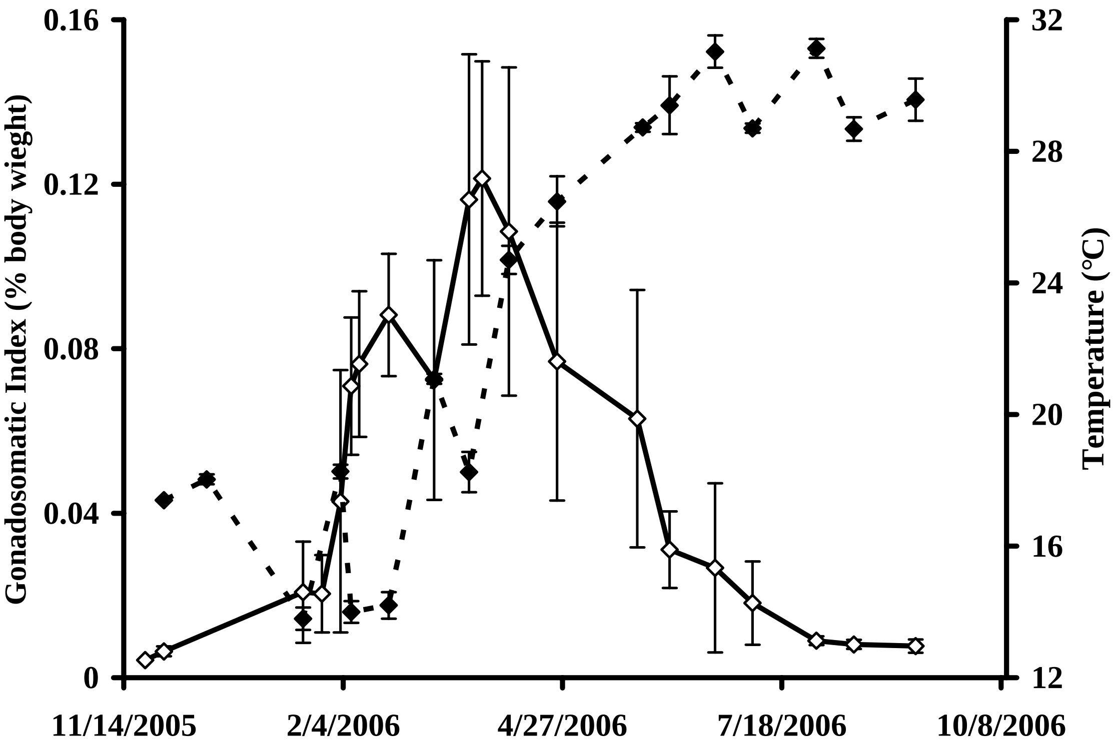

**Figure 22.** Mean (±SD) female GSI (open diamonds) and mean temperature (ºC; closed diamonds) for all four sites in Bayou Chevreuil for each sample date.

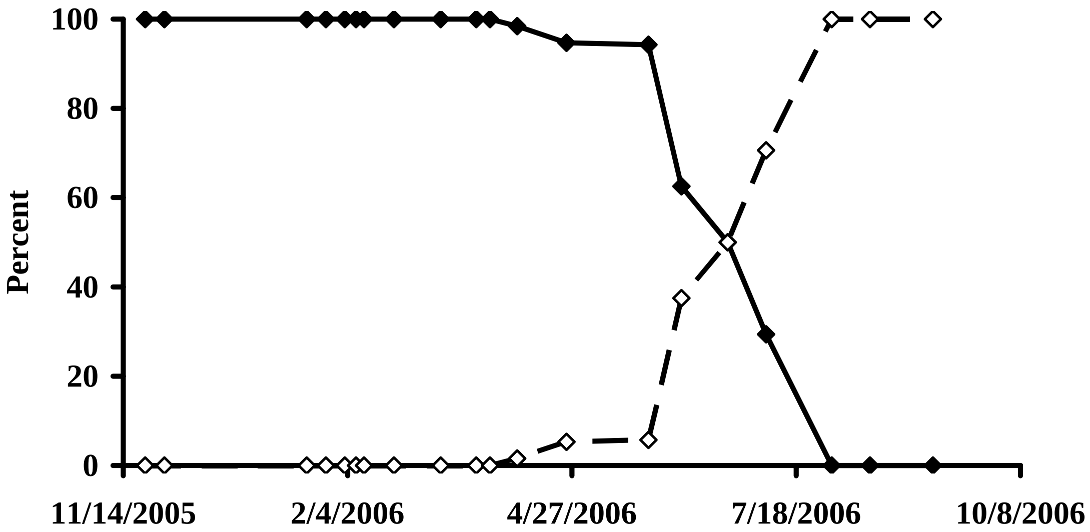

**Figure 23.** Percentage of spent (open diamonds) and non-spent ovaries (closed diamonds) in female gizzard shad collected from 22 November 2005 to 6 September 2006.

# DISCUSSION

Large river ecosystems function as landscape corridors for migratory birds and fishes and provide ecological services such as removing wastes and transporting nutrients, sediment, and water to downstream systems (Lubinski and Theiling 1999). Large rivers tend to support more fish species than smaller rivers within a stream network (Welcomme 1985). Although the annual floodpulse of large rivers is predictable, it can vary significantly depending on basin wide precipitation and discharge. Rivers flow within well defined channels at low discharge rates but can overflow their banks at high discharge rates and inundate their floodplains. Junk et al. (1989) define a floodplain as an area that is periodically inundated by the lateral overflow of rivers or lakes, and the resulting physiochemical environment causes the biota to respond by physiological, and/or ethological adaptations, and produces characteristic community structures.

Many spring-spawning fish exhibit seasonal shifts in movement patterns along lotic systems (Eiler et al. 1992; Langhurst and Schoenike 1990). In addition, some species of fish, including northern hog suckers *Hypentelium nigricans* (Matheney and Rabeni 1995), shortnose gars *Lepisosteus platostomus* (Guillory 1979), and spotted gars *Lepisosteus oculatus* (Snedden et al. 1999), make seasonal movements onto overflow (lentic) habitats for spawning. The timing and duration of the flood pulse are key factors in the spawning sequence of many fishes (Junk et al. 1989). Some fish spawn at the beginning, or during the rising flood, to best utilize the floodplain for feeding and shelter (Holland et al. 1983). In addition, changes in seasonal temperatures and light cycles (photoperiod) influence fish behavior in a floodplain. Photoperiod and light intensity vary throughout the year in temperate regions. In temperate regions, photosynthetically active radiation (PAR) can range from below 10 PARmol $m^{-2}yr^{-1}$ in January to above 50 PARmol $m^{-2}yr^{-1}$ in June (Junk 1999). The combination of temperature and photoperiod trigger physiological processes which influence reproduction (Junk 1999). Gonad development hormones are produced in response to environmental cues, such as photoperiod and temperature, and can induce physiological or behavioral responses within fish (Moyle and Cech 1982). Spotted gar in the Atchafalaya River Basin do not move onto the floodplain, until water temperatures approach 15°C, even though large areas of the floodplain may be available for spawning at lower temperatures. This suggests a movement onto the floodplain in response to a concurrent increase in temperature and photoperiod (Snedden et al. 1999). The coupled rise of water level and temperature allows for prolonged ideal spawning conditions, and promotes the success of spring spawning fishes. Recruitment can be low if water levels recede before temperatures reach optimal levels (Junk et al. 1989). Gizzard shad in the upper Barataria Estuary do not experience a large river driven floodpulse as do fishes in the Atchafalaya River Basin (Fontenot et al. 2001; Rutherford et al. 2001; Bonvillain 2006). In addition, the difference in photoperiod between the upper Barataria Estuary and more northern latitudes is negligible when gizzard shad in the upper Barataria Estuary initiate spawning. Therefore, the migration of gizzard shad into Bayou Chevreuil is probably triggered by a combination of photoperiod and temperature and not floodplain inundation.

Juvenile gizzard shad abundance increases with reservoir productivity (Bremigan and Stein 1999), and swamps and estuaries like the Barataria Estuary are some of the most productive areas in the world (Miller 2001). In highly eutrophic (nutrient-rich) ecosystems, gizzard shad often attain the highest biomass relative to other fish in the ecosystem (Miranda 1983; Bachmann et al. 1996). DiCenzo et al. (1996) found gizzard shad to have an 80-86% higher relative abundance in eutrophic Alabama reservoirs than in comparable oligotrophic (nutrient-limited) reservoirs. Clayton and Maceina (2002), when comparing two Tennessee River impoundments, observed a higher abundance of gizzard shad in the reservoir with higher chlorophyll-a concentrations, which corresponds to higher primary production. As the Barataria Estuary is highly productive, it is not surprising that gizzard shad were by far the most abundant species collected during this study. The fact that their abundance levels in Bayou Chevreuil were greatest during their spawning period is typical of gizzard shad (Noble 1981; Fontenot et al. 2001; Rutherford et al. 2001; Bonvillain 2006).

Growth and mortality rates of fishes can dictate, to a certain extent, the relationship between male body size and female body size (sexual size dimorphism). If the ratio of growth rate/mortality rate is higher in one sex, then the mean size of that sex may be larger than the mean size of the other sex (Parker 1992). Sexual size dimorphism in fish is a result of natural selection in both sexes (Selander 1965; Shine 1989). For example, male cyprinids that guard territories are usually larger than same age females of the same species (Snelson 1972). In addition, high levels of sperm competition may favor increased body size in males (Parker 1992). However, in species with low sperm competition, males can be of the same size or smaller than same age females (Pyron 1996), as is the case with many fishes (Moyle and Cech 1982). Fecundity, the number of eggs in the ovaries of a female fish, generally increases with increasing female body size (Moyle and Cech 1982). The benefits of large female body size are twofold. First, larger females usually produce larger eggs than smaller females of the same species, suggesting that the energetic investment in reproduction is higher in large fish when compared to the energetic investment in growth. Secondly, larger fish tend to produce more eggs than smaller fish of the same species (Bagenal 1978). Female gizzard shad in Bayou Chevreuil were significantly larger than males by age 3, suggesting a selection for females that are more fecund, as is usually the case with species that have a single annual spawning event (Moyle and Cech 1982). This phenomenon has also been observed in the Colorado pikeminnow *Ptychocheilus lucius* (Osmundson 2006), the bowfin *Amia calva* (Davis 2006), and the freshwater eel *Anguilla anguilla* (Melia et al. 2006).

The majority of gizzard shad research has been conducted in lakes or reservoirs (Bodola 1964; Baglin et al. 1968; Quist and Bernot 2001; Willis 1987; Michaletz 1994, 1997, 1998; Clayton and Maceina 2002) and not in large river floodplain ecosystems. Quist et al. (2001) documented high catches of gizzard shad in a Kansas reservoir in March, April, and May with numbers peaking in May. The highest CPUE recorded by Michaletz (1994), with gill nets similar to the nets used in this study, in fourteen Missouri reservoirs was approximately 4/net hour, with the mean April CPUE being < 1. CPUE for gizzard shad in Bayou Chevreuil ranged from 0 to 19.5, with a mean April CPUE of approximately 3.6. Gizzard shad relative abundance in Bayou Chevreuil began to increase in January 2006, peaked in March 2006, and remained relatively high through April, 2006. This is not to suggest that gizzard shad become more abundant in the Barataria Estuary from January throughout April, but rather implies an increase in density in specific habitats where gizzard shad possibly spawn. The fact that gizzard shad relative abundance remained relatively high for three months and then steadily declined suggests that gizzard shad in the upper Barataria Estuary make a spring time seasonal migration into and out of Bayou Chevreuil.

The structure of gizzard shad populations can vary significantly across the United States. Jenkins (1967) reported that gizzard shad abundance varied from 1 to 475 kg/ha among 116 United States reservoirs. Gizzard shad collected with gill nets in Missouri by Michaletz (1994) were generally < 240mm TL, and the majority of gizzard shad collected by electrofishing in Alabama by Clayton and Maceina (2002) were between 250 and 325mm TL. The vast majority of gizzard shad collected in this study were between 300 and 400mm TL. Although small gizzard shad were collected until the beginning of February, gill nets can be selective for larger, older gizzard shad (DiCenzo et al. 1996), which may explain why larger fish (>300mm) dominated the catch throughout the rest of the study period.

In a survey of 14 Missouri reservoirs, gizzard shad mean TL at age 1 ranged from 83 to 140mm, and mean TL at age 3 ranged from 172-229mm (Michaletz 1998). Mean TL for ages 1 and 3 gizzard shad in Bayou Chevreuil was larger than that observed by Michaletz (1998). Mean TL for age 1 was 194mm and mean TL for age 3 was 335mm. Although Clayton and Maciena (2002) observed larger mean TL at age for gizzard shad than Michaletz (1998), their values were smaller, for all age classes, than gizzard shad in Bayou Chevreuil. Michaletz (1998) documented a maximum age of 12 years in Missouri reservoirs while the oldest gizzard shad collected in Bayou Chevreuil was 5 years old. The variances in size structure and growth rates of gizzard shad are expected as gizzard shad population dynamics can be highly variable across the United States (Jenkins 1967; Heidinger 1983). Reported mean TL at age 1 has ranged from 86 to 254mm, and mean

TL for age 3 has ranged from 214 to 467mm (Jester and Jensen 1972). Yearly temperatures in the upper Barataria Estuary provide gizzard shad a longer growing season than their more northern counterparts. Water temperature is an important factor in the growth rate of fishes, and warmer temperatures have been linked to faster growth rates for some species (Moyle and Cech 1982).

In Lake Erie, gizzard shad spawn during June and early July (Bodola 1964). Willis (1987) states that the gizzard shad spawning period occurred from early May to mid June in Kansas reservoirs, and Baglin et al. (1968) documented a single spawn in Beaver Reservoir, Arkansas, which lasted from mid-April through May. As with relative abundance, the spawning period of gizzard shad appears to occur earlier in the upper Barataria Estuary than in other studies. The unimodal distribution of GSI values, and the percentage of spent versus non-spent ovaries throughout the sample period suggest that gizzard shad spawning began in late March and continued through July. It appears that the gizzard shad spawning period begins later in northern habitats than in southern habitats. Although the movement of gizzard shad into Bayou Chevreuil may not be triggered by the flood pulse, the movement of gizzard shad into Bayou Chevreuil and simultaneous rise in GSI may correspond to an increase in water temperature and photoperiod. Although, the photoperiod is longer when gizzard shad initiate spawning in northern latitudes than in southern latitudes, female gizzard shad in Bayou Chevreuil appeared to spawn when water temperature was between 18˚ and 29˚C.

