THE RESPONSES OF TURBIDITY, CDOM, BENTHIC MICROALGAE, PHYTOPLANKTON AND ZOOPLANKTON TO VARIATION IN SEASONAL FRESHWATER INFLOW TO THE CALOOSAHATCHEE ESTUARY

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1.0 INTRODUCTION

Increasing human population and concomitant changes in land and water use alter the timing and amount of freshwater delivered to estuaries. Though coastal counties represent 17% of the total land area of the U.S. (excluding Alaska), they account for 53% of the total population (Crossett et al. 2004). Regionally, Florida led the nation in coastal population growth (75%), normalized to percent change, from 1980 to 2003 (Crossett et al. 2004). This concentration of population along the coastline results in an intensification of environmental problems in coastal watersheds. Urbanization and development of coastal watersheds increases the area of impervious surfaces. As a result, runoff leaves the landscape more quickly and enters estuaries downstream in a pulse: peak flows become higher than under predevelopment conditions and the lag between rainfall and runoff is greatly reduced (Hopkinson & Vallino 1995), rendering tidal tributaries "flashy." In estuaries where seasonal rainfall often determines the degree of freshwater inflow (i.e., relatively low groundwater contributions), estuarine tributaries become more flashy with increasing watershed development.

Increases in the maximum freshwater inflow rate influence estuarine ecosystems by increasing nutrient availability, decreasing benthic primary production as a result of decreased light penetration (i.e., turbidity, chlorophyll, colored dissolved organic matter), relocating the chlorophyll maximum downstream, and reducing residence time of planktonic organisms through advective processes. Freshwater inflow has been identified as a significant landscape process shaping community structure within estuaries (Mannino & Montagna 1997, Sklar & Browder 1998, Palmer et al. 2002). High levels of freshwater inflow can decrease the abundance of both estuarine residents and marine species that utilize estuaries as nurseries (Garcia et al. 2004). Extreme fluctuations in salinity often elicit stress responses or emigration, resulting in a reduction of biodiversity (Sklar & Browder 1998). Altered freshwater delivery can greatly influence salinity distribution within an estuary both spatially, through the establishment of salinity gradients, and seasonally, through the relocation of isohalines. Biotic responses to these changes can restructure communities associated with affected habitats such as seagrasses (e.g., Matheson et al. 1999, Biber & Irlandi 2006) and oyster reefs (e.g., Maurer & Watling 1973, Tolley et al. 2005, 2006). In addition, suspended sediment and chlorophyll *a* concentration, along with their associated light attenuation, are important factors affecting the health of a variety of organisms, including oysters, clams and seagrasses (e.g., Lawson et al. 2007, Wilber & Clarke 2001).

Survival of fish stocks depends on the survival of juveniles within nursery habitats. On Florida's west coast, young estuarine-dependent fishes (e.g., bay anchovy, yellowfin menhaden, red drum, sand seatrout) congregate at specific locations along the estuarine gradient. These congregations typically occur within the interiors of riverine estuaries, where 90% of individuals can occur within a few km of river reach (Peebles et al. 2007). Benthic or hyperbenthic invertebrates, some of which are prey for these fishes, also co-occur here. These areas have mud or sand bottoms and are generally devoid of seagrasses and other macrophytes. Predators (fishes) and potential prey (invertebrates) move upstream and downstream with changing freshwater inflows (Flannery et al. 2002, Greenwood et al. 2007). However, salinity and inflow are not proximal habitat determinants for these animals, as the animals congregate at significantly different salinities in different estuaries (Peebles et al. 2007), and, over time, individual species' locations are sometimes better correlated with each other than they are with either freshwater inflow or salinity.

Longitudinal in-situ fluorometry transects, synchronized with standardized fish and invertebrate surveys, have identified associations between fish and chlorophyll *a* peaks within the Alafia River, Florida, provided that the peaks were located within depositional, normoxic habitats (English et al. 2007). Time-averaged fish distributions correlate with sediments that have small grain size and high organic content.

In summary, analyses of diet, prey distribution, salinity fidelity, in-situ fluorometry, and sediment characteristics indicate that fish are congregating in and deriving biomass from benthic habitats where microalgae are either produced (benthic microalgae) or deposited (sedimented phytoplankton). The dynamics of microalgal production and deposition in these areas are poorly understood, particularly as they relate to freshwater inflow.

This project represents a multidisciplinary approach to understanding the influence of freshwater inflow on estuarine production and ecosystem condition and examines both phytoplankton and benthic microalgal biomass. In addition, the project examines an important estuarine function that often goes overlooked when assessing ecosystem condition—the production of prey organisms (i.e., zooplankton and hyperbenthos) for fishes that use estuaries as nursery habitat.

1.1 Objectives

The overall goal of this project is to establish linkages between variability in freshwater inflow and ecosystem condition by characterizing and quantifying the responses of estuarine phytoplankton, zooplankton, and benthic microalgae to variation in freshwater inflow and by identifying linkages among these responses. The resulting relationships can be used to assess ecosystem change, to predict future environmental impact based on projected inflow alterations and to develop targets for ecosystem restoration or enhancement.

Specifically, this project addresses the following objectives:

1. Characterize seasonal (wet/dry) differences in phytoplankton and fish-prey distribution, abundance, and community structure; benthic microalgal biomass and condition; CDOM and the ETM.

2. Investigate how freshwater inflow influences abundance, distribution, and community structure of phytoplankton and zooplankton, benthic microalgal biomass and condition, CDOM and the ETM along the estuarine salinity gradient.

3. Investigate freshwater inflow influences on linkages among CDOM, ETM, benthic microalgae, phytoplankton and zooplankton.

2.0 METHODS

2.1 Study Area

The study area consists of the tidal Caloosahatchee River and Estuary (Fig. 1). The Caloosahatchee watershed is highly altered and highly managed. The historic Caloosahatchee watershed was augmented in the 19th century through a man-made direct connection with Lake Okeechobee and thereby an indirect connection to the Kissimmee River watershed (Antonini et al. 2002). As a result, the Caloosahatchee derives its freshwater both from its own watershed and from the Lake (Doering & Chamberlain 1999). As part of the Okeechobee Waterway that traverses the state, the upper Caloosahatchee has been converted from a meandering river to a canal over much of its length, and water in the river is impounded behind a series of control structures. The W.P. Franklin Lock and Dam is the water control structure located farthest downstream on the Caloosahatchee and represents the upper boundary of the study area. Significant freshwater releases into the river from Lake Okeechobee occur as a means of flood prevention during the rainy season and as a result of periodic drawdowns in the Lake to manage aquatic vegetation and habitat.

2.2 Survey Design

A total of seven zones were sampled from Point Ybel, Sanibel in San Carlos Bay to just below the Franklin Lock and Dam, with two stations (downstream and upstream) sampled within each zone for a total of 14 stations per sampling transect (Table 2.1.1). The use of zones was not based on the identification of strata along the estuarine gradient but simply facilitated station location and sampling along the approximately 47-km transect. Zooplankton and phytoplankton sampling sites were fixed for all collections, with water quality stations being located at approximately the mid-point of each plankton-net tow. The position of the collection vessel was recorded at the beginning of each zooplankton tow using a GPS chartplotter. Mean distance between adjacent sampling sites was 3.26 (± 2.01) km. This systemic sampling approach

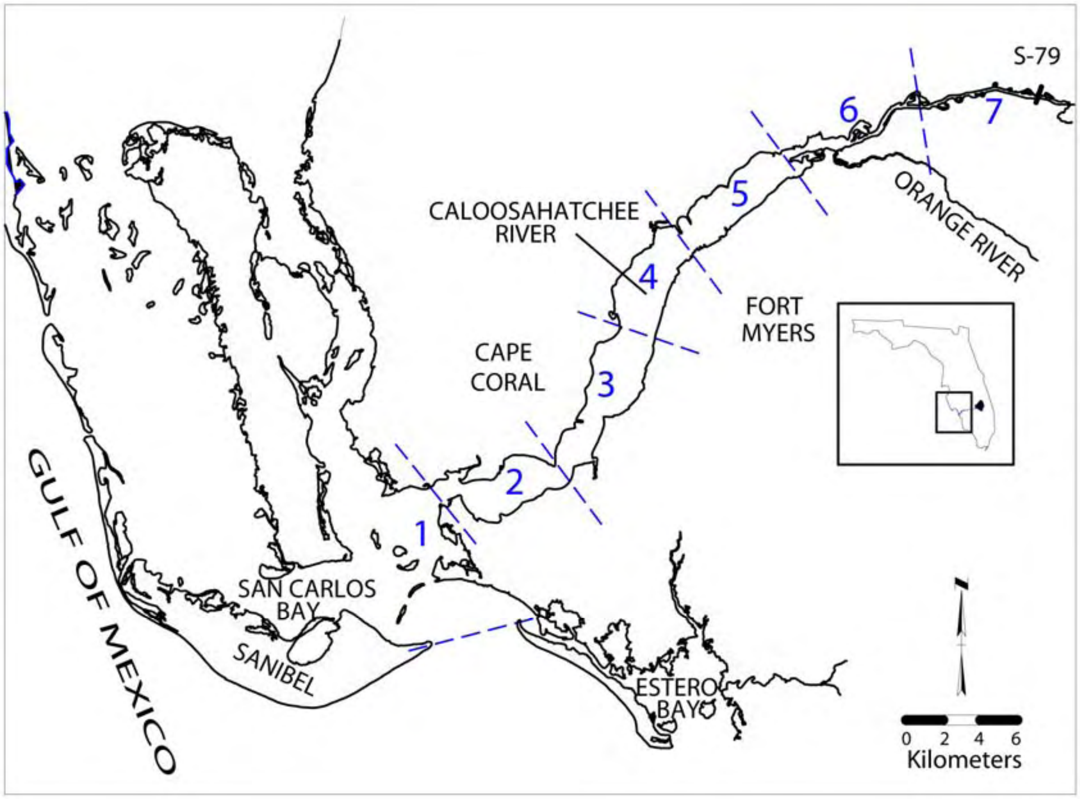

Figure 2.1.1. Map of the tidal Caloosahatchee River and Estuary indicating sampling zones. Two stations (downstream and upstream) were sampled within each zone for a total of 14 sites. S-79 represents the W.P. Franklin Lock and Dam, the upstream extent of the Caloosahatchee Estuary.

(equidistant sampling locations) is preferred over stratified-random sampling for surveying estuarine water quality (Jassby et al. 1997). The following landmarks were used to demarcate zones:

Zone 1: Inside Point Ybel, Sanibel Island to upstream end of Big Shell Island
Zone 2: Upstream end of Big Shell Island to Redfish Point
Zone 3: Redfish Point to Fourmile Point (Midpoint Bridge)
Zone 4: Midpoint Bridge to Caloosahatchee Bridge
Zone 5: Caloosahatchee Bridge to Beautiful Island
Zone 6: Beautiful Island to Trout Creek (just upstream of S.R. 31 Bridge)
Zone 7: Trout Creek to W.P. Franklin Lock & Dam

Sampling and data collection were conducted at night during a flood tide when larval fishes and invertebrates are generally more abundant in the water column (Wilkins and Lewis 1971, King 1971, Olmi 1994, Morgan 1995a, 1995b). Organisms that selectively occupy the water column during flood tides tend to move upstream, and organisms that occupy the water column during all tidal stages tend to have little net horizontal movement other than that caused by net estuarine outflow (Cronin 1982, McCleave and Kleckner 1982, Olmi 1994). The zooplankton catch was therefore likely biased toward organisms that were either invading the Caloosahatchee River and Estuary or were attempting to maintain position within the system. Furthermore, transects were typically conducted on two consecutive nights in order to ensure that sampling and data collection fell on a similar tide (Table 2.1.2).

Table 2.1.1. Sampling sites for biological and water quality data. Sites were sampled May 2008 through April 2010. Depth represents the mean maximum water depth recorded at each site during biological sampling. D = downstream and U = upstream stations within each zone, with zones as described above.

Zone	Station	Location (rkm)	Latitude (N)	Longitude (W)	Mean depth (m)
1	D	-5.9	26.47760	82.01157	2.92
	U	-3.6	26.49721	82.01514	3.09
2	D	2.5	26.53089	81.98688	3.96
	U	5.2	26.52616	81.96375	2.91
3	D	7.6	26.54528	81.94169	4.06
	U	10.6	26.56413	81.92283	3.88
4	D	16.2	26.60805	81.90220	3.73
	U	20.0	26.64585	81.88743	2.53
5	D	24.2	26.66452	81.85461	1.97
	U	26.9	26.68076	81.83474	2.03
6	D	30.2	26.69704	81.80800	2.97
	U	34.4	26.70864	81.77011	4.38
7	D	37.1	26.71587	81.75259	3.83
	U	41.0	26.72397	81.71516	1.64

Table 2.1.2. Sampling dates during the study period. Sampling efforts typically consisted of two back-to-back sampling nights to ensure that samples were collected on an incoming tide.

Month	Day 2008	 2009	 2010
January		21–22	26-27
February		20–21	25
March		20–21	25-26
April		20-21	22-23
May	28–29	19–20	
June	26–27	17–19	
July	27–28	16–17	
August	24–25	13–14	
September	24–25	13–14	
October	25–26	10–11	
November	19–20	13	
December	16–18	11-12	

2.3 Water Quality Determination

A water quality profile was taken from a second vessel at each site along the sampling transect in conjunction with each biological sampling effort (Fig. 2.3.1). Water quality data acquired are identified in Table 2.3.1. The Seabird 19+ CTD measured conductivity, temperature, and depth at a frequency of 4 Hz and allowed for an examination of water-column structure at high vertical resolution. Attached to the CTD was a Downing Optical Backscatter (OBS) that measured turbidity at high vertical resolution. Bulk water samples were collected using a Geosub purge pump affixed to the CTD instrument at the same level as the OBS. One liter was collected for total suspended sediment concentration (TSS) and percent organic matter analyses at near bottom (1 meter above) and near surface (1 meter below) depths for each cast. Bulk water samples were also used to determine chlorophyll *a* concentration in order to calibrate the fluorometry data.

Table 2.3.1. Details of water quality determination. Unless otherwise specified, parameters were measured throughout the water column at each sampling site. Depth resolution was estimated using mean sampling frequency for each instrument.

Instrument	**Parameters**	**Depth resolution**	**No. Sites**	**Sampling frequency**
Sea Bird CTD	Conductivity, temperature, depth	~ 8 mm	14	Monthly
Downing Optical Backscatter	Turbidity	~ 8 mm	14	Monthly
YSI multiparameter sonde	Salinity, temperature, DO, pH, chlorophyll *a*	~ 0.30 m	14	Monthly
WET Labs ECO Triplet	CDOM, turbidity (red backscatter)	~ 0.15 m	14	Monthly
Diving-PAM Fluorometer	Photosynthetic efficiency (effective quantum yield)	Bottom	14	Monthly
Bulk water samples (pumped)	Chlorophyll *a* concentration	mid-depth, 1 m off bottom	14	Monthly

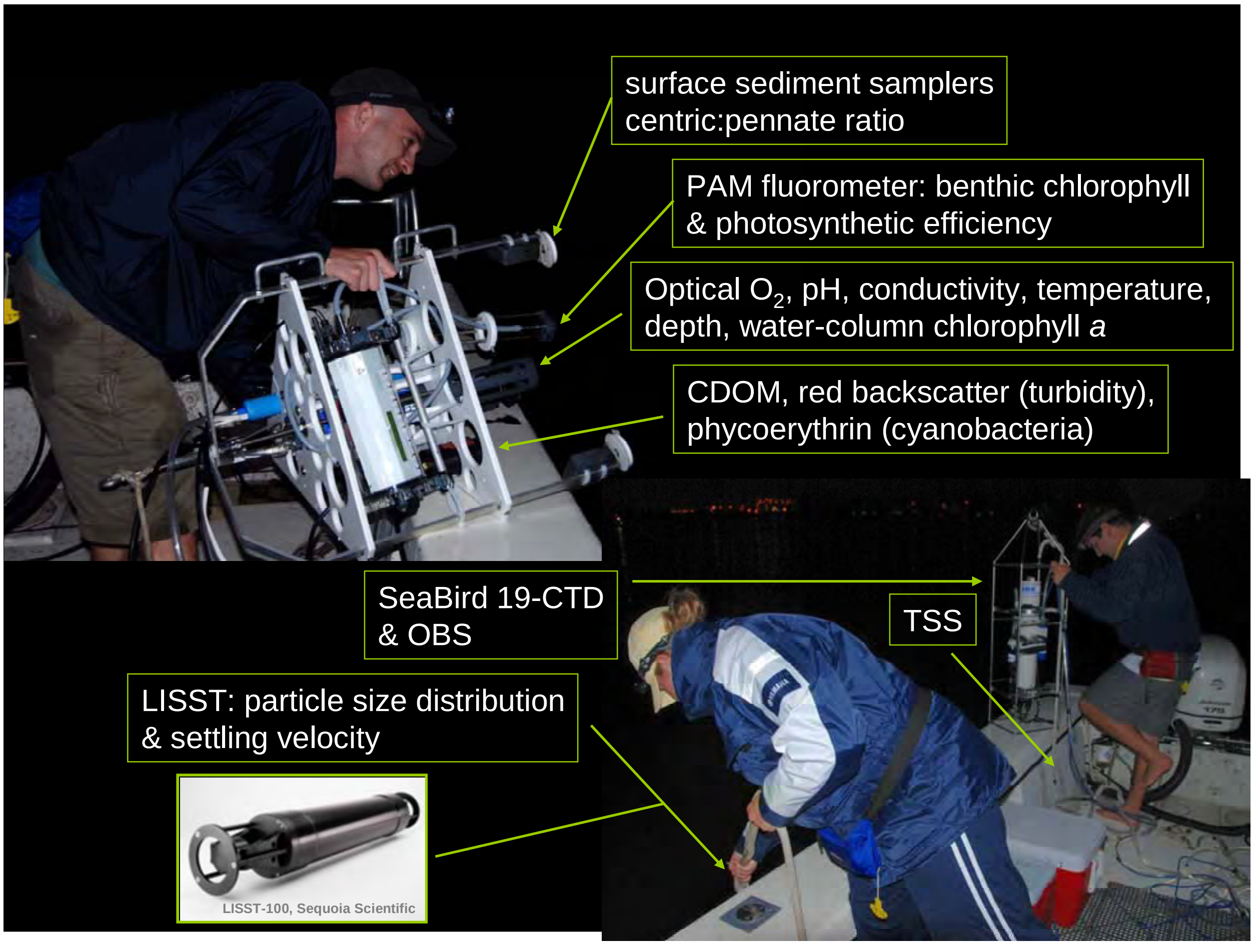

Figure 2.3.1. Water quality instrumentation and associated sampling devices employed in conjunction with biological sampling.

2.4 Biological Sample Collection

In addition to deployment of the above instrumentation at each sampling site, zooplankton (500-µm mesh), phytoplankton (10-µm mesh), and nannoplankton (bulk water) samples were collected (Fig. 2.4.1). Benthic microalgae were collected using glass microscope slides that were smeared with silicone sealant and pressed against surface sediments within 3 min of sealant application (i.e., prior to sealant skinning). The microscope slides were subsequently examined microscopically to identify the relative contributions of planktonic (primarily centric diatoms) and benthic (primarily pennate diatoms) microalgae to the surface sediment.

2.4.1 Phytoplankton Sample Collection

Vertical net-tow samples were collected monthly at each of the sampling sites. A 10-μm mesh, 30-cm diameter, conical (5:1 aspect ratio) plankton net, similar to that described below for zooplankton sampling, was lowered to the near bottom and then retrieved upward through the water column to collect phytoplankton. The plankton-net sample was then transferred to a 125-ml bottle. Each sample was immediately preserved with 0.5% glutaraldehyde to prevent cell lysis and deterioration that could otherwise hinder identification and measurement. Samples were stored on ice for transport back to the laboratory for processing.

2.4.2 Phytoplankton Sample Analysis

Selected phytoplankton vertical net tow samples were examined using an Olympus BX51 microscope under transmitted light and differential interference contrast optics when necessary. Samples were selected from the stations exhibiting the highest chlorophyll concentrations according to integrated YSI chlorophyll profiles. Small aliquots (0.06 ml) of each sample were transferred to a calibrated Phycotech® Nannochamber counting slide.

Phytoplankton specimens were identified to the lowest taxonomic level practical according to Tomas (1997), Horner (2002), and Wehr and Sheath (2003). Other publications were consulted as necessary. Phytoplankton taxa were also grouped into their respective phytoplankton classes to provide a more robust measure of phytoplankton composition. All phytoplankton cells >10 μm were enumerated and measured. Filamentous and other colonial forms comprised of smaller cells were also counted if the colony was >10 μm. Dimensions of all autotrophs and heterotrophs encountered were measured with a calibrated eyepiece micrometer on the microscope. These measurements were used to calculate biovolume (μm^3) based on appropriate geometric formulas (Hillebrand et al. 1999).

2.4.3 Phytoplankton Data Analysis

Phytoplankton abundance was calculated as cells L^{-1} and cell volume L^{-1} (μm^3) for each class and taxon of phytoplankton encountered. Average phytoplankton size was calculated by dividing the total volume of phytoplankton by the total number of phytoplankton cells. Multidimensional scaling (MDS) analysis was used to determine how phytoplankton assemblages changed over time and as water flow and water chemistry changed. Phytoplankton classes and average cell size were also compared to cumulative river flow for the 30 days prior to sampling, as past research has demonstrated that phytoplankton (measured as chlorophyll) are best correlated with a 30-day average flow (Doering et al. 2006).

2.4.4 Chlorophyll data analysis

The ascending profiles from the YSI Sonde casts for each station from each sampling trip were averaged to obtain vertically-integrated values for water chemistry parameters including temperature, salinity, dissolved oxygen (% saturation and concentration), CDOM, pH, and chlorophyll *a*. All parameters except chlorophyll *a* were used in the MDS analysis above. The salinity and chlorophyll *a* data were analyzed against averaged and lagged river flow with additional analyses examining relationships between chlorophyll *a* changes at each station versus river flow (30-d lag) and sampling date. For the flow analyses, the upstream and downstream chlorophyll values were averaged to provide a zone average to provide clearer interpretation of changes observed.

2.4.5 Zooplankton Sampling

Zooplankton samples were also collected monthly at each sampling site. Standard zooplankton collection gear consisted of a 500-µm Nitex mesh, 0.5-m mouth diameter, conical (3:1 aspect ratio) plankton net, equipped with a three-point bridle, 1-liter cod-end jar, 20 kg of weight suspended from the mouth ring, and a General Oceanics model 2030R flowmeter suspended at the center of the net's mouth. Deployment at each site consisted of a three-step oblique tow that divided fishing time equally between bottom, mid-depth, and surface waters. Tow duration was 5 min with tow speed estimated at 1.0-1.5 m/s. Net position in the water column was regulated using a gunwale-mounted winch with metered tow line. Flowmeter readings were recorded before and after deployment so that catch could be normalized to the

Figure 2.4.1. Biological sampling conducted at 14 stations along the Caloosahatchee River and Estuary.

volume of water filtered during each tow. Upon retrieval, the net was suspended vertically and rinsed from the outside using ambient water delivered by a high pressure, on-demand washdown pump. The final volume within the cod-end jar was reduced by draining excess water through a small area of mesh in the throat of the net, followed by a second rinse of the throat area using approximately 500-800 ml of water. The sample was then preserved by adding 50 ml of formalin (37% formaldehyde) to the 500-800 ml sample volume. One zooplankton net tow was made at each site from May 2008 through April 2010 (14 sites x 24 months = 336 samples).

To reduce both processing time in the field and the potential for contamination, samples were preserved in the plastic cod-end jars in which they were collected. Each cod-end jar was redundantly marked with a unique identifier to facilitate sample handling and track sample custody: an adhesive label placed on the cod-end jar lid and the same unique identifier copied onto the side of the jar using permanent ink. All jars were pre-labeled in the laboratory.

Fixed zooplankton samples were stored in ice chests as collected and were transported back to the laboratory at USF, where they were stored in a fume hood. After a minimum of three days in formalin, plankton-net samples were transferred to a 250-µm mesh sieve (one half the mesh size opening of the collection gear), rinsed with tap water, and then preserved in their original cod-end jars using a rinse of 50% isopropanol in deionized water.

2.4.6 Zooplankton Sample Processing

Plankton-net samples were divided into two size fractions using two stacked sieves of 4-mm and 250-µm mesh openings. This process separated larger items to prevent them from obscuring smaller items during analysis. Sample analysis consisted of determining taxonomic composition, expressed as the number of each taxon per unit volume of water filtered. The >4-mm fraction could often be analyzed without the aid of a microscope. After sieving, the contents of the 4-mm sieve were returned to the original cod-end jar and the contents of the 250-µm sieve were transferred to a numbered beaker. The unique sample identifier (the sample number), the unique number of the beaker containing the 250 µm–4 mm fraction, and the taxonomic composition of the >4-mm fraction were recorded.

A zoom stereomicroscope was used by the Primary Taxonomist to analyze the 250 µm–4 mm fraction of the sample. Successive aliquots were poured from the numbered beaker into a 90-mm square Petri dish delineated into 6 x 6, 13.5 mm square grids. Each aliquot was methodically examined by the Primary Taxonomist, who used the grid delineations to define the processing path. After each aliquot had been processed, the contents of the dish were rinsed into a 1000-ml graduated cylinder using 50% isopropanol in deionized water. Taxonomic quality control was achieved through maintenance of a photographic reference collection. Ichthyoplankton and other zooplankton were identified to the lowest practical taxonomic level.

Taxonomic data for each sample were entered into a specially constructed spreadsheet directly from the microscope workstation. As each sample was processed, a list of encountered taxa was constructed by the Primary Taxonomist within a specialized template area of the spreadsheet. The list was compiled as a subset of a master lookup table for taxonomic descriptions and associated numeric codes. Spreadsheet macros allowed the Primary Taxonomist to select individual taxonomic descriptions/codes from the lookup table for copying to the template area. The template area was divided into two work areas: a direct enumeration work area and a split-sample work area. The Primary Taxonomist determined which taxa were abundant enough in a given sample to warrant enumeration after splitting and used a macro to construct a list of these taxa within the split-sample work area. All other taxa in the sample were added to a list in the direct enumeration work area as they were encountered. The Primary Taxonomist counted these non-abundant and difficult-to-identify taxa but was responsible for making a list of all taxa in the sample. With few exceptions, the Primary Taxonomist was able to process the entire sample by methodically examining successive aliquots. Each aliquot was rinsed into a 1000-ml graduated cylinder after examination and enumeration within the aliquot were complete. After all aliquots had been processed, the graduated cylinder was covered and inverted multiple times, and a 30-50 ml aliquot was immediately decanted. Beginning and ending volumes within the cylinder were entered into specific cells within the split-sample work area, and a multiplier value was automatically calculated. The split-sample work area of the template was printed, complete with the multiplier value.

The printout of the split-sample work area was then transferred to the Secondary Taxonomist along with the measured aliquot. The Secondary Taxonomist then enumerated the listed taxa in the measured aliquot using a second zoom stereomicroscope. At the computer, the Primary Taxonomist examined the two lists for errors and then executed a macro that transferred the lists to the database region of the spreadsheet. Counts from the direct enumeration of the large and small fractions were included in this data transfer. After the Secondary Taxonomist had processed the measured aliquot, it was recombined with the remainder of the sample in the original cod-end jar and the numbers estimated for the split sample taxa were entered into the database. All template areas were automatically cleared of data after transfer.

All fishes were classified according to developmental stage as follows:

preflexion larva = period between hatching and notochord flexion; The tip of the straight notochord is the most distal osteological feature.

flexion larva = period during notochord flexion; The upturned notochord or urostyle is the most distal osteological feature.

postflexion larva = period between completion of flexion and the juvenile stage; The hypural bones are the most distal osteological feature.

juvenile = period beginning with attainment of meristic characters and body shape comparable to adult fish and ending with sexual maturity

adult = period beginning with sexual maturity

In many fish species, the juvenile stage was difficult to distinguish. At its lower limit, the juvenile stage often lacked a clear developmental juncture that distinguished it from the postflexion stage. Likewise, more than one length at maturity has often been reported for a single species, or the reported length at maturity may differ between males and females. To avoid inconsistency in the staging process, length-based staging conventions were applied to the more common taxa. These staging conventions agree with stage designations used by the U.S. Fish and Wildlife Service (e.g., Jones et al. 1978).

Decapod larvae were classified as zoea, megalopa, or mysis stage. These are terms of convenience and should not be interpreted as technical definitions. Planktonic larvae belonging to Anomura and Brachyura (crabs) were called zoea and individuals from these groups displaying planktonic to benthic transitional morphologies were classified as megalopae. All other decapod larvae (shrimps) were classified as mysis stage until the uropods differentiated into exopods and endopods (5 total elements in the telsonic fan), after which they were classified as postlarvae until they reached the juvenile stage. The juvenile stage was characterized by resemblance to small (immature) adults. Under this system, the juvenile shrimp stage (e.g., for *Palaemonetes* spp.) is equivalent to the postlarval designation used by some authors.

2.5 Water Quality Data Processing

For each water-quality transect, salinity and temperature were used to estimate the vertical density structure at each profile. Bulk water samples were filtered and weighed to determine TSS concentrations. Bulk water samples were also filtered and run through an Aminco-Bowman fluorometer using standard DEP procedures to determine chlorophyll *a* concentrations.

The profiles from each transect were combined in Matlab® to produce a 2D vertical and longitudinal high resolution representation of the salinity and density structure of the

Caloosahatchee River and Estuary. Mass concentration of TSS was estimated by calibrating the OBS results to the bulk water sample results. The calibrated OBS results were then used to produce a 2D vertical and longitudinal high resolution representation of the suspended sediment distribution

2.5.1 Total Suspended Sediment

Total suspended sediment concentrations were determined gravimetrically from the bulk water samples. First, 47-mm glass fiber filters were baked at 525 °C then pre-weighed. Approximately 1 L of the bulk water sample was vacuum filtered, dried at 80 °C for 24 h, weighed, then dried another 24 h and weighed again. Once the weight stabilized, these values were used to derive the TSS concentrations. In order to estimate the organic content of the suspended sediment, the filters were then baked in a muffle furnace at 525 °C for 4 h. Subsequently, the filters were weighed to determine the loss on ignition from volatile carbon.

2.6 Data Analysis

2.6.1 Freshwater Inflow

Data for freshwater inflow from May 2008 through April 2010 were obtained from the U.S. Army Corps of Engineers through the DBHYDRO database maintained by the South Florida Water Management District (SFWMD 2009). Data represent inflow measured at the W.P. Franklin Lock and Dam (S-79) and are reported as cubic feet per second (cfs). Missing values were estimated using polynomial regressions. Inflow data are presented as mean ± standard deviation unless otherwise specified. Rainfall data were also obtained for S-79 using DBHYDRO.

2.6.2 Organism Center of Abundance

Organism center of abundance was calculated as the weighted mean

$$rkm_U = \frac{\sum (km \cdot U)}{\sum U}$$

where U is organism density (no. m^{-3}) and rkm is distance in river kilometers from the river mouth extending along a conveyance channel or likely path of flow. Positive values represent distances associated with stations located upstream within the Caloosahatchee River, and negative values represent distances associated with stations located downstream of the mouth of the Caloosahatchee River.

2.6.3 Organism Number

Using plankton-net data, the total number of organisms collected (*N*) in the survey area during each sampling effort (month) was estimated by summing the products of mean organism density (*U*, as no. m^{-3}) and tide-corrected water volume (*V*) for each sampling zone of the Caloosahatchee River and Estuary. The study area was first divided into segments representative of each sampling zone (Fig. 2.6.3.1) and the area of each segment was determined using GIS. Bathymetry data taken from digital NOAA charts (zones 1D-6U or derived from local knowledge (zones 6U-7U) were averaged, and the product of area and mean depth for each zone were summed as an estimate of total volume at Mean Lower Low Water. This volume was then adjusted to sampling data using water stage data (NGVD 29) recorded at Shell Point and I-75 stations along the river and provided by SFWMD.

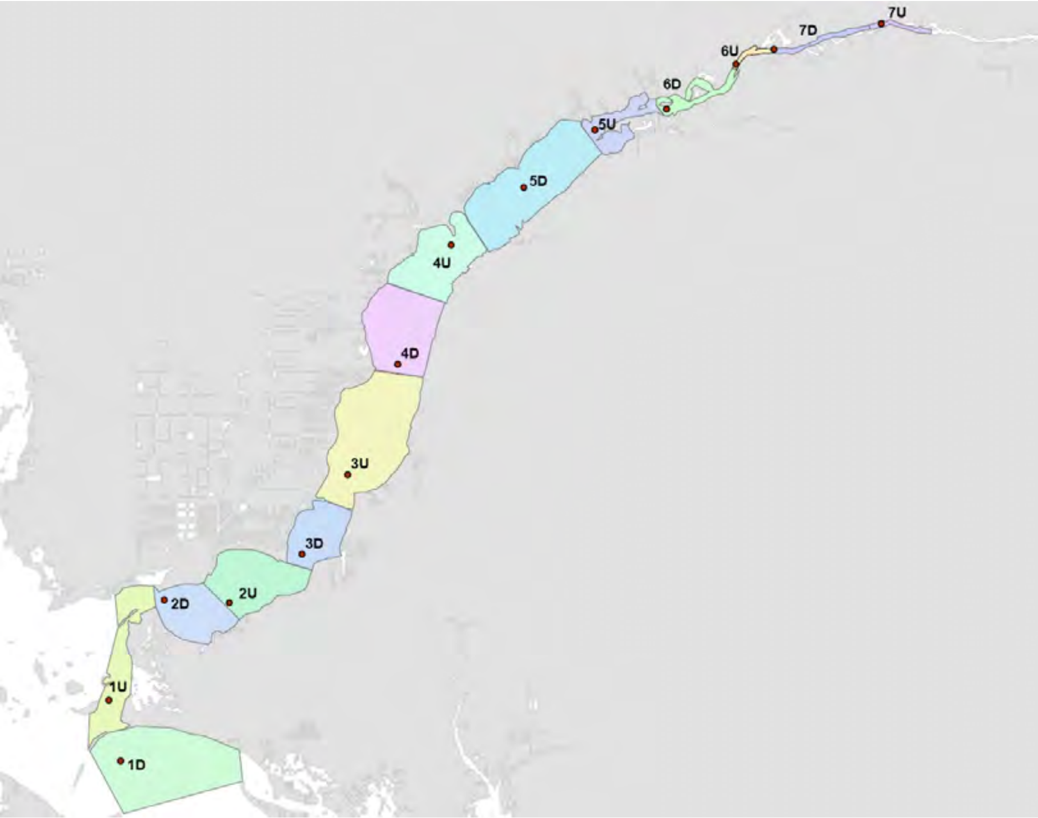

Figure 2.6.3.1. Sampling zones constructed to calculate total volume of the study area. Each color shaded area represents a different sampling zone (1D-7U) and each red circle represents the downstream starting point of each zooplankton net tow.

2.6.4 Identification of Truncated Zooplankton Distributions

When organisms shift their distributions upstream in response to decreased freshwater inflows and an upper abundance percentile (e.g., the 90th percentile) is calculated to be near a fixed barrier to upstream movement (e.g., S-79), then habitat compression due to barrier impingement is likely (Peebles and Greenwood 2009). Abundance, represented as organism density (no. m^{-3}), was summed for each monthly survey to produce a total monthly value. Monthly density at individual stations was then summed sequentially in the upstream direction, and the resulting sums were expressed as a percentage of total monthly density. This process is analogous to creating a cumulative distribution curve or function, except that it sums sequential density values from successive stations along a transect instead of summing data-class frequencies. The location (rkm) of the 90th percentile (the upper decile) of total monthly density was interpolated linearly. These linear interpolations were always made between the station with the highest percentile <90 and the next station upstream. Monthly surveys were excluded from this analysis if >10% of the catch was encountered at the downstream-most station, or if there were fewer than three stations with non-zero densities.

2.6.5 Biodiversity

Biodiversity was estimated using taxa richness. Taxa richness is the number of taxa present in a sample, where an individual taxon reflects both an organism's taxonomic designation (to the lowest level practical) and its developmental stage. The minimum species present in each sample was identified by pooling organisms of a single taxonomic designation (e.g., species) representing different developmental stages and by pooling organisms of different taxonomic levels (e.g., species, genus, family, etc.) regardless of developmental stage.

Center of diversity was calculated as the weighted mean

$$rkm_T = \frac{\sum (km \cdot T)}{\sum T}$$

where T is taxa richness (no. taxa) and *rkm* is distance in river kilometers from the river mouth extending along a conveyance channel or likely path of flow. Positive rkm values represent distances associated with stations located upstream within the Caloosahatchee River, and negative values represent distances associated with stations located downstream of the mouth of the Caloosahatchee River.

3.0 RESULTS AND DISCUSSION

3.1 Inflow Status

During the period of May 1 through April 30, 2010, freshwater inflow to the Caloosahatchee, as recorded at the W.P. Franklin Lock and Dam (S-79), averaged 1,451 (± 2,159) cfs with a median inflow of 704 cfs. Inflow varied considerably between wet and dry seasons: mean inflow for May 2008 was 0 (± 0) cfs; however, mean inflow during August 2008 average 5,855 (± 5,997) cfs (Fig. 3.1.1). In 2008, wet season rains arrived in the study area in early June, with increased inflow present by mid-June. In mid-August, seasonal precipitation was augmented by basin runoff caused by Tropical Storm Fay, resulting in a peak inflow of 18,139 cfs at S-79 on August 20th, in the midst of a 10-d sustained inflow of >10,000 cfs (Figs. 3.1.1-3.1.2). In 2009, wet season rains arrived early, beginning in May; however, daily rainfall events >1 in. did not occur until June (Fig. 3.1.1-3.1.2). Freshwater inflow in 2009 peaked at 10,616 cfs on July 3. Although seasonal rains diminished by the end of September of each year, the El Niño event of 2009-2010 resulted in a wetter than normal dry season, triggering releases in Spring 2010 by the U.S. Army Corps of Engineers to reduce water levels in Lake Okeechobee.

In addition to these general patterns of rainfall and inflow recorded in the study area, a series of pulsed releases from S-79 was made in early 2009 to increase freshwater inflow to the estuarine portion of the system and to reduce the need for larger regulatory releases later in the year (Fig. 3.1.1).

3.2 Water Quality

Summary statistics for water quality data collected are presented in Table 3.2.1. Dissolved oxygen at depth ranged from 1.81-11.38 mg L^{-1} (25.7-118.9 % air saturation) and was generally ≥6.0 mg L^{-1}, with 75% of the values ≥6.75 mg L^{-1}. However, during the wet season, minimum DO values were consistently low upstream (Fig. 3.2.1) in bottom waters near rkm 34.4. Although water quality measurements were not made in the main channel at deeper depths, hypoxia (<2.0 mg L^{-1}) was encountered once at this location during May 2009.

3.2.1 Density Structure

Variations in vertical and longitudinal salinity structure were strongly related to wet and dry season conditions (Fig. 3.2.1.1; Appendix A). The highest salinity near the mouth (38 psu) was recorded in May 2008. At this time the mouth was well mixed and there was some slight stratification at the head of tidal intrusion where salinity was ~20 psu (Fig. 3.2.1.1). With the onset of higher freshwater discharge in June 2008 salinity was still around 36 psu at the mouth, but stronger stratification was set up at the Franklin Lock and Dam, where salinity ranged from 18 psu near bottom to 9 psu at the surface. By August 2009, as freshwater discharge continued, a highly stratified salt wedge type structure developed near the mouth with maximum salinities around 18 psu (Fig. 3.2.1.1). Thereafter, throughout the decreasing freshwater discharge

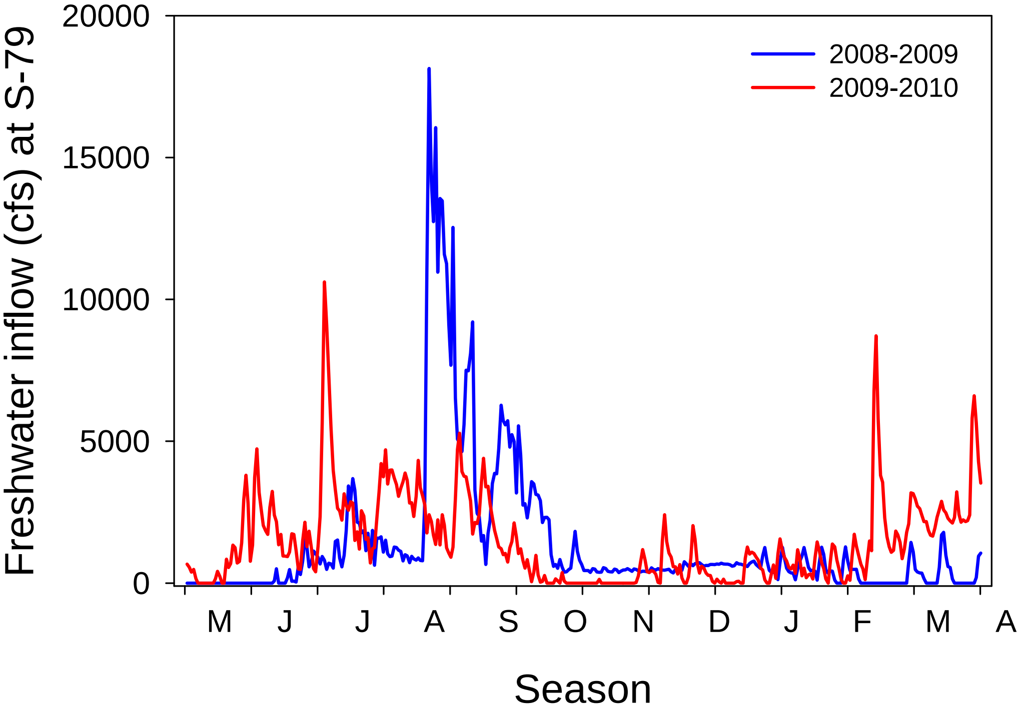

Figure 3.1.1. Freshwater inflow to the Caloosahatchee River and Estuary as recorded at the W.P. Franklin Lock and Dam, May 1, 2008 – April 30, 2010. Note pulsed releases from S-79 in the winter and spring of 2009.

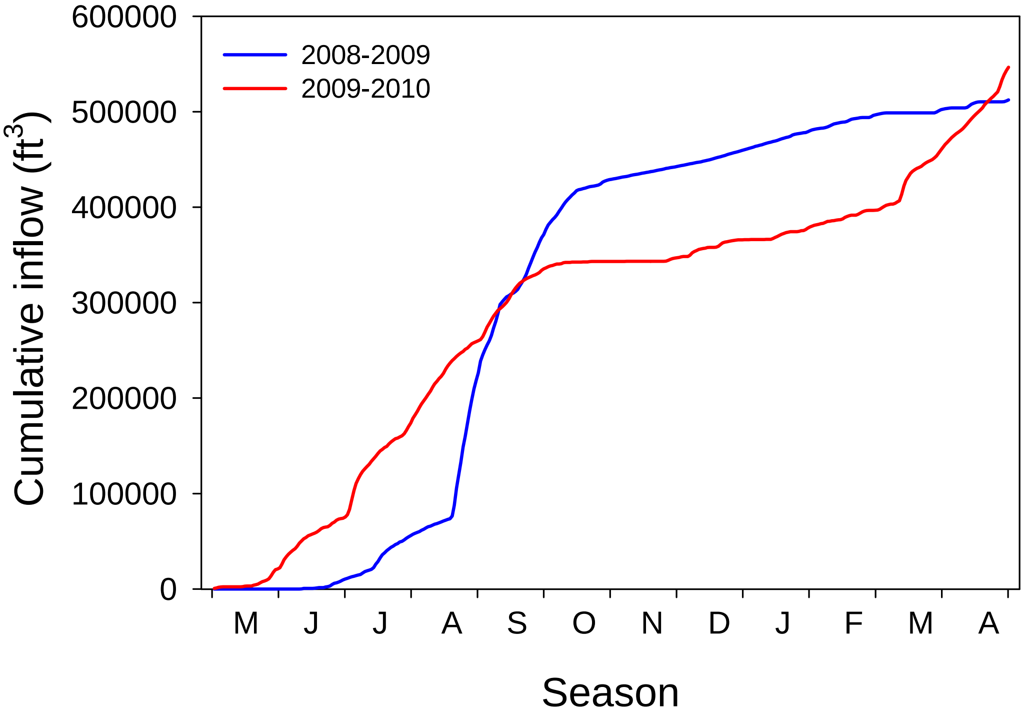

Figure 3.1.2. Cumulative freshwater inflow delivered to the Caloosahatchee River and Estuary, May 1, 2008 – April 30, 2010.

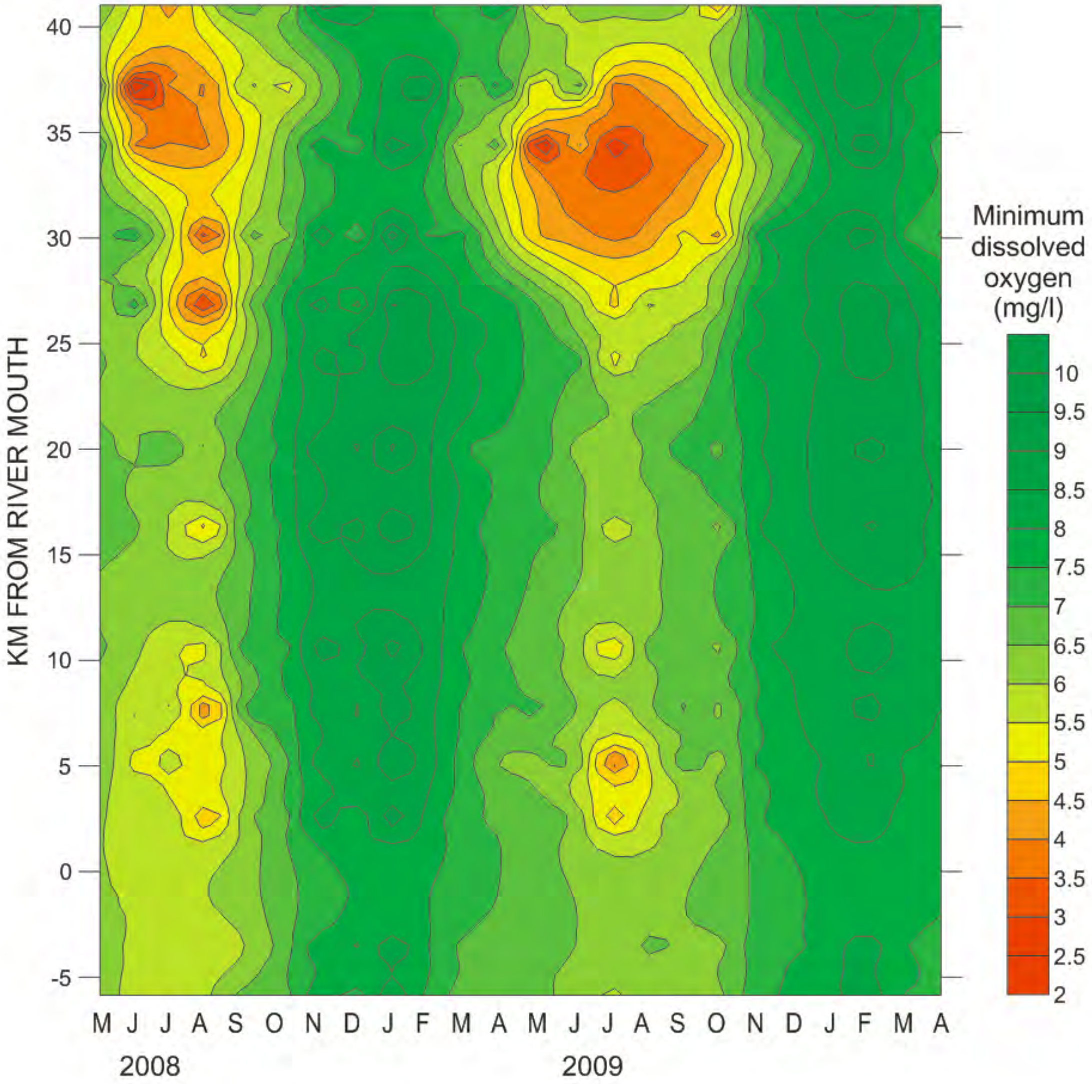

Figure 3.2.1. Time series of minimum dissolved oxygen concentration (mg L^{-1}) sampled along the length of the study area, May 2008–April 2010.

of fall and dry season of 2009 salt water crept back up the estuary and remained generally well mixed during the surveys, which were always conducted during flood tides.

With the onset of the wet season in 2009 stratification increased at the mouth again and salinity dropped. As in the previous year, by October salinity began to intrude back into the estuary, and the water column remained generally well mixed throughout the dry season of 2010.

The general seasonal pattern is of a rapid transition of well mixed salty water during dry seasons to wet season conditions. Freshwater moves rapidly down the estuary at the onset of seasonal rains, as can be seen by noting the rapid movement down the estuary of the location of the 2 psu isohaline (Fig. 3.2.1.2). The freshwater region is well mixed, but there is usually a region of strong stratification at the extent of the salinity intrusion. As freshwater discharge decreases during fall, the 2 psu isohaline rapidly moves back up the estuary, accompanied by a region of high stratification, with well mixed waters both up and downstream of the salinity intrusion (Figs. 3.2.1.3). An exception to this trend occurs around August of 2009 when there was a moderate degree of density stratification upstream of the 2 psu isohaline. This stratification was due to vertical temperature gradients rather than vertical salinity gradients, shown in Fig. 3.2.1.4, demonstrating that the highest salinity gradients occurred just downstream of the 2 psu isohaline. Comparisons of absolute values of surface and bottom salinities for all stations and months show the generally well mixed nature of the Caloosahatchee, with the exceptions predominantly occurring during the wet season (Fig. 3.2.1.5). There are also interesting annual trends in salinity. As noted earlier, the maximum salinity occurs at the end of the 2008 dry season. By following the 20 psu contour, one can observe that mean salinities decreased during each consecutive dry season. Conversely, by following the 2 psu isohaline, one can observe that the extent of freshwater also decreased from the 2008 wet season to the 2009 wet season. The pattern results in a decreasing annual range of salinity at any given spot along the river and may have an effect on the ecology of the river.

3.2.2 Turbidity and Suspended Sediment Characteristics

General Characteristics

Suspended sediment concentrations in the Caloosahatchee are very low compared to most temperate estuaries, rarely rising above 0.025 g l^{-1}. Figures 3.2.2.1–3.2.2.4 show median concentrations and percent organic content of water samples collected from all stations along the transect for each deployment month and depth (i.e., near surface and near bottom). Median concentrations are very low, ranging from 0.003-0.016 g l^{-1} at the bottom and 2-10 mg l^{-1} at the surface (excluding an anomolous value at 15 mg l^{-1}). In 2008 there was a trend from higher

Table 3.2.1. Summary statistics for water quality data collected May 2008–April 2010. Data represent means (± SD) calculated from vertically averaged data from each sampling effort.

Location (rkm)	Temperature (°C)	Salinity (‰)	pH	DO %	DO mg L^{-1}	chl *a** (µg L^{-1})	Turbidity (OBS volts)	CDOM (absorption$_{440}$ [m^{-1}])
-5.9	24.76	31.44	7.77	101.7	7.11	3.9	2.8	1.50
	(5.38)	(5.36)	(0.41)	(3.8)	(0.72)	(1.6)	(2.0)	(2.72)
-3.6	24.77	29.52	8.03	101.0	7.13	4.7	2.7	2.14
	(5.27)	(6.77)	(0.14)	(4.2)	(0.70)	(2.4)	(2.0)	(3.30)
2.5	24.86	21.79	8.08	99.9	7.37	6.4	1.9	4.12
	(5.01)	(9.32)	(0.12)	(4.5)	(0.82)	(3.9)	(1.8)	(4.24)
5.2	24.73	20.03	8.07	98.6	7.36	8.8	2.8	4.31
	(5.10)	(8.41)	(0.09)	(6.7)	(0.84)	(5.5)	(2.1)	(3.66)
7.7	24.89	17.06	8.11	99.9	7.56	9.8	2.3	5.08
	(4.87)	(9.45)	(0.16)	(6.0)	(0.84)	(6.0)	(1.6)	(4.41)
10.6	24.73	14.71	8.13	100.2	7.71	10.8	2.1	5.49
	(4.95)	(9.19)	(0.12)	(5.4)	(0.89)	(6.1)	(1.5)	(4.36)
16.2	24.64	11.68	8.16	101.1	7.93	13.3	2.7	5.82
	(5.06)	(8.68)	(0.23)	(6.7)	(0.99)	(6.4)	(1.4)	(3.99)
20.0	24.59	10.06	8.14	101.2	8.02	12.2	2.6	6.14
	(5.01)	(8.44)	(0.19)	(4.4)	(0.89)	(2.8)	(1.6)	(4.07)
24.2	25.14	7.39	8.20	100.0	7.97	12.1	3.6	6.28
	(5.00)	(7.05)	(0.25)	(7.2)	(1.04)	(2.8)	(3.2)	(3.69)

26.9	25.13	6.55	8.06	98.7	7.92	12.4	5.2	6.60
	(5.01)	(6.99)	(0.22)	(6.4)	(1.02)	(2.7)	(5.7)	(3.79)
30.2	26.61	4.53	8.00	95.40	7.53	12.6	2.9	7.10
	(4.31)	(5.32)	(0.21)	(9.80)	(1.15)	(3.7)	(2.2)	(3.83)
34.4	25.40	4.39	7.91	90.8	7.36	13.7	2.3	7.36
	(4.33)	(5.44)	(0.27)	(12.8)	(1.46)	(3.9)	(2.3)	(4.00)
37.1	25.00	3.92	7.92	93.8	7.65	12.6	1.9	7.58
	(4.59)	(5.02)	(0.20)	(10.9)	(1.26)	(3.2)	(0.9)	(4.13)
41.0	24.41	3.63	7.94	95.6	7.91	11.9	2.4	7.59
	(4.54)	(4.87)	(0.16)	(7.4)	(1.13)	(3.5)	(1.7)	(4.08)

* Chlorophyll *a* data from May 2009-April 2010 only.

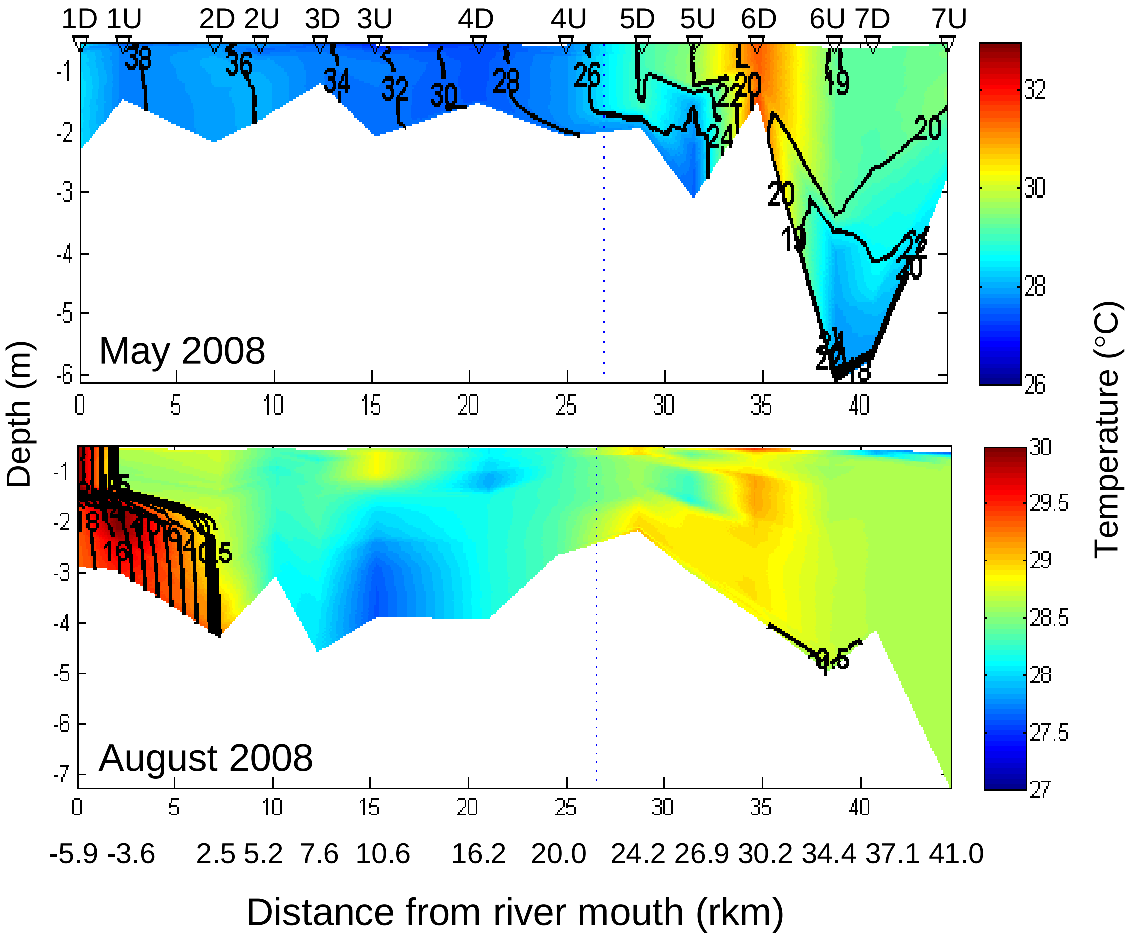

Figure 3.2.1.1. Longitudinal temperature distribution with isohalines illustrating seasonal extremes in salinity structure (May: dry season; August: wet season). Triangles denote locations of profiles along the Caloosahatchee River and Estuary and are labeled according to site.

values during the wet season, decreasing as the wet season waned, at both surface and bottom water samples. In contrast, there was little seasonal trend in 2009, with both surface and bottom concentrations remaining relatively constant. The median percentage of organic material trended from low values (~25–40 %) during the early dry season (February-April), then increasing throughout the rest of the year (February and March 2010 samples were incinerated due to a malfunctioning muffle furnace). The maximum transect median percentage of organics was around 82% at the surface and 57% at the bottom. Surface suspended material was generally higher in organic material than that at the bottom.

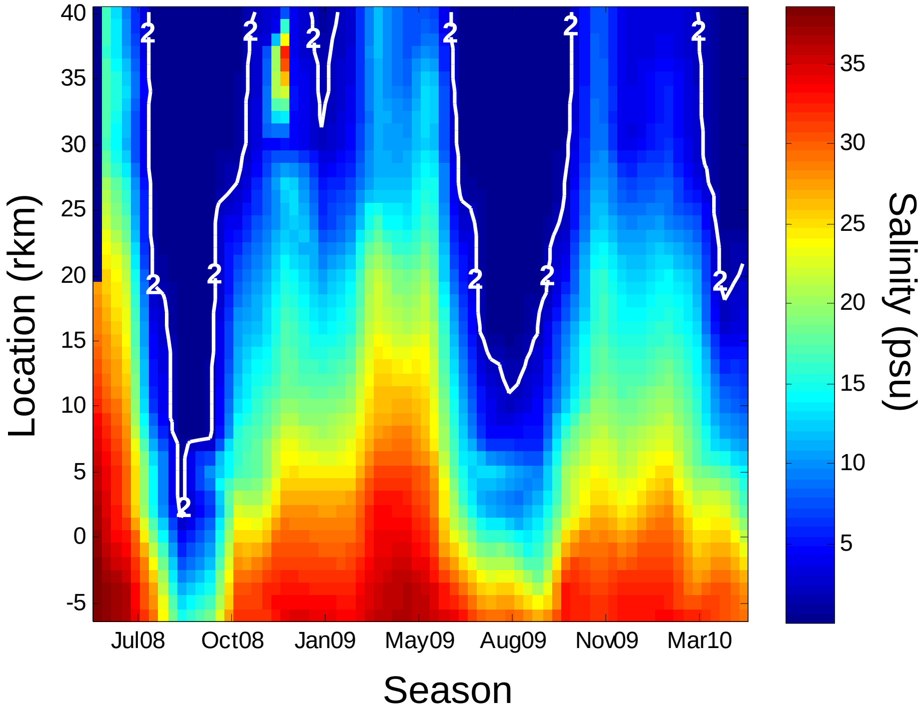

Figure 3.2.1.2. Time series of vertically averaged salinity. White line represents the 2 psu isohaline.

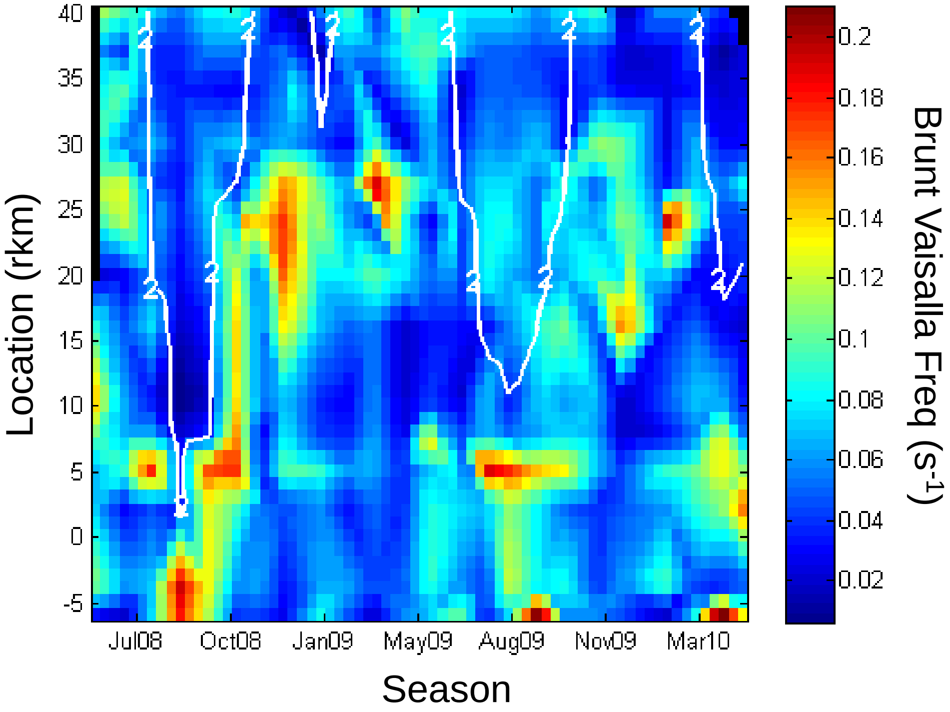

Figure 3.2.1.3. Time series of density stratification. More stratified regions are in warm colors, well mixed regions in cool colors.

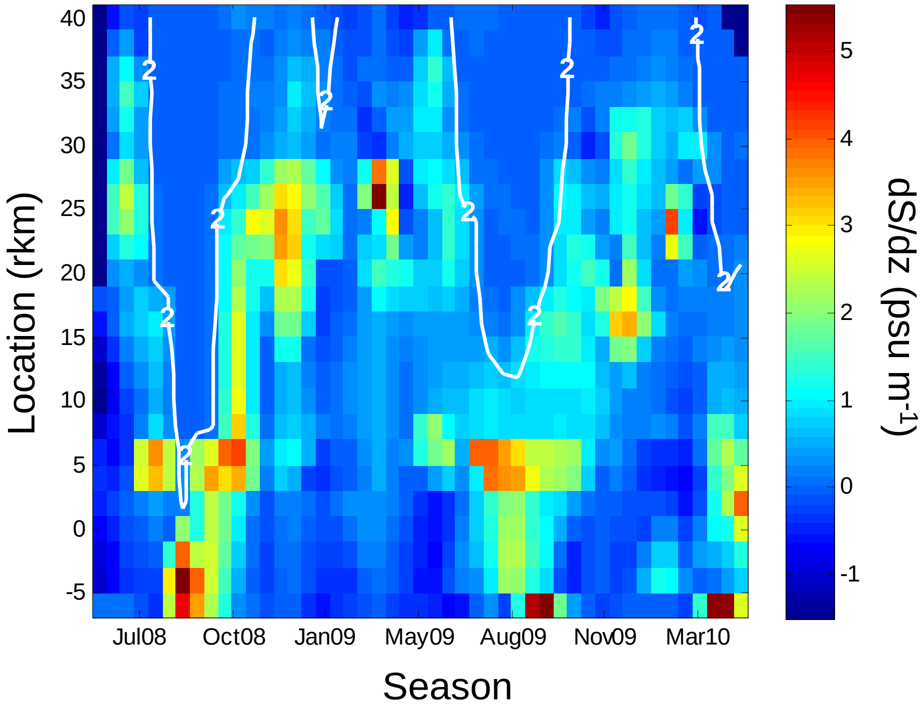

Figure 3.2.1.4. Time series of vertical salinity gradient (difference between surface and bottom salinities, dS, and depth, dz). Stratified regions are in warm colors, well mixed regions in cool colors.

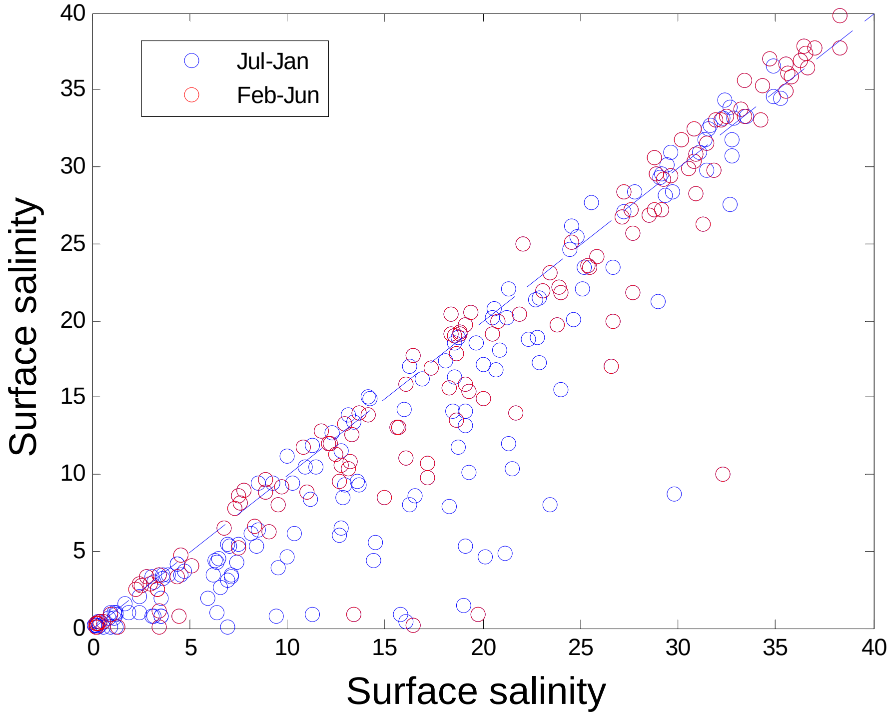

Figure 3.2.1.5. Surface and bottom salinities for all months and stations. Dashed line represents a slope of one.

Temporal and Longitudinal Distributions

Turbidity levels peak regularly near the 2 psu isohaline, as might be expected from classically formed estuarine turbidity maxima (ETMs) (Fig. 3.2.2.5). During the dry seasons, peak turbidity levels develop around rkm 27, a region where the Caloosahatchee becomes restricted, and resuspension was probably due to the increasing currents in the shallow narrow channel. Additionally, turbidity peaks also formed just outside of the mouth (-5 to 0 rkm) and appeared to be dispersed into the mouth by tidal oscillations. Two large peaks in these locations occurred during the wet season of 2008 and the end of the dry season in 2010. Total mass concentrations track the turbidity peaks well (Figs. 3.2.2.6-3.2.2.7). The majority of the peaks in turbidity were due to increases in inorganic mass concentrations of suspended sediments. Near bottom total organic concentrations peaked during three distinct periods around river km 27, during the wet season of 2008, the dry season and beginning of wet season 2009, and the dry season of 2010 (Figs. 3.2.2.8-3.2.2.9). High organic content was responsible for the upriver turbidity peak during the wet season of 2008, which was accompanied by a classical ETM downstream of the 2 psu isohaline. Time series of the percentage of organic material in the water column reveals inter- and intra-annual patterns in the nature of the suspended sediment (Figs. 3.2.2.10-3.2.2.11). Surface material tends to have a higher percentage of organic material, as expected. There was a tendency for higher organic content upriver of the 2 psu halocline during the rainy seasons. In both 2008 and 2009, high organic content material reached all the way down river in the early wet season. As each season continued, the percentage of organic material decreased first at the downstream extent and then decreased going upriver. Although some of the data from late 2009 and 2010 is missing, there appears to be an intra-annual decreasing trend in percentage of organic material. This decrease may be associated with the extent of freshwater discharge during the rainy seasons, which also is greatest in 2008 and decreases each year thereafter.

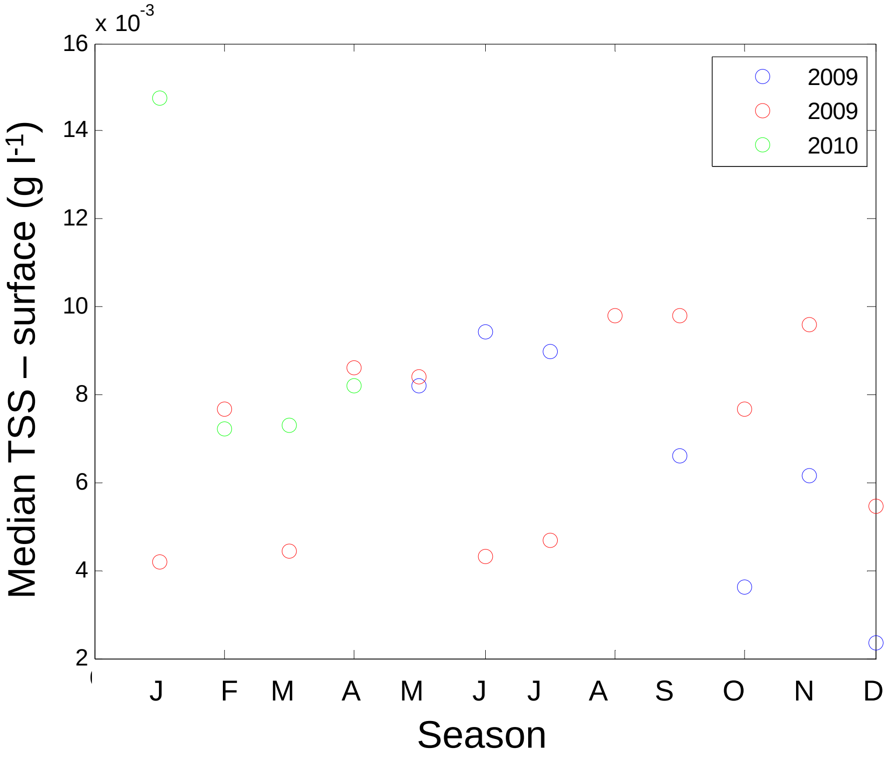

Figure 3.2.2.1. Seasonal distribution of total suspended solids in water samples collected near the surface.

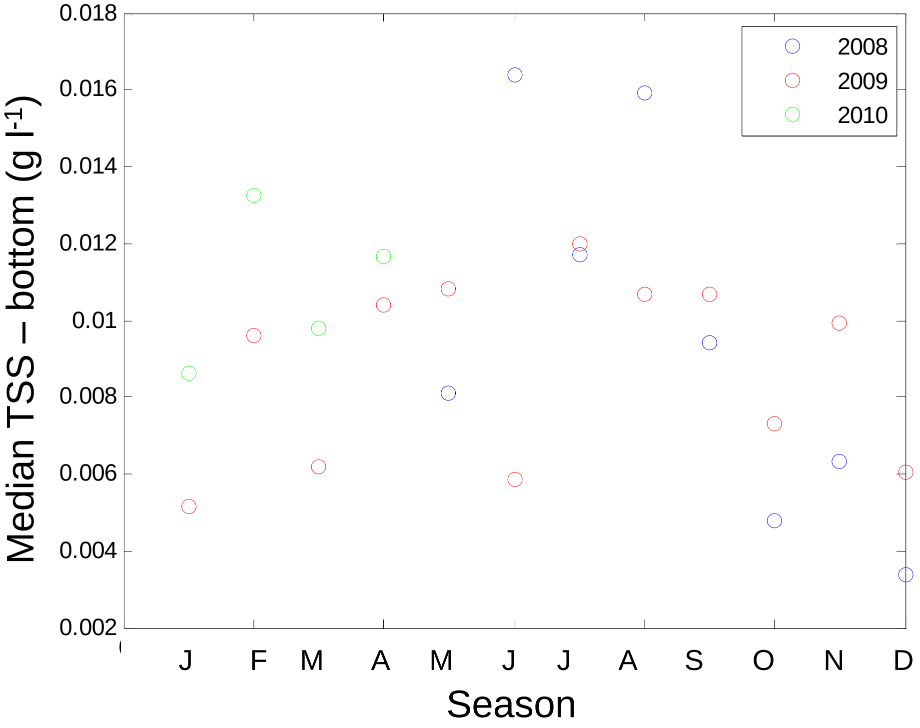

Figure 3.2.2.2. Seasonal distribution of total suspended solids in water samples collected near the bottom.

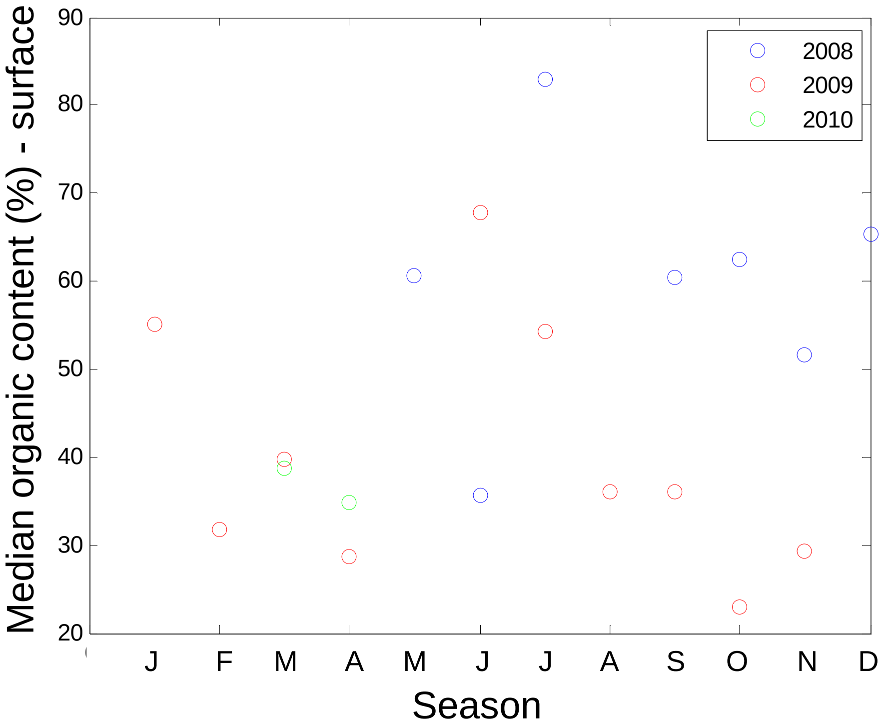

Figure 3.2.2.3. Seasonal distribution of organic content from water samples collected near the surface.

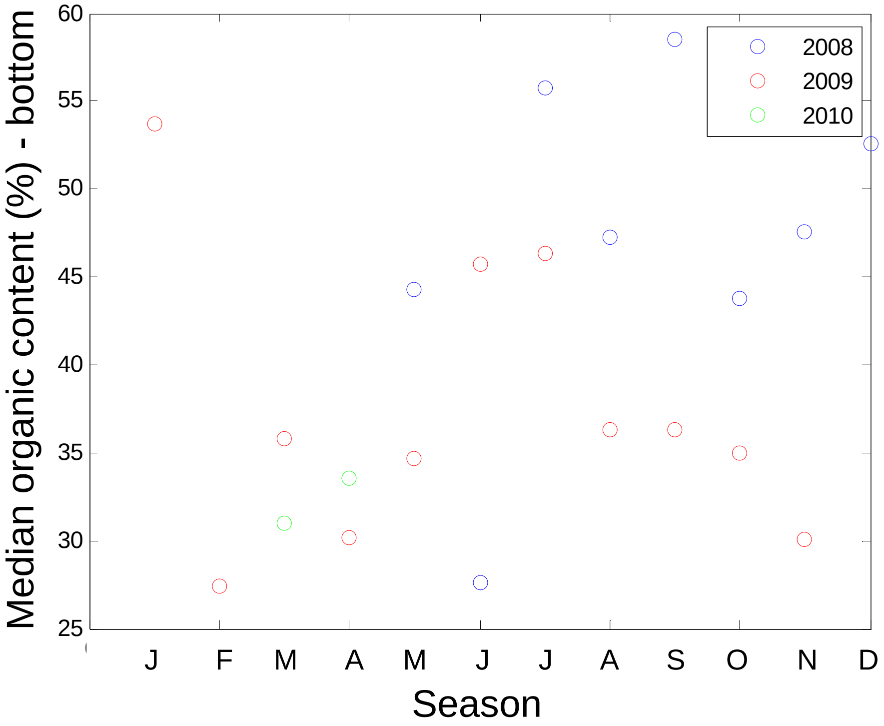

Figure 3.2.2.4. Seasonal distribution of organic content from water sampled collected near the bottom.