The diet and movement pattern of fish influences their ability to cycle nutrients within the water column and transfer nutrients between habitats (Shapiro and Carlson 1982; Durbin et al. 1979; Meyer et al. 1983; Meyer and Schultz 1985; Kline et al 1990).

The transport of nutrients from the benthos to the water column can increase the total nutrient content of the water column and stimulate primary productivity (Dugdale and Goering 1967; Caraco et al. 1992). Gizzard shad ingest nutrients associated with sediment detritus and excrete them in dissolved organic forms; thus, nutrients are translocated from benthic to pelagic habitats (Shaus et al. 1997, Shaus and Vanni 2000), which may be important if the upper Barataria Estuary is deprived of nutrients normally supplied by a river-driven floodpulse.

Omnivores link detrital and grazing food webs, and therefore, can have a strong effect on planktonic community structure (Polis and Strong 1996). Gizzard shad can impact a phosphorus and nitrogen limited freshwater phytoplankton community (Schindler 1977; Elser et al. 1990) through a combination of top-down and bottom-up effects (Schaus and Vanni 2000; Schaus et al. 2002). When zooplankton are present, they are consumed by gizzard shad, and the phytoplankton community grows until nutrients (usually phosphorus) limit further population expansion (Schaus and Vanni 2000). However, at high gizzard shad densities, a biomass-dependent diet shift occurs and gizzard shad shift their diet from zooplankton to detritus (Schaus et al. 2002). This shift allows zooplankton to become more abundant, and phytoplankton become limited by grazing pressure rather than nutrients (Shaus and Vanni 2000).

The geographic location of a water body can influence gizzard shad population dynamics (Heidinger 1983). The conversion of watersheds to agriculture increases the amount of allochthonous particulate detritus to aquatic detritus pools. In addition, the input of dissolved nutrients from agricultural runoff stimulates phytoplankton production, which increases the flux of dead phytoplankton to the detritus pool (Vanni et al. 2005).

The carbon-nitrogen ratios of diets consumed by some gizzard shad imply that some material is derived from terrestrial sources (Mundahl and Wissing 1987). Gizzard shad benefit from the input of additional detritus because they are the only clupeid that can utilize detritus as a food source (Vanni et al. 2005).

Agricultural watersheds contribute a large input of sediment associated detritus to the water column, which serves as a potential food source for post-larval gizzard shad that feed on sediment detritus (Vanni et al. 2005). The introduced sediment also reduces light intensity by increasing the turbidity of the water column, which in turn, favors gizzard shad by selecting against species that require vision for feeding (Vanni et al. 2005). As watersheds are converted to agriculture, primary productivity, and gizzard shad abundance are likely to increase (Vanni et al. 2005; Bachmann et al. 1996; DiCenzo et al. 1996; Michaletz 1997; Bremigan and Stein 2001). However, too much nutrient input will lead to anthropogenic eutrofication. Approximately 27,709 ha of land (38%) in the upper Barataria Estuary is used for agriculture, with approximately 24% being used for sugarcane farming (Braud et al. 2006). The dominance of an agricultural landscape in the upper Barataria Estuary likely contributes nutrients to the water column and may indirectly influence gizzard shad abundance in Bayou Chevreuil.

In summary, gizzard shad in the upper Barataria Estuary exhibit a seasonal movement into Bayou Chevreuil, which appears to be associated with an increase in water temperature rather than a seasonal large-river influenced floodpulse. Gizzard shad are abundant in the upper Barataria Estuary as in most southeastern US reservoirs (Noble 1981), and the Atchafalaya River Basin (Fontenot et al. 2001; Rutherford et al. 2001; Bonvillain 2006). Gizzard shad were relatively abundant in Bayou Chevreuil from

January 2006 throughout April 2006, which implies a seasonal movement into backwater habitats during the spawning period. Gizzard shad in Bayou Chevreuil appear to have a faster growth rate and attain larger sizes than gizzard shad from more northern latitudes (Michaletz 1998; Clayton and Maecina 2002); which may be accredited to warmer year round water temperatures. GSI values indicated that gizzard shad in Bayou Chevreuil had a single spawning event beginning in late March and continuing throughout July, when water temperature was between 18˚ and 29˚C. Gizzard shad may be important in the upper Barataria Estuary as nutrient cyclers, as the area does not benefit from the addition of nutrients provided by an annual large-river driven floodpulse. Gizzard shad may have an advantage over other fishes in the Upper Barataria Estuary because they can use detritus as a food source. The dominance of an agricultural landscape likely favors gizzard shad over other fishes by contributing to the detritus pool and impairing the feeding capacity of vision feeding fishes through increased turbidity. However, the long term effects of anthropogenic eutrophication on gizzard shad are not known for the Barataria Estuary.

## RECOMMENDATIONS

A long term study in the upper Barataria Estuary would provide insight into how gizzard shad, and other fishes, are affected by alterations of the Mississippi River's natural floodpulse. I recommend a comparison between drought years and years with significant rainfall to test whether the fish of the upper Barataria Estuary benefit, or would benefit, from an artificial floodpulse. Long-term data on water quality would also be useful in understanding the effects that altered hydrology and agriculture have on the area.

In addition to this study, the Bayousphere Research Laboratory at Nicholls State University is currently engaged in projects that will help develop an understanding of the dynamics of the upper Barataria Estuary. Projects involving water quality monitoring, bowfin populations, larval fish studies, blue crab migration, and stomach contents of top predatory fish are currently underway. A long-term larval fish study would be useful in comparing the reproductive success of gizzard shad, and other fishes, among years of varying rainfall.

Finally, in order to restore what is now an impaired estuary, an artificial, seasonal pulse of water from the Mississippi River could help restore the ecosystem to a more natural condition. Many fishes that depend on the floodpulse and backwater spawning habitats could benefit from an introduction of river water to the system.

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# APPENDIX I

**Appendix I.** Fishes collected during the entire study period. The date of collection, study site, net, number, and CPUE of each species are listed.

| Date | Site | Net | *Species* | Number | CPUE |
|---|---|---|---|---|---|
| 11/22/2005 | 1 | 1 | *Amia calva* | 2 | 1 |
| 11/22/2005 | 1 | 2 | *Dorosoma cepedianum* | 2 | 1 |
| 11/22/2005 | 2 | 1 | *Dorosoma cepedianum* | 5 | 2.5 |
| 11/22/2005 | 2 | 1 | *Ictalurus punctatus* | 1 | 0.5 |
| 11/22/2005 | 1 | 1 | *Lepisosteus oculatus* | 2 | 1 |
| 11/22/2005 | 1 | 2 | *Lepisosteus oculatus* | 1 | 0.5 |
| 11/22/2005 | 1 | 2 | *Lepomis macrochirus* | 1 | 0.5 |
| 11/22/2005 | 2 | 1 | *Morone mississippiensis* | 1 | 0.5 |
| 11/22/2005 | 1 | 1 | *Mugil cephalus* | 1 | 0.5 |
| 11/22/2005 | 1 | 2 | *Mugil cephalus* | 1 | 0.5 |
| 11/29/2005 | 3 | 1 | *Amia calva* | 1 | 0.5 |
| 11/29/2005 | 3 | 2 | *Amia calva* | 1 | 0.5 |
| 11/29/2005 | 4 | 1 | *Amia calva* | 1 | 0.5 |
| 11/29/2005 | 2 | 1 | *Dorosoma cepedianum* | 1 | 0.5 |
| 11/29/2005 | 2 | 2 | *Dorosoma cepedianum* | 1 | 0.5 |
| 11/29/2005 | 3 | 2 | *Micropterus salmoides* | 1 | 0.5 |
| 11/29/2005 | 3 | 2 | *Morone mississippiensis* | 1 | 0.5 |
| 11/29/2005 | 2 | 2 | *Pomoxis nigromaculatus* | 2 | 1 |
| 12/15/2005 | 1 | 2 | *Amia calva* | 1 | 0.5 |
| 12/15/2005 | 2 | 1 | *Amia calva* | 2 | 1 |
| 12/15/2005 | 2 | 2 | *Amia calva* | 2 | 1 |
| 12/15/2005 | 1 | 2 | *Dorosoma cepedianum* | 4 | 2 |
| 12/15/2005 | 1 | 1 | *Lepisosteus oculatus* | 9 | 4.5 |
| 12/15/2005 | 2 | 1 | *Lepisosteus oculatus* | 9 | 4.5 |
| 12/15/2005 | 2 | 2 | *Lepisosteus oculatus* | 1 | 0.5 |
| 12/15/2005 | 3 | 1 | *Lepisosteus oculatus* | 2 | 1 |
| 1/20/2006 | 3 | 1 | *Amia calva* | 1 | 0.5 |
| 1/20/2006 | 3 | 2 | *Amia calva* | 2 | 1 |
| 1/20/2006 | 2 | 1 | *Ciprinus carpio* | 1 | 0.5 |
| 1/20/2006 | 2 | 1 | *Dorosoma cepedianum* | 2 | 1 |
| 1/20/2006 | 2 | 2 | *Dorosoma cepedianum* | 20 | 10 |
| 1/20/2006 | 3 | 2 | *Dorosoma cepedianum* | 3 | 1.5 |
| 1/20/2006 | 3 | 3 | *Dorosoma cepedianum* | 1 | 0.5 |
| 1/20/2006 | 2 | 2 | *Ictalurus punctatus* | 1 | 0.5 |
| 1/20/2006 | 1 | 2 | *Ictalurus furcatus* | 1 | 0.5 |

| Date | Site | Net | ***Species*** | Number | CPUE |
|---|---|---|---|---|---|
| 1/20/2006 | 1 | 3 | *Ictalurus furcatus* | 3 | 1.5 |
| 1/20/2006 | 2 | 1 | *Ictalurus furcatus* | 1 | 0.5 |
| 1/20/2006 | 1 | 1 | *Lepisosteus oculatus* | 4 | 2 |
| 1/20/2006 | 1 | 3 | *Lepisosteus oculatus* | 1 | 0.5 |
| 1/20/2006 | 2 | 1 | *Lepisosteus oculatus* | 5 | 2.5 |
| 1/20/2006 | 2 | 2 | *Lepisosteus oculatus* | 1 | 0.5 |
| 1/20/2006 | 2 | 3 | *Lepisosteus oculatus* | 4 | 2 |
| 2/3/2006 | 1 | 3 | *Amia calva* | 1 | 0.5 |
| 2/3/2006 | 1 | 2 | *Dorosoma cepedianum* | 9 | 4.5 |
| 2/3/2006 | 2 | 1 | *Dorosoma cepedianum* | 11 | 5.5 |
| 2/3/2006 | 2 | 2 | *Dorosoma cepedianum* | 45 | 22.5 |
| 2/3/2006 | 3 | 1 | *Dorosoma cepedianum* | 2 | 1 |
| 2/3/2006 | 2 | 1 | *Lepisosteus oculatus* | 11 | 5.5 |
| 2/3/2006 | 2 | 3 | *Lepisosteus oculatus* | 6 | 3 |
| 2/3/2006 | 3 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 2/7/2006 | 3 | 1 | *Amia calva* | 5 | 2.5 |
| 2/7/2006 | 3 | 2 | *Amia calva* | 1 | 0.5 |
| 2/7/2006 | 3 | 3 | *Amia calva* | 1 | 0.5 |
| 2/7/2006 | 4 | 1 | *Amia calva* | 2 | 1 |
| 2/7/2006 | 4 | 2 | *Ciprinus carpio* | 1 | 0.5 |
| 2/7/2006 | 1 | 2 | *Dorosoma cepedianum* | 6 | 3 |
| 2/7/2006 | 1 | 3 | *Dorosoma cepedianum* | 1 | 0.5 |
| 2/7/2006 | 2 | 1 | *Dorosoma cepedianum* | 3 | 1.5 |
| 2/7/2006 | 2 | 2 | *Dorosoma cepedianum* | 20 | 10 |
| 2/7/2006 | 2 | 3 | *Dorosoma cepedianum* | 5 | 2.5 |
| 2/7/2006 | 3 | 1 | *Dorosoma cepedianum* | 1 | 0.5 |
| 2/7/2006 | 3 | 3 | *Dorosoma cepedianum* | 6 | 3 |
| 2/7/2006 | 4 | 1 | *Dorosoma cepedianum* | 3 | 1.5 |
| 2/7/2006 | 4 | 2 | *Dorosoma cepedianum* | 2 | 1 |
| 2/7/2006 | 4 | 1 | *Morone mississippiensis* | 2 | 1 |
| 2/7/2006 | 1 | 2 | *Mugil cephalus* | 1 | 0.5 |
| 2/7/2006 | 3 | 2 | *Pomoxis nigromaculatus* | 1 | 0.5 |
| 2/21/2006 | 4 | 1 | *Amia calva* | 2 | 1 |
| 2/21/2006 | 4 | 3 | *Amia calva* | 1 | 0.5 |
| 2/21/2006 | 2 | 1 | *Dorosoma cepedianum* | 3 | 1.5 |
| 2/21/2006 | 2 | 2 | *Dorosoma cepedianum* | 9 | 4.5 |
| 2/21/2006 | 3 | 2 | *Dorosoma cepedianum* | 9 | 4.5 |
| 2/21/2006 | 3 | 3 | *Dorosoma cepedianum* | 10 | 5 |
| 2/21/2006 | 4 | 1 | *Dorosoma cepedianum* | 2 | 1 |
| 2/21/2006 | 4 | 2 | *Dorosoma cepedianum* | 7 | 3.5 |