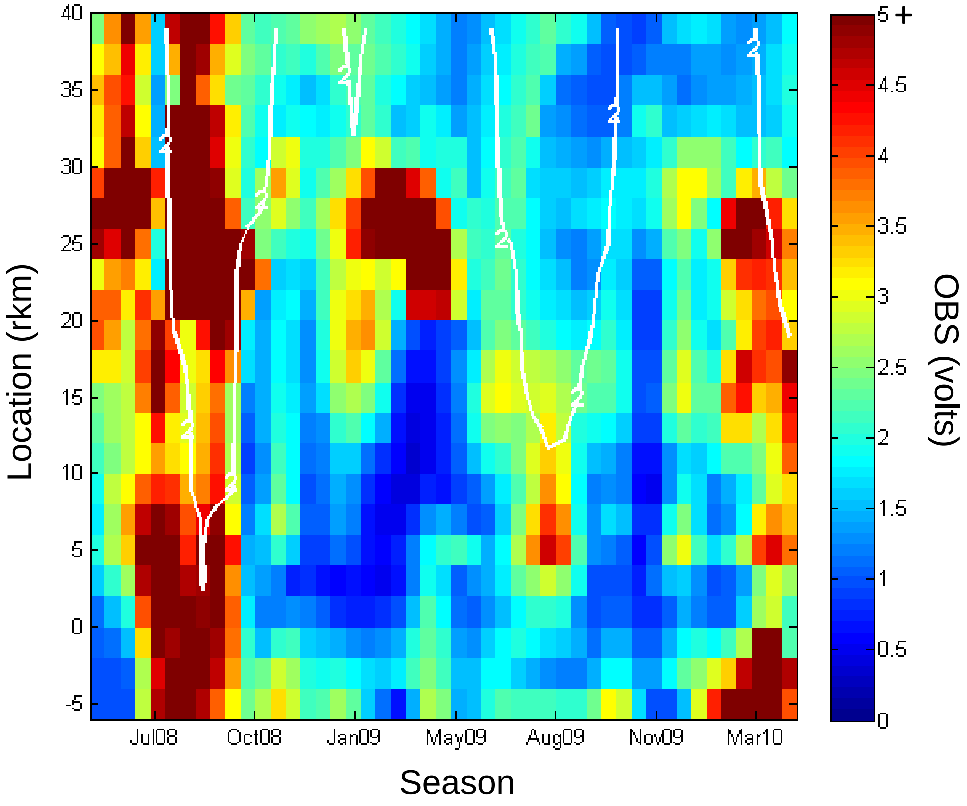

Figure 3.2.2.5. Time series of turbidity distribution as measured using optical back scatter.

3.2.3 Colored Dissolved Organic Matter

Colored dissolved organic matter (CDOM) was determined fluorometrically using a WET Labs ECO Triplet instrument and was converted to absorption coefficient via calibration of bulk water samples (collected at each site for each sampling period) for which absorption at 440 nm was measured using a spectrometer. The distribution of CDOM throughout the study period suggested an upstream source that was diluted by mixing downstream (Figs. 3.2.3.1-3.2.3.4). CDOM values were relatively low during dry months and increased substantially with the onset of the wet season. During periods of high freshwater inflow (e.g., August 2008, Fig. 3.2.3.1), high levels of CDOM were present throughout the tidal portion of the river.

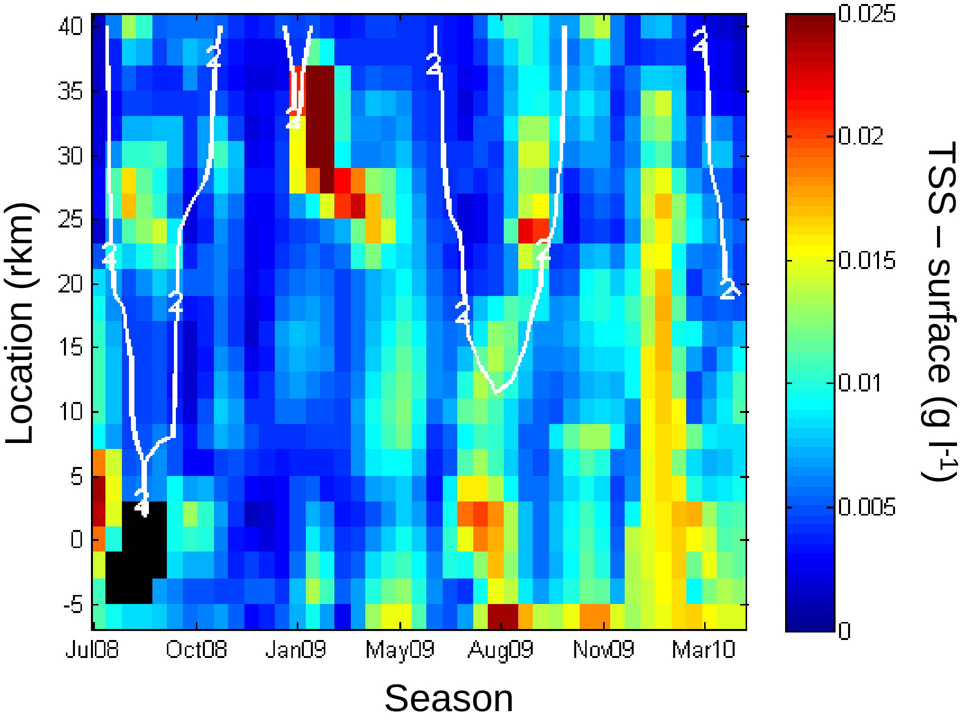

Figure 3.2.2.6. Time series of total suspended solids estimated from water samples taken near the surface.

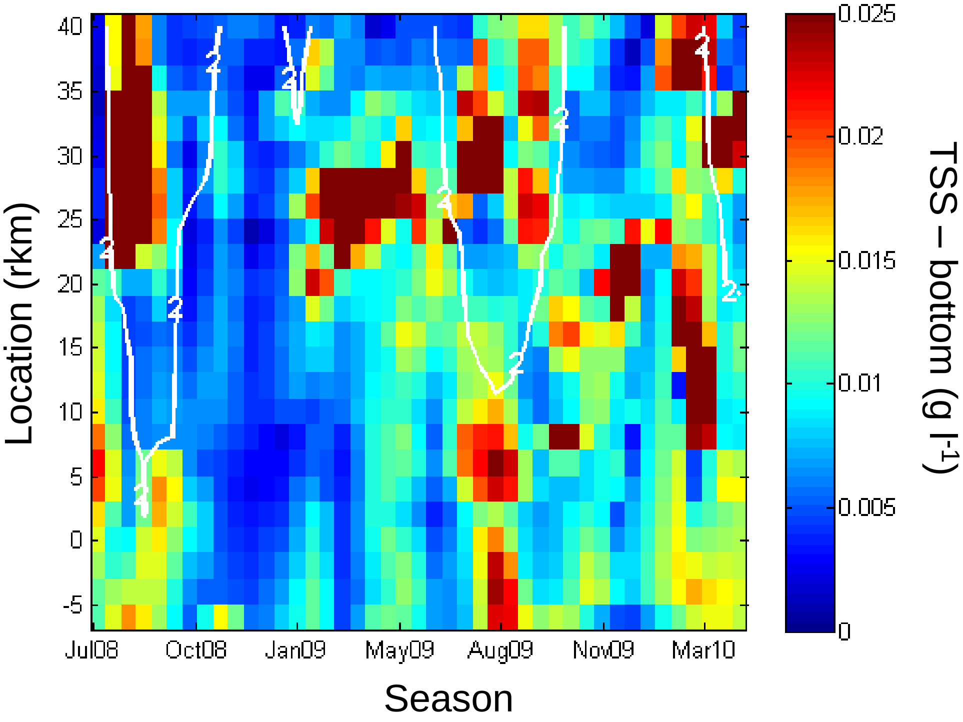

Figure 3.2.2.7. Time series of total suspended solids estimated from water samples taken near the bottom.

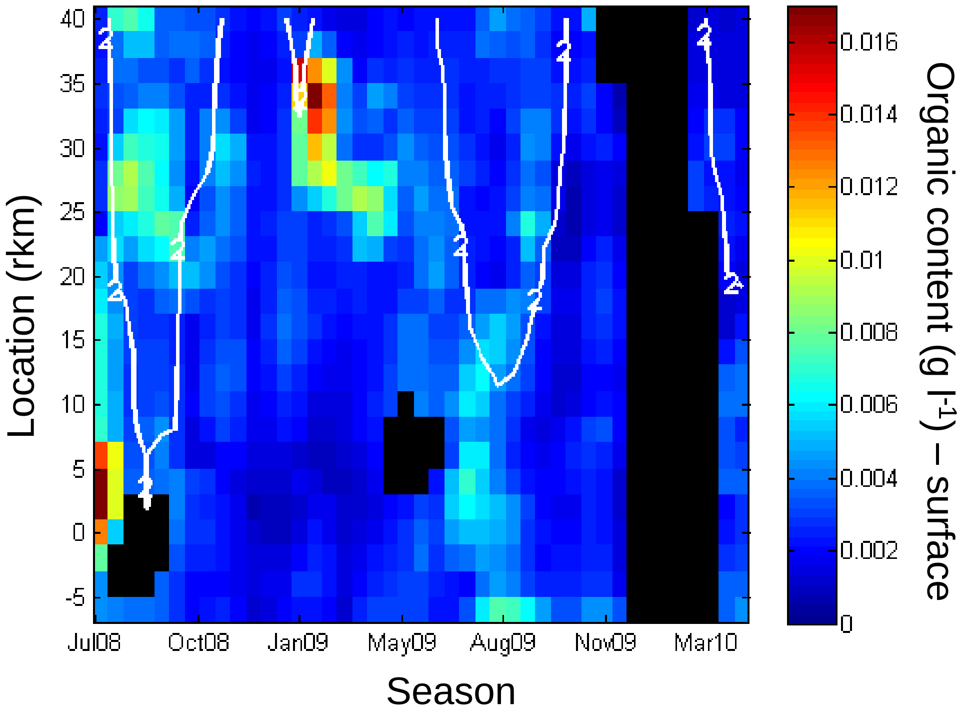

Figure 3.2.2.8. Time series of organic matter estimated from water samples collected near the surface.

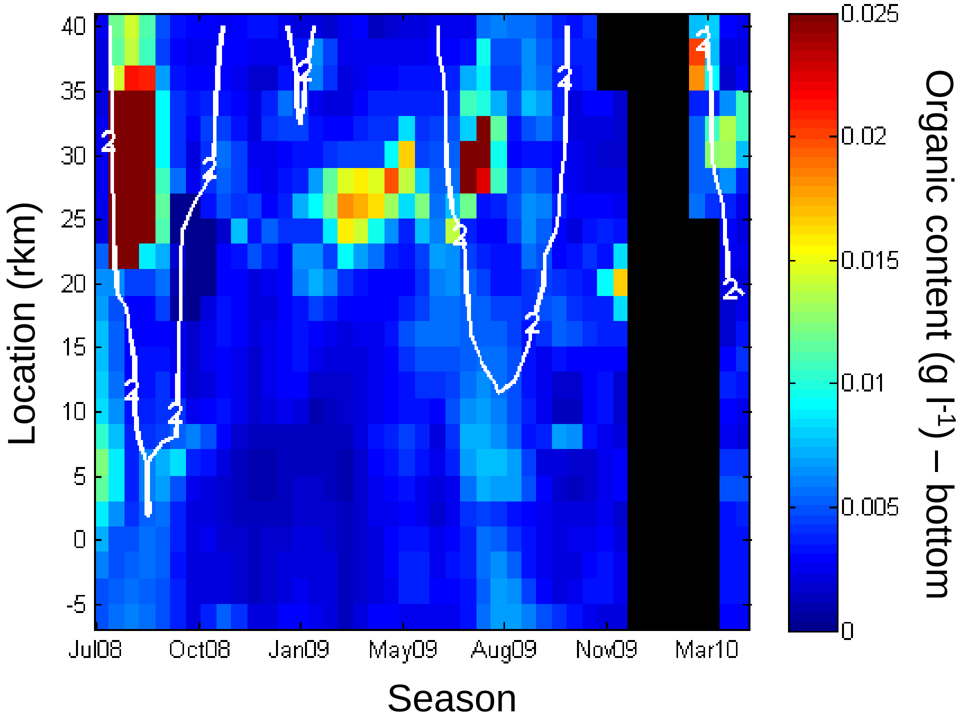

Figure 3.2.2.9. Time series of organic matter estimated from water samples collected near the bottom.

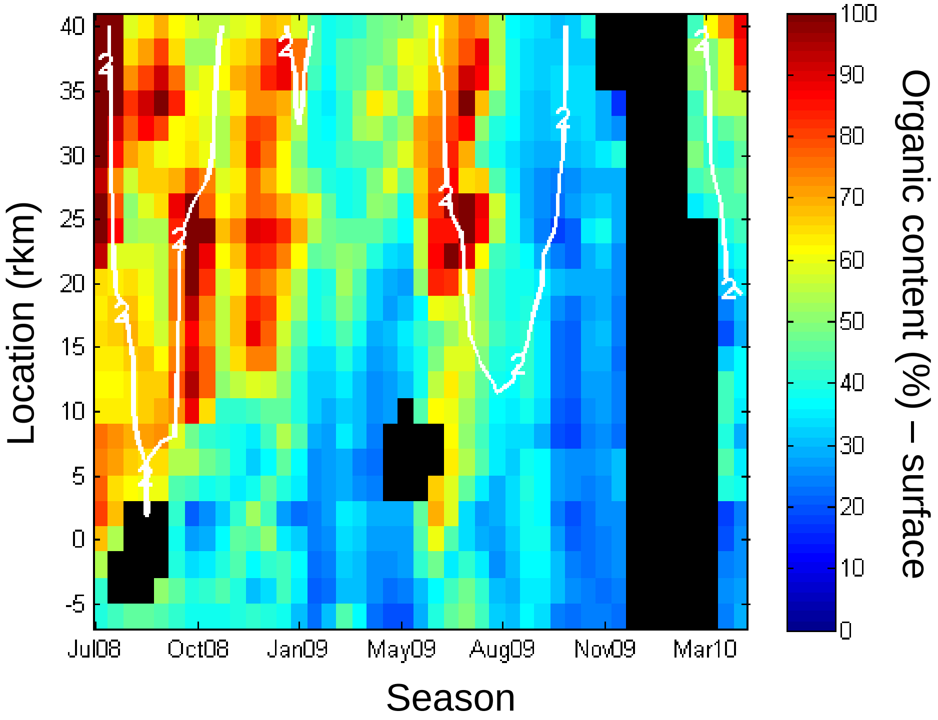

Figure 3.2.2.10. Time series of relative organic content determined from water samples collected near the surface.

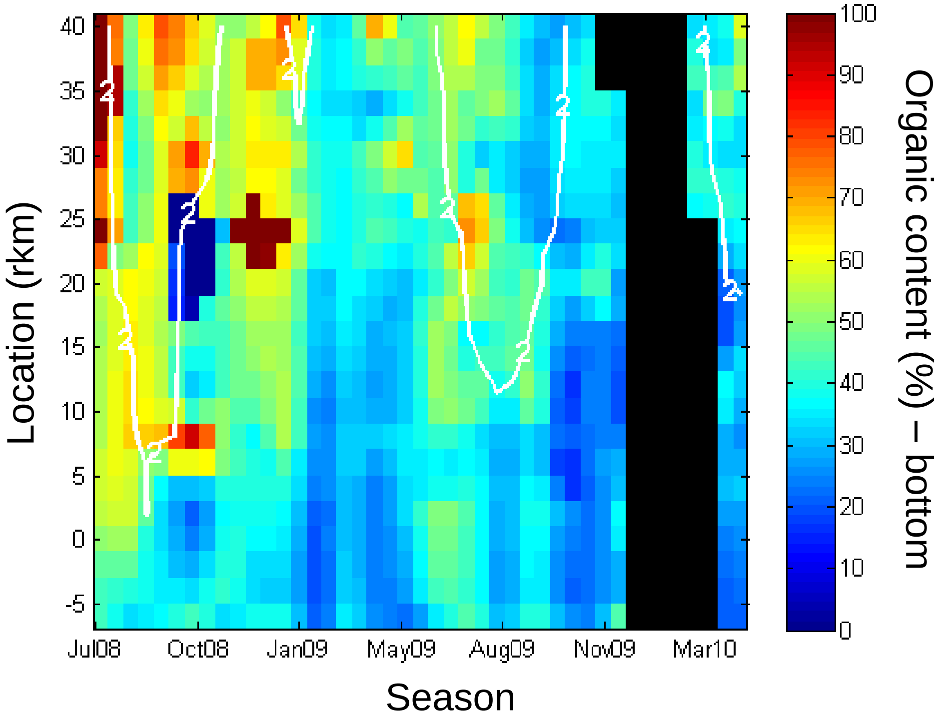

Figure 3.2.2.11. Time series of relative organic content determined from water samples collected near the bottom.

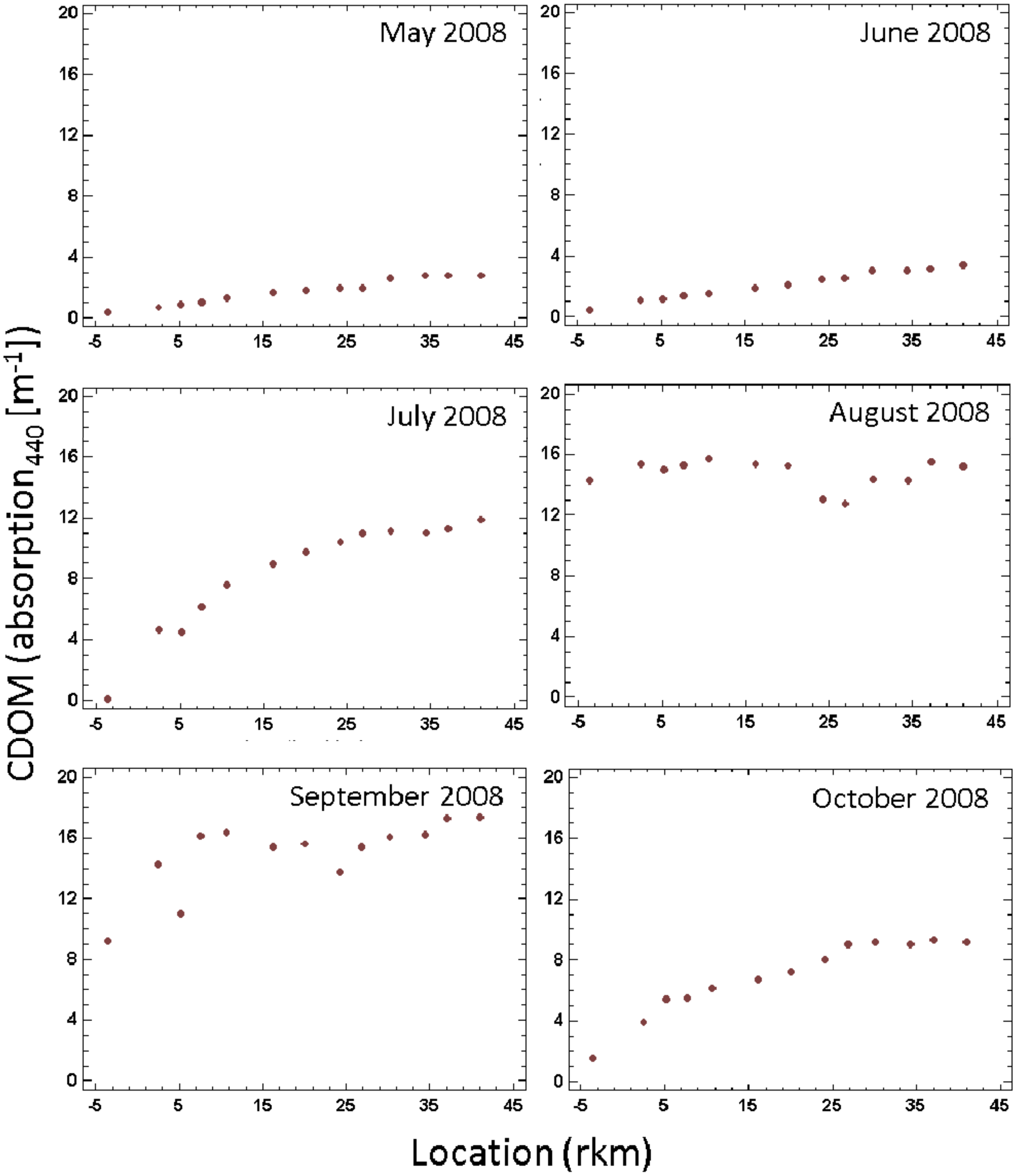

Figure 3.2.3.1. Vertically averaged colored dissolved organic matter (CDOM) calculated along the length of the study area May–October 2008.

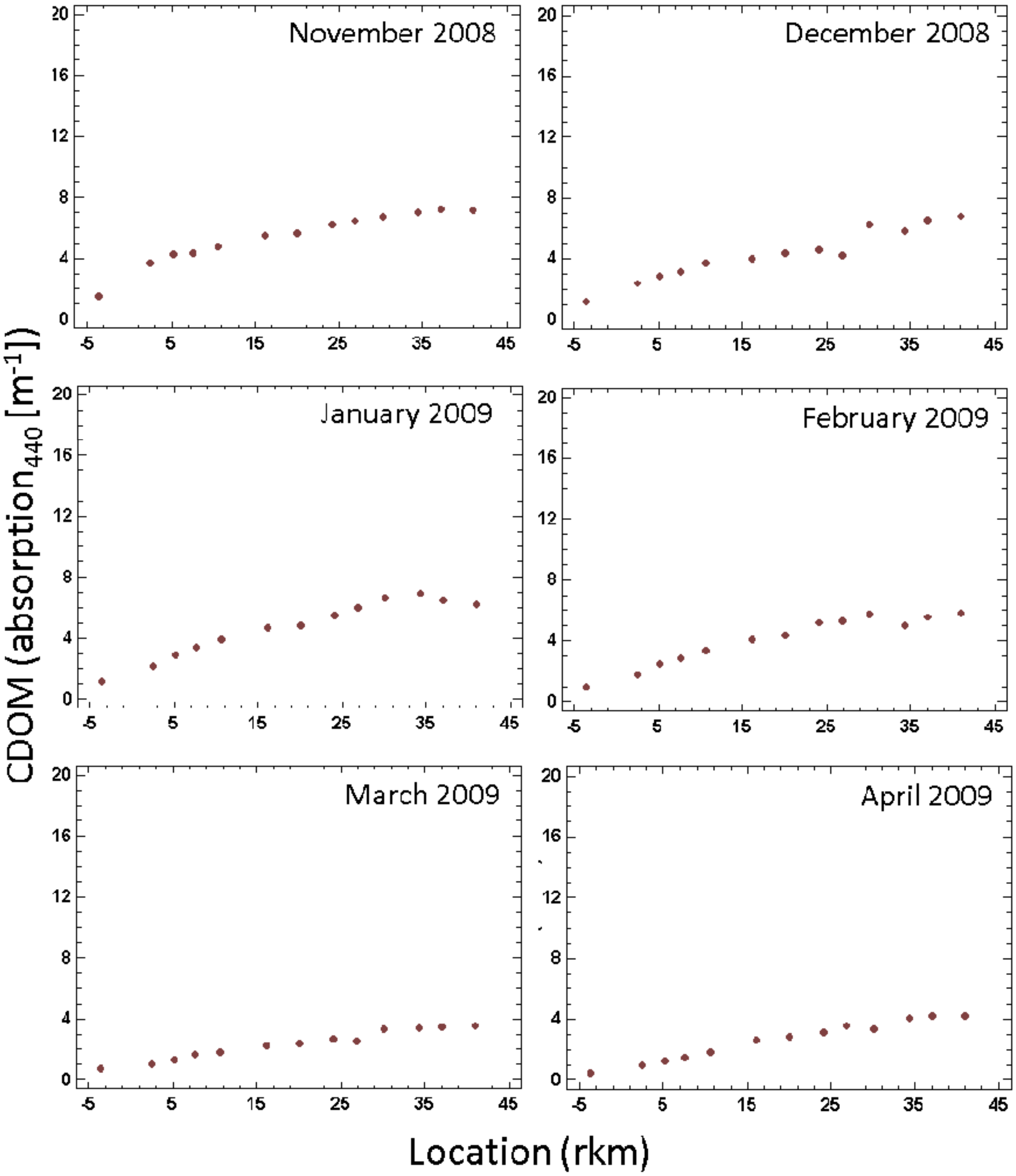

Figure 3.2.3.2. Vertically averaged colored dissolved organic matter (CDOM) calculated along the length of the study area November 2008–April 2009.

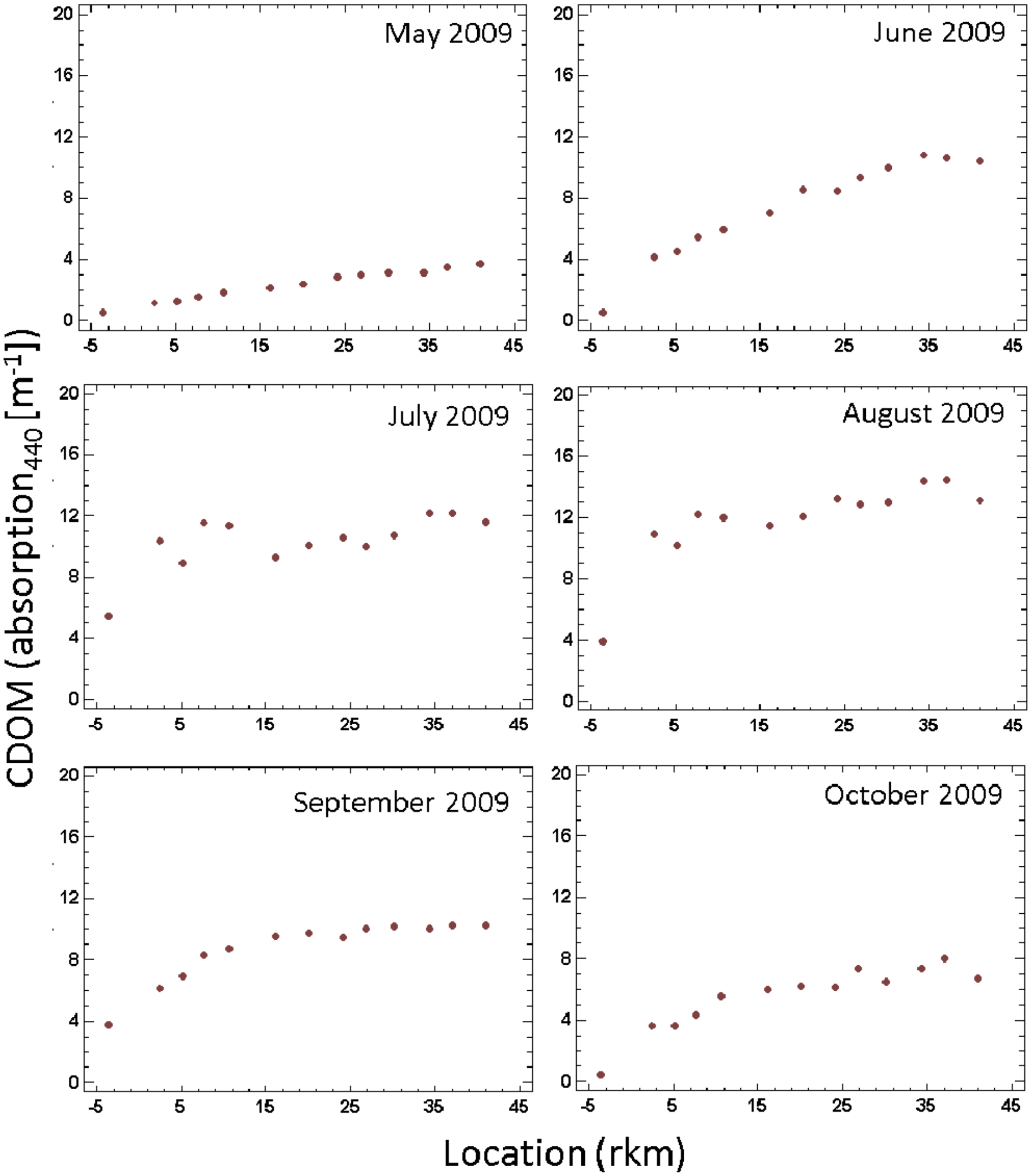

Figure 3.2.3.3. Vertically averaged colored dissolved organic matter (CDOM) calculated along the length of the study area May–October 2009.

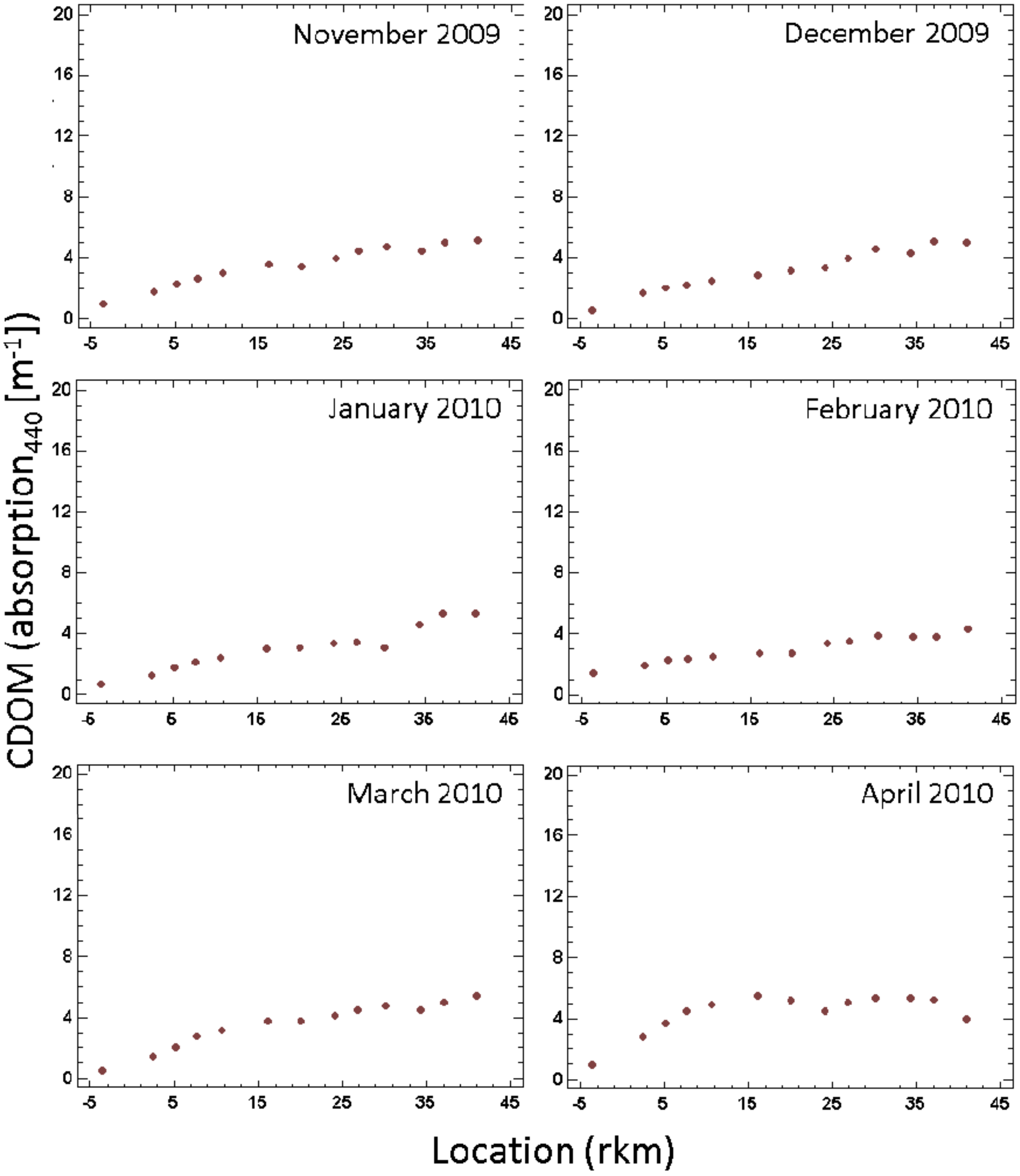

Figure 3.2.3.4. Vertically averaged colored dissolved organic matter (CDOM) calculated along the length of the study area November 2009–April 2010.

3.3 Water Column and Benthic Primary Production

Mean chlorophyll *a* concentration for each sampling station is presented in Table 3.2.1. In general, chlorophyll *a* concentrations were higher upstream, especially above 10.6 rkm, where mean concentrations were typically >10 μg L^{-1}.

A comparison of water column and benthic primary production along the length of the study area was made by examining monthly mean chlorophyll *a* concentration and maximum fluorescence (F_{max}) measured using the diving PAM fluorometer (Figs. 3.3.1–3.3.6) for the period May 2009-April 2010. These figures also illustrate that chlorophyll *a* concentrations were typically higher upstream and tended to decrease downstream, the exceptions occurring in July 2009 when concentrations were highest just inside the mouth of the river. In contrast, F_{max} values tended to be highest downstream, typically below the river mouth in San Carlos Bay. These downstream peaks in F_{max} were associated almost exclusively with pennate diatoms; when Fmax peaks occurred upstream, they were more likely to be associated with large percentages of centric diatoms. These results suggest that production downstream was truly benthic in nature, with pennate diatoms dominating in the clear waters below the river mouth. Benthic production upstream was likely the result of phytoplankton sedimentation.

Comparison of water column chlorophyll *a* concentration (estimated using maximum fluorescence, relative fluorescence units) and effective quantum yield suggests that even though phytoplankton biomass was typically greater upstream, phytoplankton were often healthier downstream (Figs. 3.3.7-3.3.18). Although increased values of quantum yield often accompanied the chlorophyll maximum, especially during dry months (Fig. 3.3.13, 3.3.15-3.3.16), higher values of quantum yield, indication healthy phytoplankton populations, were often present downstream relative to the chlorophyll maximum during wet months (Figs. 3.3.10-3.3.12). These results suggest that phytoplankton occurring upstream during the wet season may have experienced salinity stress, with associated quantum yield values falling below 0.3.

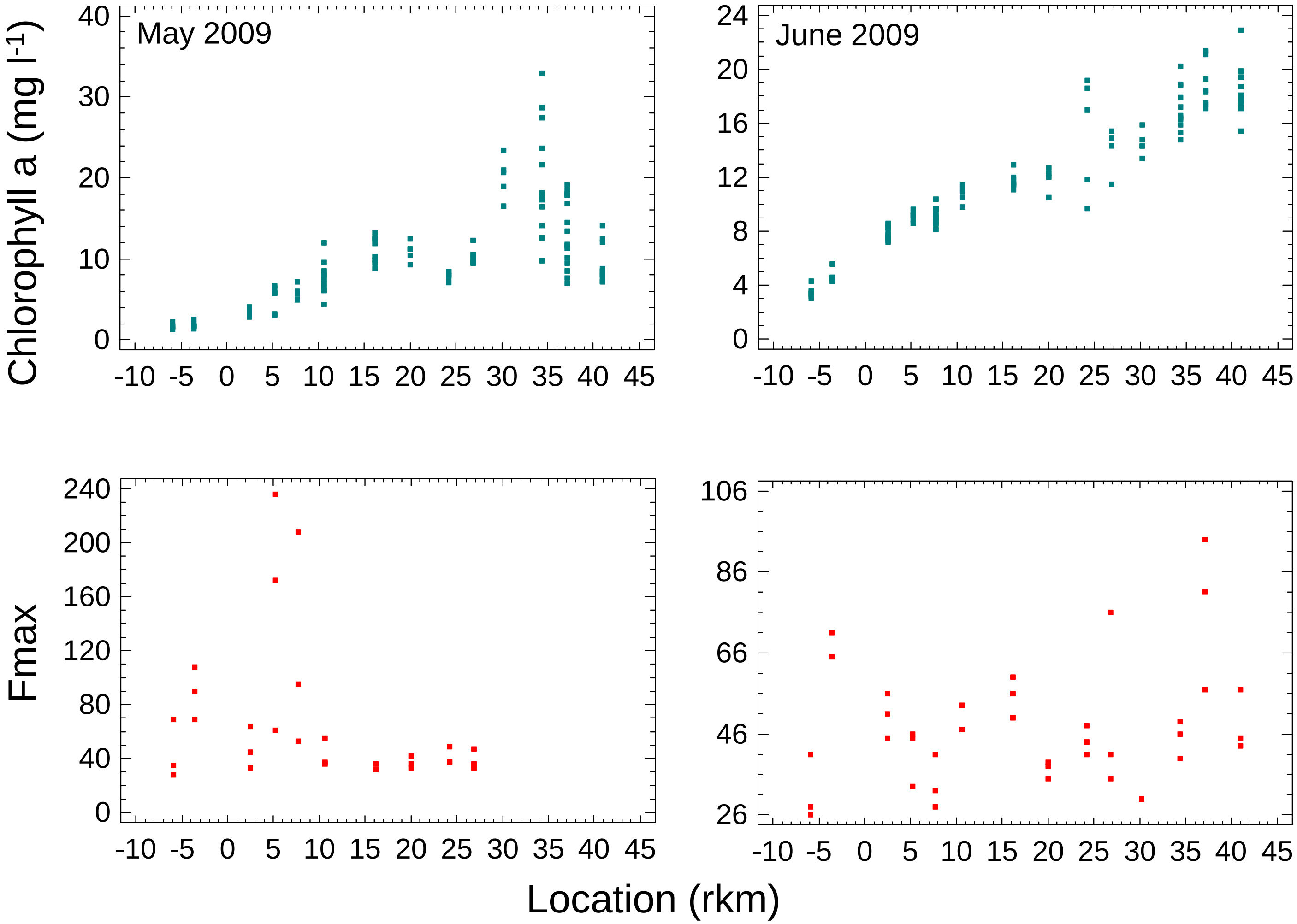

Figure 3.3.1. Comparison of water column (chlorophyll *a* concentration) and benthic primary production (F_{max}) along the study area, May–June 2009.