| Date | Site | Net | *Species* | Number | CPUE |
|---|---|---|---|---|---|
| 2/21/2006 | 4 | 3 | *Dorosoma cepedianum* | 1 | 0.5 |
| 2/21/2006 | 4 | 2 | *Ictalurus punctatus* | 1 | 0.5 |
| 2/21/2006 | 3 | 1 | *Lepisosteus oculatus* | 9 | 4.5 |
| 2/21/2006 | 3 | 1 | *Morone mississippiensis* | 10 | 5 |
| 3/10/2006 | 3 | 1 | *Amia calva* | 1 | 0.5 |
| 3/10/2006 | 3 | 2 | *Amia calva* | 1 | 0.5 |
| 3/10/2006 | 3 | 3 | *Amia calva* | 1 | 0.5 |
| 3/10/2006 | 2 | 1 | *Dorosoma cepedianum* | 14 | 7 |
| 3/10/2006 | 2 | 2 | *Dorosoma cepedianum* | 21 | 10.5 |
| 3/10/2006 | 2 | 3 | *Dorosoma cepedianum* | 33 | 16.5 |
| 3/10/2006 | 3 | 1 | *Dorosoma cepedianum* | 8 | 4 |
| 3/10/2006 | 3 | 2 | *Dorosoma cepedianum* | 3 | 1.5 |
| 3/10/2006 | 3 | 3 | *Dorosoma cepedianum* | 20 | 10 |
| 3/10/2006 | 4 | 1 | *Dorosoma cepedianum* | 16 | 8 |
| 3/10/2006 | 4 | 2 | *Dorosoma cepedianum* | 5 | 2.5 |
| 3/10/2006 | 4 | 3 | *Dorosoma cepedianum* | 74 | 37 |
| 3/10/2006 | 2 | 1 | *Ictalurus punctatus* | 1 | 0.5 |
| 3/10/2006 | 3 | 3 | *Ictalurus punctatus* | 2 | 1 |
| 3/10/2006 | 2 | 1 | *Ictalurus furcatus* | 1 | 0.5 |
| 3/10/2006 | 2 | 3 | *Lepisosteus oculatus* | 1 | 0.5 |
| 3/10/2006 | 2 | 1 | *Morone mississippiensis* | 3 | 1.5 |
| 3/10/2006 | 2 | 3 | *Morone mississippiensis* | 2 | 1 |
| 3/10/2006 | 3 | 3 | *Morone mississippiensis* | 1 | 0.5 |
| 3/23/2006 | 1 | 2 | *Amia calva* | 1 | 0.5 |
| 3/23/2006 | 2 | 2 | *Dorosoma cepedianum* | 8 | 4 |
| 3/23/2006 | 1 | 1 | *Dorosoma cepedianum* | 2 | 1 |
| 3/23/2006 | 1 | 2 | *Dorosoma cepedianum* | 7 | 3.5 |
| 3/23/2006 | . | . | *Dorosoma cepedianum* | 20 | 10 |
| 3/23/2006 | 2 | 1 | *Ictalurus furcatus* | 1 | 0.5 |
| 3/23/2006 | 1 | 1 | *Ictalurus furcatus* | 1 | 0.5 |
| 3/23/2006 | 2 | 3 | *Lepisosteus oculatus* | 1 | 0.5 |
| 3/23/2006 | 1 | 2 | *Lepisosteus oculatus* | 1 | 0.5 |
| 4/7/2006 | 2 | 1 | *Amia calva* | 1 | 0.5 |
| 4/7/2006 | 3 | 3 | *Amia calva* | 1 | 0.5 |
| 4/7/2006 | 4 | 2 | *Amia calva* | 1 | 0.5 |
| 4/7/2006 | 1 | 1 | *Dorosoma cepedianum* | 10 | 5 |
| 4/7/2006 | 1 | 2 | *Dorosoma cepedianum* | 10 | 5 |
| 4/7/2006 | 1 | 3 | *Dorosoma cepedianum* | 3 | 1.5 |
| 4/7/2006 | 2 | 1 | *Dorosoma cepedianum* | 13 | 6.5 |
| 4/7/2006 | 2 | 3 | *Dorosoma cepedianum* | 16 | 8 |

| **Date** | **Site** | **Net** | ***Species*** | **Number** | **CPUE** |
|---|---|---|---|---|---|
| 4/7/2006 | 2 | 2 | *Dorosoma cepedianum* | 27 | 13.5 |
| 4/7/2006 | 3 | 1 | *Dorosoma cepedianum* | 6 | 3 |
| 4/7/2006 | 3 | 2 | *Dorosoma cepedianum* | 4 | 2 |
| 4/7/2006 | 3 | 3 | *Dorosoma cepedianum* | 4 | 2 |
| 4/7/2006 | 4 | 1 | *Dorosoma cepedianum* | 14 | 7 |
| 4/7/2006 | 4 | 2 | *Dorosoma cepedianum* | 17 | 8.5 |
| 4/7/2006 | 4 | 3 | *Dorosoma cepedianum* | 39 | 19.5 |
| 4/7/2006 | 1 | 1 | *Ictalurus punctatus* | 6 | 3 |
| 4/7/2006 | 1 | 3 | *Ictalurus punctatus* | 2 | 1 |
| 4/7/2006 | 2 | 1 | *Ictalurus punctatus* | 3 | 1.5 |
| 4/7/2006 | 2 | 2 | *Ictalurus punctatus* | 4 | 2 |
| 4/7/2006 | 3 | 3 | *Ictalurus punctatus* | 2 | 1 |
| 4/7/2006 | 4 | 1 | *Ictalurus punctatus* | 1 | 0.5 |
| 4/7/2006 | 1 | 1 | *Ictalurus furcatus* | 2 | 1 |
| 4/7/2006 | 1 | 2 | *Ictalurus furcatus* | 1 | 0.5 |
| 4/7/2006 | 2 | 3 | *Lepisosteus oculatus* | 1 | 0.5 |
| 4/7/2006 | 2 | 2 | *Lepisosteus oculatus* | 1 | 0.5 |
| 4/7/2006 | 3 | 1 | *Lepisosteus oculatus* | 2 | 1 |
| 4/7/2006 | 3 | 3 | *Lepisosteus oculatus* | 3 | 1.5 |
| 4/7/2006 | 4 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 4/7/2006 | 4 | 1 | *Lepomis macrochirus* | 1 | 0.5 |
| 4/25/2006 | 1 | 1 | *Dorosoma cepedianum* | 2 | 1 |
| 4/25/2006 | 1 | 2 | *Dorosoma cepedianum* | 1 | 0.5 |
| 4/25/2006 | 1 | 3 | *Dorosoma cepedianum* | 1 | 0.5 |
| 4/25/2006 | 2 | 1 | *Dorosoma cepedianum* | 2 | 1 |
| 4/25/2006 | 2 | 2 | *Dorosoma cepedianum* | 1 | 0.5 |
| 4/25/2006 | 3 | 1 | *Dorosoma cepedianum* | 1 | 0.5 |
| 4/25/2006 | 3 | 2 | *Dorosoma cepedianum* | 2 | 1 |
| 4/25/2006 | 3 | 3 | *Dorosoma cepedianum* | 5 | 2.5 |
| 4/25/2006 | 4 | 1 | *Dorosoma cepedianum* | 5 | 2.5 |
| 4/25/2006 | 1 | 1 | *Ictalurus punctatus* | 1 | 0.5 |
| 4/25/2006 | 3 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 4/25/2006 | 3 | 3 | *Lepisosteus oculatus* | 2 | 1 |
| 5/27/2006 | 1 | 1 | *Dorosoma cepedianum* | 2 | 1 |
| 5/27/2006 | 1 | 2 | *Dorosoma cepedianum* | 2 | 1 |
| 5/27/2006 | 1 | 3 | *Dorosoma cepedianum* | 2 | 1 |
| 5/27/2006 | 2 | 1 | *Dorosoma cepedianum* | 4 | 2 |
| 5/27/2006 | 2 | 2 | *Dorosoma cepedianum* | 3 | 1.5 |
| 5/27/2006 | 2 | 1 | *Dorosoma cepedianum* | 1 | 0.5 |
| 5/27/2006 | 1 | 3 | *Ictalurus punctatus* | 1 | 0.5 |

| Date | Site | Net | *Species* | Number | CPUE |
|---|---|---|---|---|---|
| 5/27/2006 | 2 | 1 | *Ictalurus punctatus* | 1 | 0.5 |
| 5/27/2006 | 1 | 2 | *Lepisosteus oculatus* | 1 | 0.5 |
| 5/27/2006 | 1 | 3 | *Lepisosteus oculatus* | 1 | 0.5 |
| 6/6/2006 | 4 | 1 | *Amia calva* | 2 | 1 |
| 6/6/2006 | 2 | 2 | *Dorosoma cepedianum* | 1 | 0.5 |
| 6/6/2006 | 3 | 1 | *Dorosoma cepedianum* | 1 | 0.5 |
| 6/6/2006 | 4 | 1 | *Dorosoma cepedianum* | 12 | 6 |
| 6/6/2006 | 4 | 3 | *Dorosoma cepedianum* | 9 | 4.5 |
| 6/6/2006 | 2 | 1 | *Dorosoma cepedianum* | 1 | 0.5 |
| 6/6/2006 | 1 | 3 | *Ictalurus punctatus* | 2 | 1 |
| 6/6/2006 | 2 | 1 | *Ictalurus punctatus* | 1 | 0.5 |
| 6/6/2006 | 2 | 2 | *Ictalurus punctatus* | 1 | 0.5 |
| 6/6/2006 | 4 | 1 | *Ictalurus punctatus* | 1 | 0.5 |
| 6/6/2006 | 1 | 1 | *Lepisosteus oculatus* | 2 | 1 |
| 6/6/2006 | 3 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 6/6/2006 | 3 | 2 | *Lepisosteus oculatus* | 2 | 1 |
| 6/6/2006 | 4 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 6/23/2006 | 2 | 1 | *Dorosoma cepedianum* | 1 | 0.5 |
| 6/23/2006 | 2 | 3 | *Dorosoma cepedianum* | 2 | 1 |
| 6/23/2006 | 3 | 1 | *Dorosoma cepedianum* | 1 | 0.5 |
| 6/23/2006 | 3 | 2 | *Dorosoma cepedianum* | 4 | 2 |
| 6/23/2006 | 2 | 3 | *Dorosoma cepedianum* | 2 | 1 |
| 6/23/2006 | 2 | 3 | *Ictalurus punctatus* | 1 | 0.5 |
| 6/23/2006 | 1 | 2 | *Ictalurus furcatus* | 1 | 0.5 |
| 6/23/2006 | 3 | 2 | *Ictalurus furcatus* | 1 | 0.5 |
| 6/23/2006 | 2 | 1 | *Mugil cephalus* | 1 | 0.5 |
| 6/23/2006 | 3 | 2 | *Mugil cephalus* | 3 | 1.5 |
| 7/7/2006 | 4 | 1 | *Amia calva* | 1 | 0.5 |
| 7/7/2006 | 3 | 3 | *Aplodinotus grunniens* | 1 | 0.5 |
| 7/7/2006 | 3 | 1 | *Dorosoma cepedianum* | 4 | 2 |
| 7/7/2006 | 3 | 3 | *Dorosoma cepedianum* | 4 | 2 |
| 7/7/2006 | 4 | 1 | *Dorosoma cepedianum* | 3 | 1.5 |
| 7/7/2006 | 4 | 2 | *Dorosoma cepedianum* | 6 | 3 |
| 7/7/2006 | 4 | 2 | *Ictalurus punctatus* | 1 | 0.5 |
| 7/31/2006 | 1 | 2 | *Dorosoma cepedianum* | 1 | 0.5 |
| 7/31/2006 | 3 | 3 | *Dorosoma cepedianum* | 4 | 2 |
| 7/31/2006 | 4 | 3 | *Dorosoma cepedianum* | 1 | 0.5 |
| 7/31/2006 | 1 | 1 | *Ictalurus punctatus* | 1 | 0.5 |
| 7/31/2006 | 1 | 2 | *Ictalurus furcatus* | 1 | 0.5 |
| 7/31/2006 | 2 | 1 | *Ictalurus furcatus* | 1 | 0.5 |

| **Date** | **Site** | **Net** | ***Species*** | **Number** | **CPUE** |
|---|---|---|---|---|---|
| 7/31/2006 | 2 | 3 | *Ictalurus furcatus* | 2 | 1 |
| 7/31/2006 | 4 | 1 | *Ictalurus furcatus* | 1 | 0.5 |
| 7/31/2006 | 3 | 3 | *Lepomis macrochirus* | 1 | 0.5 |
| 7/31/2006 | 2 | 1 | *Micropterus salmoides* | 1 | 0.5 |
| 7/31/2006 | 1 | 1 | *Morone mississippiensis* | 1 | 0.5 |
| 7/31/2006 | 2 | 3 | *Morone mississippiensis* | 1 | 0.5 |
| 7/31/2006 | 4 | 2 | *Morone mississippiensis* | 1 | 0.5 |
| 8/14/2006 | 4 |  | *Amia calva* | 1 | 0.5 |
| 8/14/2006 | 1 | 1 | *Dorosoma cepedianum* | 3 | 1.5 |
| 8/14/2006 | 1 | 1 | *Ictalurus furcatus* |  | 0 |
| 8/14/2006 | 2 | 2 | *Ictalurus furcatus* | 1 | 0.5 |
| 8/14/2006 | 2 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 8/14/2006 | 2 | 3 | *Lepisosteus oculatus* | 2 | 1 |
| 8/14/2006 | 3 | 1 | *Lepisosteus oculatus* | 2 | 1 |
| 8/14/2006 | 3 | 3 | *Lepisosteus oculatus* | 1 | 0.5 |
| 8/14/2006 | 4 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 8/14/2006 | 4 | 1 | *Lepisosteus oculatus* | 4 | 2 |
| 8/14/2006 | 4 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 8/14/2006 | 2 | 3 | *Lepomis macrochirus* | 1 | 0.5 |
| 9/6/2006 | 1 |  | *Morone mississippiensis* | 1 | 0.5 |
| 9/6/2006 | 2 | 1 | *Dorosoma pentenese* | 2 | 1 |
| 9/6/2006 | 3 | 1 | *Dorosoma pentenese* | 2 | 1 |
| 9/6/2006 | 1 | 2 | *Ictalurus punctatus* | 1 | 0.5 |
| 9/6/2006 | 2 | 3 | *Lepisosteus oculatus* | 2 | 1 |
| 9/6/2006 | 3 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 9/6/2006 | 4 | 1 | *Lepisosteus oculatus* | 1 | 0.5 |
| 9/6/2006 | 4 | 3 | *Lepisosteus oculatus* | 1 | 0.5 |
| 9/6/2006 | 2 | 1 | *Mugil cephalus* | 10 | 5 |
| 9/6/2006 | 2 | 2 | *Mugil cephalus* | 2 | 1 |
| 9/6/2006 | 4 | 1 | *Mugil cephalus* | 6 | 3 |
| 9/6/2006 | 4 | 2 | *Mugil cephalus* | 1 | 0.5 |
| 9/6/2006 | 4 | 3 | *Mugil cephalus* | 2 | 1 |

# APPENDIX II

**Appencix II.** Total length, weight, sex, gonad weight (left, right, total), GSI, and age of gizzard shad collected in Bayou Chevreuil from 11/22/2005 to 9/6/2006.

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 11/22/2005 | 1 | 247 | 139 | f | 0.3 | 0.3 | 0.6 | 0.004 | 2 |
| 11/22/2005 | 2 | 284 | 335.5 | m | 2 | 2.9 | 4.9 | 0.015 | 2 |
| 11/22/2005 | 3 | 305 | 295.5 | m | 2.5 | 3.1 | 5.6 | 0.019 | 3 |
| 11/22/2005 | 4 | 277 | 220.5 | m | 0.9 | 0.8 | 1.7 | 0.008 | 2 |
| 11/22/2005 | 5 | 326 | 346.5 | m | 2.6 | 2.6 | 5.2 | 0.015 | 3 |
| 11/22/2005 | 6 | 335 | 380 | m | 1.6 | 1.7 | 3.3 | 0.009 | 4 |
| 11/29/2005 | 7 | 232 | 124.5 | f | 0.4 | 0.5 | 0.9 | 0.007 | 1 |
| 11/29/2005 | 8 | 247 | 125.5 | f | 0.4 | 0.3 | 0.7 | 0.006 | 2 |
| 11/29/2005 | 9 | 245 | 140.5 | m | 0.9 | 0.8 | 1.7 | 0.012 | 2 |
| 1/20/2006 | 10 | 225 | 142 | m | 1.5 | 1.5 | 3 | 0.021 | 1 |
| 1/20/2006 | 11 | 243 | 139 | f | 3 | 2 | 5 | 0.036 | 2 |
| 1/20/2006 | 12 | 186 | 52.5 | f | 0.5 | 0.5 | 1 | 0.019 | 1 |
| 1/20/2006 | 13 | 197 | 65 | m | 1 | 0.5 | 1.5 | 0.023 | . |
| 1/20/2006 | 14 | 223 | 67 | m | 0.1 | 0.1 | 0.2 | 0.003 | 1 |
| 1/20/2006 | 15 | 219 | 88.5 | m | 0.097 | 0.113 | 0.21 | 0.002 | 1 |
| 1/20/2006 | 16 | 195 | 56.5 | f | 0.3 | 0.3 | 0.6 | 0.011 | 1 |
| 1/20/2006 | 17 | 205 | 64.5 | m | 0.3 | 0.4 | 0.7 | 0.011 | 1 |
| 1/20/2006 | 18 | 175 | 44 | m | 0.226 | 0.276 | 0.502 | 0.011 | 1 |
| 1/20/2006 | 19 | 182 | 55 | f | 0.264 | 0.253 | 0.517 | 0.009 | 1 |
| 1/20/2006 | 20 | 210 | 83.5 | f | 0.279 | 0.219 | 0.498 | 0.006 | 1 |
| 1/20/2006 | 21 | 199 | 64.5 | f | 0.912 | 0.799 | 1.711 | 0.027 | . |
| 1/20/2006 | 22 | 330 | 366 | m | 3.2 | 3.4 | 6.6 | 0.018 | 3 |
| 1/20/2006 | 23 | 185 | 64 | m | 0.531 | 0.42 | 0.951 | 0.015 | 1 |
| 1/20/2006 | 24 | 182 | 51.5 | m | 0.269 | 0.169 | 0.438 | 0.009 | . |
| 1/20/2006 | 25 | 175 | 45.5 | m | 0.303 | 0.191 | 0.494 | 0.011 | 1 |
| 1/20/2006 | 26 | 212 | 83.5 | f | 0.227 | 0.237 | 0.464 | 0.006 | 1 |
| 1/20/2006 | 27 | 195 | 71 | f | 0.758 | 1.258 | 2.016 | 0.028 | 1 |
| 1/20/2006 | 28 | 170 | 55.5 | m | 0.511 | 0.309 | 0.82 | 0.015 | 1 |
| 1/20/2006 | 29 | 163 | 44 | f | 0.656 | 0.775 | 1.431 | 0.033 | 1 |
| 1/20/2006 | 30 | 195 | 64.5 | f | 0.486 | 0.362 | 0.848 | 0.013 | 1 |
| 1/20/2006 | 31 | 213 | 83.5 | f | 0.889 | 0.769 | 1.658 | 0.02 | 1 |
| 1/20/2006 | 32 | 297 | 268.5 | m | 2.818 | 2.717 | 5.535 | 0.021 | 2 |
| 1/20/2006 | 33 | 315 | 365.5 | f | 11.9 | 3.52 | 15.42 | 0.042 | 3 |
| 1/20/2006 | 34 | 304 | 264.5 | m | 2.147 | 3.52 | 5.667 | 0.021 | 2 |
| 1/27/2006 | 35 | 200 | 66.8 | m | 0.639 | 0.63 | 1.269 | 0.019 | 1 |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 1/27/2006 | 36 | 190 | 61 | f | 0.745 | 0.274 | 1.019 | 0.017 | 1 |
| 1/27/2006 | 37 | 200 | 67.9 | f | 0.727 | 0.288 | 1.015 | 0.015 | 1 |
| 1/27/2006 | 38 | 195 | 63.2 | f | 0.746 | 0.23 | 0.976 | 0.015 | 1 |
| 1/27/2006 | 39 | 326 | 368.8 | m | 3.85 | 3.37 | 7.22 | 0.02 | 3 |
| 1/27/2006 | 40 | 342 | 355.7 | m | 4.17 | 3.56 | 7.73 | 0.022 | 3 |
| 1/27/2006 | 41 | 346 | 422.1 | m | 3.94 | 2.8 | 6.74 | 0.016 | 4 |
| 1/27/2006 | 42 | 188 | 69.5 | f | 1.4 | 1 | 2.4 | 0.035 | 1 |
| 2/3/2006 | 43 | 322 | 374.5 | m | 3.9 | 3.8 | 7.7 | 0.021 | 3 |
| 2/3/2006 | 44 | 363 | 542 | f | 23.3 | 23.6 | 46.9 | 0.087 | . |
| 2/3/2006 | 45 | 371 | 520.5 | f | 15.4 | 14 | 29.4 | 0.056 | 3 |
| 2/3/2006 | 46 | 180 | 50.5 | m | 0.197 | 0.185 | 0.382 | 0.008 | 1 |
| 2/3/2006 | 47 | 324 | 377.5 | m | 4.7 | 3.2 | 7.9 | 0.021 | 3 |
| 2/3/2006 | 48 | 340 | 361.5 | m | 3.7 | 3.2 | 6.9 | 0.019 | 3 |
| 2/3/2006 | 49 | 345 | 494 | f | 13.3 | 12.1 | 25.4 | 0.051 | . |
| 2/3/2006 | 50 | 360 | 520.5 | f | 14.2 | 12.5 | 26.7 | 0.051 | 3 |
| 2/3/2006 | 51 | 321 | 373 | m | 3.7 | 2.9 | 6.6 | 0.018 | 3 |
| 2/3/2006 | 52 | 361 | 515.5 | m | 5.1 | 4.8 | 9.9 | 0.019 | 4 |
| 2/3/2006 | 53 | 316 | 359 | f | 22.6 | 14.4 | 37 | 0.103 | 2 |
| 2/3/2006 | 54 | 328 | 401.5 | f | 11.4 | 9.9 | 21.3 | 0.053 | 3 |
| 2/3/2006 | 55 | 375 | 609 | f | 12 | 10.5 | 22.5 | 0.037 | 3 |
| 2/3/2006 | 56 | 340 | 437 | m | 4.7 | 6 | 10.7 | 0.024 | 3 |
| 2/3/2006 | 57 | 332 | 398.5 | f | 15.2 | 12.2 | 27.4 | 0.069 | 3 |
| 2/7/2006 | 58 | 351 | 437.5 | f | 17 | 12.8 | 29.8 | 0.068 | 3 |
| 2/7/2006 | 59 | 388 | 768 | f | 38.6 | 29 | 67.6 | 0.088 | 4 |
| 2/7/2006 | 60 | 319 | 353 | m | 4.6 | 4 | 8.6 | 0.024 | 2 |
| 2/7/2006 | 61 | 323 | 335 | m | 4.1 | 4.2 | 8.3 | 0.025 | 3 |
| 2/7/2006 | 62 | 321 | 390 | m | 4.8 | 4.5 | 9.3 | 0.024 | 3 |
| 2/7/2006 | 63 | 336 | 394 | m | 4.8 | 5.1 | 9.9 | 0.025 | 4 |
| 2/7/2006 | 64 | 335 | 344 | m | 3.8 | 4.7 | 8.5 | 0.025 | 3 |
| 2/7/2006 | 65 | 329 | 357 | m | 4.7 | 5 | 9.7 | 0.027 | 3 |
| 2/7/2006 | 66 | 332 | 401 | m | 3.8 | 6 | 9.8 | 0.024 | 3 |
| 2/7/2006 | 67 | 336 | 372.5 | m | 5.3 | 4 | 9.3 | 0.025 | 3 |
| 2/7/2006 | 68 | 347 | 388 | m | 4.1 | 2.7 | 6.8 | 0.018 | . |
| 2/7/2006 | 69 | 351 | 417 | m | 4 | 5.6 | 9.6 | 0.023 | 3 |
| 2/7/2006 | 70 | 346 | 433.5 | f | 17.7 | 15 | 32.7 | 0.075 | . |
| 2/7/2006 | 71 | 335 | 365 | m | 5.4 | 5 | 10.4 | 0.028 | . |
| 2/7/2006 | 72 | 378 | 547.5 | f | 21.2 | 16.3 | 37.5 | 0.068 | 3 |
| 2/7/2006 | 73 | 320 | 350.5 | m | 4.3 | 3.8 | 8.1 | 0.023 | 3 |
| 2/7/2006 | 74 | 316 | 339 | m | 4.7 | 3.9 | 8.6 | 0.025 | 3 |
| 2/7/2006 | 75 | 342 | 415.5 | f | 23.8 | 20 | 43.8 | 0.105 | . |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 2/7/2006 | 76 | 333 | 390 | m | 4 | 4.3 | 8.3 | 0.021 | 3 |
| 2/7/2006 | 77 | 335 | 412.5 | m | 4.4 | 5.4 | 9.8 | 0.024 | 3 |
| 2/7/2006 | 78 | 334 | 354 | m | 5.3 | 4.8 | 10.1 | 0.029 | . |
| 2/7/2006 | 79 | 307 | 337 | f | 14.4 | 12.4 | 26.8 | 0.08 | . |
| 2/7/2006 | 80 | 326 | 361.5 | m | 4.5 | 5.3 | 9.8 | 0.027 | . |
| 2/7/2006 | 81 | 379 | 490 | f | 22.9 | 13 | 35.9 | 0.073 | . |
| 2/7/2006 | 82 | 322 | 329.5 | m | 4.6 | 4.3 | 8.9 | 0.027 | . |
| 2/7/2006 | 83 | 229 | 379 | m | 4.4 | 4.4 | 8.8 | 0.023 | . |
| 2/7/2006 | 84 | 385 | 545.5 | f | 16.3 | 15 | 31.3 | 0.057 | 3 |
| 2/7/2006 | 85 | 306 | 368 | m | 3.8 | 4.2 | 8 | 0.022 | . |
| 2/7/2006 | 86 | 345 | 450 | m | 4.4 | 4.7 | 9.1 | 0.02 | . |
| 2/7/2006 | 87 | 343 | 431 | m | 4.5 | 4.3 | 8.8 | 0.02 | . |
| 2/7/2006 | 88 | 380 | 646.5 | f | 12.9 | 13.2 | 26.1 | 0.04 | 4 |
| 2/7/2006 | 89 | 322 | 351.5 | m | 4.4 | 4.6 | 9 | 0.026 | . |
| 2/7/2006 | 90 | 331 | 347.5 | m | 3.8 | 4.1 | 7.9 | 0.023 | . |
| 2/7/2006 | 91 | 329 | 323 | m | 4.1 | 4.5 | 8.6 | 0.027 | . |
| 2/7/2006 | 92 | 319 | 344.5 | m | 3 | 4.1 | 7.1 | 0.021 | . |
| 2/7/2006 | 93 | 332 | 368.5 | m | 4.2 | 3.6 | 7.8 | 0.021 | 3 |
| 2/7/2006 | 94 | 322 | 328 | m | 4.3 | 4.1 | 8.4 | 0.026 | . |
| 2/7/2006 | 95 | 334 | 423 | f | 14.2 | 10.9 | 25.1 | 0.059 | 3 |
| 2/7/2006 | 96 | 330 | 403 | f | 15.8 | 15.4 | 31.2 | 0.077 | . |
| 2/7/2006 | 97 | 315 | 333.5 | m | 2.8 | 3.9 | 6.7 | 0.02 | . |
| 2/7/2006 | 98 | 340 | 469.5 | m | 3.1 | 5.5 | 8.6 | 0.018 | . |
| 2/7/2006 | 99 | 335 | 491.5 | f | 15.8 | 12.8 | 28.6 | 0.058 | 3 |
| 2/7/2006 | 100 | 333 | 377.5 | m | 4.1 | 4.6 | 8.7 | 0.023 | . |
| 2/7/2006 | 101 | 329 | 388 | m | 6 | 5.6 | 11.6 | 0.03 | . |
| 2/7/2006 | 102 | 304 | 278.5 | m | 4.3 | 3.4 | 7.7 | 0.028 | 3 |
| 2/7/2006 | 103 | 313 | 341 | m | 3.8 | 4 | 7.8 | 0.023 | . |
| 2/3/2006 | 104 | 196 | 68 | f | 0.25 | 0.26 | 0.51 | 0.008 | 1 |
| 2/3/2006 | 105 | 185 | 57 | f | 0.43 | 0.52 | 0.95 | 0.017 | 1 |
| 2/3/2006 | 106 | 192 | 57.5 | f | 0.124 | 0.123 | 0.247 | 0.004 | 1 |
| 2/3/2006 | 107 | 185 | 50.5 | f | 0.094 | 0.194 | 0.288 | 0.006 | . |
| 2/3/2006 | 108 | 185 | 61 | m | 0.536 | 0.595 | 1.131 | 0.019 | 1 |
| 2/3/2006 | 109 | 165 | 42 | m | 0.498 | 0.47 | 0.968 | 0.023 | 1 |
| 2/3/2006 | 110 | 165 | 47 | m | 0.358 | 0.298 | 0.656 | 0.014 | 1 |
| 2/3/2006 | 111 | 184 | 48.5 | m | 0.157 | 0.175 | 0.332 | 0.007 | . |
| 2/3/2006 | 112 | 180 | 53 | f | 0.467 | 0.392 | 0.859 | 0.016 | . |
| 2/3/2006 | 113 | 205 | 80 | m | 0.926 | 0.801 | 1.727 | 0.022 | 1 |
| 2/3/2006 | 114 | 180 | 56.5 | m | 0.295 | 0.263 | 0.558 | 0.01 | . |
| 2/3/2006 | 115 | 220 | 102.5 | m | 0.952 | 0.677 | 1.629 | 0.016 | 1 |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 2/3/2006 | 116 | 315 | 356.5 | m | 3.1 | 3.9 | 7 | 0.02 | 3 |
| 2/3/2006 | 117 | 341 | 407 | m | 4.4 | 4.1 | 8.5 | 0.021 | 3 |
| 2/10/2006 | 118 | 316 | 305.5 | m | 3.4 | 3.5 | 6.9 | 0.023 | 2 |
| 2/10/2006 | 119 | 326 | 322 | m | 4.1 | 3.4 | 7.5 | 0.023 | 3 |
| 2/10/2006 | 120 | 319 | 312 | m | 4.1 | 3.7 | 7.8 | 0.025 | . |
| 2/10/2006 | 121 | 301 | 366 | m | 3.8 | 3.36 | 7.16 | 0.02 | 2 |
| 2/10/2006 | 122 | 356 | 553.5 | f | 26.2 | 26.5 | 52.7 | 0.095 | 3 |
| 2/10/2006 | 123 | 317 | 313 | m | 3.5 | 3 | 6.5 | 0.021 | 2 |
| 2/10/2006 | 124 | 329 | 357 | m | 5.9 | 3.9 | 9.8 | 0.027 | 3 |
| 2/10/2006 | 125 | 318 | 325 | m | 4 | 3.7 | 7.7 | 0.024 | . |
| 2/10/2006 | 126 | 313 | 266 | m | 2.6 | 3.2 | 5.8 | 0.022 | . |
| 2/10/2006 | 127 | 290 | 220 | m | 2.1 | 1.9 | 4 | 0.018 | 2 |
| 2/10/2006 | 128 | 322 | 347.5 | m | 3.6 | 3.1 | 6.7 | 0.019 | . |
| 2/10/2006 | 129 | 302 | 234 | m | 3.5 | 3 | 6.5 | 0.028 | . |
| 2/10/2006 | 130 | 321 | 321 | m | 2 | 4.9 | 6.9 | 0.021 | . |
| 2/10/2006 | 131 | 330 | 377 | m | 5 | 3.5 | 8.5 | 0.023 | 3 |
| 2/10/2006 | 132 | 298 | 307 | m | 3.3 | 4.9 | 8.2 | 0.027 | 3 |
| 2/10/2006 | 133 | 306 | 287 | m | 3.8 | 3.7 | 7.5 | 0.026 | . |
| 2/10/2006 | 134 | 314 | 276 | m | 2.3 | 2.3 | 4.6 | 0.017 | . |
| 2/10/2006 | 135 | 338 | 440.5 | f | 13.6 | 12.9 | 26.5 | 0.06 | 3 |
| 2/10/2006 | 136 | 330 | 343.5 | m | 4.3 | 4.2 | 8.5 | 0.025 | 3 |
| 2/10/2006 | 137 | 304 | 281 | m | 3.1 | 2.3 | 5.4 | 0.019 | . |
| 2/10/2006 | 138 | 251 | 155.5 | m | 2.2 | 1.8 | 4 | 0.026 | 2 |
| 2/10/2006 | 139 | 309 | 303 | m | 4.9 | 3.1 | 8 | 0.026 | . |
| 2/10/2006 | 140 | 315 | 309.5 | f | 12 | 10.8 | 22.8 | 0.074 | . |
| 2/21/2006 | 141 | 375 | 628 | f | 24.65 | 21.9 | 46.55 | 0.074 | 4 |
| 2/21/2006 | 142 | 311 | 340.5 | m | 3.11 | 4.23 | 7.34 | 0.022 | 2 |
| 2/21/2006 | 143 | 344 | 493 | f | 25.79 | 21.83 | 47.62 | 0.097 | 3 |
| 2/21/2006 | 144 | 318 | 349 | m | 5.09 | 2.05 | 7.14 | 0.02 | 3 |
| 2/21/2006 | 145 | 378 | 597.5 | f | 30.67 | 27.36 | 58.03 | 0.097 | 3 |
| 2/21/2006 | 146 | 313 | 349.5 | m | 3 | 2.97 | 5.97 | 0.017 | 3 |
| 2/21/2006 | 147 | 309 | 347 | f | 20.7 | 14.9 | 35.6 | 0.103 | 2 |
| 2/21/2006 | 148 | 330 | 373 | m | 5.54 | 3.5 | 9.04 | 0.024 | 3 |
| 2/21/2006 | 149 | 306 | 301.5 | m | 3.95 | 3.44 | 7.39 | 0.025 | 3 |
| 2/21/2006 | 150 | 380 | 669.5 | f | 34.5 | 31.5 | 66 | 0.099 | 4 |
| 2/21/2006 | 151 | 330 | 358 | f | 14.5 | 6.5 | 21 | 0.059 | 4 |
| 2/21/2006 | 152 | 319 | 313.5 | m | 3.5 | 4 | 7.5 | 0.024 | . |
| 2/21/2006 | 153 | 320 | 362.5 | m | 3.97 | 4.17 | 8.14 | 0.022 | . |
| 2/21/2006 | 154 | 314 | 327 | m | 4.58 | 3.51 | 8.09 | 0.025 | . |
| 2/21/2006 | 155 | 325 | 327 | m | 5.37 | 3.36 | 8.73 | 0.027 | . |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 2/21/2006 | 156 | 302 | 279 | m | 3.11 | 3.6 | 6.71 | 0.024 | . |
| 2/21/2006 | 166 | 320 | 367.5 | f | 16.28 | 14.64 | 30.92 | 0.084 | . |
| 2/21/2006 | 167 | 321 | 362.5 | m | 3.83 | 4.12 | 7.95 | 0.022 | . |
| 2/21/2006 | 168 | 321 | 347 | m | 3.3 | 4.01 | 7.31 | 0.021 | . |
| 2/21/2006 | 169 | 328 | 360 | m | 4.49 | 4.23 | 8.72 | 0.024 | 3 |
| 2/21/2006 | 170 | 325 | 324.5 | m | 4.23 | 3.6 | 7.83 | 0.024 | . |
| 2/21/2006 | 171 | 348 | 452.5 | f | 21.57 | 19.63 | 41.2 | 0.091 | 3 |