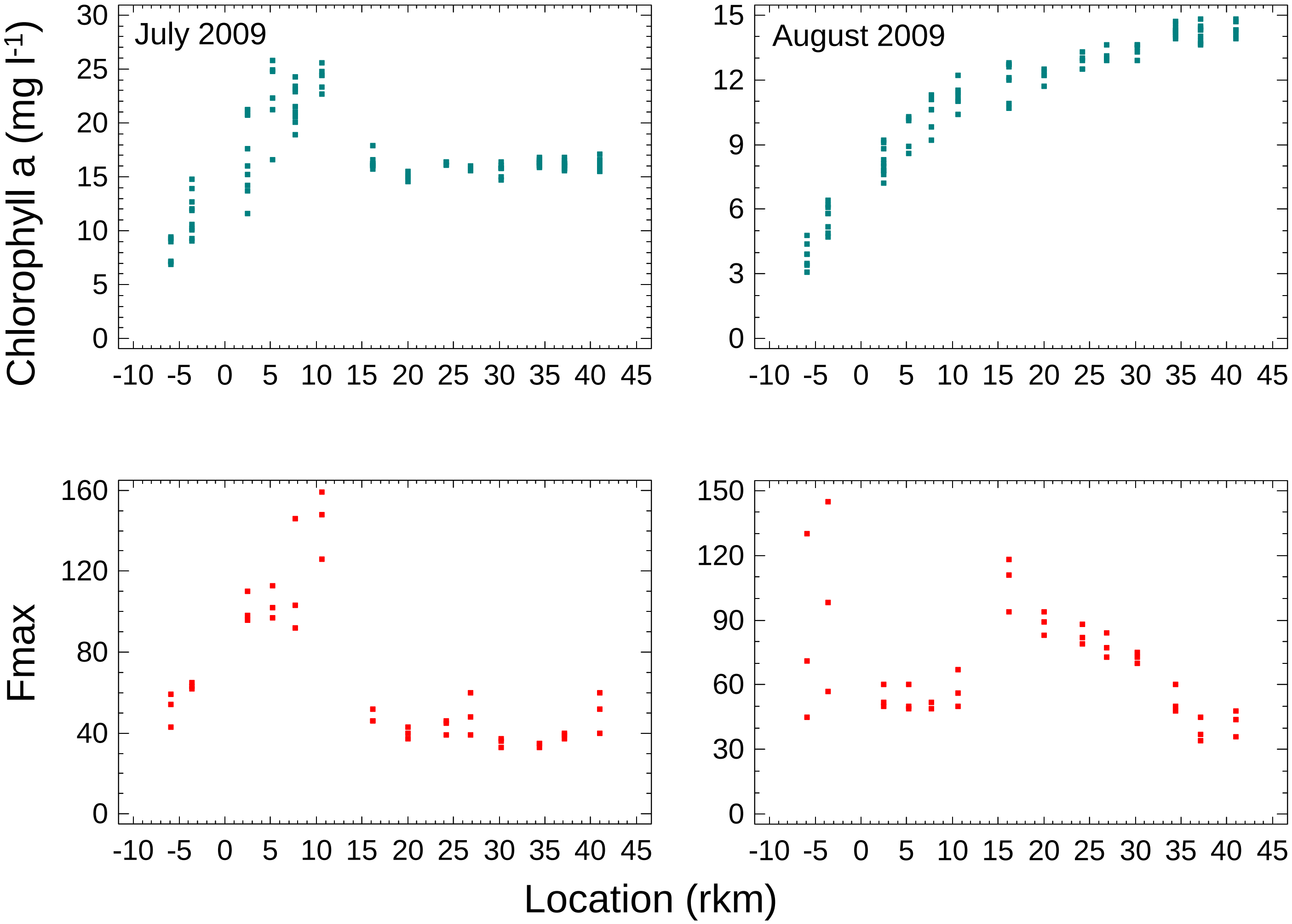

Figure 3.3.2. Comparison of water column (chlorophyll *a* concentration) and benthic primary production (F_{max}) along the study area, July–August 2009.

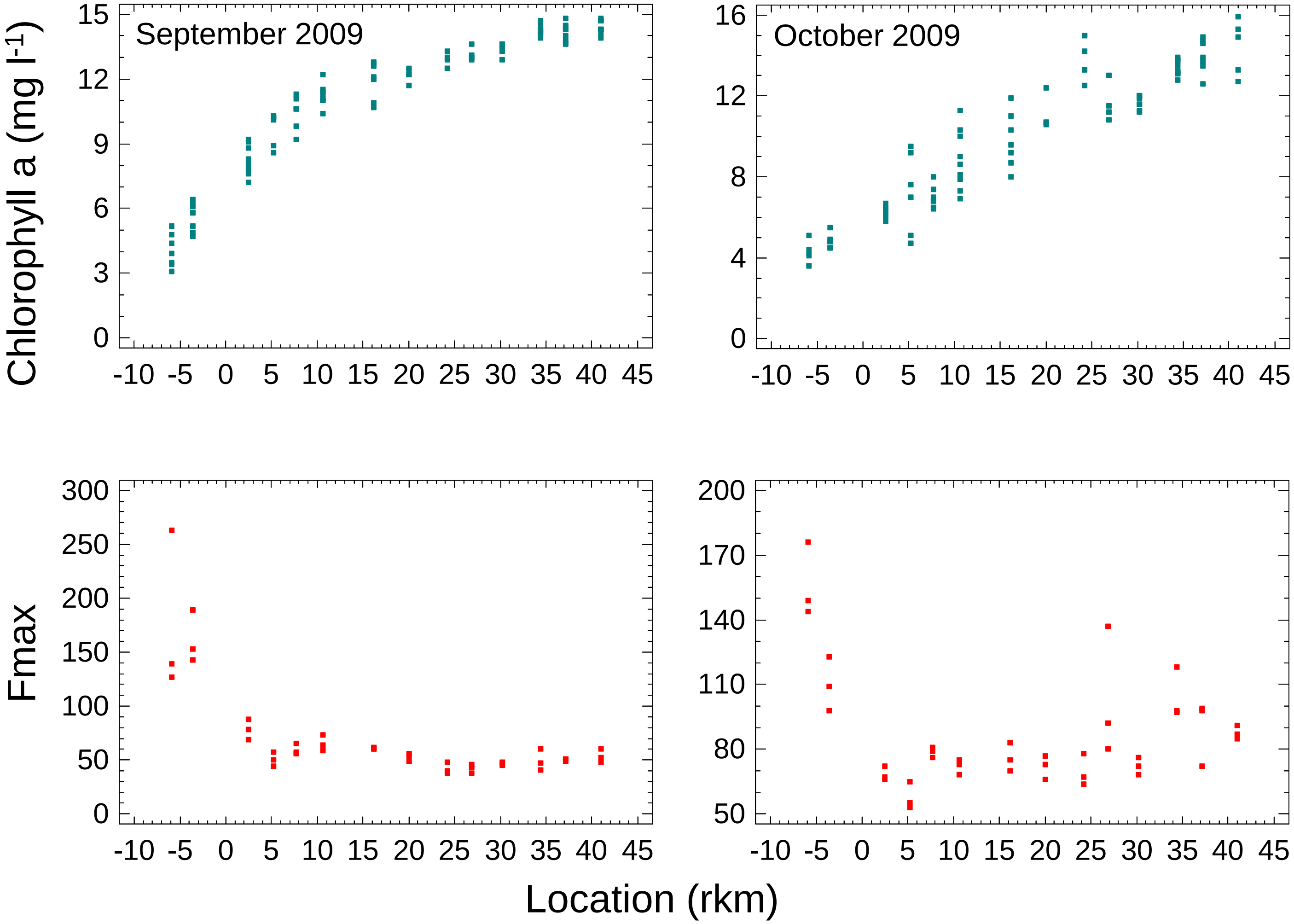

Figure 3.3.3. Comparison of water column (chlorophyll *a* concentration) and benthic primary production (F_{max}) along the study area, September–October 2009.

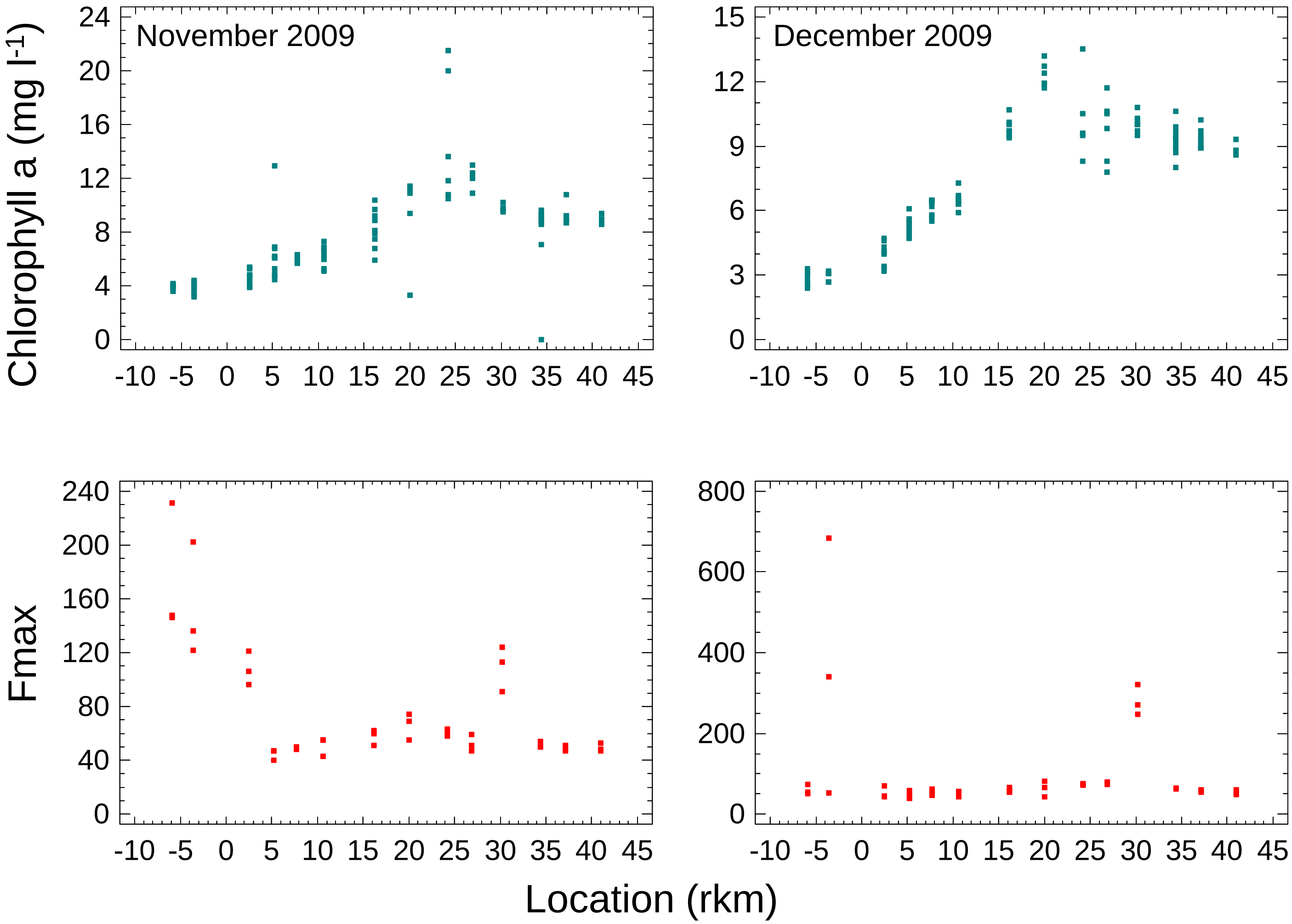

Figure 3.3.4. Comparison of water column (chlorophyll *a* concentration) and benthic primary production (F_{max}) along the study area, November–December 2009.

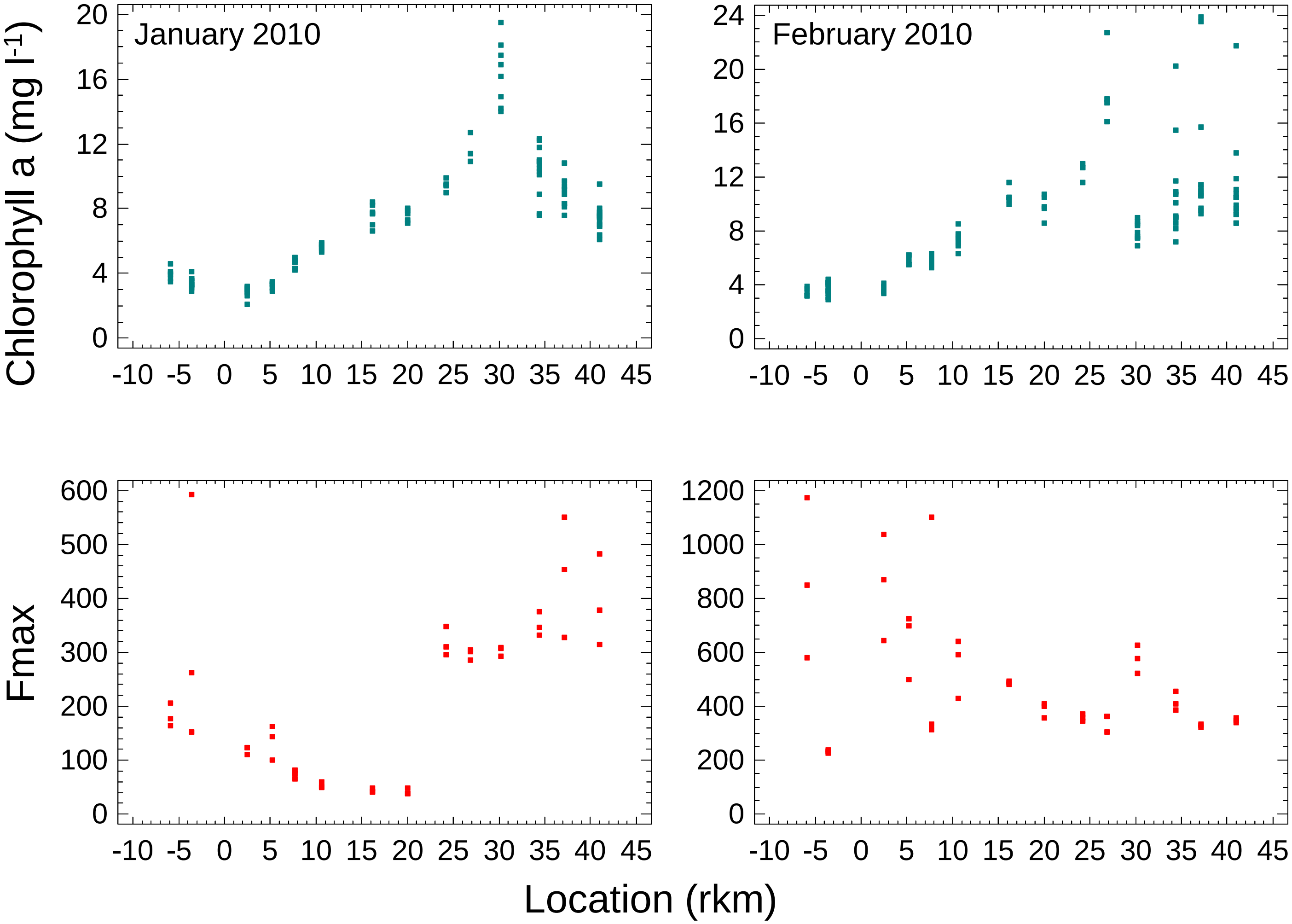

Figure 3.3.5. Comparison of water column (chlorophyll *a* concentration) and benthic primary production (F_{max}) along the study area, January–February 2010.

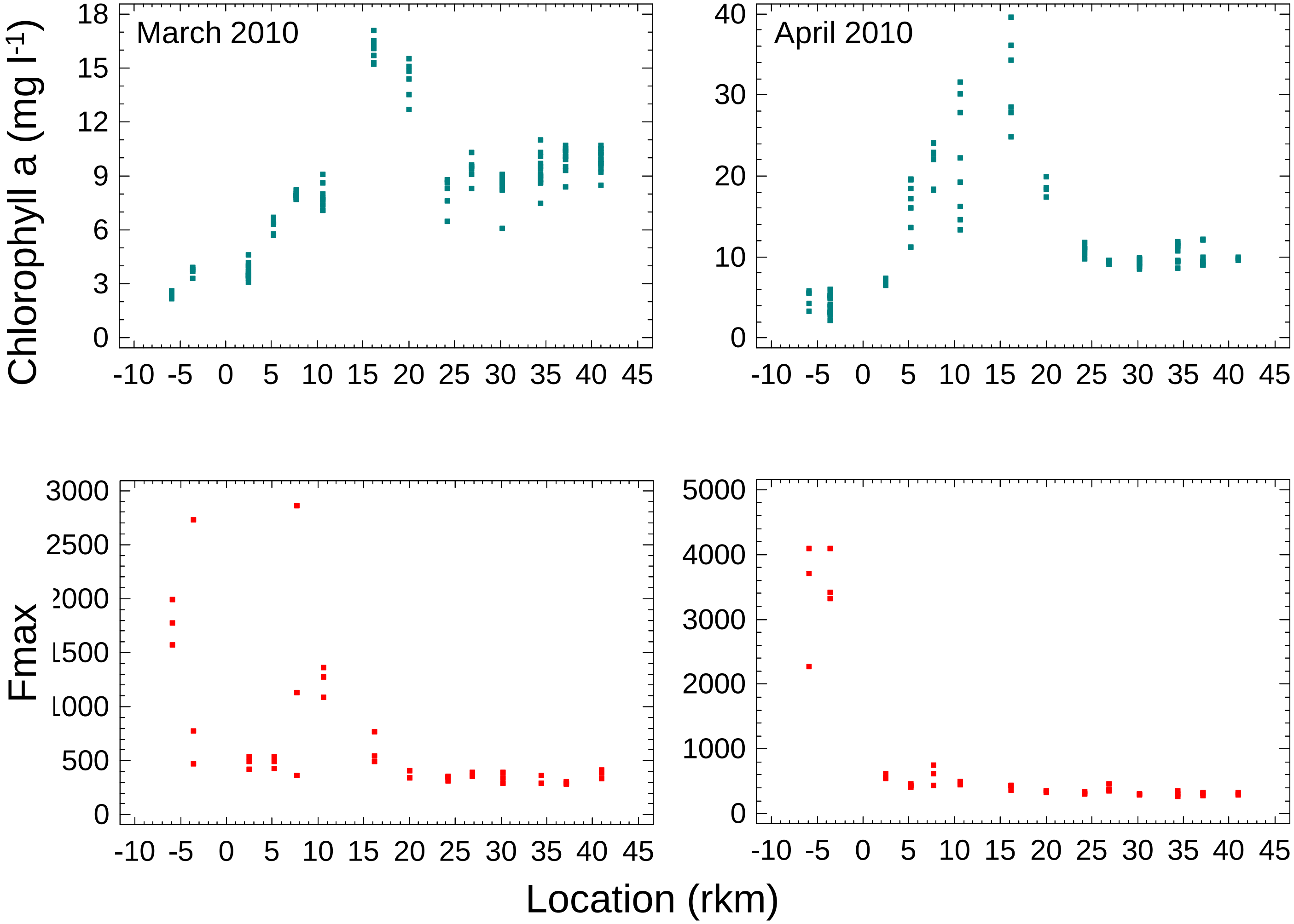

Figure 3.3.6. Comparison of water column (chlorophyll *a* concentration) and benthic primary production (F_{max}) along the study area, March–April 2010.

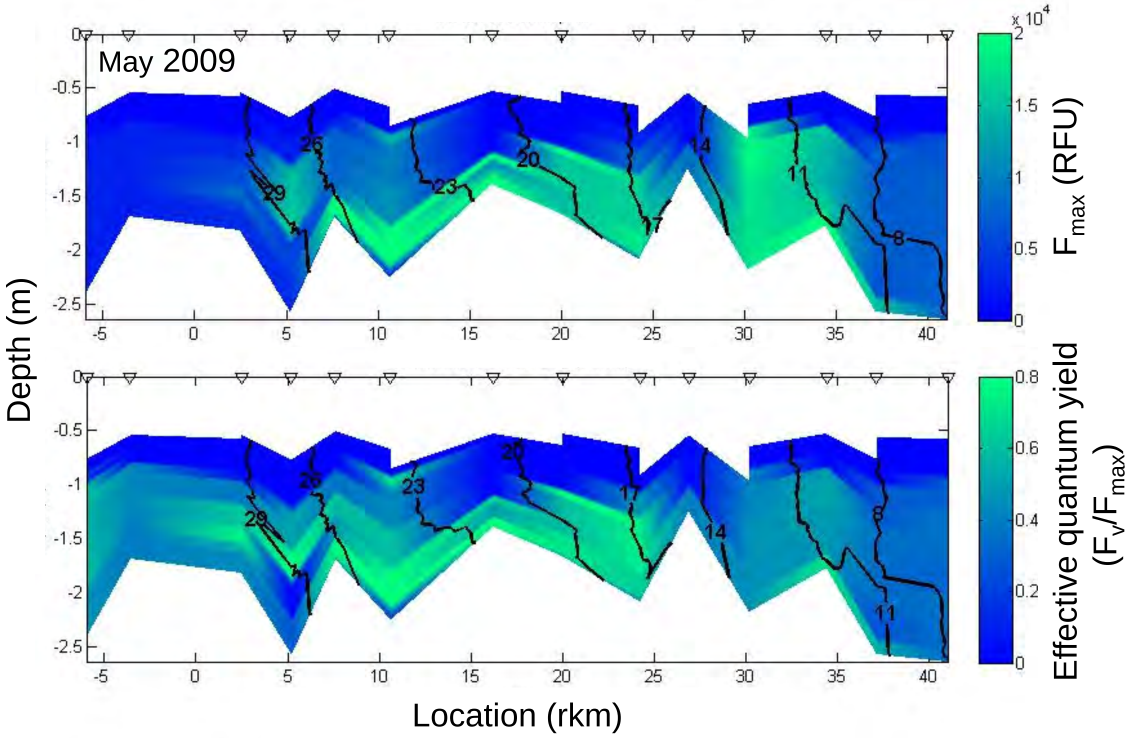

Figure 3.3.7. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for May 2009. Triangles denote profile locations and lines represent isohalines.

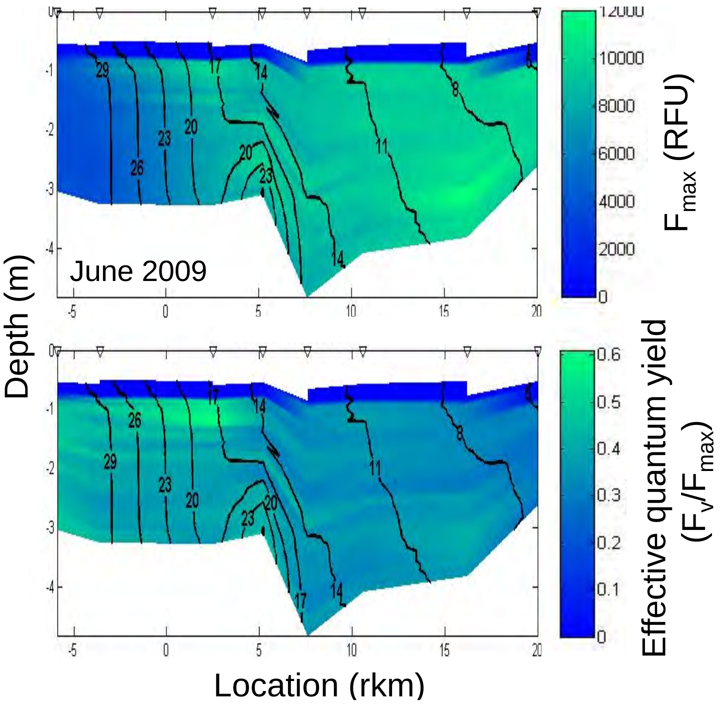

Figure 3.3.8. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for June 2009. Triangles denote profile locations and lines represent isohalines. Data are lacking in the upper portion of Caloosahatchee due to instrument failure.

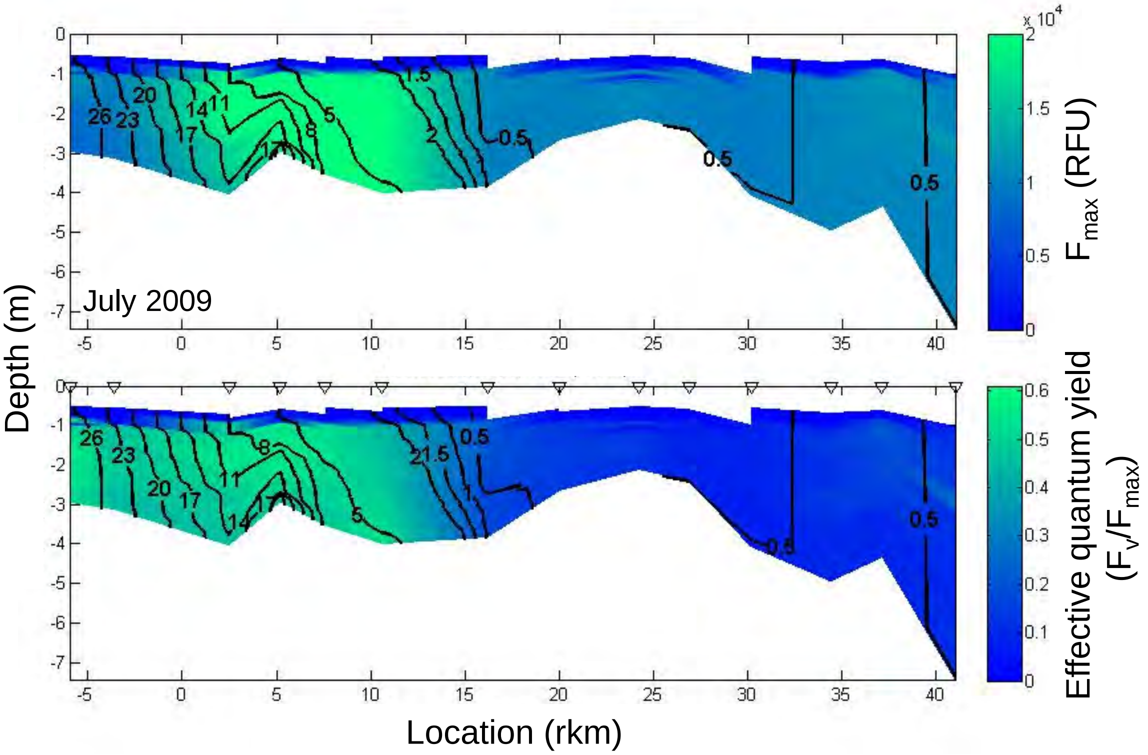

Figure 3.3.9. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for July 2009. Triangles denote profile locations and lines represent isohalines.

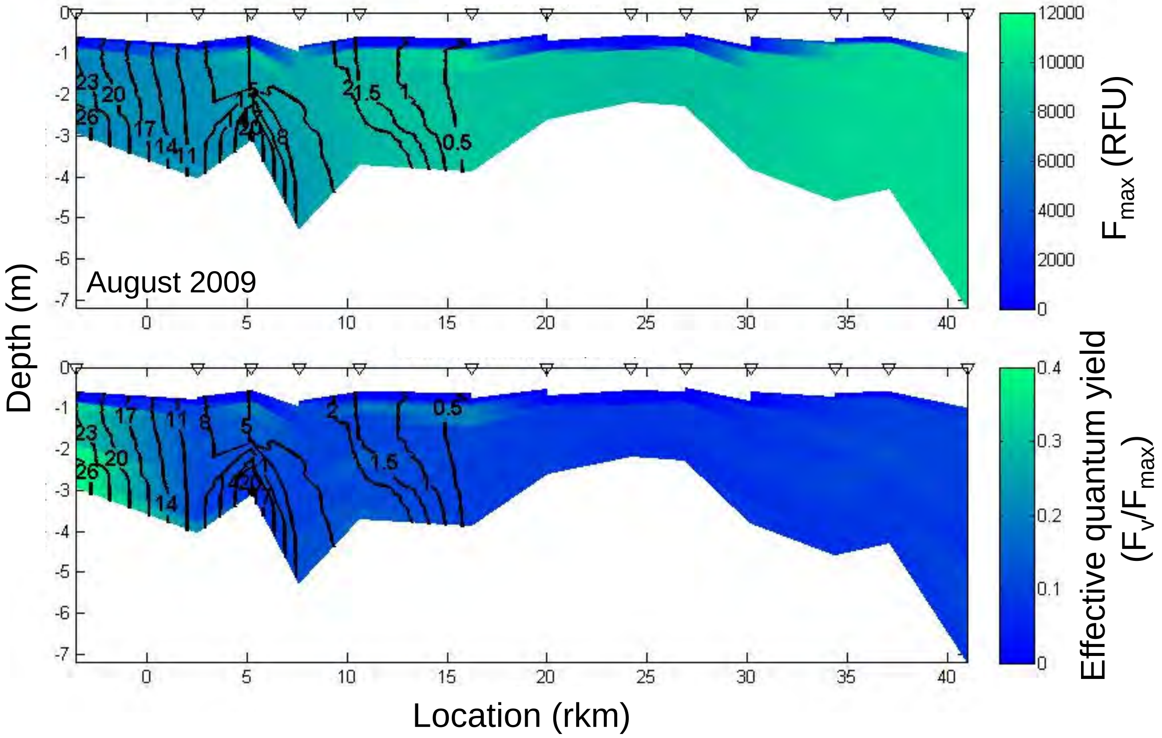

Figure 3.3.10. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for August 2009. Triangles denote profile locations and lines represent isohalines.

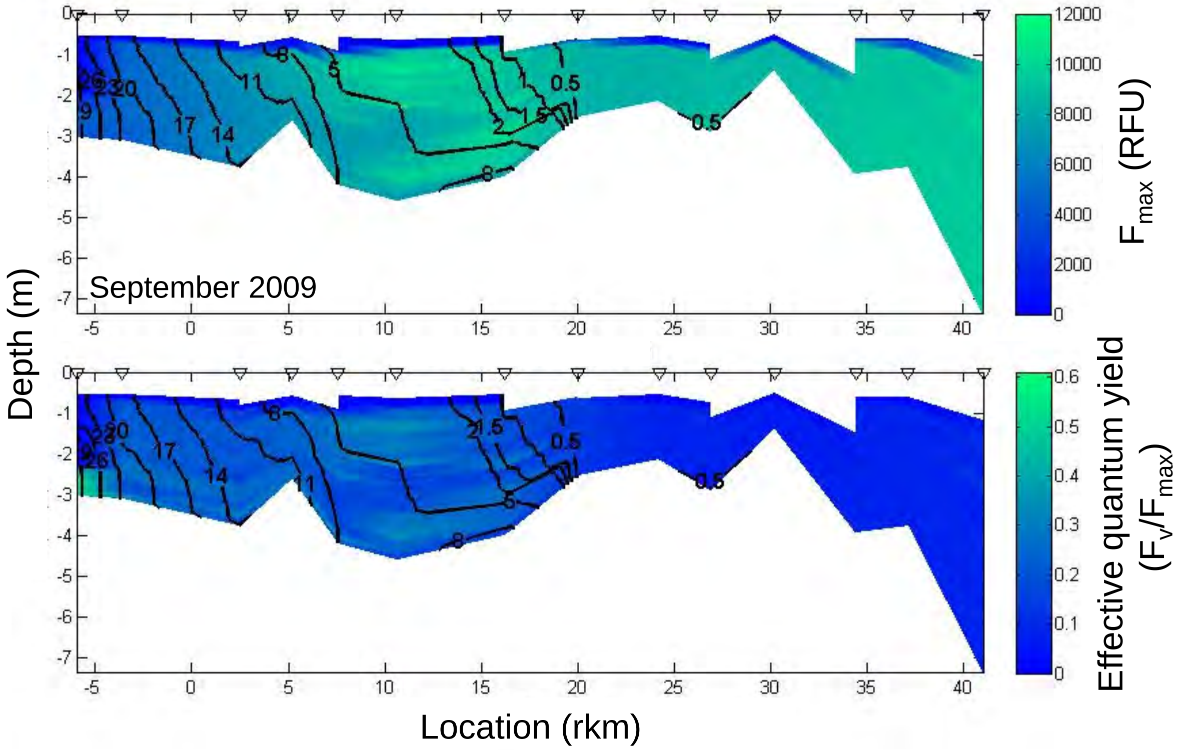

Figure 3.3.11. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for September 2009. Triangles denote profile locations and lines represent isohalines.

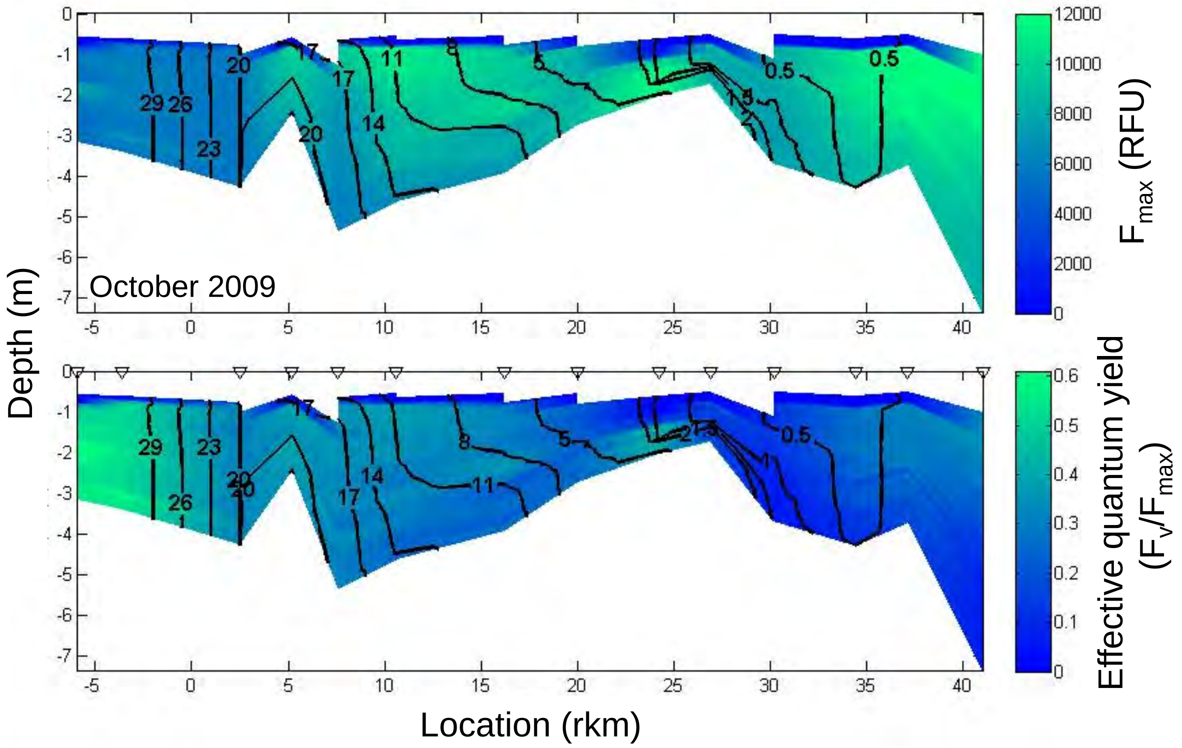

Figure 3.3.12. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for October 2009. Triangles denote profile locations and lines represent isohalines.

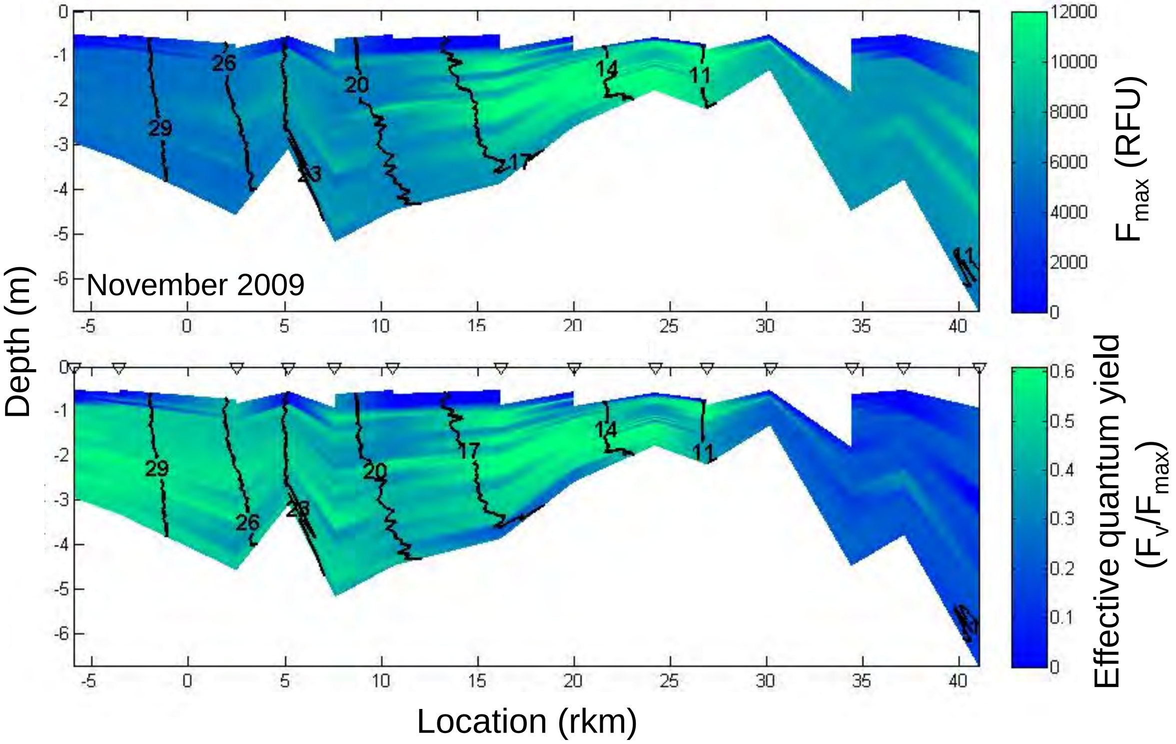

Figure 3.3.13. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for November 2009. Triangles denote profile locations and lines represent isohalines.

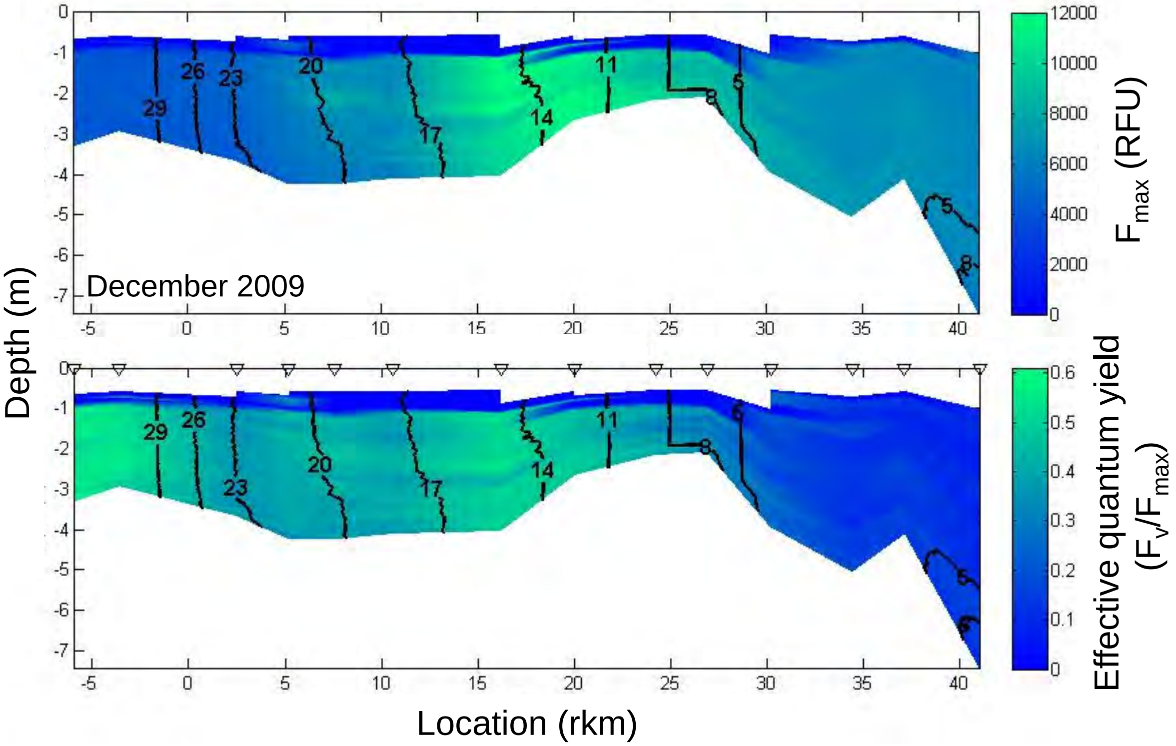

Figure 3.3.14. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for December 2009. Triangles denote profile locations and lines represent isohalines.

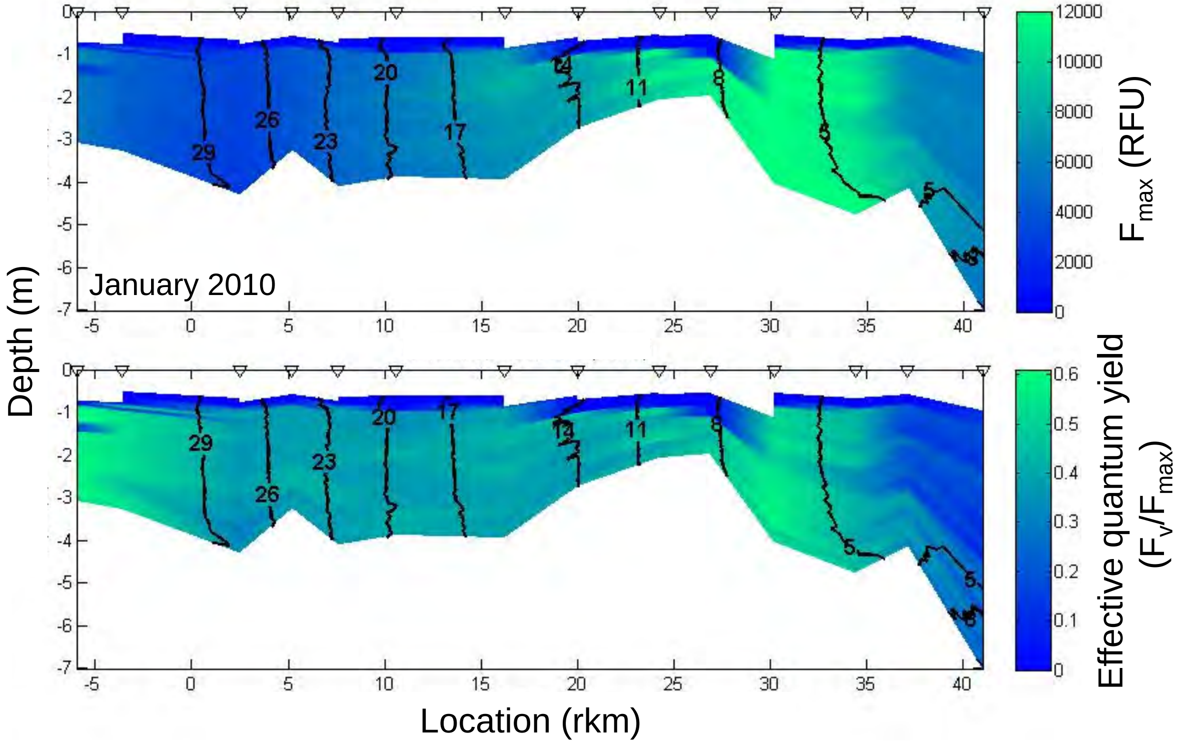

Figure 3.3.15. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for January 2010. Triangles denote profile locations and lines represent isohalines.

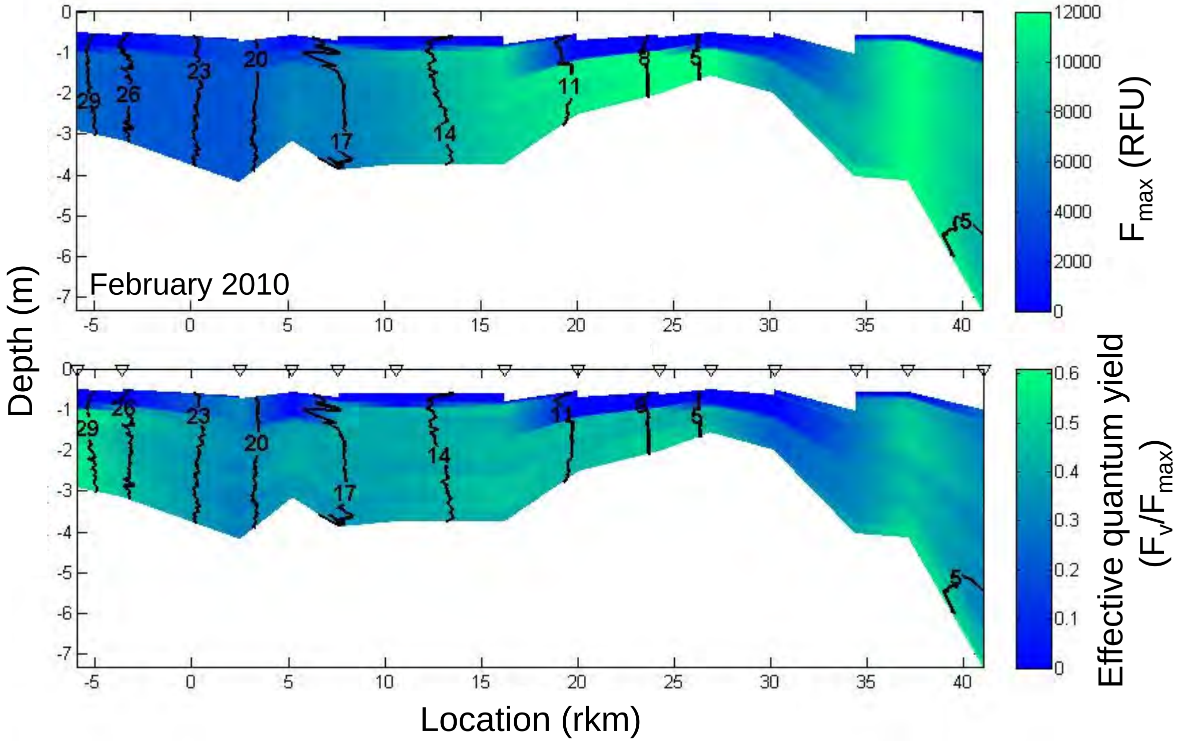

Figure 3.3.16. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for February 2010. Triangles denote profile locations and lines represent isohalines.

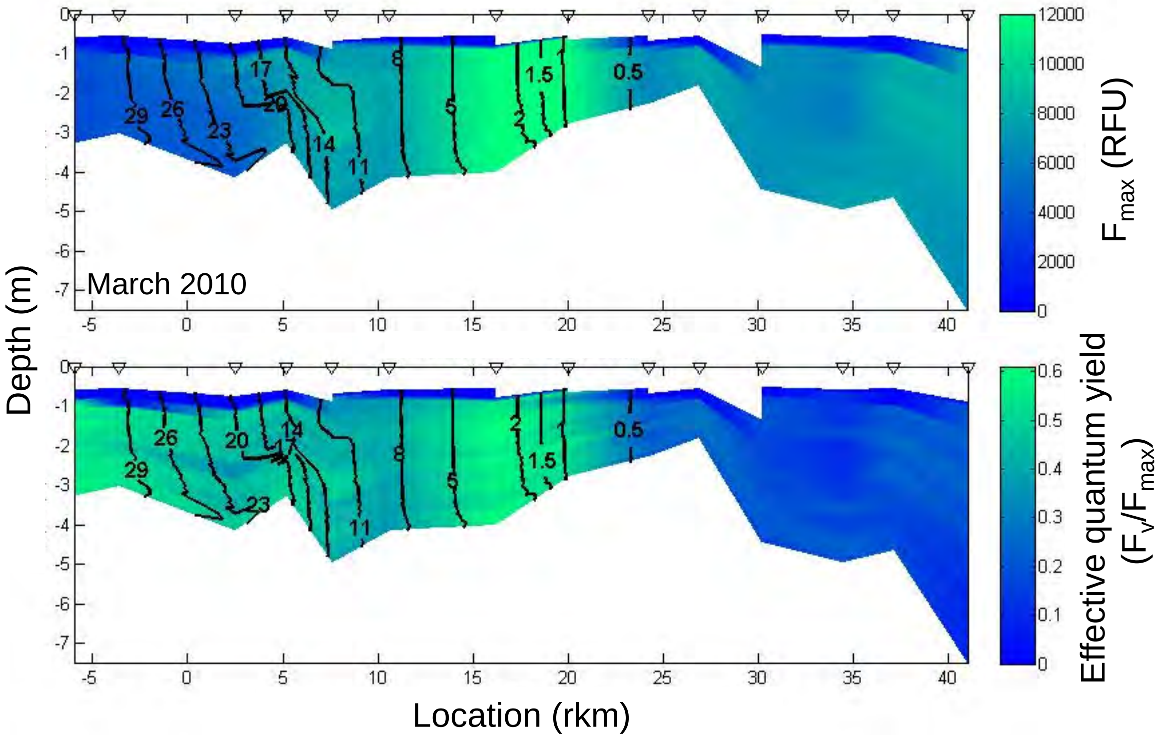

Figure 3.3.17. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for March 2010. Triangles denote profile locations and lines represent isohalines.

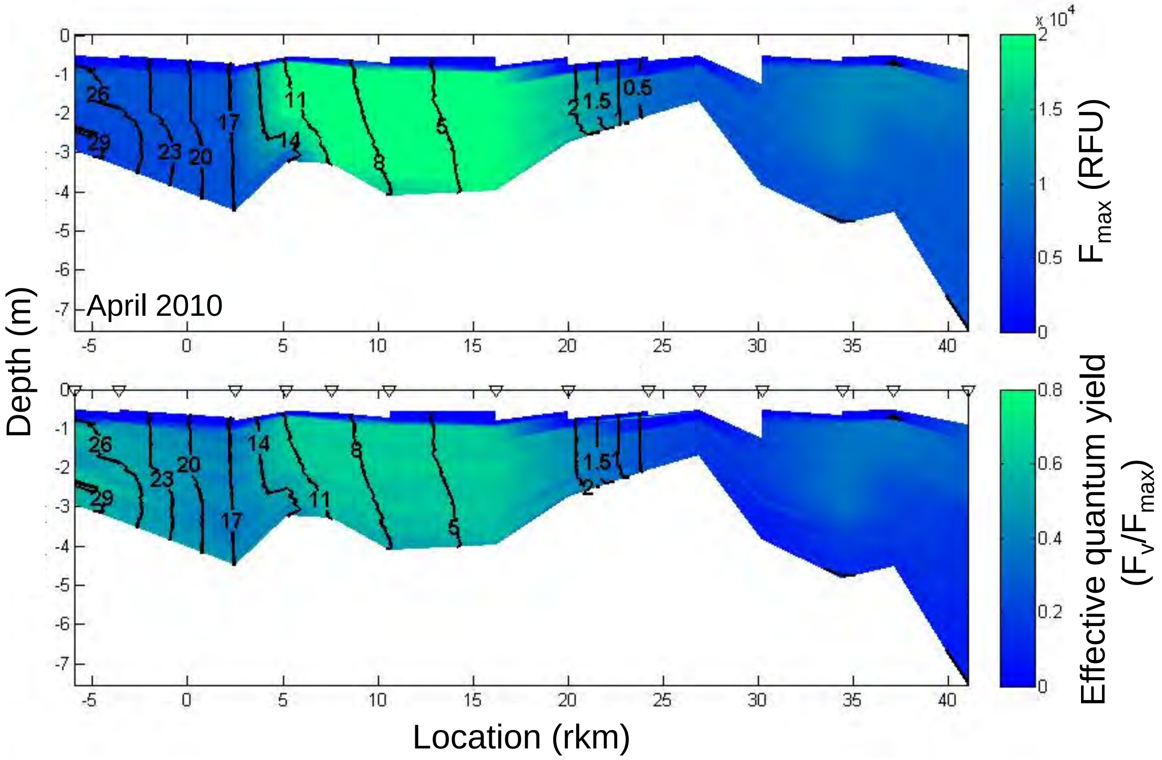

Figure 3.3.18. Longitudinal distribution of maximum fluorescence (top) and quantum yield (bottom) for April 2010. Triangles denote profile locations and lines represent isohalines.

3.4 Phytoplankton Composition and Changes in Community Structure

A total of 93 net tow samples were analyzed for this project. Data analysis focused on stations with the highest vertically-averaged chlorophyll concentrations from each sampling trip (n = 24) based on descending profiles. An unforeseen lag in the data collection/processing of the YSI (12-second integration) resulted in incomplete data collection during the descent of the YSI, resulting in erroneous chlorophyll estimates. Consequently, many of the 24 samples selected for further analysis did not represent chlorophyll peaks from each sampling trip. Comparisons with chlorophyll data from water grab samples collected and analyzed from the stations, however, indicates that 29% of the samples were confirmed from the chlorophyll peaks, whereas another 33% of samples were from a station adjacent to the location of maximum chlorophyll concentration. Therefore, 62% of samples were at least proximal to the chlorophyll peak and the associated maximal phytoplankton biomass. Subsequent chlorophyll data analyses (see below) used ascending profiles of the YSI, which alleviated some of the concerns with the lagged collection of chlorophyll data.

There were 181 different phytoplankton taxa encountered in this study, 86 (47%) of which were diatoms (Table 3.4.1; Appendices B-C). Cyanobacteria and diatoms were most abundant in terms of cells per liter of water (Table 3.4.2), although the dinoflagellate *Akashiwo sanguineum* was the most abundant phytoplankter based on total cell volume (i.e., there were fewer cells, but these cells were large). The composite group, cyanobacteria filament, is likely composed of multiple, non-descript species similar in appearance to *Jaaginema*. This group will require further taxonomic (and molecular) work to identify the taxa present. *Skeletonema subsalsum* was the most commonly occurring phytoplankter, being present in 83% of the samples (Table 3.4.3). Generally speaking, diatoms and cyanobacteria were the most abundant groups of phytoplankton.

Table 3.4.1. Classes or phyla of phytoplankton encountered and the number of species within each group. The abbreviation for each group is given in parenthesis.

Class/Phylum	**# of species**
Bacillariophyceae (D)	86
Chlorophyta (CH)	38
Dinophyta (I)	16
Cyanophyta (CY)	16
Prymnesiophyceae (F)	8
Euglenophyta (E)	7
Ciliophora (CI)	4
Cryptophyta (CX)	3
Haptophyta (CR)	2
Phaeophyta (BR)	1
TOTAL	181

Table 3.4.2. Top ten phytoplankton taxa encountered in terms of cells L^{-1} abundance. Sampling event, date, and station correspond to occurrence of maximal abundance for each taxon. Class (or phylum) is also noted for each taxon (see Table 1).

Sampling Event	Sampling Date	Station	species	cells/L	class
17	Sep 2009	6U	cyanobacteria filament	2262433	CY
24	Apr 2010	4D	*Skeletonema subsalsum*	1690646	D
17	Sep 2009	6U	*Planktolyngbya* sp.	269229.5	CY
18	Oct 2009	5U	*Aulacoseira* sp.	178149.6	D
15	Jul 2009	3U	*Melosira varians*	149457.2	D
1	May 2008	7D	*Pseudo-nitzschia pungens* group	128800	D
2	Jun 2008	6D	*Planktothrix* sp.	118657.2	CY
16	Aug 2009	7U	*Skeletonema tropicum*	101650.2	D
16	Aug 2009	7U	*Fragilaria* 5-10	72607.26	D
14	Jun 2009	6U	*Microcystis* sp.	48920.36	CY

Table 3.4.3. Top ten phytoplankton taxa encountered in terms of cell volume (μm^3). Sampling event, date, and station are noted for when the maximal abundance was recorded. Class (or phylum) is also noted for each taxon (see Table 1).

Sampling Event	Sampling Date	Station	Species	Total volume (μm^3)	Class
9	Jan 2009	5U	*Gymnodinium sanguineum*	2.22E+08	I
7	Nov 2008	5U	*Skeletonema subsalsum*	1.53E+08	D
23	Mar 2010	4D	*Surirella* sp.	1.41E+08	D
19	Nov 2009	5U	*Cerataulina bicornis*	1.1E+08	D
1	May 2008	7D	*Pseudo-nitzschia pungens* group	94836753	D
16	Aug 2009	7U	*Skeletonema tropicum*	29938420	D
7	Nov 2008	5U	armored auto dino >30	27525874	I
15	Jul 2009	3U	*Melosira varians*	18341137	D
18	Oct 2009	5U	*Aulacoseira* sp.	17489783	D
2	Jun 2008	6D	*Planktothrix* sp.	13105275	CY

Results of multidimensional scaling (Fig. 3.4.1) indicate that variations in the phytoplankton assemblage were significantly related ($r = 0.56$; $p<0.01$) to salinity and river flow (averaged over previous 30 d). Specifically, diatom abundance decreased and cyanobacteria abundance increased as river flow increased (Fig. 3.4.2). Accompanying this shift in phytoplankton, cell sizes also decreased with increasing flow (Fig. 3.4.3), likely reflecting this shift from diatoms to cyanobacteria.

Accompanying this shift towards smaller, cyanobacteria cells were changes in the location of the chlorophyll maximum within the river and estuary. In May 2008, the chlorophyll maximum was located in zone 7 (near S-79), likely reflecting the lack of flow through the structure and the accumulation of biomass in the upper reaches of the estuary due to tidal forcing. As flows began to increase through June and July 2008, the chlorophyll maximum moved downstream and appears to have been flushed out by August (Fig. 3.4.4).

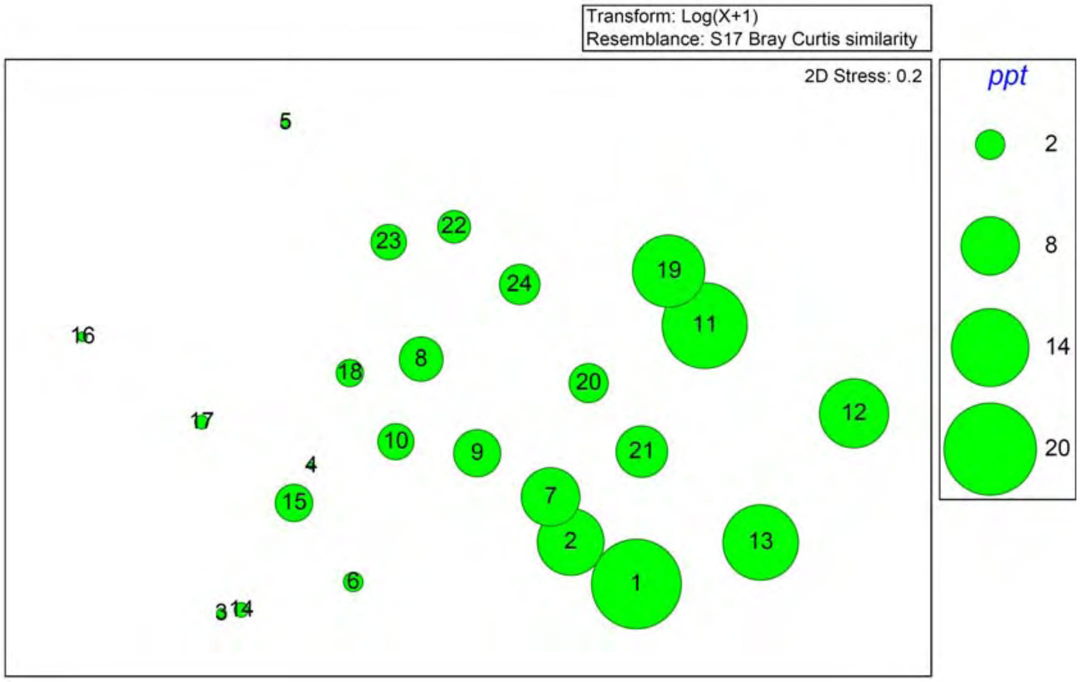

Figure 3.4.1. MDS plot of phytoplankton species >10% occurrence. Sampling month (1-24) is depicted and vertically-averaged salinity is noted via the bubble plot.

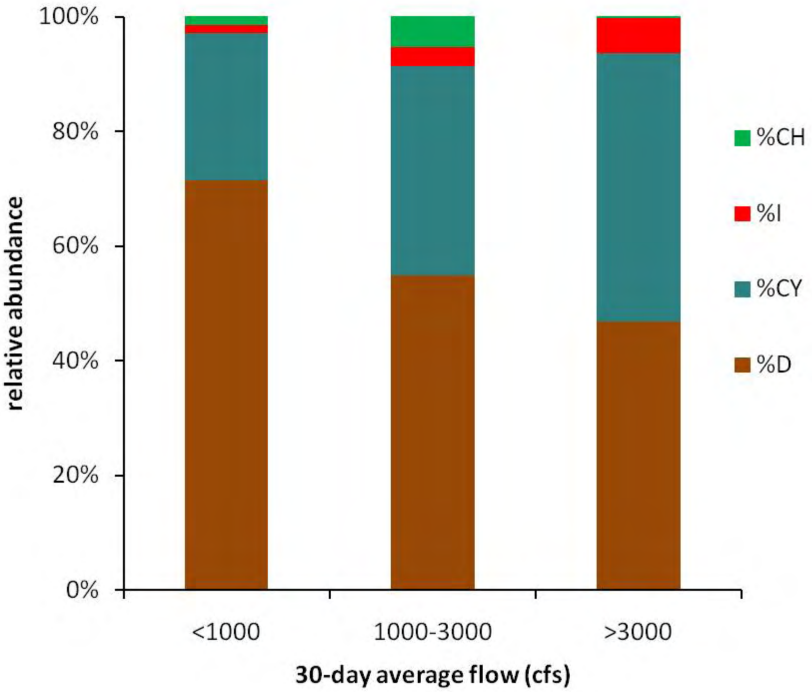

Figure 3.4.2. Abundance of cyanobacteria (CY), diatoms (D), dinoflagellates (I), and chlorophytes (CH) relative to mean freshwater inflow through S-79 for previous 30 days.

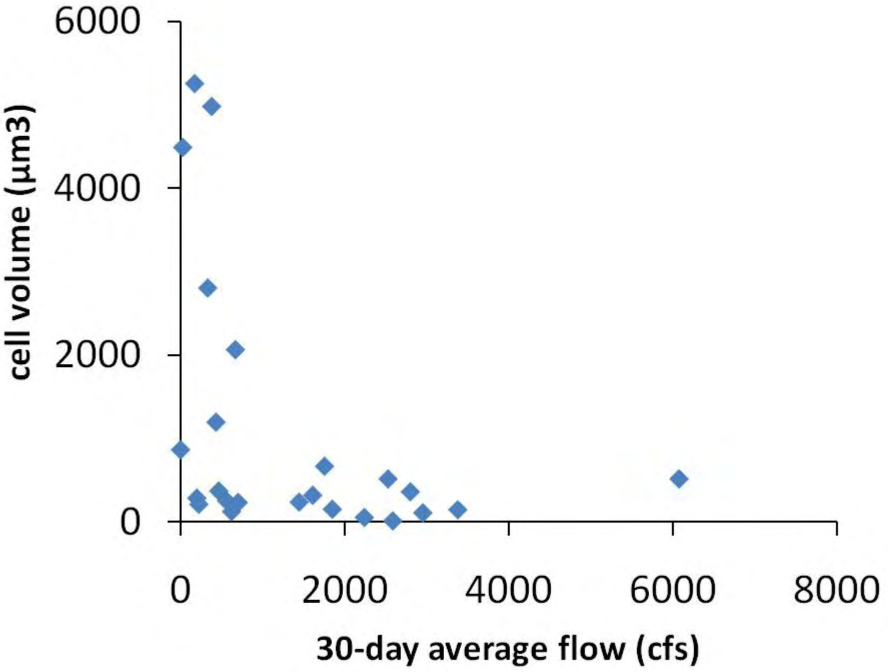

Figure 3.4.3. Mean phytoplankton cell volume (µm^3) versus mean freshwater inflow through S-79 for previous 30 days.

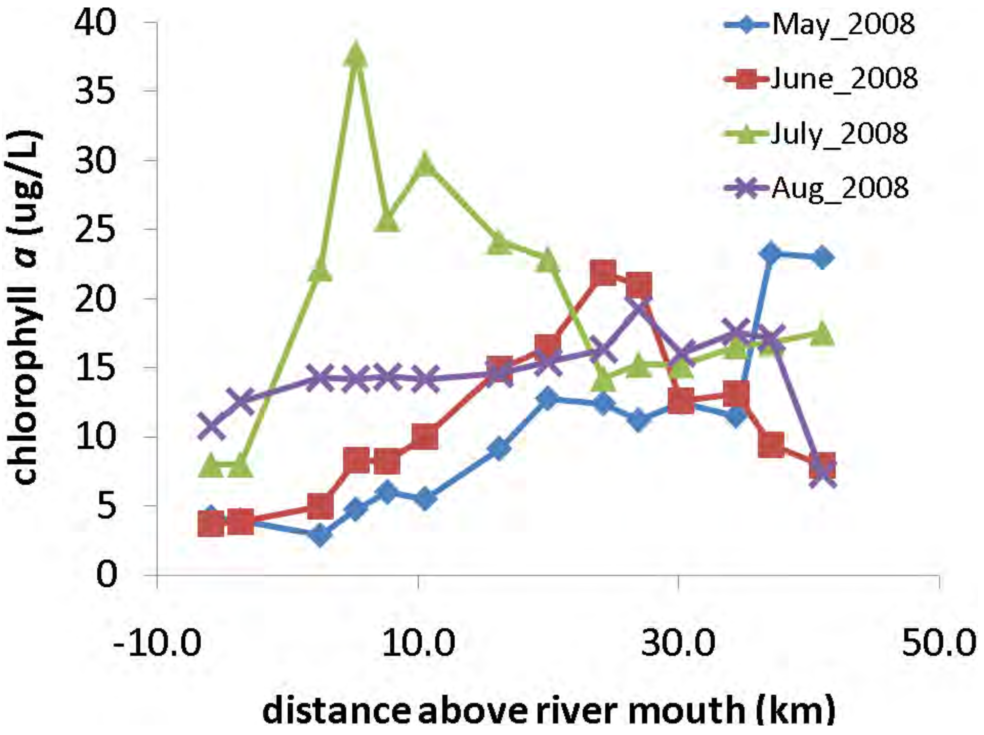

Figure 3.4.4. Chlorophyll *a* concentration versus distance upstream from the river mouth, May through August 2008.

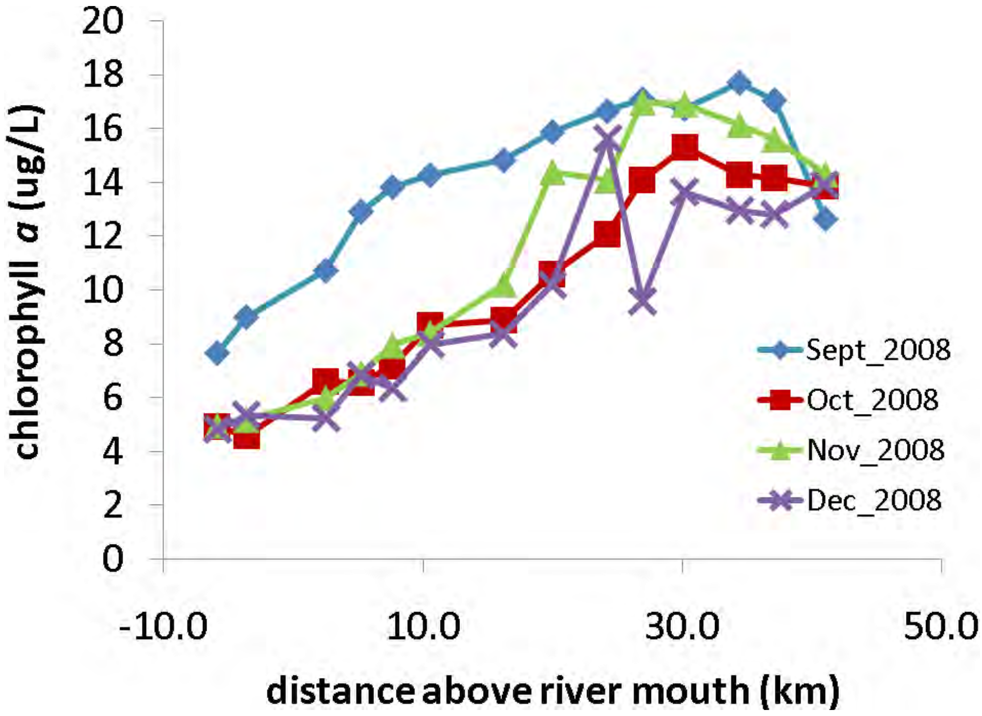

Figure 3.4.5. Chlorophyll *a* concentration versus distance upstream from the river mouth, September through December 2008.

Phytoplankton did not build up biomass over the course of the wet season (Fig. 3.4.5) and decreased downstream from September through December 2008. Between January and May 2009, chlorophyll concentrations increased in the upper zones (Figs. 3.4.6-3.4.7: stations 5U and 6D), but chlorophyll again decreased with the onset of the wet season in June, being reduced downstream through August 2009 (Fig. 3.4.7). This trend continued into September 2009 (Fig. 3.4. 8), followed by the observed chlorophyll maximum moving up the estuary at the end of 2009 (Fig. 3.4.8) and back down the estuary in the first four months of 2010 (Fig. 3.4.9).

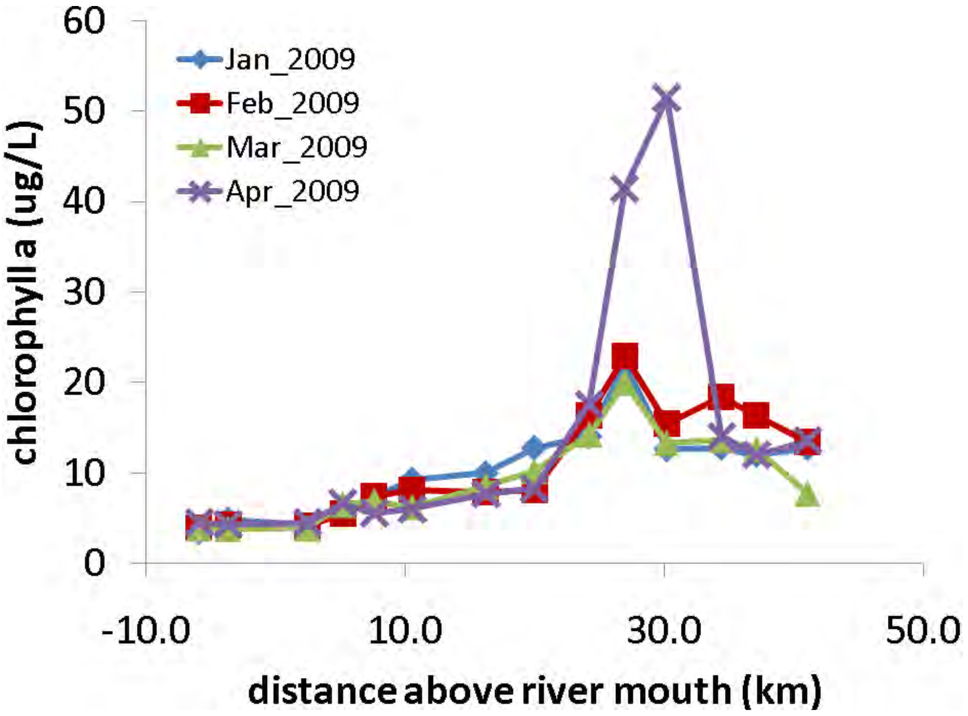

Figure 3.4.6. Chlorophyll *a* concentration versus distance upstream from river mouth, January through April 2009.

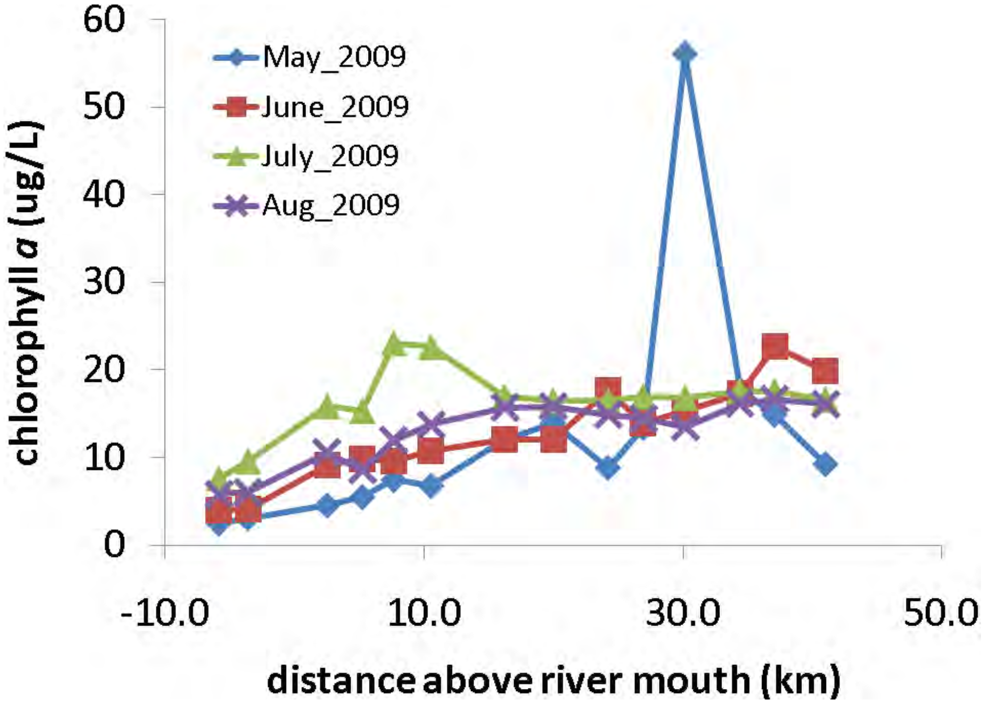

Figure 3.4.7. Chlorophyll *a* concentration versus distance upstream from river mouth, May through August 2009.

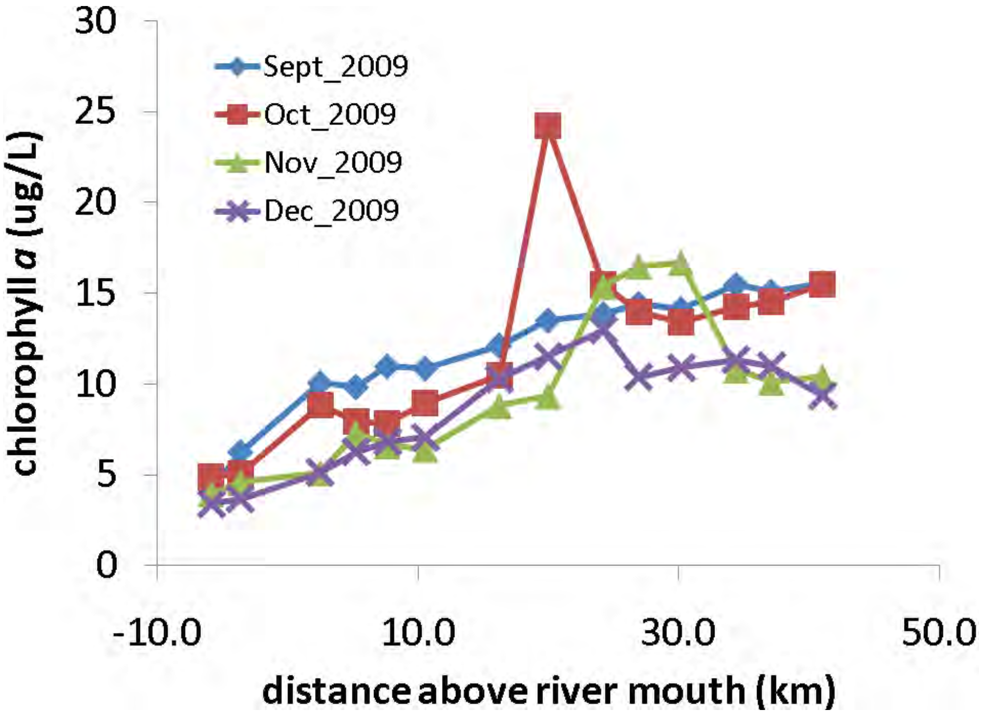

Figure 3.4.8. Chlorophyll *a* concentration versus distance upstream from river mouth, September through December 2009.