| 2/21/2006 | 172 | 321 | 373 | m | 4.82 | 4.12 | 8.94 | 0.024 | . |
| 2/21/2006 | 173 | 359 | 523 | f | 27.05 | 22.72 | 49.77 | 0.095 | 4 |
| 2/21/2006 | 174 | 368 | 519.5 | f | 29.09 | 20.13 | 49.22 | 0.095 | 3 |
| 2/21/2006 | 175 | 348 | 423.5 | f | 22.41 | 24.29 | 46.7 | 0.11 | . |
| 2/21/2006 | 176 | 358 | 562 | f | 23.49 | 20.81 | 44.3 | 0.079 | . |
| 2/21/2006 | 177 | 363 | 490 | f | 24.4 | 21.53 | 45.93 | 0.094 | 4 |
| 2/21/2006 | 178 | 318 | 323 | m | 3.71 | 4 | 7.71 | 0.024 | . |
| 2/21/2006 | 179 | 368 | 583 | f | 29.3 | 31.63 | 60.93 | 0.105 | . |
| 2/21/2006 | 180 | 320 | 381 | m | 4.59 | 3.96 | 8.55 | 0.022 | . |
| 2/21/2006 | 181 | 347 | 444 | f | 19.97 | 16.14 | 36.11 | 0.081 | . |
| 2/21/2006 | 182 | 339 | 425 | m | 4.21 | 4.17 | 8.38 | 0.02 | . |
| 2/21/2006 | 183 | 321 | 348 | m | 2.72 | 3.62 | 6.34 | 0.018 | . |
| 2/21/2006 | 184 | 349 | 532 | f | 24.47 | 20.36 | 44.83 | 0.084 | . |
| 2/21/2006 | 185 | 323 | 380 | m | 4.4 | 4.59 | 8.99 | 0.024 | . |
| 2/21/2006 | 186 | 350 | 502.5 | f | 18.05 | 20.22 | 38.27 | 0.076 | . |
| 2/21/2006 | 187 | 338 | 450.5 | m | 3.5 | 4.04 | 7.54 | 0.017 | . |
| 2/21/2006 | 188 | 353 | 508 | f | 24.53 | 20.58 | 45.11 | 0.089 | . |
| 2/21/2006 | 189 | 359 | 533.5 | f | 16.97 | 14.26 | 31.23 | 0.059 | . |
| 2/21/2006 | 190 | 314 | 322.5 | m | 2.41 | 2.2 | 4.61 | 0.014 | . |
| 2/21/2006 | 191 | 321 | 405 | f | 19.02 | 19.55 | 38.57 | 0.095 | . |
| 3/23/2006 | 192 | 380 | 808.5 | f | 67.33 | 64.15 | 131.48 | 0.163 | 4 |
| 3/23/2006 | 193 | 342 | 416 | f | 40.29 | 34.22 | 74.51 | 0.179 | 3 |
| 3/23/2006 | 194 | 382 | 744 | f | 72.92 | 51.54 | 124.46 | 0.167 | 4 |
| 3/23/2006 | 195 | 340 | 404 | f | 25.39 | 23.78 | 49.17 | 0.122 | 3 |
| 3/23/2006 | 196 | 320 | 272.5 | m | 1.33 | 2.37 | 3.7 | 0.014 | 3 |
| 3/23/2006 | 197 | 353 | 491 | f | 27.41 | 22.75 | 50.16 | 0.102 | 3 |
| 3/23/2006 | 198 | 352 | 441 | f | 20.46 | 24.05 | 44.51 | 0.101 | 3 |
| 3/23/2006 | 199 | 331 | 400.5 | f | 26.12 | 23.1 | 49.22 | 0.123 | 3 |
| 3/23/2006 | 200 | 360 | 392 | f | 20.33 | 18.7 | 39.03 | 0.1 | 3 |
| 3/23/2006 | 201 | 370 | 474.5 | f | 28.44 | 26.45 | 54.89 | 0.116 | . |
| 3/23/2006 | 202 | 353 | 418 | f | 24.46 | 20.36 | 44.82 | 0.107 | 3 |
| 3/23/2006 | 203 | 366 | 430.5 | f | 14.26 | 13.35 | 27.61 | 0.064 | . |
| 3/23/2006 | 204 | 369 | 491.5 | f | 24.88 | 25.67 | 50.55 | 0.103 | . |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 3/23/2006 | 205 | 311 | 425.5 | f | 34.26 | 30.93 | 65.19 | 0.153 | 3 |
| 3/23/2006 | 206 | 340 | 400 | f | 13 | 11.45 | 24.45 | 0.061 | 3 |
| 3/23/2006 | 207 | 358 | 397 | f | 26.65 | 19.89 | 46.54 | 0.117 | . |
| 3/23/2006 | 208 | 356 | 419.5 | f | 17.23 | 15.12 | 32.35 | 0.077 | . |
| 3/23/2006 | 209 | 365 | 463.5 | f | 36.26 | 34.81 | 71.07 | 0.153 | . |
| 3/23/2006 | 210 | 357 | 506.5 | f | 29.26 | 22.96 | 52.22 | 0.103 | . |
| 3/23/2006 | 211 | 332 | 335 | f | 28.96 | 21.83 | 50.79 | 0.152 | 3 |
| 3/23/2006 | 212 | 364 | 471.5 | f | 34.51 | 30.08 | 64.59 | 0.137 | . |
| 3/23/2006 | 213 | 360 | 404.5 | m | 3.77 | 3.68 | 7.45 | 0.018 | . |
| 3/23/2006 | 214 | 315 | 369.5 | m | 7.16 | 3.59 | 10.75 | 0.029 | 3 |
| 3/23/2006 | 215 | 362 | 461.5 | f | 13.82 | 13.78 | 27.6 | 0.06 | . |
| 3/23/2006 | 216 | 330 | 356.5 | f | 19.69 | 19.27 | 38.96 | 0.109 | . |
| 3/23/2006 | 217 | 327 | 352 | m | 3.2 | 2.93 | 6.13 | 0.017 | . |
| 3/23/2006 | 218 | 350 | 416 | f | 21.59 | 20.43 | 42.02 | 0.101 | . |
| 3/23/2006 | 219 | 291 | 243.5 | m | 2.54 | 2.31 | 4.85 | 0.02 | 2 |
| 3/23/2006 | 220 | 313 | 314 | m | 2.97 | 3.82 | 6.79 | 0.022 | 3 |
| 3/23/2006 | 221 | 339 | 407.5 | f | 37.63 | 32.74 | 70.37 | 0.173 | . |
| 3/23/2006 | 222 | 306 | 321 | m | 3.31 | 2.86 | 6.17 | 0.019 | 3 |
| 3/23/2006 | 223 | 329 | 287 | m | 3.47 | 4.05 | 7.52 | 0.026 | . |
| 3/23/2006 | 224 | 317 | 243.5 | m | 3.23 | 2.16 | 5.39 | 0.022 | . |
| 3/23/2006 | 225 | 305 | 232.5 | m | 2.58 | 2.61 | 5.19 | 0.022 | . |
| 3/23/2006 | 226 | 307 | 323 | m | 3.37 | 3.99 | 7.36 | 0.023 | . |
| 3/23/2006 | 227 | 355 | 386 | f | 22.8 | 22.64 | 45.44 | 0.118 | . |
| 3/10/2006 | 228 | 312 | 311.5 | m | 4.83 | 5.38 | 10.21 | 0.033 | . |
| 3/10/2006 | 229 | 282 | 224 | m | 1.1 | 2.31 | 3.41 | 0.015 | 2 |
| 3/10/2006 | 230 | 311 | 370 | f | 15.21 | 14.89 | 30.1 | 0.081 | 2 |
| 3/10/2006 | 231 | 364 | 499.5 | f | 16.03 | 12.44 | 28.47 | 0.057 | 3 |
| 3/10/2006 | 232 | 306 | 272 | m | 3.68 | 2.83 | 6.51 | 0.024 | 3 |
| 3/10/2006 | 233 | 333 | 365 | m | 4.88 | 3.85 | 8.73 | 0.024 | 3 |
| 3/10/2006 | 234 | 308 | 280 | m | 4.59 | 4.3 | 8.89 | 0.032 | 3 |
| 3/10/2006 | 235 | 323 | 321.5 | m | 3.14 | 3.07 | 6.21 | 0.019 | 3 |
| 3/10/2006 | 236 | 315 | 350 | m | 4.22 | 4.73 | 8.95 | 0.026 | 3 |
| 3/10/2006 | 237 | 318 | 314 | m | 2.33 | 4.15 | 6.48 | 0.021 | . |
| 3/10/2006 | 238 | 324 | 381 | f | 22.12 | 19.27 | 41.39 | 0.109 | . |
| 3/10/2006 | 239 | 329 | 359 | m | 6.2 | 4.51 | 10.71 | 0.03 | 3 |
| 3/10/2006 | 240 | 299 | 262 | f | 13.52 | 13.09 | 26.61 | 0.102 | 3 |
| 3/10/2006 | 241 | 303 | 285 | m | 2.35 | 3.13 | 5.48 | 0.019 | . |
| 3/10/2006 | 242 | 318 | 332 | m | 5.32 | 4.42 | 9.74 | 0.029 | . |
| 3/10/2006 | 243 | 296 | 268 | m | 4.15 | 3.97 | 8.12 | 0.03 | 2 |
| 3/10/2006 | 244 | 324 | 331.5 | m | 4.65 | 4.57 | 9.22 | 0.028 | . |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 3/10/2006 | 245 | 306 | 281.5 | m | 3.12 | 2.24 | 5.36 | 0.019 | . |
| 3/10/2006 | 246 | 308 | 278 | m | 3.17 | 3.78 | 6.95 | 0.025 | . |
| 3/10/2006 | 247 | 315 | 325.53 | m | 3.76 | 3.85 | 7.61 | 0.023 | . |
| 3/10/2006 | 248 | 315 | 243.5 | m | 4 | 4.63 | 8.63 | 0.035 | . |
| 3/10/2006 | 249 | 323 | 349 | m | 3.97 | 4.62 | 8.59 | 0.025 | . |
| 3/10/2006 | 250 | 329 | 345.5 | m |  |  | 0 | 0 | 3 |
| 3/10/2006 | 251 | 308 | 318.5 | m | 2.06 | 1.88 | 3.94 | 0.012 | . |
| 3/10/2006 | 252 | 336 | 344 | m | 5.44 | 3.91 | 9.35 | 0.027 | 3 |
| 3/10/2006 | 253 | 296 | 282 | f | 7.77 | 5.13 | 12.9 | 0.046 | . |
| 3/10/2006 | 254 | 270 | 178 | f | 3.69 | 3.47 | 7.16 | 0.04 | 2 |
| 3/10/2006 | 255 | 280 | 213 | m | 1.99 | 2.16 | 4.15 | 0.019 | .. |
| 3/23/2006 | 256 | 362 | 364 | m | 4.15 | 3.72 | 7.87 | 0.022 | . |
| 3/23/2006 | 257 | 304 | 380 | f | 12.41 | 11.66 | 24.07 | 0.063 | . |
| 3/23/2006 | 258 | 317 | 388 | m | 3 | 2.12 | 5.12 | 0.013 | . |
| 3/28/2006 | 259 | 301 | 274.5 | f | 18.1 | 15.91 | 34.01 | 0.124 | 3 |
| 3/28/2006 | 260 | 365 | 522 | f | 30.68 | 23.27 | 53.95 | 0.103 | 3 |
| 3/28/2006 | 261 | 302 | 274 | m | 3.13 | 3.23 | 6.36 | 0.023 | 3 |
| 3/28/2006 | 262 | 327 | 380 | m | 5.57 | 4.49 | 10.06 | 0.026 | 3 |
| 3/28/2006 | 263 | 310 | 308 | m | 3.38 | 3.73 | 7.11 | 0.023 | 3 |
| 3/28/2006 | 264 | 308 | 315 | m | 3.69 | 3.53 | 7.22 | 0.023 | 3 |
| 3/28/2006 | 265 | 315 | 293.5 | m | 3.35 | 2.48 | 5.83 | 0.02 | 3 |
| 3/28/2006 | 266 | 311 | 323 | m | 3.37 | 3.33 | 6.7 | 0.021 | . |
| 3/28/2006 | 267 | 354 | 385.5 | m | 4.05 | 4.63 | 8.68 | 0.023 | 3 |
| 3/28/2006 | 268 | 322 | 310 | m | 3.83 | 4.21 | 8.04 | 0.026 | . |
| 3/28/2006 | 269 | 308 | 349 | m | 4.55 | 4.05 | 8.6 | 0.025 | . |
| 3/28/2006 | 270 | 317 | 307.5 | m | 3.15 | 3.29 | 6.44 | 0.021 | . |
| 3/28/2006 | 271 | 316 | 307.5 | m | 2.6 | 2.04 | 4.64 | 0.015 | . |
| 3/28/2006 | 272 | 342 | 360.5 | m | 2.54 | 3.85 | 6.39 | 0.018 | . |
| 3/28/2006 | 273 | 329 | 352 | m | 4.34 | 5.37 | 9.71 | 0.028 | 3 |
| 3/28/2006 | 274 | 342 | 352.5 | m | 3.69 | 3.16 | 6.85 | 0.019 | 3 |
| 3/28/2006 | 275 | 362 | 473.5 | f | 40.79 | 27.6 | 68.39 | 0.144 | 3 |
| 3/28/2006 | 276 | 318 | 344 | m | 4.76 | 4.28 | 9.04 | 0.026 | . |
| 3/28/2006 | 277 | 281 | 253 | f | 14.3 | 8.05 | 22.35 | 0.088 | 2 |
| 3/28/2006 | 278 | 316 | 340 | m | 4.44 | 4.26 | 8.7 | 0.026 | . |
| 3/28/2006 | 279 | 322 | 344.5 | m | 3.96 | 3.48 | 7.44 | 0.022 | . |
| 3/28/2006 | 280 | 331 | 381 | f | 33.52 | 25.44 | 58.96 | 0.155 | 3 |
| 3/28/2006 | 281 | 337 | 388.5 | m | 5.52 | 3.66 | 9.18 | 0.024 | . |
| 3/28/2006 | 282 | 311 | 275 | m | 2.46 | 1.83 | 4.29 | 0.016 | . |
| 3/28/2006 | 283 | 302 | 301 | m | 3.5 | 2.5 | 6 | 0.02 | . |
| 3/28/2006 | 284 | 348 | 433 | f | 37.78 | 26.1 | 63.88 | 0.148 | . |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 3/28/2006 | 285 | 335 | 402 | f | 18.14 | 18.09 | 36.23 | 0.09 | 3 |
| 3/28/2006 | 286 | 313 | 321 | m | 3.36 | 3.5 | 6.86 | 0.021 | . |
| 3/28/2006 | 287 | 321 | 361 | f | 28.86 | 28.45 | 57.31 | 0.159 | . |
| 3/28/2006 | 288 | 351 | 474 | f | 37.54 | 28.78 | 66.32 | 0.14 | 3 |
| 3/28/2006 | 289 | 338 | 382.5 | m | 5.16 | 3.48 | 8.64 | 0.023 | . |
| 3/28/2006 | 290 | 342 | 388 | f | 28.4 | 24.67 | 53.07 | 0.137 | . |
| 3/28/2006 | 291 | 345 | 396 | f | 13.68 | 12.66 | 26.34 | 0.067 | . |
| 3/28/2006 | 292 | 335 | 361 | m | 4.63 | 4.98 | 9.61 | 0.027 | . |
| 3/28/2006 | 293 | 350 | 435 | f | 27.73 | 22.93 | 50.66 | 0.116 | . |
| 3/28/2006 | 294 | 336 | 419 | f | 20.81 | 18.98 | 39.79 | 0.095 | . |
| 3/28/2006 | 295 | 357 | 483 | f | 37.53 | 27.08 | 64.61 | 0.134 | . |
| 3/28/2006 | 296 | 313 | 298 | m | 4.08 | 3.11 | 7.19 | 0.024 | 3 |
| 4/7/2006 | 297 | 336 | 358 | f | 13.6 | 13.36 | 26.96 | 0.075 | 3 |
| 4/7/2006 | 298 | 318 | 297 | m | 2.34 | 1.86 | 4.2 | 0.014 | 3 |
| 4/7/2006 | 299 | 305 | 296 | f | 20.1 | 14.42 | 34.52 | 0.117 | 3 |
| 4/7/2006 | 300 | 300 | 298.5 | m | 2.84 | 2.39 | 5.23 | 0.018 | 3 |
| 4/7/2006 | 301 | 336 | 357.5 | f | 18.8 | 7.57 | 26.37 | 0.074 | 3 |
| 4/7/2006 | 302 | 324 | 346 | f | 13.26 | 15.5 | 28.76 | 0.083 | 3 |
| 4/7/2006 | 303 | 292 | 241 | m | 2.12 | 2.46 | 4.58 | 0.019 | 2 |
| 4/7/2006 | 304 | 338 | 400 | m | 3.98 | 4.67 | 8.65 | 0.022 | 3 |
| 4/7/2006 | 305 | 314 | 293 | m | 2.31 | 1.76 | 4.07 | 0.014 | 3 |
| 4/7/2006 | 306 | 302 | 283.5 | m | 3.57 | 3.15 | 6.72 | 0.024 | 2 |
| 4/7/2006 | 307 | 330 | 367.5 | m | 3.71 | 3.9 | 7.61 | 0.021 | 3 |
| 4/7/2006 | 308 | 339 | 392.5 | f | 11.79 | 12.29 | 24.08 | 0.061 | 3 |
| 4/7/2006 | 309 | 245 | 140 | m | 1.02 | 0.81 | 1.83 | 0.013 | 2 |
| 4/7/2006 | 310 | 308 | 346 | f | 31.8 | 25.3 | 57.1 | 0.165 | . |
| 4/7/2006 | 311 | 306 | 338 | m | 3.25 | 3.89 | 7.14 | 0.021 | . |
| 4/7/2006 | 312 | 326 | 295 | m | 2.9 | 2.79 | 5.69 | 0.019 | . |
| 4/7/2006 | 313 | 308 | 326 | m | 3.57 | 4.49 | 8.06 | 0.025 | . |
| 4/7/2006 | 314 | 327 | 295 | m | 2.79 | 2.48 | 5.27 | 0.018 | . |
| 4/7/2006 | 315 | 332 | 354 | m | 4.16 | 4.08 | 8.24 | 0.023 | . |
| 4/7/2006 | 316 | 312 | 308 | m | 2.5 | 2.48 | 4.98 | 0.016 | . |
| 4/7/2006 | 317 | 379 | 519 | f | 49.93 | 37.32 | 87.25 | 0.168 | 3 |
| 4/7/2006 | 318 | 318 | 353 | f | 14.18 | 12.11 | 26.29 | 0.074 | . |
| 4/7/2006 | 319 | 305 | 323 | f | 27.31 | 21.39 | 48.7 | 0.151 | . |
| 4/7/2006 | 320 | 328 | 325.5 | m | 3.75 | 3.01 | 6.76 | 0.021 | . |
| 4/7/2006 | 321 | 312 | 378.5 | f | 35.28 | 37.86 | 73.14 | 0.193 | . |
| 4/7/2006 | 322 | 325 | 336 | f | 17.8 | 15.79 | 33.59 | 0.1 | . |
| 4/7/2006 | 323 | 315 | 339.5 | m | 2.47 | 3.08 | 5.55 | 0.016 | . |
| 4/7/2006 | 324 | 321 | 317 | f | 23.46 | 20.73 | 44.19 | 0.139 | . |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 4/7/2006 | 325 | 324 | 323 | f | 8.46 | 8 | 16.46 | 0.051 | . |
| 4/7/2006 | 326 | 305 | 285.5 | m | 3.08 | 2.74 | 5.82 | 0.02 | . |
| 4/7/2006 | 327 | 340 | 453 | f | 32.21 | 27.3 | 59.51 | 0.131 | . |