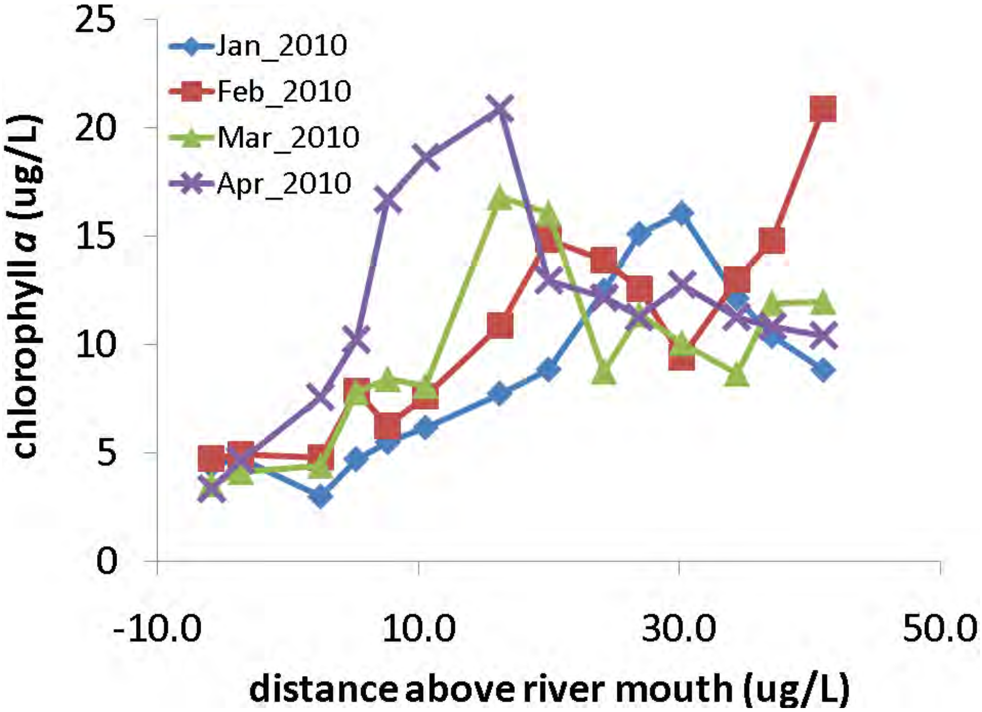

Figure 3.4.9. Chlorophyll *a* concentration versus distance upstream from river mouth, January through April 2010.

The above dynamics likely result from changing discharges through S-79. Chlorophyll *a* concentrations tended to increase as flow increased in zones 1-3, with peaks seen at flows of approximately 1,500 cfs in zones 2 and 3, but fell off above 3,500 cfs, likely indicating flushing (Fig. 3.4.10). Chlorophyll *a* responses were much different in the upper zones (4-7), where the highest concentrations were seen at low flows (<1,000 cfs) in zones 5 and 6, with no apparent response to increasing flow otherwise (indicating flushing; Fig. 3.4.11).

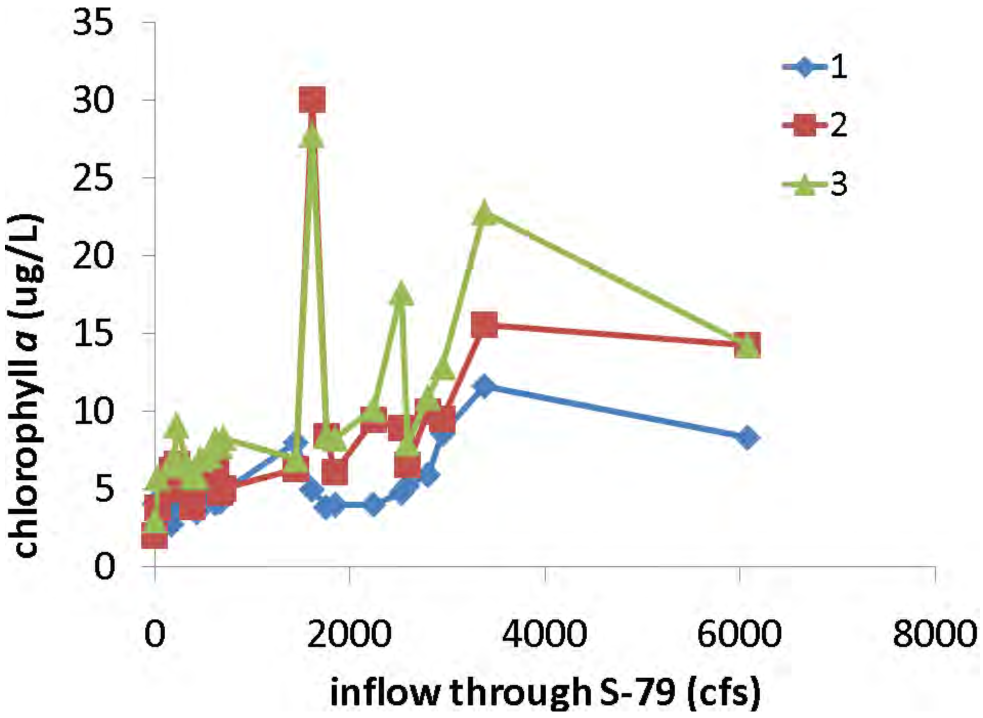

Figure 3.4.10. Chlorophyll *a* concentration versus freshwater inflow through S-79, downstream stations 1-3.

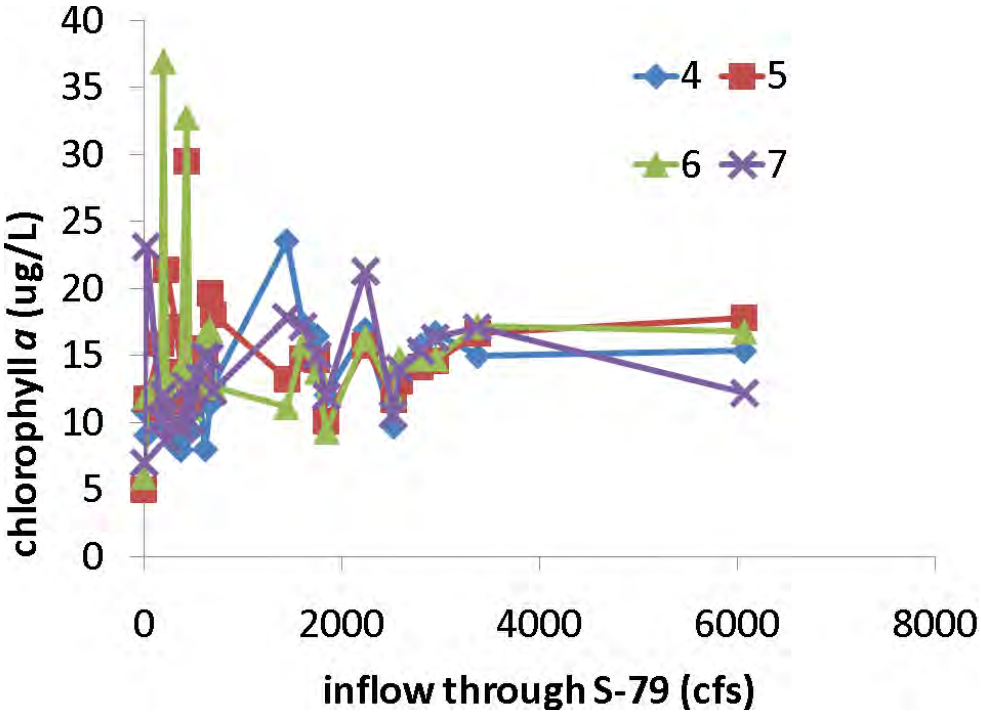

Figure 3.4.11. Chlorophyll *a* concentration versus freshwater inflow through S-79, upstream stations 4-7.

All zones (except zone 1) exhibited similar correlations between observed salinity and river flow (Fig. 3.4.12), with the highest correlations between salinity and river flows averaged over the previous 10–25 d. In terms of chlorophyll, however, zones 2–4 had similar correlations with river flow averaged over the previous 15–25 days, whereas the upper zones (5–7) exhibited weak correlations, and zone 1 has the best correlation with flows <10 days (Fig. 3.4.13).

Phytoplankton clearly responded to changing inflow: low flow conditions (<1000 cfs) generally corresponded to larger cells, predominately diatoms, and as flows increased the assemblage shifted towards smaller cells, predominately cyanobacteria. The shift is likely in response to reduced salinities and lower residence times associated with higher inflows, favoring faster growing forms such as cyanobacteria. Both of these scenarios present benefits and concerns. Diatoms, more dominant in low flow conditions, are considered beneficial nourishment for grazers (Officer and Ryther 1980): cell sizes tend to be larger when diatoms dominate, leading to shorter food chains and greater energy transfer to fishes (Lalli and Parsons 1997). However, many diatoms (including *Skeletonema* sp.) are "sinkers," settling on the bottom and resulting in low dissolved oxygen levels as bacteria breakdown the diatom biomass (Dortch et al. 1992). Doering et al. (2006) reported a negative relationship between water column chlorophyll *a* concentration and bottom dissolved oxygen concentration, possibly demonstrating this sinking phenomenon. Conversely, cyanobacteria are smaller and many contain gas vacuoles that inhibit sinking. Though cyanobacteria may not cause low dissolved oxygen levels in bottom waters, they are not considered to be a high quality food source for grazers (Martin-Creuzburg and Von Elert 2009). Therefore, a shift to cyanobacteria may reduce the quality of the (planktonic) food source for grazers, impacting higher trophic levels.

Although phytoplankton are responding to changing flow, the upper zones (e.g., 5 and 6) are more susceptible to phytoplankton biomass build-up when flows are low (<1,000 cfs), probably due to increased residence time that allows for longer incubations. Lower zones (1-3) are more susceptible to higher chlorophyll concentrations as flow increases, but only to a point. Flows >3,500 cfs result in phytoplankton being flushed out (probably more quickly than their generation times of <1–4 days), whereas flows of ~1,500 cfs may cause chlorophyll maxima in zones 2 and 3. Doering et al. (2006) noted similar inflection points in the relationship between chlorophyll and flow.

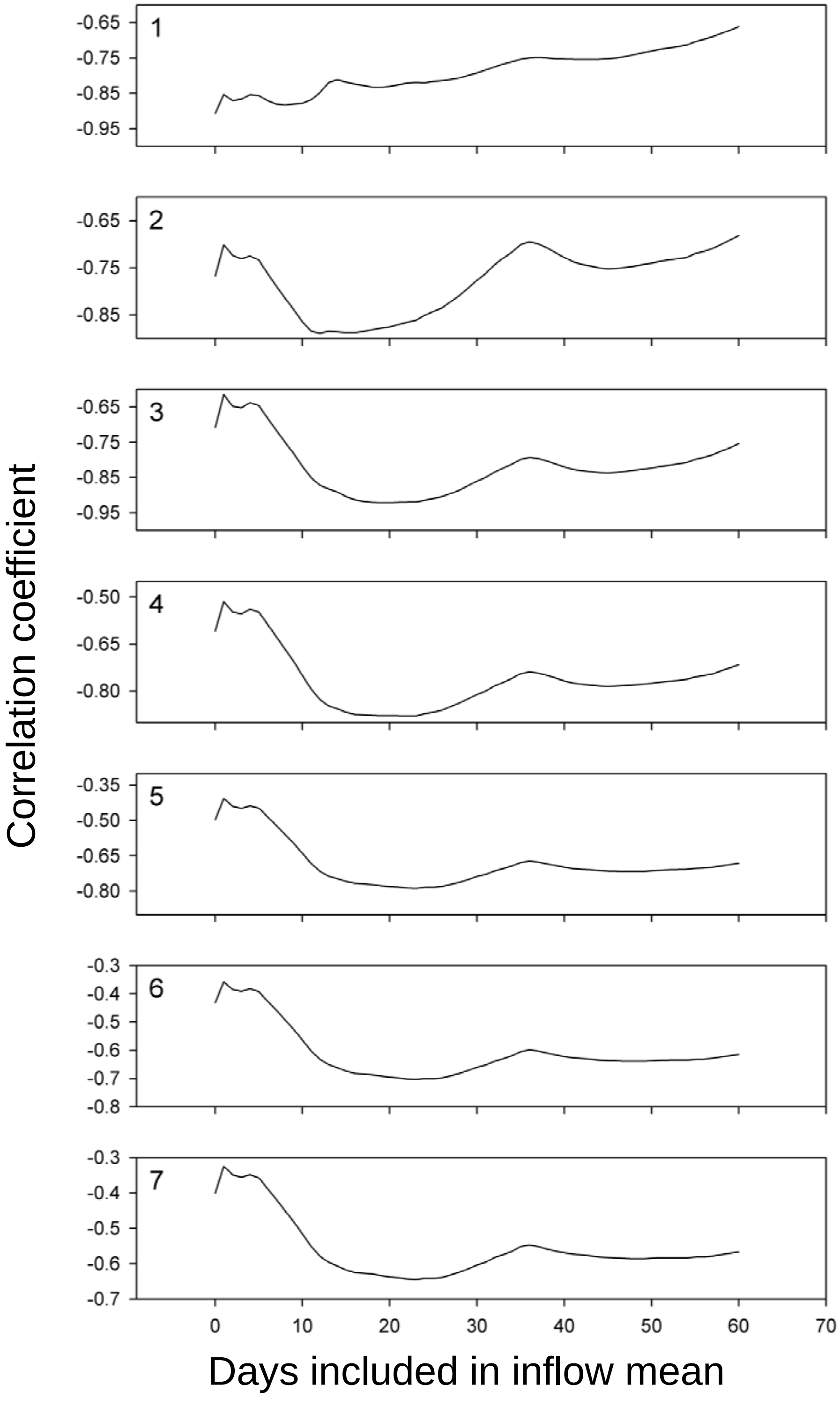

Figure 3.4.12. Correlation coefficients for relationships between salinity and lagged freshwater inflow for each sampling zone. Zones are identified in the upper left corner of each panel.

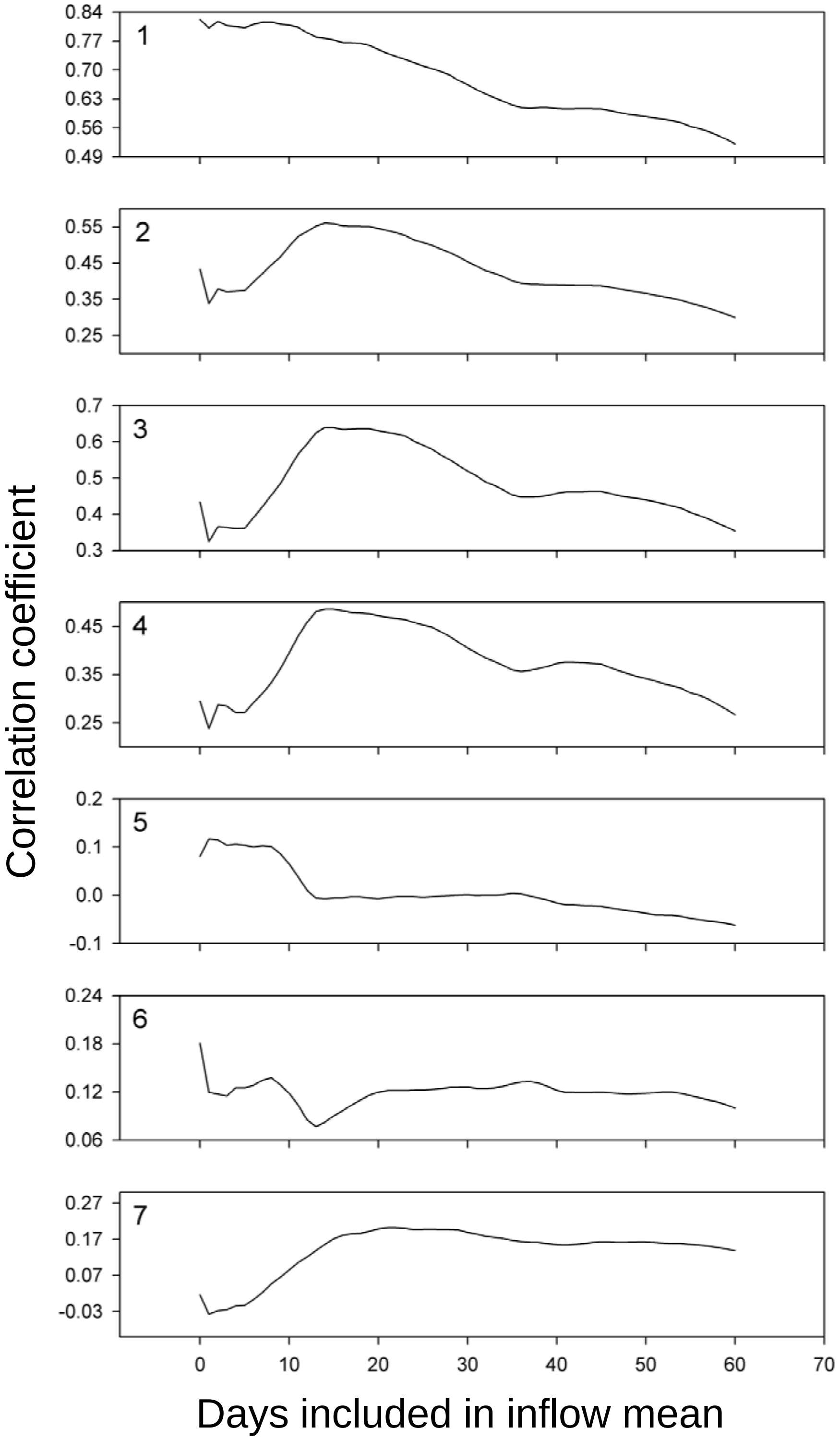

Figure 3.4.13. Correlation coefficients for relationships between chlorophyll *a* and lagged freshwater inflow for each sampling zone. Zones are identified in the upper left corner of each panel.

3.5 Zooplankton Catch Composition

A total of 3,278,566 individuals representing 321 zooplankton taxa and an estimated minimum of 208 species were identified from samples collected May 2008–April 2010. Zooplankton samples were dominated by decapod crustaceans, representing 51.6% of the total catch (Appendix D). Other major groups in order of abundance were amphipods (13.6%: primarily gammarideans), copepods (8.1%), fishes (6.4%), cumaceans (6.2%), and cladocerans (4.9%). Less abundant groups of interest represented a minor component of the total catch and included gelatinous predators (3.2%), mysids (2.4%), and the larvacean *Oikopleura dioica* (1.7%). Together all these groups comprised 98.2% of the total zooplankton catch.

Among the decapods, unidentified zoeae, mysis stage larvae, and megalopae comprised 93.6% of the total. Important decapods identified that were collected in numbers greater than 10,000 included the mud shrimp *Upogebia* spp., the sergestid *Lucifer faxoni*, snapping shrimp of the family Alpheidae, zostera shrimp *Hippolyte zostera*, and hermit crabs. A total of 49 decapod taxa were identified from the samples, representing a minimum of 25 species.

Ichthyoplankton were dominated by the eggs of both unidentified percomorph fishes (47.4%) and bay anchovies *Anchoa mitchilli* (33.4%), and by larvae of anchovies (11.0%) and gobies (3.2%) (Appendix D). Anchovies were dominated by the bay anchovy *Anchoa mitchilli*, gobies of the genus *Gobiosoma* were found in greater numbers than those of the genus *Microgobius*, and the Florida blenny *Chasmodes saburrae* was the most abundant identifiable blenny. Fishes were relatively diverse, with a total of 137 fish taxa identified from the samples, representing a minimum of 57 species.

Among other taxonomic groups of interest, the copepods were represented by 26 species, with *Acartia tonsa*, *Labidocera aestiva*, and *Mesocyclops edax* dominating in order of abundance; isopods were represented by 15 species, though only *Edotia triloba* could be considered abundant; and mysids were represented by 11 species and were dominated numerically by juvenile *Americamysis* spp. and by adult *Americamysis almyra* and *Bowmaniella brasiliensis*; and (Appendix D).

3.6 Zooplankton Seasonal and Spatial Trends

In general, total zooplankton densities peaked spring/early summer in both sampling years, with a secondary peak in October 2009 (Fig. 3.6.1; Appendix E). Throughout the sampling periods, decapod zoeae and mysis stage shrimps were the dominant species associated with many of the peaks in zooplankton abundance; however, there were some notable exceptions (Figs. 3.6.2-3.6.5). Gammaridean amphipods were the dominant taxa associated with zooplankton peaks in August 2008 and in October and December 2009; cumaceans were associated with a peak downstream (rkm 16.2) in March 2009; *Anchoa mitchilli* eggs were associated with one of many peaks present in April 2009; the larvacean *Oikopleura dioica* was associated with a peak in abundance at rkm 20.0 in May 2009; and *Daphnia* spp. comprised the dominant taxon present at peaks upstream in July 2009 (Appendix F).

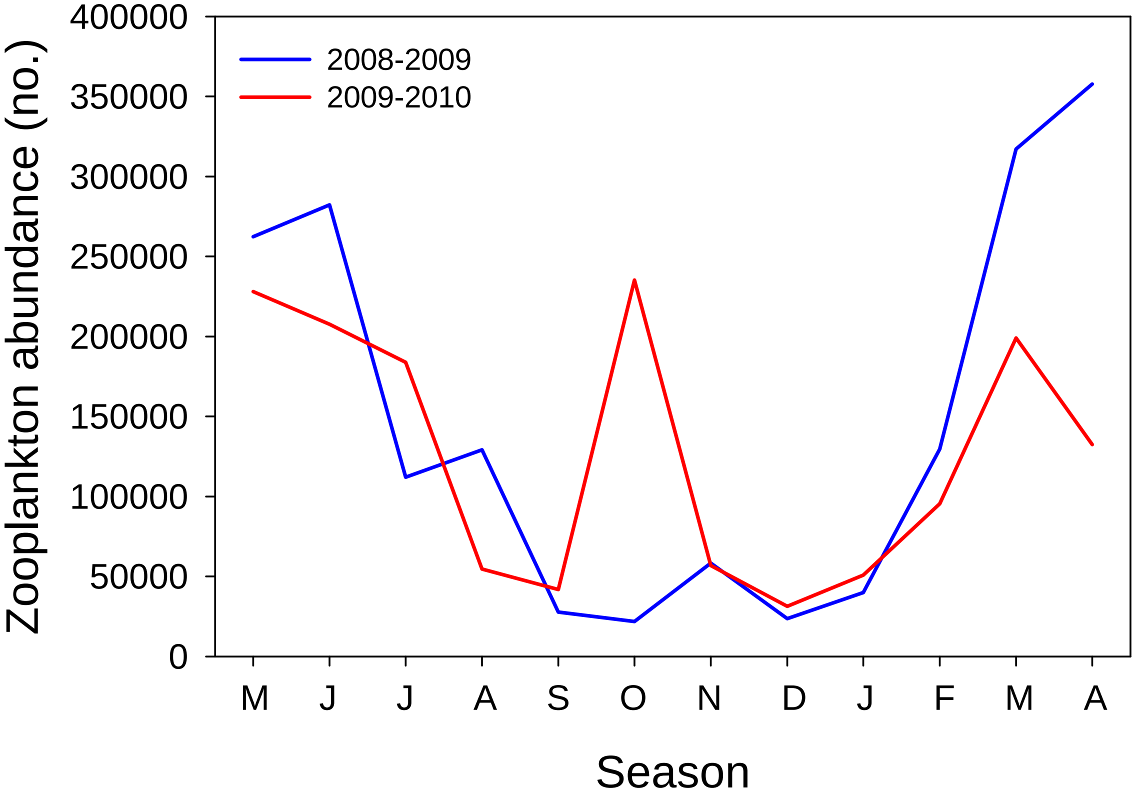

Figure 3.6.1. Seasonal variation in zooplankton abundance collected at all stations.

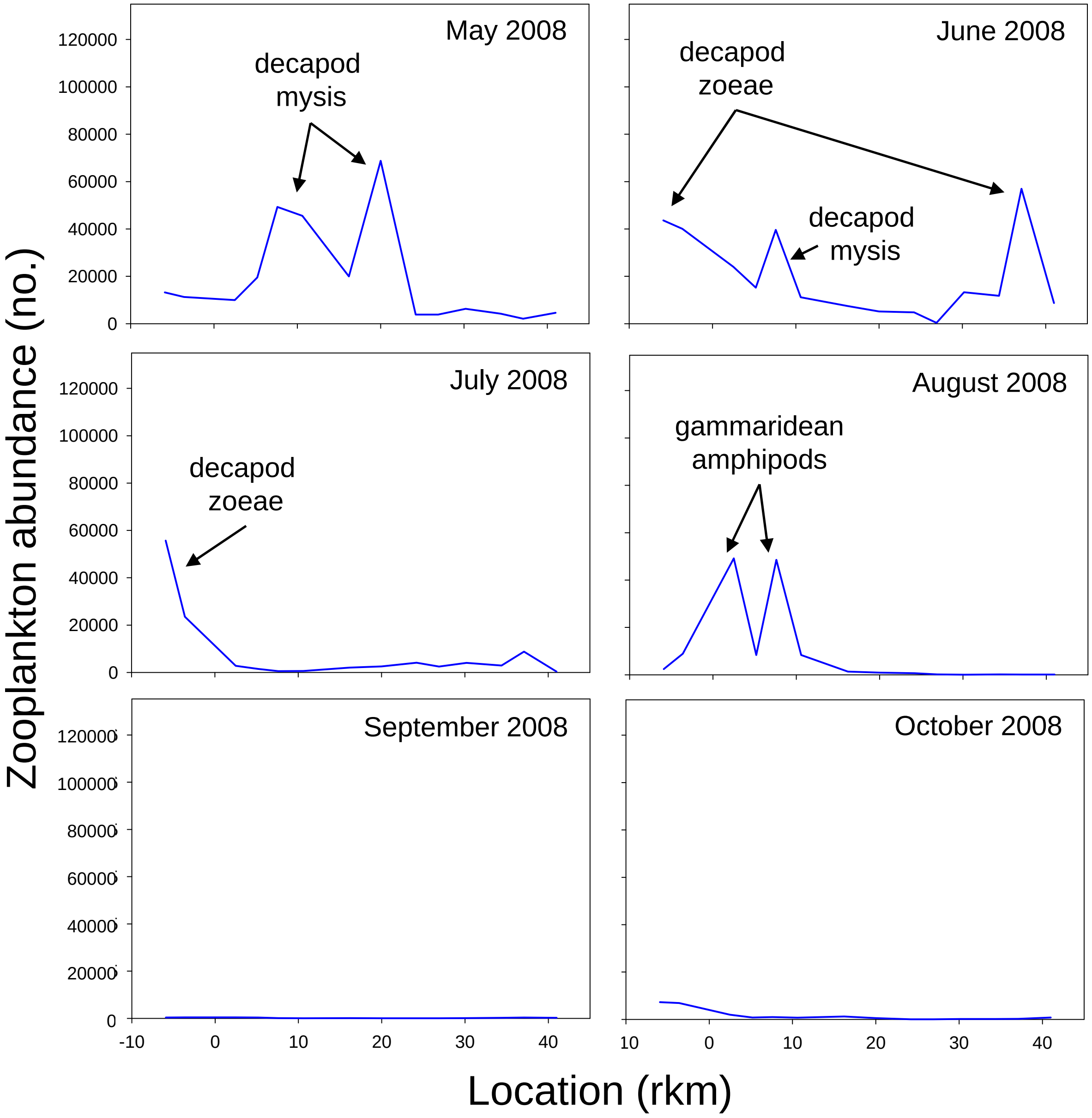

Figure 3.6.2. Monthly variation in zooplankton abundance along the study area, May–October 2008. Arrows identify dominant species associated with peaks in zooplankton abundance.

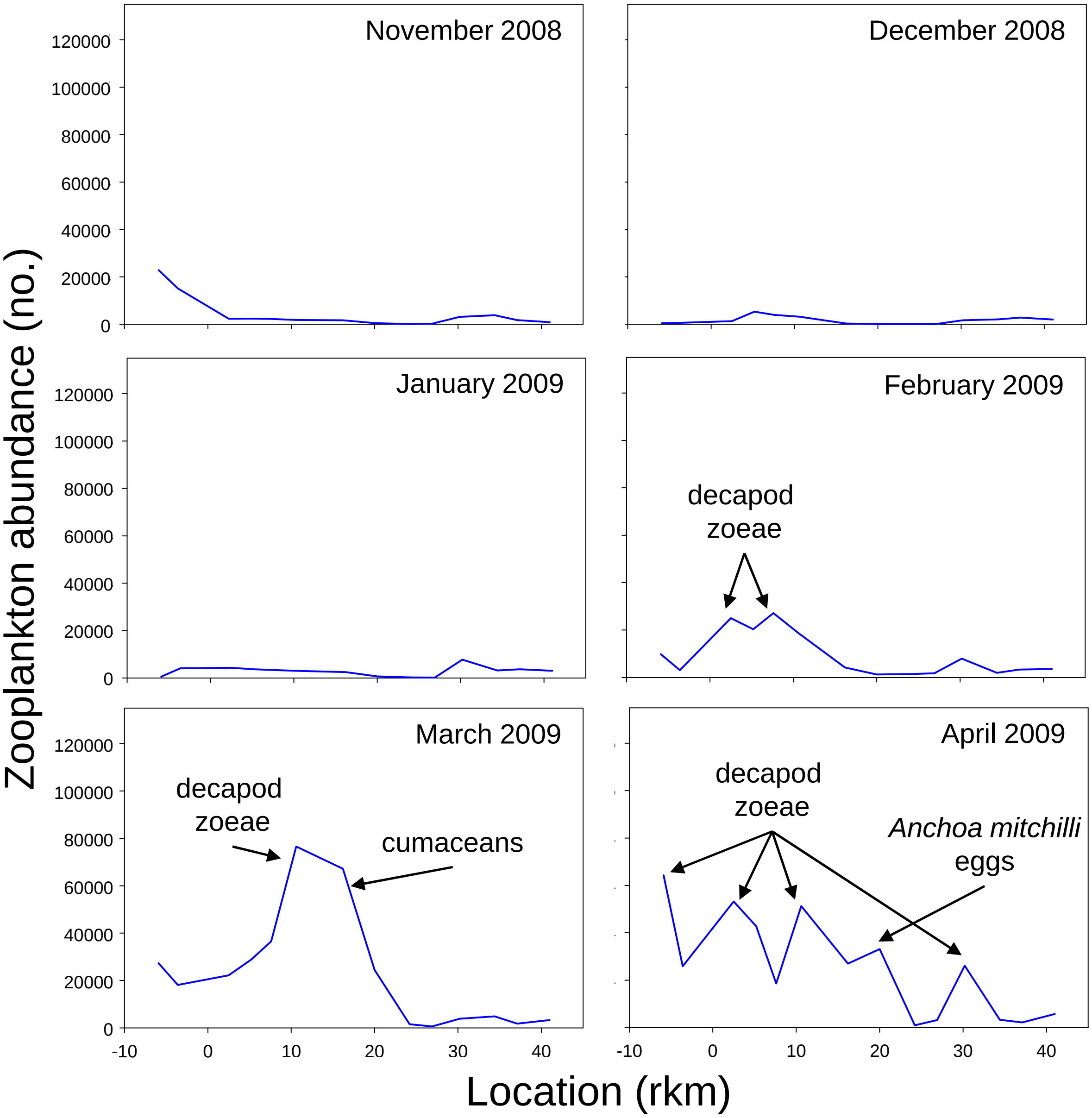

Figure 3.6.3. Monthly variation in zooplankton abundance along the study area, November 2008–April 2009. Arrows identify dominant species associated with peaks in zooplankton abundance.

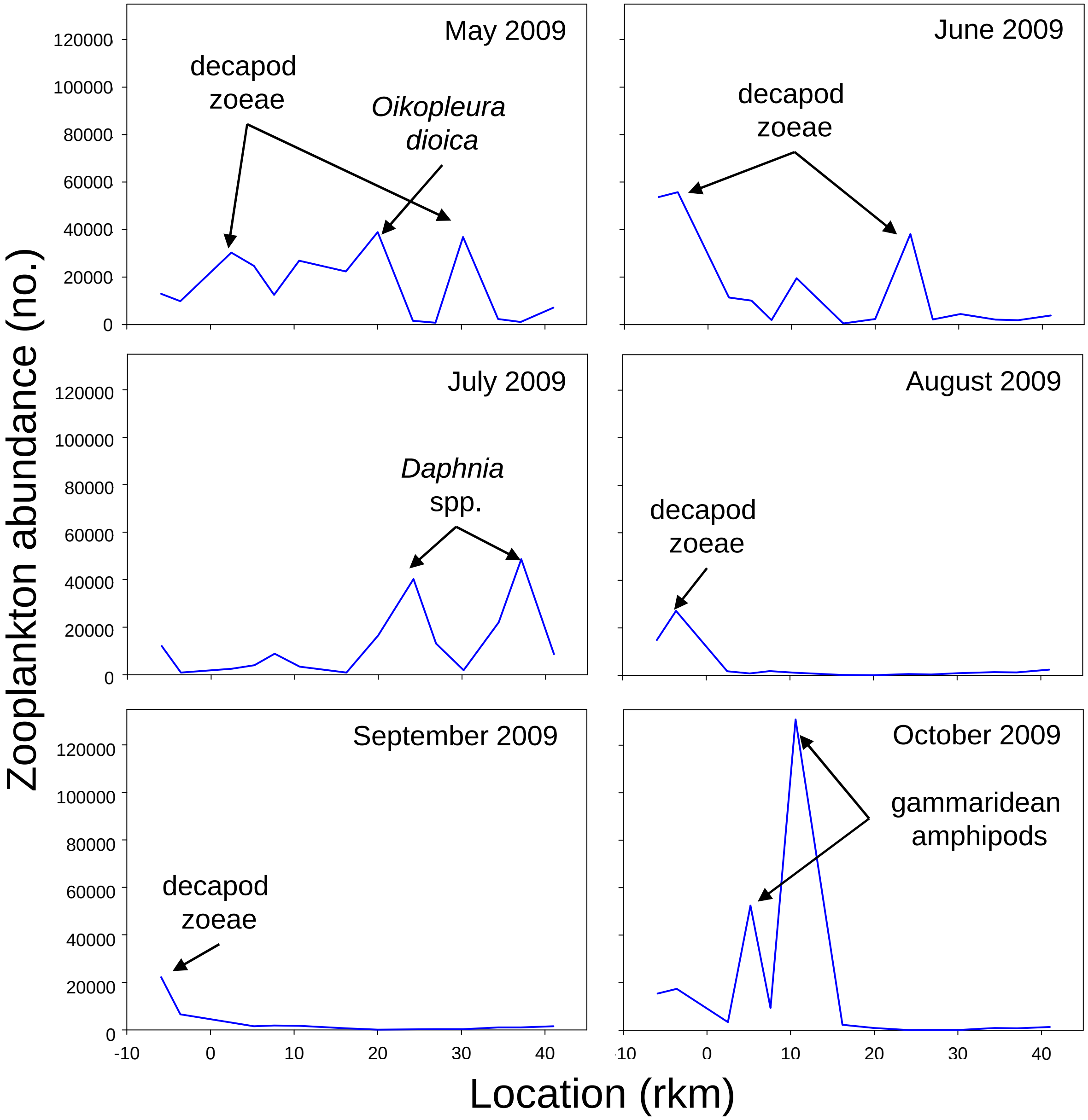

Figure 3.6.4. Monthly variation in zooplankton abundance along the study area, May–October 2009. Arrows identify dominant species associated with peaks in zooplankton abundance.

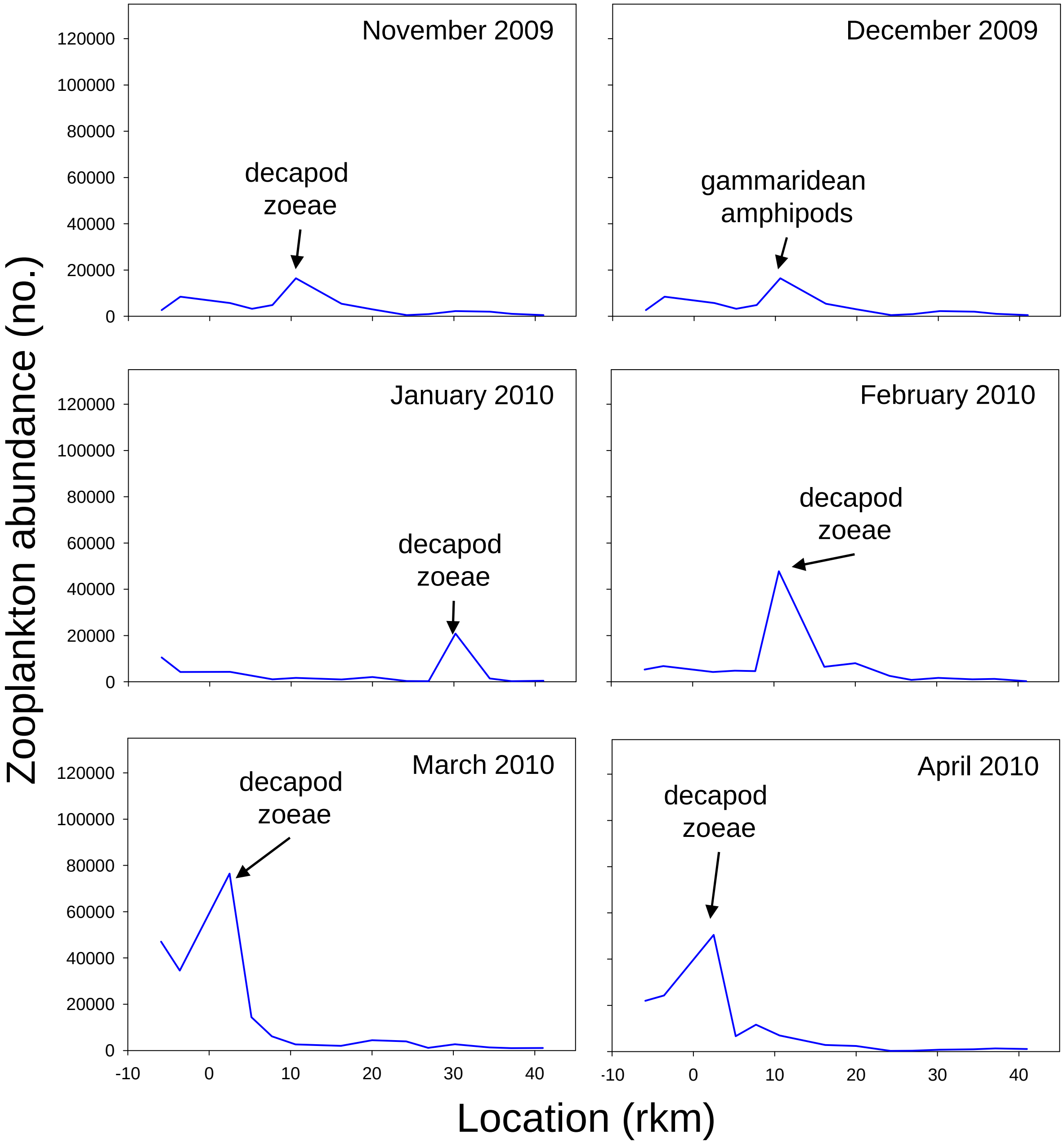

Figure 3.6.5. Monthly variation in zooplankton abundance along the study area, November 2009–April 2010. Arrows identify dominant species associated with peaks in zooplankton abundance.

A number of taxa exhibited marked seasonal changes in their centers of abundance, responding to reduced flows by moving upstream and relocating downstream during periods of higher inflow (Figs. 3.6.6–3.6.7). For example, in May 2008 (dry) the copepod *Acartia tonsa*, the chaetognaths *Sagitta* spp., and larval gobies were located well inside the river, but during September 2008 (wet) were likely most abundant downstream of the study area. During the dry season, the hyperbenthic animals *Edotia triloba* and *Americamysis almyra*, along with juvenile bay anchovies, were located well upstream above Beautiful Island, where the river narrows considerably; during the wet season, the former species were located well downstream but still inside the river proper and the latter was likely most abundant downstream of the study area.

Taxa richness, an estimate of biodiversity, and the estimated minimum number of species present also suggested that the system was more diverse in spring/early summer, with peak taxa richness occurring in May–July 2008 and March–June 2009 (Figs. 3.6.8-3.6.9). A second peak in taxa richness was also present in November 2008. In general, biodiversity was greater downstream, with a broad region of increased taxa richness (>40 taxa) present below rkm 20.0 in May 2008 and below 16.2 in April 2009 (Figs. 3.6.10–3.6.11). With the onset of the wet season, peak taxa richness was relocated downstream toward the mouth of the river or beyond (Figs. 3.6.10–3.6.13). It is important not to oversell the relative importance of these trends in biodiversity, as the largest portion of the zooplankton catch (47.7%) was identified only as larval decapods, and it is not known how much biodiversity this taxon actually comprised.

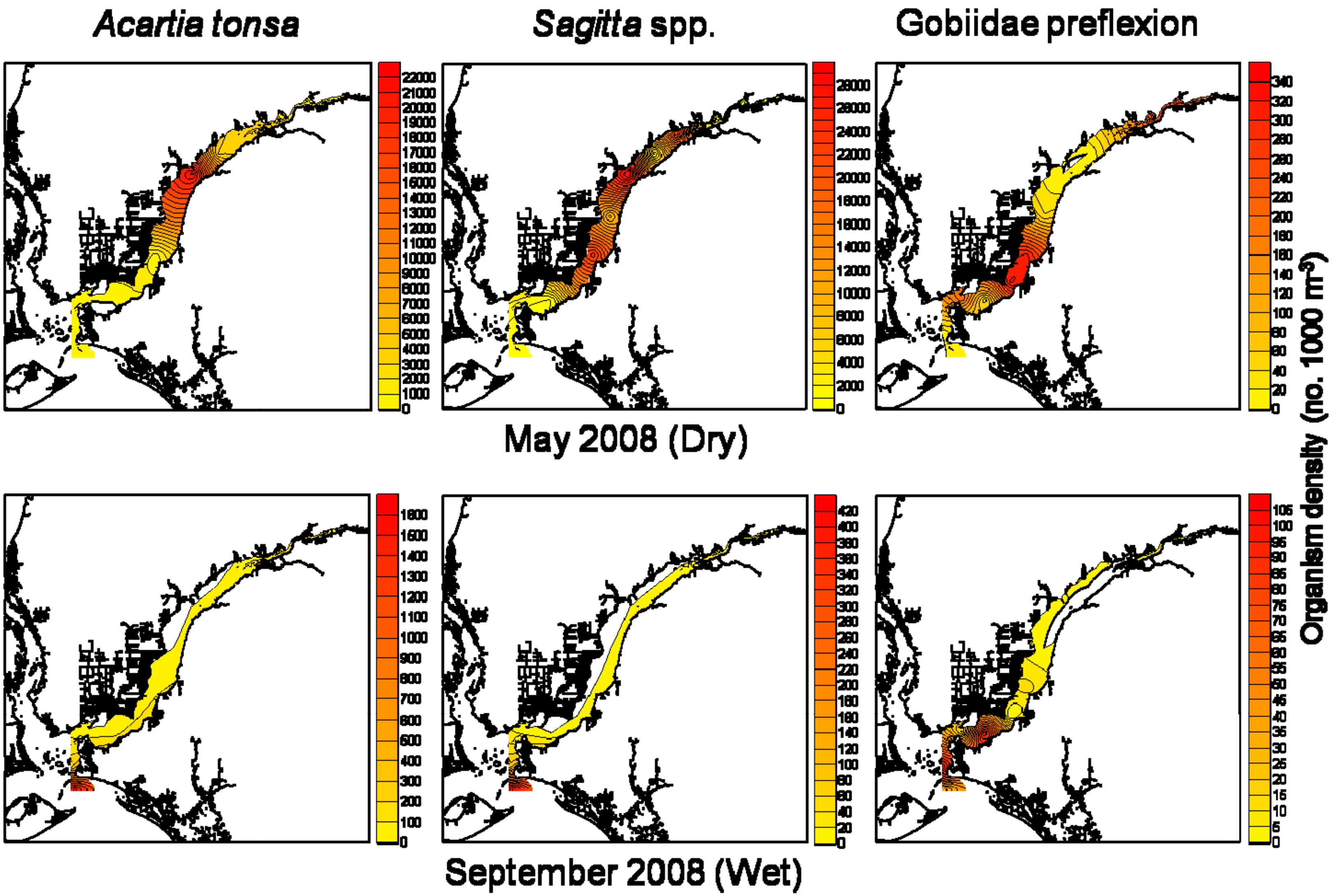

Figure 3.6.6. Seasonal changes (dry vs. wet) in the distribution of select zooplankton species.

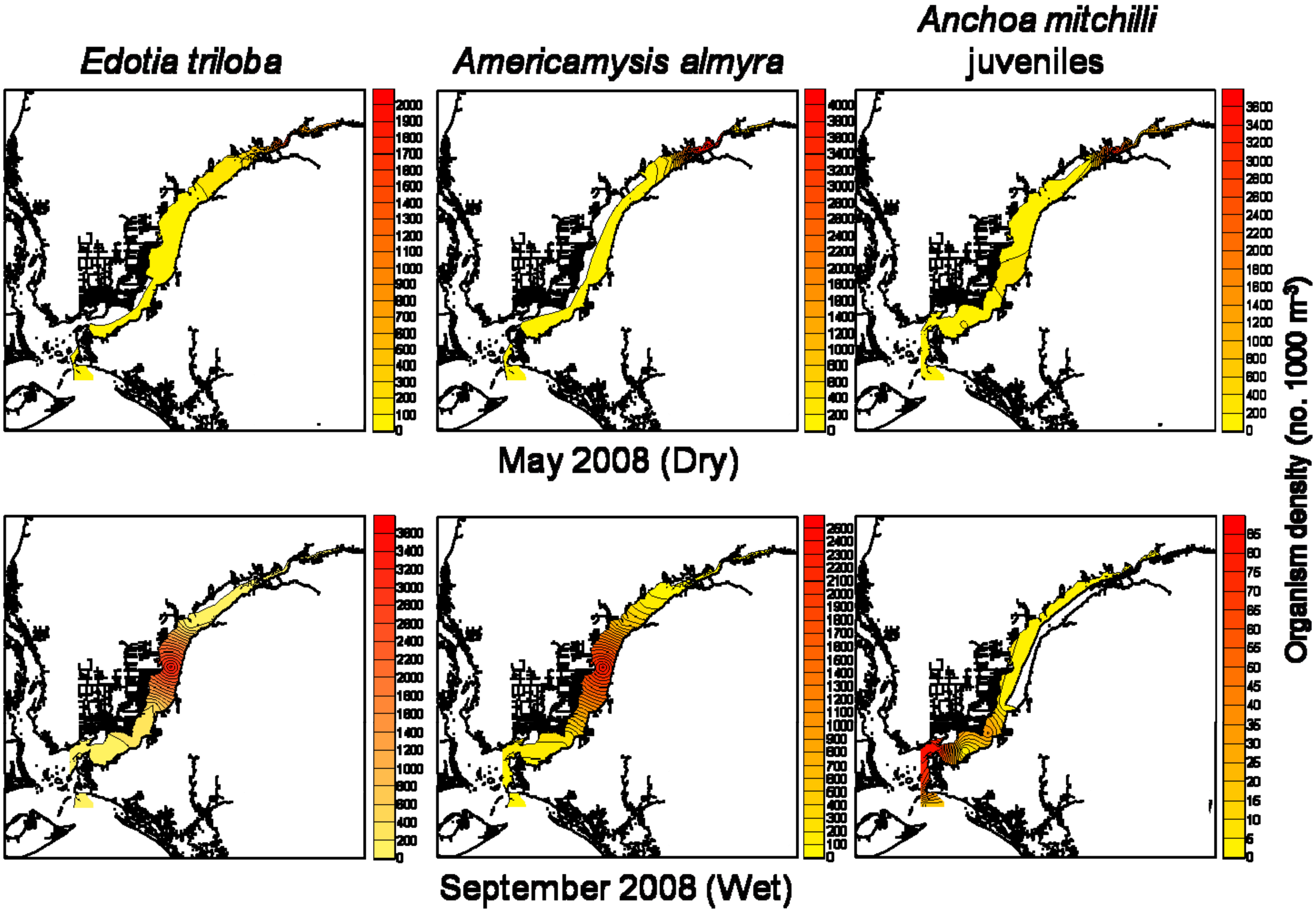

Figure 3.6.7. Seasonal changes (dry vs. wet) in the distribution of select hyperbenthos and juvenile bay anchovy.

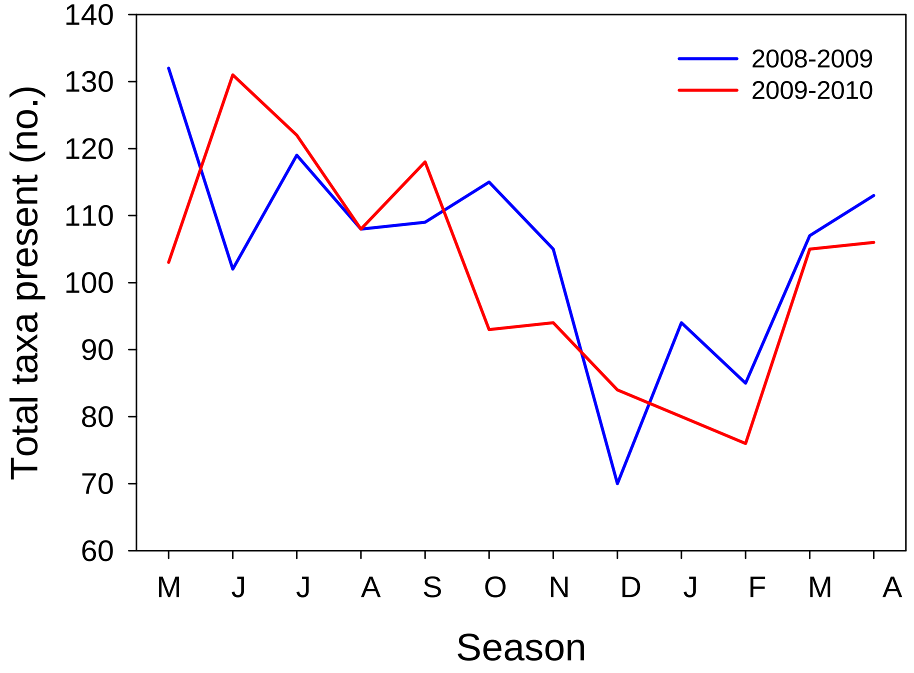

Figure 3.6.8. Seasonal variation in taxa richness for the Caloosahatchee River and Estuary (all stations combined).

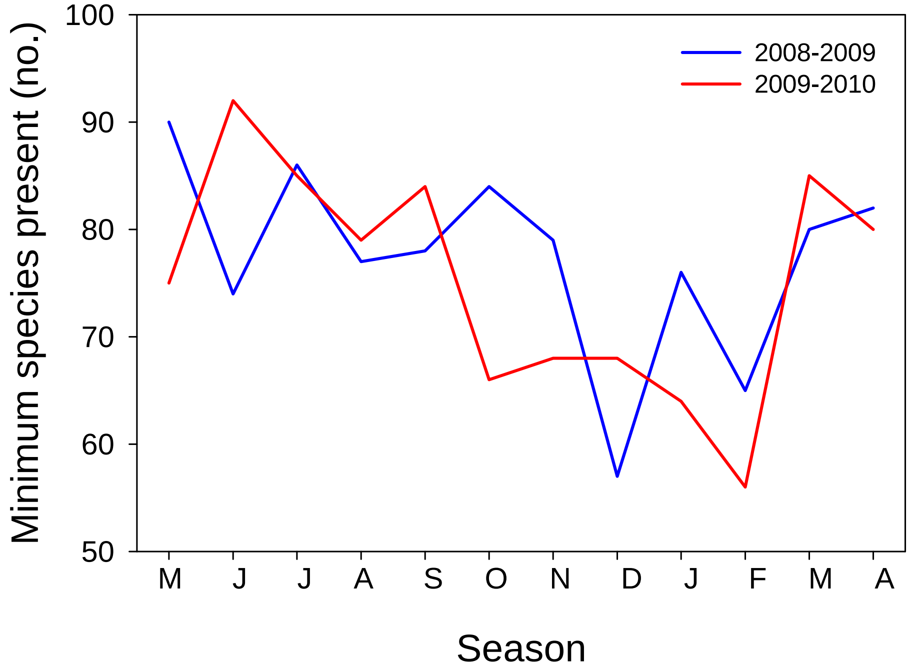

Figure 3.6.9. Seasonal variation in the minimum number of species present for the Caloosahatchee River and Estuary (all stations combined).

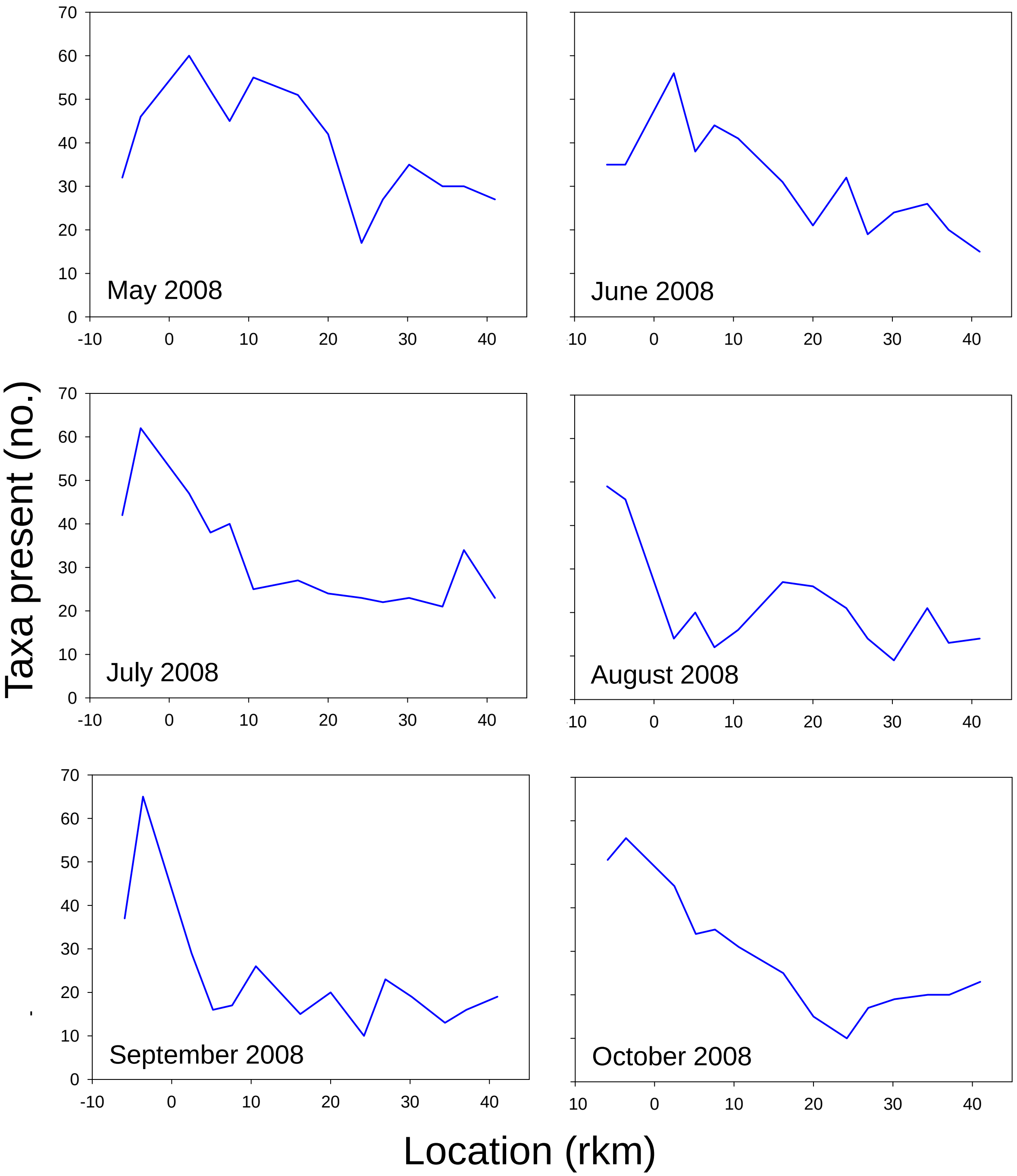

Figure 3.6.10. Monthly variation in taxa richness along the study area, May–October 2008.

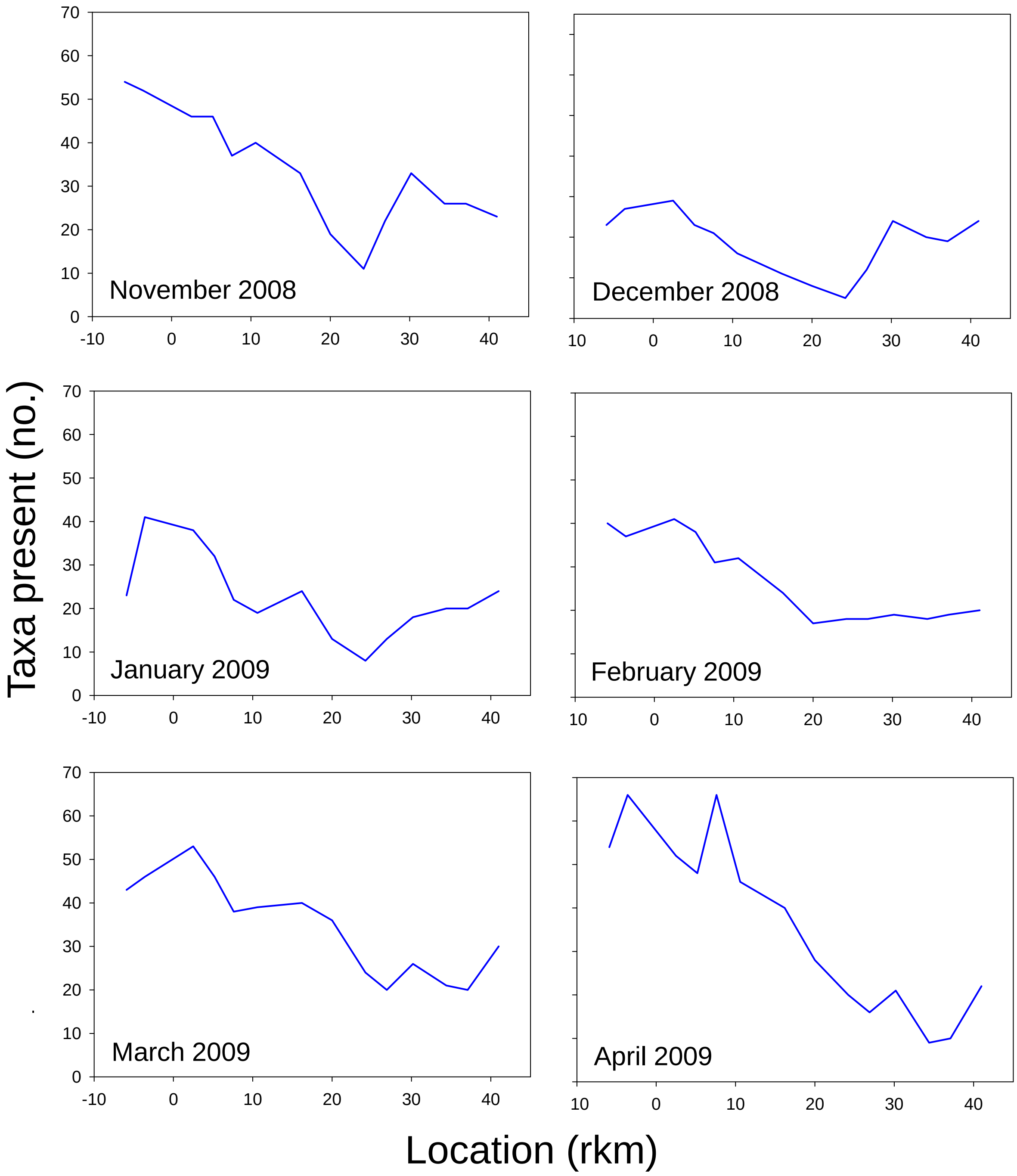

Figure 3.6.11. Monthly variation in taxa richness along the study area, November 2008–April 2009.

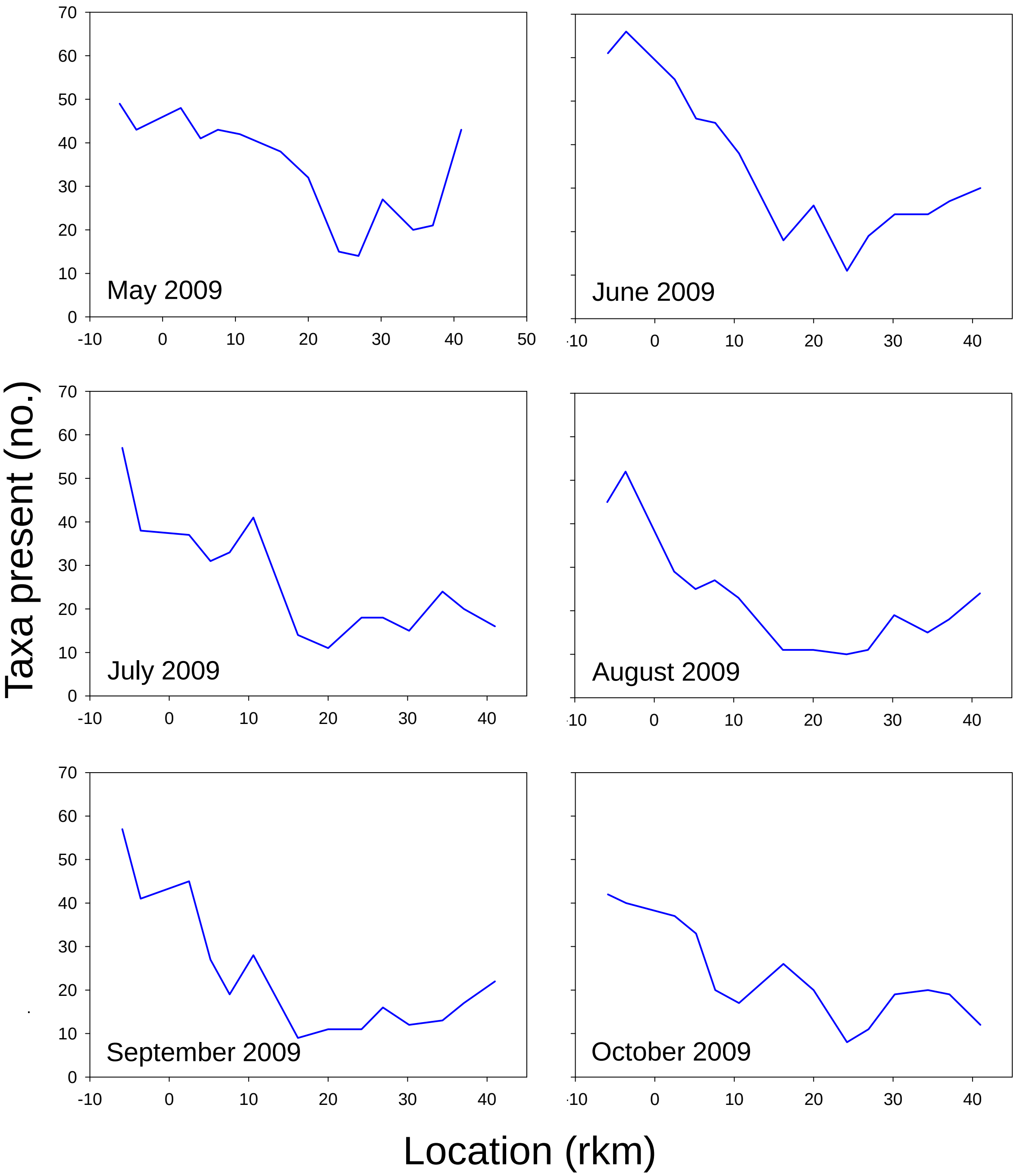

Figure 3.6.12. Monthly variation in taxa richness along the study area, May–October 2009.

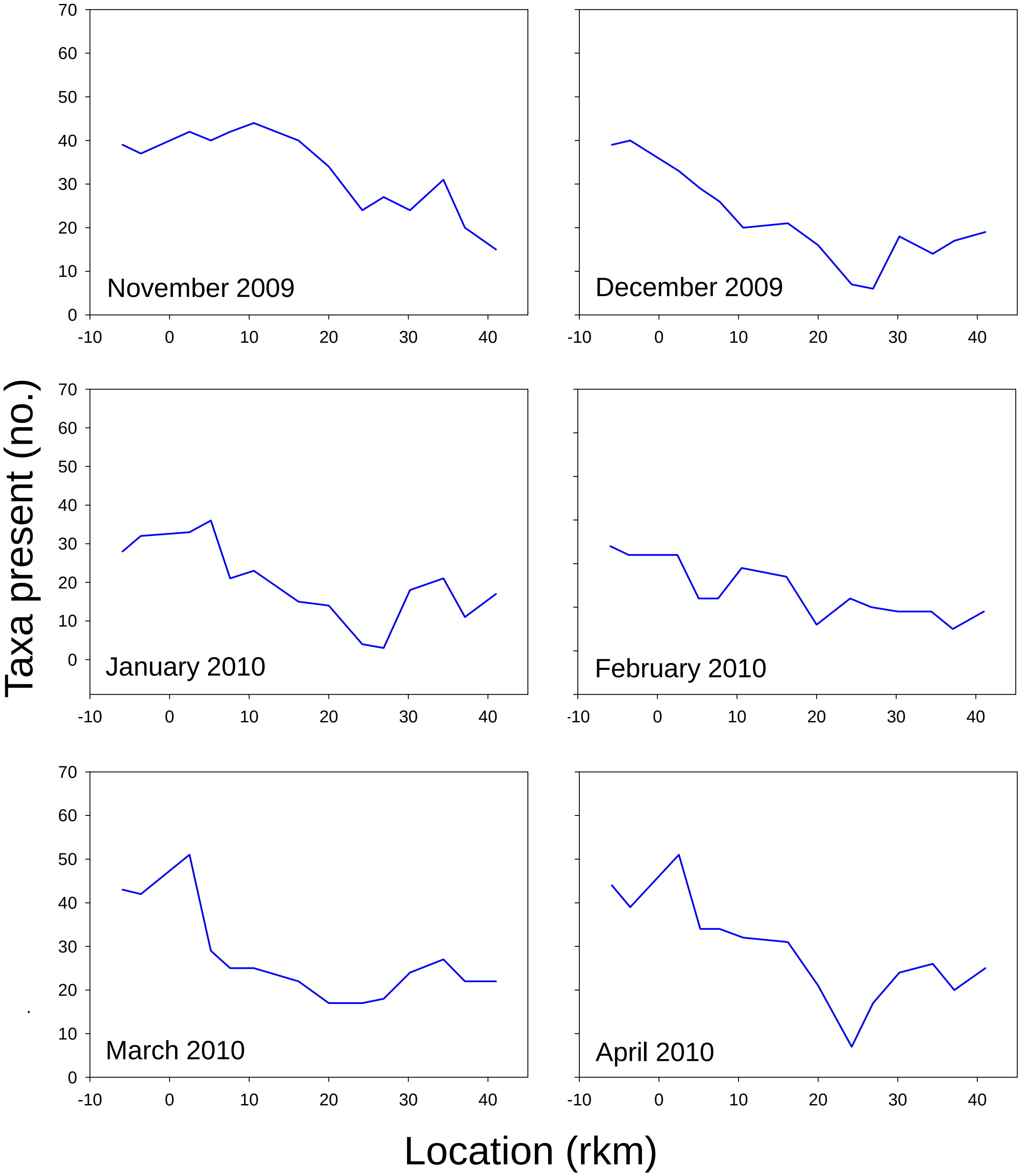

Figure 3.6.13. Monthly variation in taxa richness along the study area, November 2009–April 2010.

3.7 Freshwater Inflow Relationships

3.7.1 Centers of Abundance

A number of taxa demonstrated significant relationships between center of abundance and freshwater inflow (natural log transformed) calculated at time lags (i.e., number of consecutive days prior to sampling used to calculated mean inflow) of 1-120 days (Table 3.7.1.1). All, save one, were negative responses, with animals moving upstream as inflows decreased. Upstream movement is the typical response to reduced inflows seen in riverine estuaries on Florida's west coast (Peebles 2002, MacDonald et al. 2005, Greenwood et al. 2006). Time lags associated with the responses were variable, but most taxa (92%) responded to inflow on a scale of <2 mo, and 32% of the responses corresponded to lags of 6-8 wk. In contrast, the tanaidacean *Hargeria rapax* exhibited a position relationship between center of abundance and freshwater inflow.

An examination of plots comparing organism center of abundance and non-transformed freshwater inflow (Appendix G) indicates that the centers of distribution for a number of estuarine taxa were located immediately downstream of S-79. These taxa all had centers of distribution at >35 rkm following periods of low inflow, typically at the end of the dry season: preflexion larval silversides *Menidia* spp.; postlarval gobies *Microgobius* spp. and hogchokers *Trinectes maculatus;* juveniles pipefish *Syngnathus louisianae;* juvenile *Americamysis* spp. and adult mysids *Americamysis almyra*; and isopods *Edotia triloba* (see Fig. 3.7.1.1 for example).

Of particular interest are the inflows required to remove predatory hydromedusae (*Clytia* sp.) and ctenophores (*Mnemiopsis leidyi*) from this region of the Caloosahatchee. Such inflows appear to be near the low end of the observed inflow range (Fig. 3.7.1.2, Appendix H). These gelatinous zooplankton are known to be voracious predators/competitors of larval fishes.

In addition to these taxa-specific responses to freshwater inflow, overall diversity, estimated using taxa richness, was negatively related to freshwater inflow at a lag of 24 d, though the relationship was not strong (Fig. 3.7.1.3).

Table 3.7.1.1. Response of center of abundance (km_U) to freshwater inflow using natural-log transformed inflow values for inflow data recorded at S-79. Regression statistics are sample size (*n*), intercept (*a*), slope (*b*), significance (*p*), and coefficient of determination r^2 as %. The Durbin-Watson statistic (*DW*) was used to identify possible serial correlation (x indicates $p<0.05$). *D* is the number of consecutive daily inflow values used to calculate mean inflow. For taxa exhibiting relationships within inflow at multiple values of *D*, data are presented for the regression with the lowest *p* value.

Taxon	*n*	*a*	*b*	*p*	r^2	*DW*	*D*
Clytia sp.	8	96.03	-12.78	0.0002	79		50
Microgobius spp. postflexion larvae	17	79.30	-8.81	0.0033	63		55
Lironeca sp. (isopod)	24	69.99	-7.84	<0.0001	56		51
Gobiosoma spp. postflexion larvae	20	62.12	-7.22	0.0022	41		57
Bowmaniella brasiliensis	24	65.56	-7.20	<0.0001	64	x	50
Pseudodiaptomus pelagicus	22	55.30	-6.90	<0.0001	69		57
Menidia spp. preflexion larvae	17	75.09	-6.81	0.0005	57		67
Edotia triloba (isopod)	24	65.25	-6.33	<0.0001	65	x	51
Gobiidae preflexion larvae	24	51.73	-5.94	0.0004	44	x	59
Americamysis almyra	24	63.51	-5.35	0.0001	49	x	51
Americamysis spp. juveniles	24	59.76	-5.22	0.0002	48	x	50
Menticirrhus spp. preflexion larvae	15	34.70	-4.85	0.0003	64		58
Oithona spp.	20	29.97	-4.49	<0.0001	62		46
Acartia tonsa	24	30.65	-4.42	<0.0001	72		45
Gobiidae flexion larvae	23	39.45	-4.31	0.0309	20	x	66
Caligoid copepods	24	29.69	-4.20	<0.0001	64		52
Oikopleura dioica	23	25.66	-4.06	<0.0001	63	x	44
Cumaceans	24	37.13	-4.04	<0.0001	66		48
Syngnathus louisianae juveniles	12	37.21	-3.96	0.0075	53		1
Mesocyclops edax	19	64.23	-3.88	0.0001	63		4
Sagitta spp.	24	25.41	-3.80	<0.0001	70		45
Anchoa spp. preflexion larvae	22	27.15	-3.62	<0.0001	70		16
Gerreidae preflexion larvae	13	24.66	-3.60	<0.0001	86		49
Microgobius spp. flexion larvae	18	43.00	-3.59	0.0314	26		80
Anchoa spp. flexion larvae	16	30.84	-3.33	<0.0001	71		21
Caprellid amphipods	18	23.19	-3.33	0.0010	50		74
Diaptomus spp.	14	58.74	-3.28	0.0062	48		4
Alpheidae postlarvae	21	19.64	-2.97	<0.0001	66		46
Trinectes maculatus postflexion larvae	12	33.48	-2.87	0.0118	49		2
Paguridae juveniles	15	14.74	-2.55	0.0006	61		26
Hippolyte zostericola juveniles	18	15.90	-2.53	<0.0001	67		43
Mnemiopsis leidyi	8	35.53	-2.53	0.0006	88		1
Paracalanid copepods	15	15.90	-2.50	0.0033	50		21
Argulus sp. (branchiuran)	16	42.19	-2.39	0.0197	33		7
Gammaridean amphipods	24	28.76	-2.37	0.0393	18	x	92
Labidocera aestiva	24	13.18	-2.31	<0.0001	74	x	43

Table 3.7.1.1. Continued

Taxon	*n*	*a*	*b*	*p*	r^2	*DW*	*D*
Temora turbinata	15	16.57	-2.29	0.0140	38		22
Palaemonetes spp. postlarvae	24	20.51	-2.29	0.0015	37		3
Bathygobius soporator preflexion	14	18.26	-2.26	0.0038	52		14
Chasmodes saburrae flexion larvae	13	18.88	-2.13	0.0063	51		24
Anchoa mitchilli postlarvae	17	20.86	-2.09	0.0001	67		2
Monstrilla sp.	18	14.02	-2.09	0.0023	45		51
Eutima sp.	17	10.28	-1.97	<0.0001	79		39
Americamysis bahia	20	17.36	-1.92	<0.0001	65		7
Upogebia spp. juvenile	10	13.59	-1.87	0.0007	78		8
Anchoa mitchilli adult	24	40.01	-1.82	0.0496	16		17
Upogebia spp. postlarvae	20	9.86	-1.73	<0.0001	71	x	12
Medusa sp. E	12	8.44	-1.72	0.0062	54		41
Chaoborus punctipennis	22	47.76	-1.56	0.0153	26		7
Paguridae postlarvae	20	7.61	-1.40	0.0003	53		14
Parasterope pollex	20	10.98	-1.38	0.0491	20		50
Penaeidae metamorphs	14	11.70	-1.38	0.0483	29	x	8
Tozeuma carolinense postlarvae	16	5.90	-1.16	0.0023	50		5
Processidae postlarvae	22	4.48	-1.11	<0.0001	58		2
Hippolyte zostericola postlarvae	24	4.97	-1.03	0.0001	50	x	2
Erichsonella attenuata	21	12.45	-0.96	0.0262	23		37
Cynoscion nebulosus preflexion larvae	11	3.03	-0.95	0.0004	77		2
Lucifer faxoni adults	23	2.40	-0.84	0.0001	51	x	14
Obelia spp.	12	0.82	-0.82	0.0072	53		1
Centropages velificatus	12	-2.92	-0.26	0.0132	30		3
Hargeria rapax	21	-2.58	1.24	0.0280	23		52

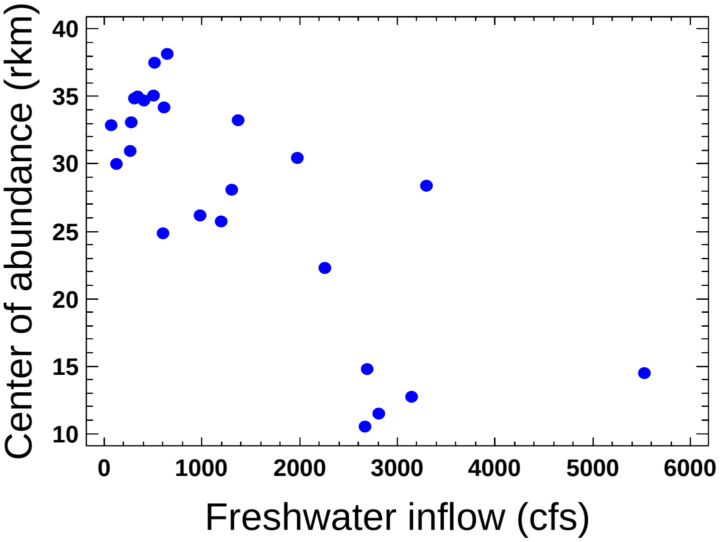

Figure 3.7.1.1. Center of abundance for the mysid *Americamysis* almyra in relation to freshwater inflow.

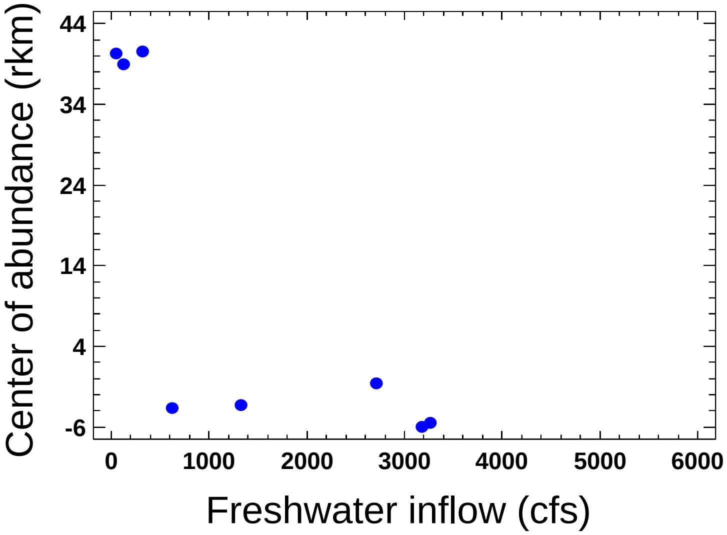

Figure 3.7.1.2. Center of abundance for the gelatinous predator *Clytia* sp. in relation to freshwater inflow.