| 4/7/2006 | 328 | 355 | 504.5 | f | 35.97 | 27.84 | 63.81 | 0.126 | . |
| 4/7/2006 | 329 | 336 | 350 | f | 14.85 | 12.51 | 27.36 | 0.078 | . |
| 4/7/2006 | 330 | 336 | 374.5 | m | 2.89 | 2.9 | 5.79 | 0.015 | . |
| 4/7/2006 | 331 | 381 | 763.5 | f | 59.63 | 55.07 | 114.7 | 0.15 | 4 |
| 4/7/2006 | 332 | 426 | 780.5 | f | 40.47 | 37.57 | 78.04 | 0.1 | 4 |
| 4/7/2006 | 333 | 401 | 820.5 | f | 45.5 | 41.15 | 86.65 | 0.106 | 4 |
| 4/7/2006 | 334 | 328 | 361 | f | 24.22 | 21.29 | 45.51 | 0.126 | . |
| 4/7/2006 | 335 | 309 | 305.5 | m | 3.51 | 2.16 | 5.67 | 0.019 | . |
| 4/7/2006 | 336 | 341 | 425.5 | m | 5.79 | 4.61 | 10.4 | 0.024 | |
| 4/7/2006 | 337 | 329 | 366.5 | m | 5.63 | 3.32 | 8.95 | 0.024 | |
| 4/7/2006 | 338 | 351 | 402.5 | f | 24.7 | 23.32 | 48.02 | 0.119 | 3 |
| 4/7/2006 | 339 | 323 | 369.5 | m | 2.62 | 4 | 6.62 | 0.018 | . |
| 4/7/2006 | 340 | 334 | 345.5 | f | 7.12 | 7.99 | 15.11 | 0.044 | . |
| 4/7/2006 | 341 | 308 | 272.5 | m | 1.74 | 3.54 | 5.28 | 0.019 | . |
| 4/7/2006 | 342 | 307 | 293.5 | m | 1.75 | 2.29 | 4.04 | 0.014 | . |
| 4/7/2006 | 343 | 326 | 304.5 | f | 5.73 | 5.8 | 11.53 | 0.038 | . |
| 4/7/2006 | 344 | 301 | 333.5 | f | 29.07 | 29.24 | 58.31 | 0.175 | . |
| 4/7/2006 | 345 | 300 | 243.5 | m | 1.64 | 2.24 | 3.88 | 0.016 | 3 |
| 4/7/2006 | 346 | 357 | 570.5 | f | 49.57 | 37.19 | 86.76 | 0.152 | 3 |
| 4/7/2006 | 347 | 368 | 556.5 | f | 7.99 | 36.01 | 44 | 0.079 | 3 |
| 4/7/2006 | 348 | 355 | 449.5 | f | 22.94 | 16.84 | 39.78 | 0.088 | 3 |
| 4/7/2006 | 349 | 390 | 773.5 | f | 69.54 | 43.05 | 112.59 | 0.146 | . |
| 4/7/2006 | 350 | 345 | 425.5 | f | 21.93 | 19.39 | 41.32 | 0.097 | . |
| 4/7/2006 | 351 | 341 | 385.5 | m | 2.77 | 3.07 | 5.84 | 0.015 | . |
| 4/7/2006 | 352 | 340 | 451.5 | f | 32.24 | 23.07 | 55.31 | 0.123 | . |
| 4/7/2006 | 353 | 355 | 468 | f | 33.65 | 30.7 | 64.35 | 0.138 | 3 |
| 4/7/2006 | 354 | 340 | 425 | f | 20.81 | 22.86 | 43.67 | 0.103 | . |
| 4/7/2006 | 355 | 355 | 419 | f | 16.79 | 14.62 | 31.41 | 0.075 | . |
| 4/7/2006 | 356 | 340 | 501 | f | 25.34 | 23.61 | 48.95 | 0.098 | . |
| 4/7/2006 | 357 | 359 | 442.5 | f | 11.04 | 12.52 | 23.56 | 0.053 | . |
| 4/7/2006 | 358 | 328 | 330.5 | m | 4.25 | 2.5 | 6.75 | 0.02 | . |
| 4/7/2006 | 359 | 334 | 325 | m | 3.63 | 2.41 | 6.04 | 0.019 | . |
| 4/25/2006 | 360 | 354 | 396 | f | 6.46 | 6.74 | 13.2 | 0.033 | 3 |
| 4/25/2006 | 361 | 386 | 737.5 | f | 42.85 | 44.27 | 87.12 | 0.118 | 4 |
| 4/25/2006 | 362 | 380 | 552 | f | 21.74 | 18.8 | 40.54 | 0.073 | . |
| 4/25/2006 | 363 | 346 | 359.5 | f | 21.1 | 17.32 | 38.42 | 0.107 | 3 |
| 4/25/2006 | 364 | 345 | 370 | f | 19.38 | 19.98 | 39.36 | 0.106 | 3 |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 4/25/2006 | 365 | 363 | 385.5 | f | 2.21 | 2.45 | 4.66 | 0.012 | 3 |
| 4/25/2006 | 366 | 347 | 455.5 | f | 24.99 | 21.09 | 46.08 | 0.101 | 3 |
| 4/25/2006 | 367 | 361 | 747 | f | 20.27 | 17.23 | 37.5 | 0.05 | 3 |
| 4/25/2006 | 368 | 319 | 291 | m | 1.85 | 1.75 | 3.6 | 0.012 | 2 |
| 4/25/2006 | 369 | 305 | 282.5 | m | 2.6 | 1.82 | 4.42 | 0.016 | 3 |
| 4/25/2006 | 370 | 311 | 288 | f | 12.25 | 10.74 | 22.99 | 0.08 | 3 |
| 4/25/2006 | 371 | 312 | 261.5 | m | 1.4 | 1.64 | 3.04 | 0.012 | 2 |
| 4/25/2006 | 372 | 312 | 293 | m | 2.27 | 2.54 | 4.81 | 0.016 | 3 |
| 4/25/2006 | 373 | 342 | 418 | m | 2.77 | 2.54 | 5.31 | 0.013 | 3 |
| 4/25/2006 | 374 | 365 | 524.5 | f | 33.61 | 30.91 | 64.52 | 0.123 | 3 |
| 4/25/2006 | 375 | 315 | 268 | f | 10.64 | 8.91 | 19.55 | 0.073 | . |
| 4/25/2006 | 376 | 310 | 274.5 | m | 3 | 2.57 | 5.57 | 0.02 | . |
| 4/25/2006 | 377 | 331 | 376.5 | f | 11.23 | 8.48 | 19.71 | 0.052 | 3 |
| 4/25/2006 | 378 | 336 | 421.5 | f | 14.04 | 15.34 | 29.38 | 0.07 | . |
| 5/25/2006 | 379 | 316 | 261.5 | m | 1.89 | 1.9 | 3.79 | 0.014 | 3 |
| 5/25/2006 | 380 | 305 | 241.5 | m | 2.06 | 1.84 | 3.9 | 0.016 | 3 |
| 5/25/2006 | 381 | 341 | 308 | f | 5.22 | 4.36 | 9.58 | 0.031 | 3 |
| 5/25/2006 | 382 | 340 | 332.5 | m | 2.21 | 2.64 | 4.85 | 0.015 | 3 |
| 5/25/2006 | 383 | 328 | 306 | m | 1.22 | 1.54 | 2.76 | 0.009 | 3 |
| 5/25/2006 | 384 | 314 | 248 | m | 1.57 | 1.6 | 3.17 | 0.013 | . |
| 5/25/2006 | 385 | 291 | 205.5 | m | 1.26 | 1.07 | 2.33 | 0.011 | 3 |
| 5/25/2006 | 386 | 336 | 330.5 | m | 1.38 | 1.46 | 2.84 | 0.009 | 3 |
| 5/25/2006 | 387 | 324 | 306.5 | m | 1.77 | 1.1 | 2.87 | 0.009 | 3 |
| 5/25/2006 | 388 | 318 | 286 | m | 1.93 | 2.06 | 3.99 | 0.014 | 3 |
| 5/25/2006 | 389 | 296 | 257 | m | 1.28 | 1.38 | 2.66 | 0.01 | 3 |
| 5/25/2006 | 390 | 419 | 851.5 | f | 64.95 | 42.58 | 107.53 | 0.126 | 4 |
| 5/25/2006 | 391 | 324 | 286 | f | 3.45 | 2.54 | 5.99 | 0.021 | . |
| 5/25/2006 | 392 | 319 | 289.5 | m | 1.9 | 1.86 | 3.76 | 0.013 | . |
| 5/25/2006 | 393 | 340 | 337 | m | 2.11 | 1.63 | 3.74 | 0.011 | 3 |
| 5/25/2006 | 394 | 330 | 296.5 | m | 1.84 | 1.74 | 3.58 | 0.012 | . |
| 5/25/2006 | 395 | 315 | 248.5 | f | 2.78 | 2.18 | 4.96 | 0.02 | . |
| 5/25/2006 | 396 | 306 | 224.5 | f | 4.44 | 4.74 | 9.18 | 0.041 | . |
| 5/25/2006 | 397 | 325 | 327 | m | 1.52 | 1.79 | 3.31 | 0.01 | . |
| 5/25/2006 | 398 | 315 | 294 | m | 2.25 | 2.36 | 4.61 | 0.016 | . |
| 5/25/2006 | 399 | 321 | 321.5 | f | 7.34 | 6.16 | 13.5 | 0.042 | . |
| 5/25/2006 | 400 | 320 | 283.5 | m | 1.57 | 1.25 | 2.82 | 0.01 | . |
| 5/25/2006 | 401 | 325 | 308 | m | 2.67 | 2.25 | 4.92 | 0.016 | . |
| 5/25/2006 | 402 | 303 | 238 | m | 1.36 | 1.62 | 2.98 | 0.013 | . |
| 5/25/2006 | 403 | 370 | 425 | f | 18.98 | 15.77 | 34.75 | 0.082 | 3 |
| 5/25/2006 | 404 | 327 | 296 | f | 4.75 | 4.67 | 9.42 | 0.032 | . |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 5/25/2006 | 405 | 328 | 286 | f | 8.15 | 6.67 | 14.82 | 0.052 | . |
| 5/25/2006 | 406 | 322 | 307 | m | 1.63 | 2 | 3.63 | 0.012 | . |
| 5/25/2006 | 407 | 330 | 265.5 | m | 1.44 | 1.05 | 2.49 | 0.009 | . |
| 5/25/2006 | 408 | 315 | 259 | m | 1.15 | 1.09 | 2.24 | 0.009 | . |
| 5/25/2006 | 409 | 346 | 305.5 | f | 5.96 | 4.9 | 10.86 | 0.036 | . |
| 5/25/2006 | 410 | 350 | 327 | f | 13.19 | 10.22 | 23.41 | 0.072 | . |
| 5/25/2006 | 411 | 329 | 308.5 | m | 1.89 | 1.51 | 3.4 | 0.011 | . |
| 5/25/2006 | 412 | 306 | 240 | m | 2.13 | 1.45 | 3.58 | 0.015 | . |
| 5/25/2006 | 413 | 316 | 253.5 | m | 2.13 | 0.75 | 2.88 | 0.011 | . |
| 5/25/2006 | 414 | 329 | 333.5 | m | 1.62 | 2.13 | 3.75 | 0.011 | . |
| 5/25/2006 | 415 | 335 | 332 | m | 4.01 | 3.95 | 7.96 | 0.024 | . |
| 5/25/2006 | 416 | 321 | 355.5 | m | 2.2 | 1.29 | 3.49 | 0.01 | . |
| 5/25/2006 | 417 | 405 | 816 | f | 39.72 | 31.56 | 71.28 | 0.087 | 4 |
| 5/25/2006 | 418 | 395 | 697.5 | f | 29.41 | 29.72 | 59.13 | 0.085 | 4 |
| 5/25/2006 | 419 | 390 | 725 | f | 47.75 | 42.02 | 89.77 | 0.124 | 4 |
| 5/25/2006 | 420 | 385 | 720.5 | f | 37.22 | 26.4 | 63.62 | 0.088 | 5 |
| 5/25/2006 | 421 | 295 | 243 | m | 1.59 | 1.21 | 2.8 | 0.012 | 2 |
| 5/25/2006 | 422 | 335 | 332 | m | 1.58 | 1.61 | 3.19 | 0.01 | . |
| 5/25/2006 | 423 | 274 | 192.5 | m | 1.4 | 1.07 | 2.47 | 0.013 | 2 |
| 5/25/2006 | 424 | 327 | 332 | f | 10.45 | 6.48 | 16.93 | 0.051 | . |
| 5/25/2006 | 425 | 332 | 328.5 | f | 13.92 | 13.81 | 27.73 | 0.084 | . |
| 5/25/2006 | 426 | 339 | 390 | m | 3.04 | 2.79 | 5.83 | 0.015 | . |
| 5/25/2006 | 427 | 324 | 279.5 | m | 2.79 | 2.03 | 4.82 | 0.017 | . |
| 5/25/2006 | 428 | 308 | 267.5 | m | 1.58 | 1.58 | 3.16 | 0.012 | . |
| 5/25/2006 | 429 | 342 | 361.5 | f | 9.19 | 9.08 | 18.27 | 0.051 | . |
| 5/25/2006 | 430 | 358 | 344.5 | f | 4.51 | 4.67 | 9.18 | 0.027 | 3 |
| 5/25/2006 | 431 | 327 | 336.5 | m | 2.1 | 3.68 | 5.78 | 0.017 | . |
| 5/25/2006 | 432 | 424 | 757.5 | f | 34.35 | 31.42 | 65.77 | 0.087 | 5 |
| 5/25/2006 | 433 | 325 | 327.5 | m | 2.12 | 2.19 | 4.31 | 0.013 | . |
| 5/25/2006 | 434 | 331 | 352.5 | m | 2.47 | 2.16 | 4.63 | 0.013 | . |
| 5/25/2006 | 435 | 325 | 347.5 | m | 1.98 | 2.69 | 4.67 | 0.013 | . |
| 5/25/2006 | 436 | 299 | 279 | f | 5.58 | 5.71 | 11.29 | 0.04 | 2 |
| 5/25/2006 | 437 | 344 | 386.5 | f | 7.77 | 7.42 | 15.19 | 0.039 | . |
| 5/25/2006 | 438 | 344 | 425 | f | 15.83 | 9.02 | 24.85 | 0.058 | . |
| 5/25/2006 | 439 | 322 | 297.5 | m | 2.66 | 2.56 | 5.22 | 0.018 | . |
| 5/25/2006 | 440 | 302 | 231 | m | 1.08 | 1.18 | 2.26 | 0.01 | . |
| 5/25/2006 | 441 | 328 | 352.5 | m | 1.83 | 2.04 | 3.87 | 0.011 | . |
| 5/25/2006 | 442 | 306 | 278 | m | 1.64 | 1.44 | 3.08 | 0.011 | . |
| 5/25/2006 | 443 | 397 | 707 | f | 29.7 | 26.11 | 55.81 | 0.079 | 4 |
| 5/25/2006 | 444 | 293 | 201.5 | m | 0.69 | 0.71 | 1.4 | 0.007 | 2 |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 5/25/2006 | 445 | 334 | 321.5 | f | 4.32 | 4.4 | 8.72 | 0.027 | . |
| 5/25/2006 | 446 | 334 | 335 | m | 2.47 | 1.31 | 3.78 | 0.011 | . |
| 5/25/2006 | 447 | 326 | 288 | m | 0.81 | 1.25 | 2.06 | 0.007 | . |
| 5/25/2006 | 448 | 345 | 357 | f | 7.4 | 8.89 | 16.29 | 0.046 | . |
| 5/25/2006 | 449 | 325 | 320 | m | 0.87 | 0.89 | 1.76 | 0.006 | . |
| 5/25/2006 | 450 | 326 | 284 | f | 8.78 | 9.63 | 18.41 | 0.065 | . |
| 5/25/2006 | 451 | 310 | 271 | m | 1.8 | 1.45 | 3.25 | 0.012 | . |
| 5/25/2006 | 452 | 304 | 228 | m | 1.15 | 1.29 | 2.44 | 0.011 | . |
| 5/25/2006 | 453 | 345 | 444.5 | f | 19.26 | 16.32 | 35.58 | 0.08 | . |
| 5/25/2006 | 454 | 378 | 411 | f | 14.13 | 15.62 | 29.75 | 0.072 | . |
| 5/25/2006 | 455 | 301 | 220 | m | 1.92 | 2.46 | 4.38 | 0.02 | . |
| 5/25/2006 | 456 | 359 | 340 | f | 3.8 | 3.9 | 7.7 | 0.023 | 3 |
| 5/25/2006 | 457 | 355 | 423 | f | 11.35 | 9.44 | 20.79 | 0.049 | 4 |
| 5/25/2006 | 458 | 307 | 345 | f | 12.56 | 9.71 | 22.27 | 0.065 | . |
| 5/25/2006 | 459 | 344 | 425.5 | f | 24.48 | 18.64 | 43.12 | 0.101 | . |
| 5/25/2006 | 460 | 350 | 428 | f | 29.91 | 27.16 | 57.07 | 0.133 | . |
| 5/25/2006 | 461 | 350 | 376.5 | m | 1.12 | 1.8 | 2.92 | 0.008 | . |
| 5/25/2006 | 462 | 343 | 372 | m | 1.9 | 2.27 | 4.17 | 0.011 | . |
| 5/25/2006 | 463 | 341 | 381 | m | 1.75 | 1.65 | 3.4 | 0.009 | . |
| 5/25/2006 | 464 | 356 | 409.5 | f | 4.68 | 5.48 | 10.16 | 0.025 | 3 |
| 5/25/2006 | 465 | 343 | 379 | m | 2.69 | 2.43 | 5.12 | 0.014 | . |
| 5/25/2006 | 466 | 365 | 462.5 | f | 19.48 | 18.23 | 37.71 | 0.082 | . |
| 5/25/2006 | 467 | 349 | 406 | f | 28.89 | 15.24 | 44.13 | 0.109 | . |
| 5/25/2006 | 468 | 331 | 362 | m | 2.24 | 2.31 | 4.55 | 0.013 | . |
| 6/23/2006 | 469 | 373 | 447.5 | f | 2.02 | 2.31 | 4.33 | 0.01 | 3 |
| 6/23/2006 | 470 | 370 | 454.5 | f | 9.36 | 9.41 | 18.77 | 0.041 | 3 |
| 6/23/2006 | 471 | 335 | 341.5 | f | 11.7 | 7.18 | 18.88 | 0.055 | 3 |
| 6/23/2006 | 472 | 359 | 446.5 | f | 3.68 | 4.28 | 7.96 | 0.018 | 3 |
| 6/23/2006 | 473 | 369 | 411 | f | 2.02 | 1.92 | 3.94 | 0.01 | 3 |
| 6/23/2006 | 474 | 337 | 299 | m | 0.56 | 0.75 | 1.31 | 0.004 | 3 |
| 7/7/2006 | 475 | 349 | 362.5 | f | 1.78 | 1.18 | 2.96 | 0.008 | 3 |
| 7/7/2006 | 476 | 327 | 321 | f | 5.88 | 5.99 | 11.87 | 0.037 | 3 |
| 7/7/2006 | 477 | 376 | 446.5 | f | 2.58 | 2.06 | 4.64 | 0.01 | 3 |
| 7/7/2006 | 478 | 352 | 405 | f | 6.63 | 8.3 | 14.93 | 0.037 | 3 |
| 7/7/2006 | 479 | 345 | 372 | f | 3.99 | 3.76 | 7.75 | 0.021 | 3 |
| 7/7/2006 | 480 | 358 | 420 | f | 5.52 | 5.2 | 10.72 | 0.026 | . |
| 7/7/2006 | 481 | 351 | 739.5 | f | 5.08 | 5.15 | 10.23 | 0.014 | 3 |
| 7/7/2006 | 482 | 339 | 406 | f | 4.05 | 4.51 | 8.56 | 0.021 | 3 |
| 7/7/2006 | 483 | 346 | 451.5 | f | 2.71 | 2.85 | 5.56 | 0.012 | 3 |
| 7/7/2006 | 484 | 320 | 311.5 | m | 0.94 | 1.34 | 2.28 | 0.007 | 3 |

| Date | Fish | TL | Weight | Sex | GWL | GWR | TGW | GSI | Age |
|---|---|---|---|---|---|---|---|---|---|
| 7/7/2006 | 485 | 349 | 379 | f | 2.65 | 2.89 | 5.54 | 0.015 | . |
| 7/7/2006 | 486 | 343 | 344.5 | f | 5.84 | 4.22 | 10.06 | 0.029 | 3 |
| 7/7/2006 | 487 | 342 | 334.5 | f | 4.63 | 3.88 | 8.51 | 0.025 | 3 |
| 7/7/2006 | 488 | 349 | 425.5 | f | 2.88 | 1.41 | 4.29 | 0.01 | . |
| 7/7/2006 | 489 | 330 | 309 | f | 1.62 | 1.6 | 3.22 | 0.01 | . |
| 7/7/2006 | 490 | 306 | 219 | f | 0.63 | 0.59 | 1.22 | 0.006 | 3 |
| 7/7/2006 | 491 | 349 | 399.5 | f | 2.27 | 1.39 | 3.66 | 0.009 | . |
| 6/6/2006 | 492 | 325 | 286 | f | 3.4 | 2.45 | 5.85 | 0.02 | . |
| 6/6/2006 | 493 | 314 | 248.5 | f | 2.7 | 2.08 | 4.78 | 0.019 | . |
| 6/6/2006 | 494 | 306 | 224.5 | f | 4.44 | 4.74 | 9.18 | 0.041 | . |
| 6/6/2006 | 495 | 378 | 411 | f | 5.13 | 7.62 | 12.75 | 0.031 | . |
| 6/6/2006 | 496 | 359 | 340 | f | 3.8 | 3.9 | 7.7 | 0.023 | . |
| 6/6/2006 | 497 | 355 | 423 | f | 11.35 | 9.44 | 20.79 | 0.049 | . |
| 6/6/2006 | 498 | 307 | 345 | f | 11.56 | 9.68 | 21.24 | 0.062 | . |
| 6/6/2006 | 499 | 344 | 425.5 | f | 4.48 | 3.64 | 8.12 | 0.019 | . |
| 6/6/2006 | 500 | 349 | 428 | f | 5.91 | 4.16 | 10.07 | 0.024 | . |
| 6/6/2006 | 501 | 356 | 409.5 | f | 4.6 | 5.28 | 9.88 | 0.024 | . |
| 6/6/2006 | 502 | 341 | 332.5 | m | 2.19 | 2.01 | 4.2 | 0.013 | . |
| 6/6/2006 | 503 | 328 | 306 | m | 1.22 | 1.54 | 2.76 | 0.009 | . |
| 6/6/2006 | 504 | 314 | 248 | m | 1.57 | 1.6 | 3.17 | 0.013 | . |
| 6/6/2006 | 505 | 291 | 205.5 | m | 1.26 | 1.07 | 2.33 | 0.011 | . |
| 6/6/2006 | 506 | 336 | 330.5 | m | 1.38 | 1.46 | 2.84 | 0.009 | . |
| 6/6/2006 | 507 | 319 | 289.5 | m | 1.9 | 1.86 | 3.76 | 0.013 | . |
| 6/6/2006 | 508 | 340 | 337 | m | 1.71 | 1.63 | 3.34 | 0.01 | . |
| 6/6/2006 | 509 | 330 | 296.5 | m | 1.84 | 1.74 | 3.58 | 0.012 | . |
| 6/6/2006 | 510 | 325 | 327 | m | 1.52 | 1.79 | 3.31 | 0.01 | . |
| 6/6/2006 | 511 | 315 | 294 | m | 2.25 | 2.36 | 4.61 | 0.016 | . |
| 6/6/2006 | 512 | 301 | 220 | m | 1.92 | 1.8 | 3.72 | 0.017 | . |
| 6/6/2006 | 513 | 341 | 381 | m | 1.75 | 1.65 | 3.4 | 0.009 | . |
| 6/6/2006 | 514 | 341 | 379 | m | 2.42 | 2.2 | 4.62 | 0.012 | . |
| 7/31/2006 | 520 | 315 | 349.5 | f | 1.75 | 1.79 | 3.54 | 0.01 | . |
| 7/31/2006 | 521 | 332 | 335.5 | f | 1.31 | 1.28 | 2.59 | 0.008 | .. |
| 7/31/2006 | 522 | 335 | 352 | f | 1.72 | 1.71 | 3.43 | 0.01 | 3 |
| 7/31/2006 | 523 | 368 | 493 | f | 1.96 | 2.2 | 4.16 | 0.008 | 3 |
| 8/14/2006 | 524 | 334 | 336 | f | 1.31 | 1.24 | 2.55 | 0.008 | . |
| 8/14/2006 | 525 | 333 | 355 | f | 1.7 | 1.65 | 3.35 | 0.009 | . |
| 8/14/2006 | 526 | 370 | 493 | f | 1.82 | 1.79 | 3.61 | 0.007 | . |
| 9/6/2006 | 527 | 335 | 335 | f | 1.22 | 1.25 | 2.47 | 0.007 | . |
| 9/6/2006 | 528 | 330 | 493 | f | 1.55 | 1.52 | 3.07 | 0.006 | . |
| 9/6/2006 | 529 | 372 | 355 | f | 1.7 | 1.66 | 3.36 | 0.009 | . |

# BIOGRAPHICAL SKETCH

Jacques Fontenot was born on January 15, 1979, in Lafayette, Louisiana. He grew up in Duralde, a small community between Eunice and Mamou, and attended St. Edmunds High School in Eunice, Louisiana. After graduating from high school in 1997, Jacques attended Louisiana State University at Eunice. After one year of study, he transferred to Louisiana State University where he graduated in 2004 with a B.S. in Biological Sciences with marine concentration. Jacques then enrolled in the graduate program at Nicholls State University in Marine and Environmental Biology. Jacques conducted research on the seasonal abundance, gonadosomatic index, and age structure of gizzard shad in the upper Barataria Estuary. Jacques is scheduled to graduate in the fall of 2006 and hopes to continue his education in a doctorate program.

# CURRICULUM VITAE

## Jacques Fontenot

Graduate Student
Nicholls State University

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Thibodaux, LA 70301
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## EDUCATION

**Master of Science, Marine and Environmental Biology, December 2006,** Nicholls State University, Thibodaux, LA 70310. Thesis title: Seasonal abundance, GSI, and age structure of gizzard shad (*Dorosoma cepedianum*) in the upper Barataria estuary.

**Bachelors of Science, Biological Sciences with marine concentration, August 2004,** Louisiana State University, Baton Rouge, LA 70806

## SELECTED COURSEWORK

Biostatistics
Environmental Biotechnology
Environmental Diagnostics and Biomarkers
Ecological Restoration
Advanced Oceanography
Marine Conservation and Management
Marine and Environmental Biology

## TEACHING EXPERIENCE:

**January 2005 – May 2005:** Teaching Assistant, Nicholls State University, Department of Biological Sciences. Duties included assisting one lab per week, preparing for labs, grading quizzes, and grading assignments.

**January 2006 – Present:** Teaching Assistant, Nicholls State University, Department of Biological Sciences. Duties include teaching two labs per week, weekly lab preparation, preparing and grading quizzes, and grading assignments. Topics include: diffusion and osmosis, enzyme activity, localization of respiration and glycolysis, photosynthesis, Mendelian genetics, animal development, population genetics, evolution, and systematics.

## RESEARCH EXPERIENCE:

1. Assessed seasonal abundance, GSI, and age structure of gizzard shad in the upper Barataria Estuary by sampling with gill nets, processing collected fish, and viewing gizzard shad otoliths in whole view and polished sections
2. Laboratory spawning and rearing of spotted gar
3. Assessment of a bowfin population in the upper Barataria Estuary
4. Documented the importance of platforms as stepping stones for corals in the northern Gulf of Mexico by collecting coral samples on deep water oil rigs and extracting and purifying DNA from those samples through AFLP techniques
5. Monitored water quality during a pipeline jetting event in the Mississippi Sound for British Petroleum with a YSI and turbidity meter
6. Performed contaminant assays on water, soil, and plant samples
7. Analyzed crawfish samples for possible fipronil associated mortality

## FIELD EXPERICNCE:

Large boat operation, small boat operation, gill net sampling, hook and line sampling, seine sampling, water quality monitoring (DO, pH, salinity, specific conductance, Secchi disc depth), Gulf of Mexico turbidity monitoring, ATV operation, GPS (handheld and total station), wetland plant identification, and wetland delineation.

## LABORATORY EXPERIENCE:

Care and maintenance of live fish, water quality monitoring and maintenance, aging of fish (gizzard shad, bowfin), pre-treatment of hermatipic corals for DNA extraction.

## MEMBERSHIP AND SERVICES:

Louisiana Chapter of the American Fisheries Society
Nicholls State University Biology Society

## SCIENTIFIC PRESENTATIONS:

2006. Fontenot, J.F. and Q.C. Fontenot. Seasonal abundance, GSI, and age structure of gizzard shad in the upper Barataria estuary. Nicholls State University, Calypseaux Expedition. Cocodrie, Louisiana