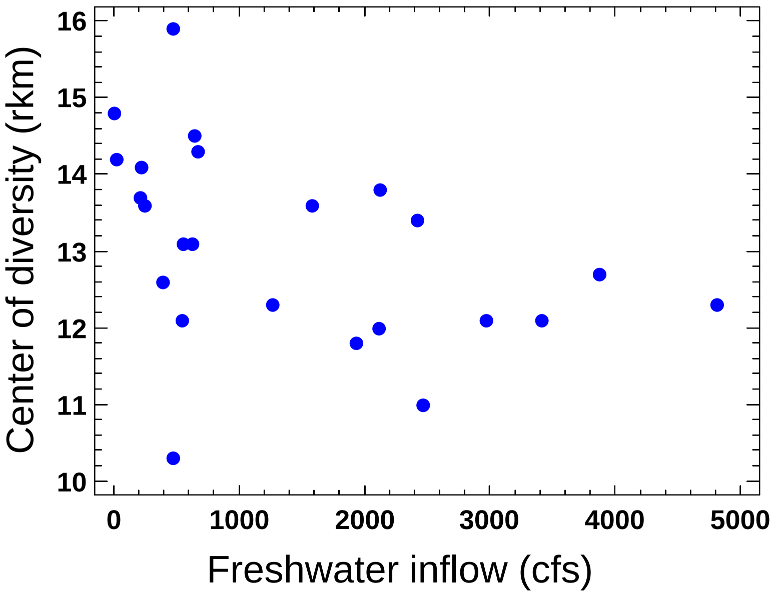

Figure 3.7.1.3. Response of density-weighted center of diversity, calculated using taxon richness, to freshwater inflow (r = -0.49, p = 0.0158, n = 24: natural log transformed inflow data).

3.7.2 Total Organism Abundance and Inflow

A number of taxa also demonstrated significant relationships between total organism abundance (natural log transformed) estimated for the entire study area and freshwater inflow (natural log transformed) calculated at time lags (i.e., number of consecutive days prior to sampling used to calculated mean inflow) of 1-120 days (Table 3.7.2.1; Appendix). Of these, the majority (72%) were negative responses, with fewer numbers of animals associated with greater levels of freshwater inflow. These results suggest that species associated with these taxa either experienced reduced spawning or downstream movement through the study area and out into the Gulf of Mexico in response to high levels of inflow. Plots of non-transformed abundance-inflow data exposed potential break points in this relationship that were much less apparent in plots that used natural log transformed data (Figs. 3.7.2.1-3.7.2.2; Appendix I). An examination of these break points in the data suggests that reduced abundances were often associated with inflows greater than 1,000 cfs (Appendix E).

Table 3.7.2.1. Response of total organism abundance to freshwater inflow using natural-log transformed abundance and inflow values (recorded at S-79). Regression statistics are sample size (*n*), intercept (*a*), slope (*b*), significance (*p*), and coefficient of determination r^2 as %. The Durbin-Watson statistic (*DW*) was used to identify possible serial correlation (x indicates $p<0.05$). *D* is the number of consecutive daily inflow values used to calculate mean inflow. For taxa exhibiting relationships within inflow at multiple values of *D*, data are presented for the regression with the lowest *p* value. Asterisk denotes those cases where a lognormal model applied to non-transformed data provided a better fit.

Taxon	*n*	*a*	*b*	*p*	r^2	*DW*	*D*
Palaemon floridanus	10	30.81	-2.05	0.0028	69		93
Upogebia sp. postlarvae*	20	27.41	-1.46	0.0111	31		120
Anchoa mitchilli postflexion larvae	17	23.60	-1.16	0.0010	52		120
Clytia sp.*	8	23.48	-1.15	0.0191	63		120
Alpheidae postlarvae	21	24.86	-1.14	0.0082	31		120
Gerreidae preflexion larvae	13	22.80	-1.10	0.0160	42		119
Cumaceans*	24	26.91	-1.05	0.0033	33	x	80
Palaemonetes spp. postlarvae	24	22.72	-1.05	0.0042	32	x	120
*Parasterope pollex**	20	22.67	-1.05	0.0001	59		67
Anchoa spp. flexion larvae*	16	21.08	-0.94	0.0167	34	x	120
Caprellid amphipods	18	20.95	-0.91	0.0023	45		120
Gobiosoma spp. postflexion larvae*	20	20.81	-0.86	0.0377	22		120
Eusarsiella zostericola	20	19.70	-0.81	0.0013	44		81
Paracalanid copepods*	15	19.72	-0.76	0.0286	32	x	104
Harrieta faxoni	13	18.33	-0.74	0.0183	41		120
Chasmodes saburrae postflexion larvae	12	19.00	-0.72	0.0196	44		57
Erichsoniella attenuata	21	17.30	-0.55	0.0120	29	x	120
Upogebia sp. juveniles	10	17.29	-0.47	0.0205	51		43
Syngnathus scovelli juveniles	19	16.67	-0.43	0.0380	23		99
Temora turbinata	15	16.62	-0.37	0.0132	39		1
Centropages velificatus	20	17.61	-0.35	0.0042	37		1
Sagitta spp.	24	21.58	-0.34	0.0015	38		1
Anchoa spp. preflexion larvae	22	19.06	-0.32	0.0448	19	x	1
Harpacticoid copepods	17	15.65	-0.30	0.0308	27	x	1
Acartia tonsa	24	21.89	-0.26	0.0204	22		1
Pseudodiaptomus coronatus	22	17.09	-0.24	0.0334	21		2
Blenniidae preflexion larvae	24	16.79	-0.19	0.0497	16	x	1
Caligoid copepods	24	14.78	-0.18	0.0123	25		1
Anchoa mitchilli adults	24	12.43	0.16	0.0375	18		2
Cynoscion nebulosus preflexion larvae	12	13.18	0.21	0.0452	34	x	1
*Americamysis bahia**	20	12.99	0.28	0.0382	22		4
Penaeidae metamorphs	14	13.48	0.35	<0.0001	77		2
Argulus sp. (branchiuran)	16	8.72	0.44	0.0211	32		51

*Penilia avirostris**	17	14.32	0.46	0.0258	29	x	5
Cyathura polita	21	8.22	0.70	0.0001	57	x	15
Menidia spp. preflexion larvae*	17	3.43	1.21	0.0047	42	x	41
Chaoborus punctipennis	22	2.66	1.83	0.0001	54	x	27
Diaptomus spp.*	14	0.63	1.89	0.0053	49		20
Mesocyclops edax	19	-0.46	2.34	0.0001	62		22

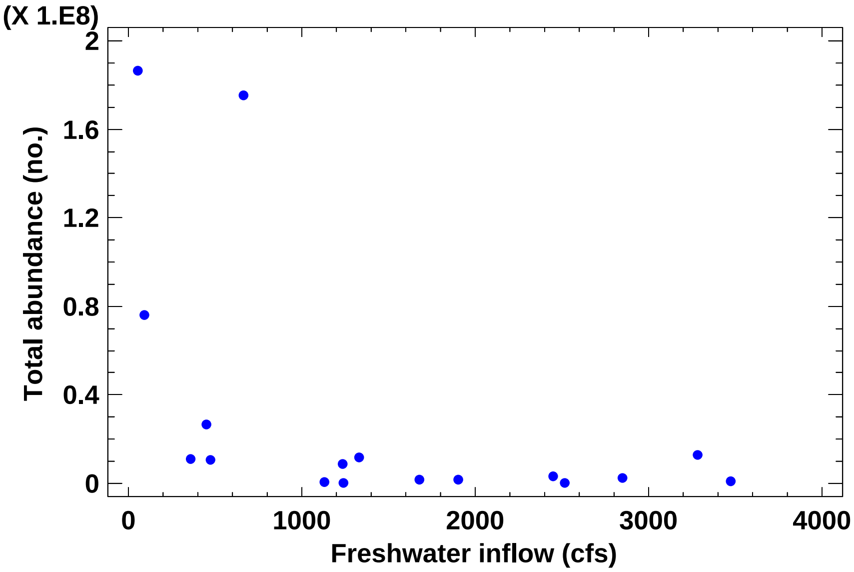

Figure 3.7.2.1. Negative relationship between total abundance of *Anchoa mitchilli* postflexion larvae and freshwater inflow (120-d lag).

Time lags associated with the responses were variable and in most cases significant correlations existing for multiple lags (Appendix J), but most taxa responded to inflow on either end of the lag spectrum, at scales of days or scales of several months. In some cases, a lognormal model applied to non-transformed data provided a better fit (based on adjusted R^2) than the linear model applied to transformed data (Fig. 3.7.2.3; Appendix I).

In contrast, eleven taxa, including preflexion larvae of the spotted seatrout *Cynoscion nebulosus* exhibited increased abundance in response to freshwater inflow. Again, associated lags were highly variable, but correlation coefficients with lowest associated p values were all at time scales of <51 days (Table 3.7.2.1). Based on the criteria of identifying non-freshwater

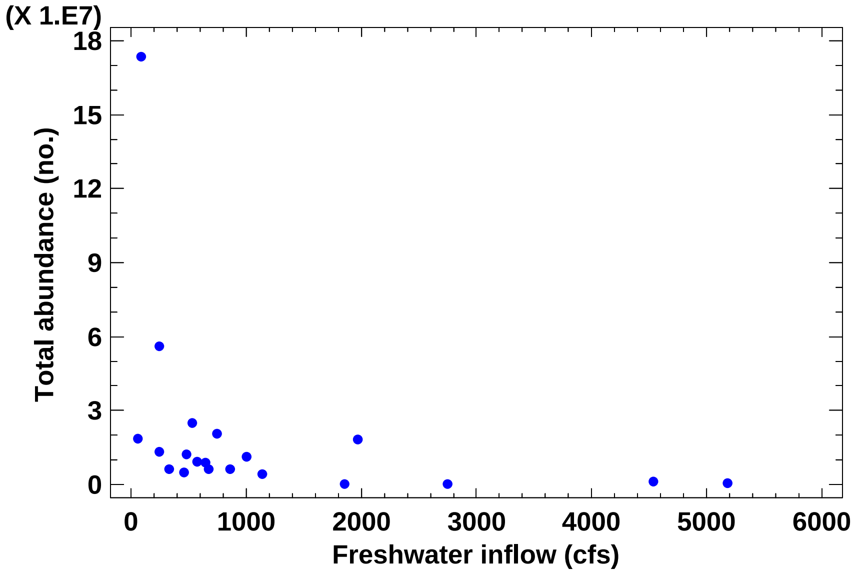

Figure 3.7.2.2. Negative relationship between total abundance of the ostracod *Parasterope pollex* and freshwater inflow (67-d lag).

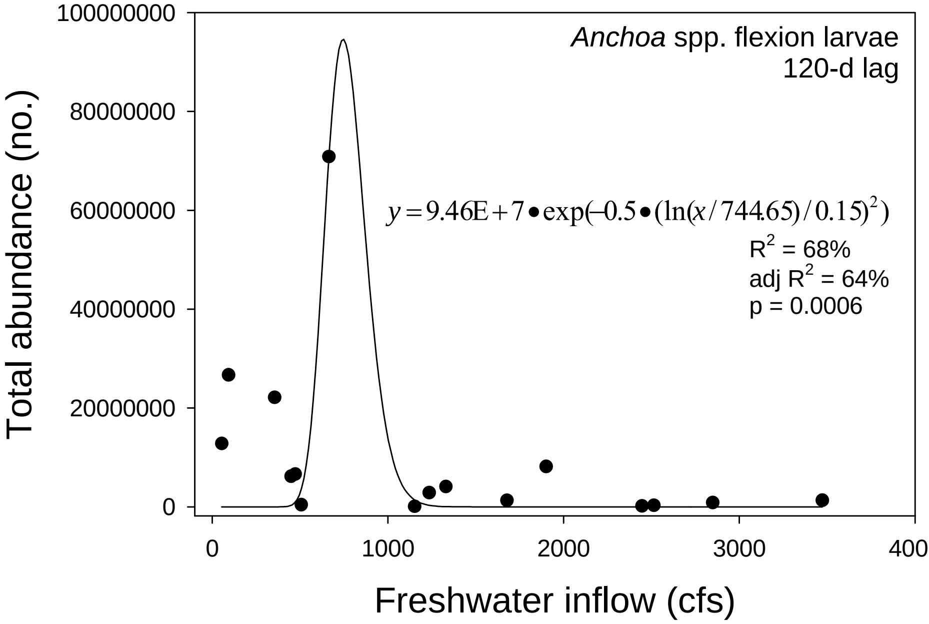

Figure 3.7.2.3. Lognormal relationship between total abundance of *Anchoa* spp. flexion larvae and freshwater inflow (120-d lag).

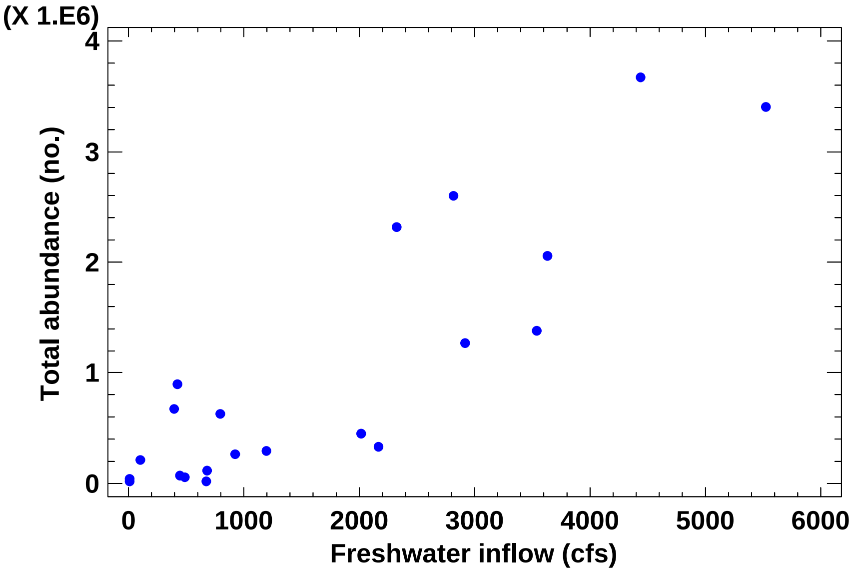

Figure 3.7.2.4. Positive relationship between total abundance of the isopod *Cyathura polita* and freshwater inflow (15-d lag).

species with a positive abundance relationship to inflow, seven taxa were identified as potential indictors of freshwater inflow: *Anchoa mitchilli* adults (bay anchovy), *Cynoscion nebulosus*, *Americamysis bahia* (mysid), Penaeidae metamorphs (commercial shrimp), *Penilia avirostris* (cladoceran), *Cyathura polita* (isopod), and *Menidia* spp. preflexion larvae (silversides). However, only the relationship for *C. polita* exhibited a coefficient of determination of >50% (Fig. 3.7.2.4).

3.8 Identifying Truncated Distributions

A plot of the 90th percentiles of cumulative organism density for each sampling survey (month) suggests that distributions of juvenile bay anchovies and adult *Americamysis almyra* may be truncated due to the presence of the W.P. Franklin Lock and Dam (Fig. 3.7.1). Such blockage of further upstream migration is inferred when data converge and become unresponsive to flow (upper left data points of Fig. 3.8.1). Bin Din and Gunter (1986) reported that *Americamysis* (=*Mysidopsis*) *almyra* was a major component in the diet of bay anchovy sampled from Biloxi Bay, Mississippi, and Peebles et al. (2007) noted that the distributions of bay anchovy and *A. almyra* tracked one another closely in the Alafia River estuary, even though some of the mysids were too large to be consumed by juvenile anchovies. In the present study, *Anchoa mitchilli* juveniles (r = 0.28, p = 0.0168, n = 75), *Americamysis* juveniles (r = 0.43, p < 0.0001, n = 125) and *A. almyra* adults (r = 0.21, p = 0.0493, n = 91) all tracked chlorophyll *a* concentration based on the results of Pearson's correlation analysis.

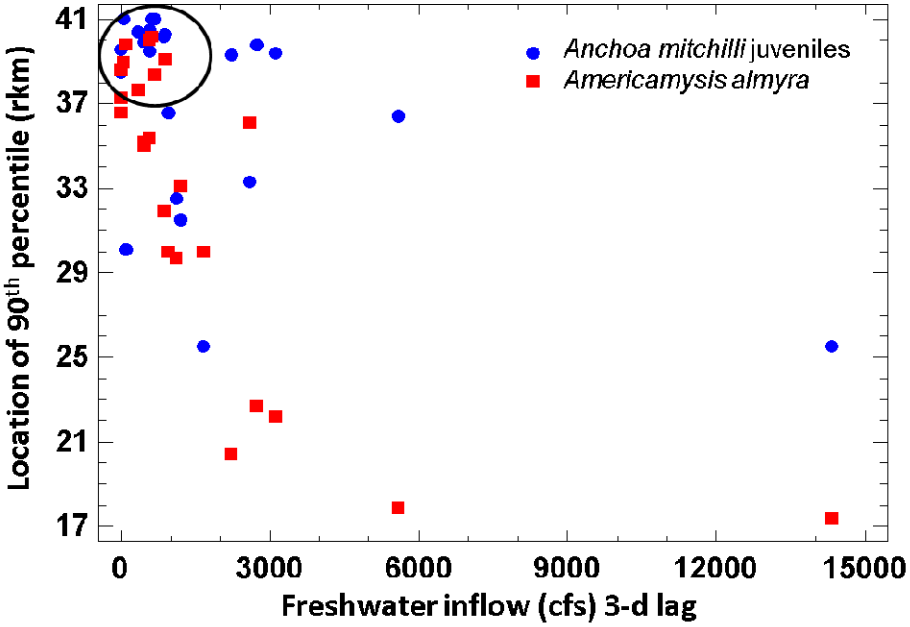

Figure 3.8.1. Location of 90th percentile of population distribution in relation to freshwater inflow. Highlighted area is evidence of population crowding downstream of the Franklin Lock and Dam, located immediately upstream of rkm 41.

4.0 CONCLUSIONS

Synthesis of the preceding information suggests that there are six principal project findings that are relevant to the establishment of water reservations for the Caloosahatchee River and Estuary.

1. It appears that phytoplankton biomass can accumulate and/or proliferate under various inflow scenarios, with inflow playing a role in determining both phytoplankton location and composition. Lower flows can cause larger phytoplankton (diatoms) to grow in the upper zones (5 and 6); although this may benefit higher trophic levels (shorter food chains, higher nutritional value) it may also lead to reduced dissolved oxygen levels in bottom waters as the diatom biomass sinks and decomposes. Higher flows support growth farther down the estuary (zones 2 and 3) and are accompanied by an increase in cyanobacteria. This scenario may have negative food web implications (longer food chains, lower nutritional value) and possible harmful algal bloom consequences (many cyanobacteria produce phycotoxins, e.g., *Microcystis*). Very high inflows (>3,500 cfs) can reduce phytoplankton biomass within the system, causing problems for those species requiring some level of salinity and flushing nutrients out into the Gulf where algal blooms may occur in coastal waters. Therefore, it appears that moderate flows (1,000 to 2,000 cfs) may be best, although potential blooms in zones 2 and 3 should be monitored in case the apparent stimulation at 1,500 cfs is a consistent and predictable response.

2. Water-column chlorophyll *a* concentrations were typically greater upstream, especially during the dry season, with peak values generally located in the region of 30-37 rkm. During the wet season, freshwater copepods *Mesocyclops edax* and *Diaptomus spp.*, cladocerans *Daphnia* spp., and larvae of the phantom midge *Chaoborus punctipennis* all exhibited centers of abundance in this region. These species are known to feed on phytoplankton or on phytoplankton grazers (Chimney et al. 1981, Williamsons and Magnien 1982).

During the dry season, however, a number of estuarine species moved into this region from centers of abundance farther downstream, including estuarine-dependent fishes (e.g., *Trinectes maculatus* postlarvae, and *Anchoa mitchilli* juveniles) and important prey of fishes including the hyperbenthic *Americamysis* spp. juveniles, *A. almyra* adults, and *Edotia triloba*.

These species were likely associated with high phytoplankton abundances, whether suspended in the water column (high chlorophyll *a* concentrations) or sedimented on the bottom (high F_{max} values associated with centric diatoms). This is not to say that these potential prey organisms were grazing on phytoplankton directly: for example, hyperbenthic species often feed on plant detritus or benthic microalgae during the day, only to migrate vertically into the water column at need to feed on zooplankton (e.g., Kouassi et al. 2006).

The combination of high primary production and the concentration of trophic-dependent species in this portion of the river is of concern, for this region is also prone to low dissolved oxygen concentrations (2-4 mg L^{-1}) in its bottom waters, especially during wet months. The potential positioning of a hyperbenthic prey base in regions of low DO could result in a substantial loss of important food resources for fishes and invertebrates that feed on these species. In addition, hypoxia has been identified as a source of habitat compression (Eby and Crowder 2002, Prince and Goodyear, Bograd et al. 2008, Diaz and Rosenberg 2008), a phenomenon that can increase competitive interactions among species and that can potentially result in dietary shifts and reduced growth rates (Eby and Crowder 2002). Because all of the taxa listed above demonstrate significant inflow responses, the release of freshwater at S-79 during dry months (when these taxa are most likely to concentrate in the upper tidal river) would result in the relocation of these taxa, downstream and away from this region prone to the development of low DO. Based on inflow relationships of hyperbenthic prey, it appears that releases of 1,000–1,200 cfs would achieve this result.

3. Based on the results of the spatial abundance quartile analysis, it appears that juvenile bay anchovy and their prey *Americamysis almyra* are blocked from moving farther upstream during the dry season by the presence of the W.P. Franklin Lock and Dam. This pattern indicates habitat compression for these organisms, as they are not only concentrated in a relatively narrow portion of the river but also are truncated in their upstream distribution. By obstructing the movement of estuarine organisms, the Lock and Dam causes habitat impingement for some species, preventing them from expanding their range upstream. Based on the 90th percentile abundance plot, it appears that releases of freshwater on the order of 1,000 cfs at S-79 would be sufficient to release these organisms from the impingement caused by the Lock and Dam structure itself.

4. As mentioned previously, a number of estuarine species collected during this study (including fishes, mysids, commercial shrimp, and isopods) responded to reduced freshwater inflow by moving upstream into the narrow portion of the tidal Caloosahatchee above Beautiful Island during the dry season. Although these organisms may experience greater overall dispersion as a result of this movement, Peebles and Greenwood (2009) cautioned that such gains in habitat extent may be offset by losses in habitat volume due to the inherent geomorphology (i.e., funnel shape) of tidal rivers. This upstream movement in response to reduced inflow into the more restricted region of the tidal Caloosahatchee resulted in a potential second source of habitat compression. By concentrating aquatic organisms in a reduced volume of habitat, habitat compression increases competitive interactions among and within species and enhances predator-prey encounters in the same habitat (Prince and Goodyear 2006). This can result in habitat overlap, higher predation rates, decreased prey availability, and reduced growth rates (Crowder 1986, Eby and Crowder 2002). Based on the compiled regressions of organism center of abundance vs. freshwater inflow, it appears that a number of these species would be relocated downstream of this restricted portion of the tidal river at inflows of 800–1,000 cfs.

5. In addition to changes in center of distribution in response to variable inflow, some taxa exhibited significant changes in total abundance in response to lagged inflow. The majority of these responses were negative, indicating reduced system-wide abundances at higher levels of inflow. Based on the examination of non-transformed data, it appears that, for many of these taxa, greatest abundances would be maintained at inflows ≤1,000 cfs.

6. Gelatinous predators can negatively impact fish populations by feeding directly on developing eggs and larvae or by competing with larvae for zooplankton prey (Purcell and Arai 2001). Centers of abundance calculated for most of the gelatinous predators identified from Caloosahatchee zooplankton samples were located well downstream, either in the lower tidal river or downstream of the river mouth in San Carlos Bay; however, two species were notably present in the upper river during periods of reduced freshwater inflow. Populations of the hydromedusa *Clytia* sp. and the ctenophore *Mnemiopsis leidyi* were centered at ~40 rkm and 32-39 rkm, respectively, during the dry season when abundances were high. As reported previously, a number of estuarine zooplankton also moved into the upper tidal river during the dry season.

Of these two gelatinous predators, *Clytia* sp. exhibited a very sensitive response to freshwater inflow (i.e., slope of the regression). Considering both species, freshwater releases of 1,000 cfs or less should result in substantial movement downstream, relocating these gelatinous predators away from areas in the upper tidal river where potential zooplankton prey (including larval fishes) are concentrated, thus reducing predation and competition pressure.

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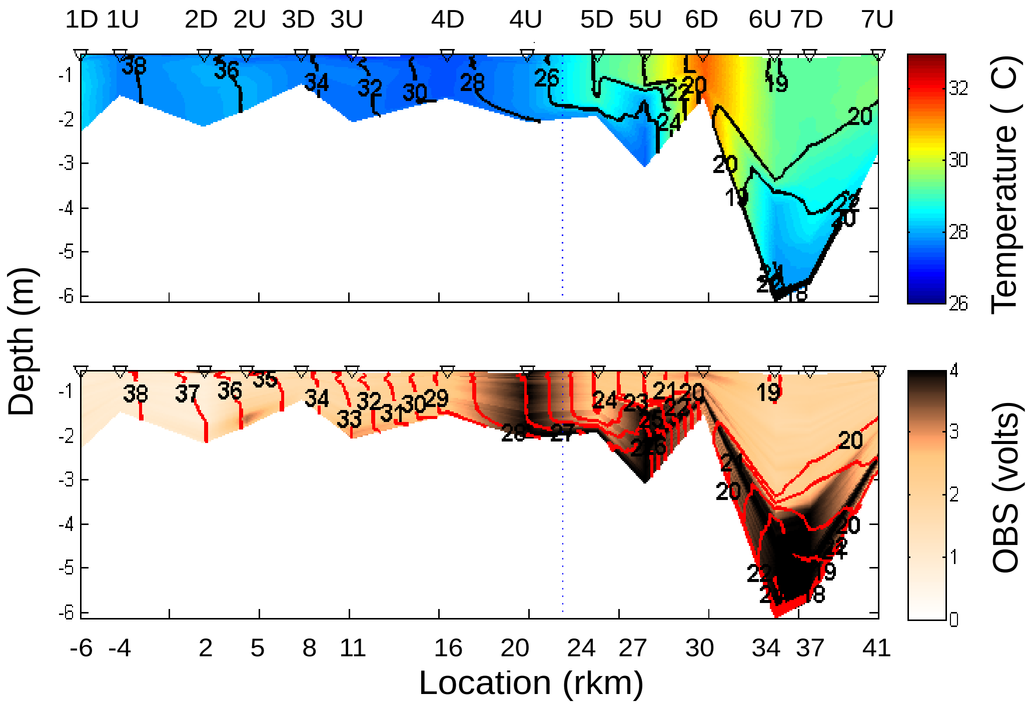
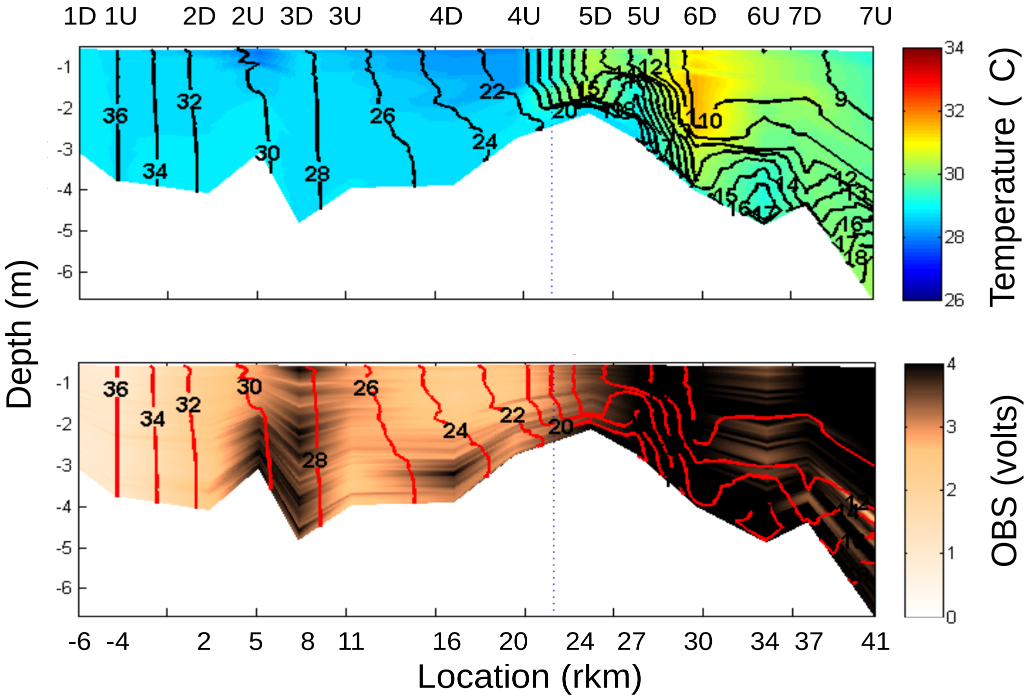
Appendix A

Monthly longitudinal temperature distribution with isohalines



Top: Longitudinal temperature distribution with isohalines for May 2008. Bottom: Turbidity distribution (optical back scatter) with isohalines for May 2008. Stations are labeled according to site.



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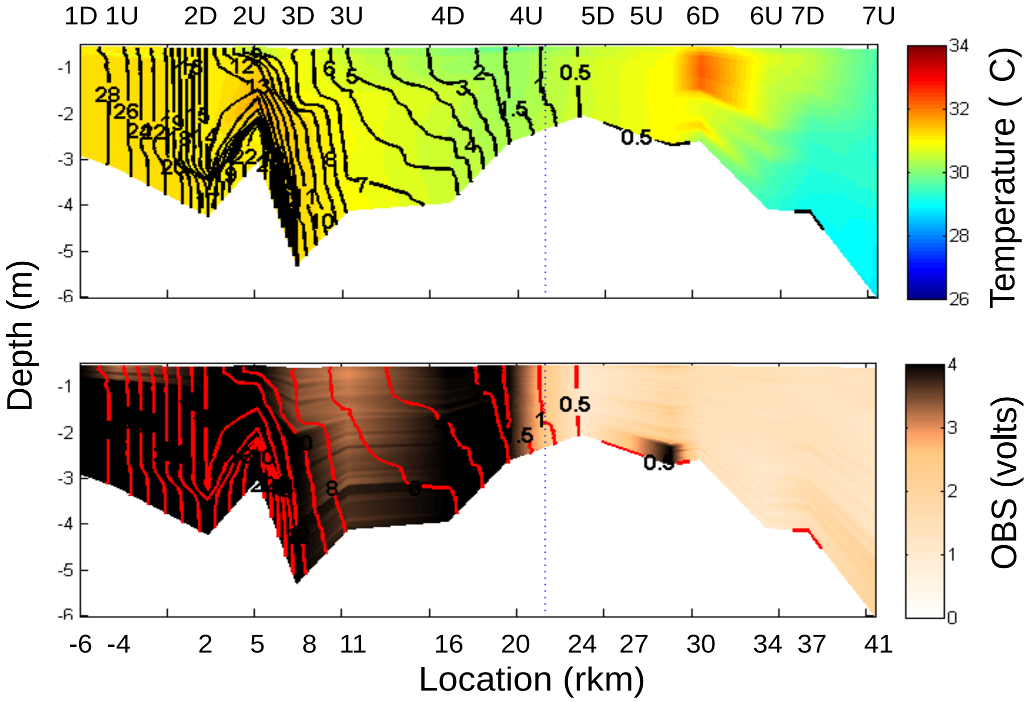

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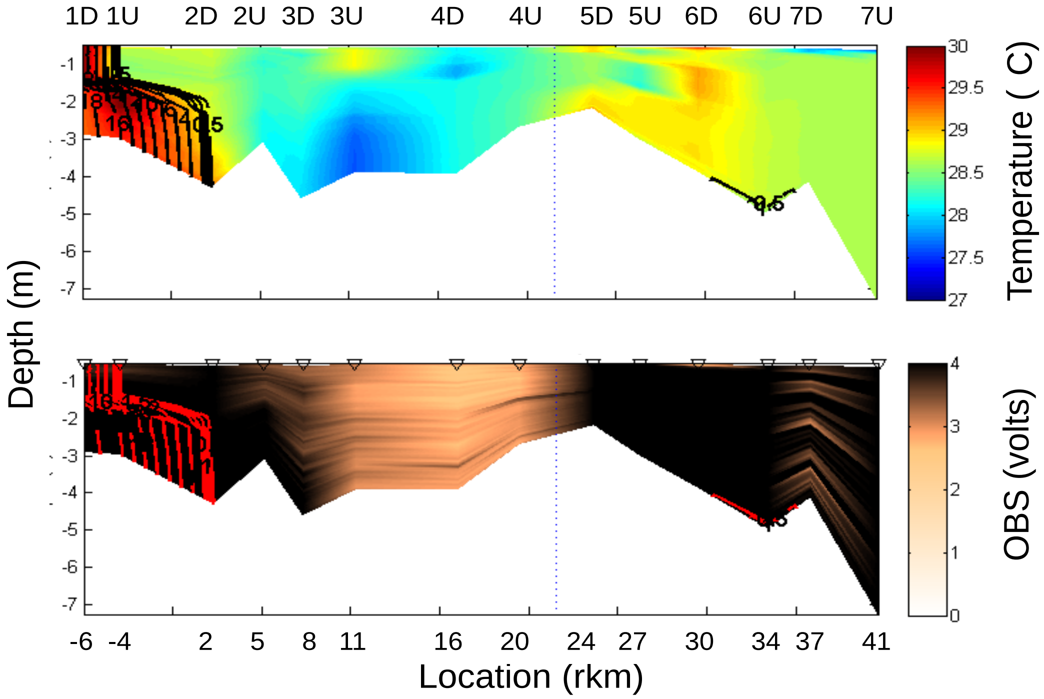

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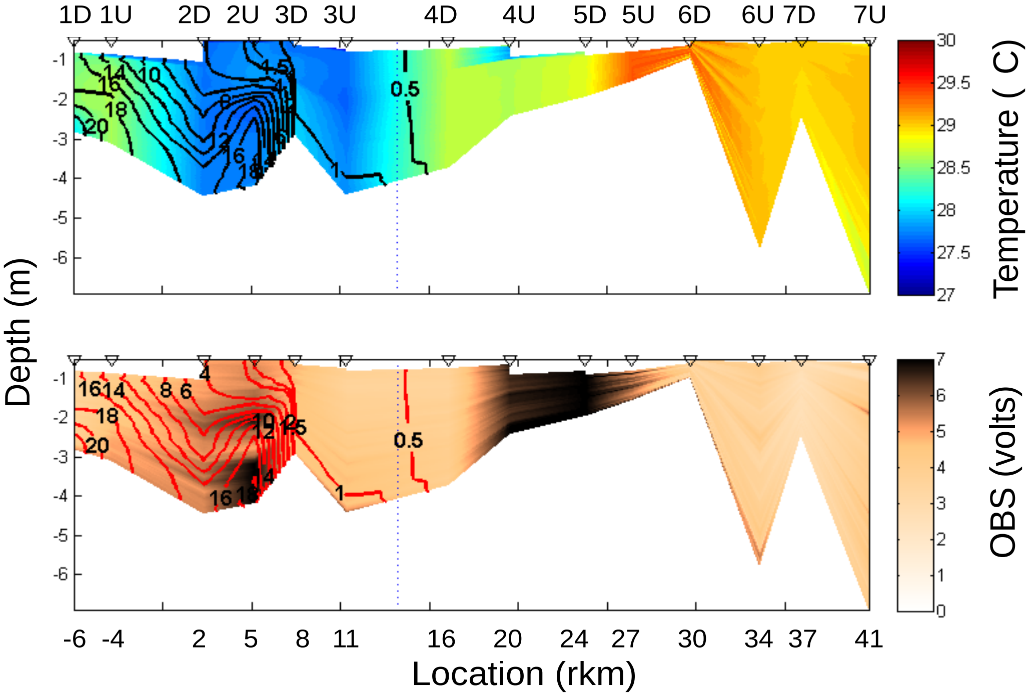
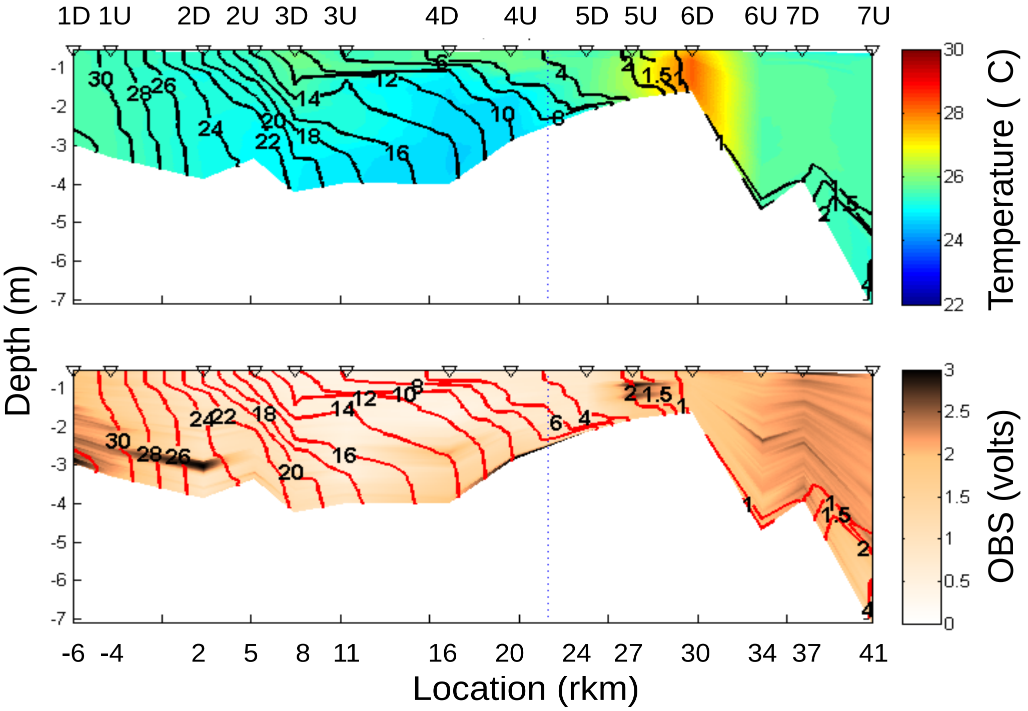
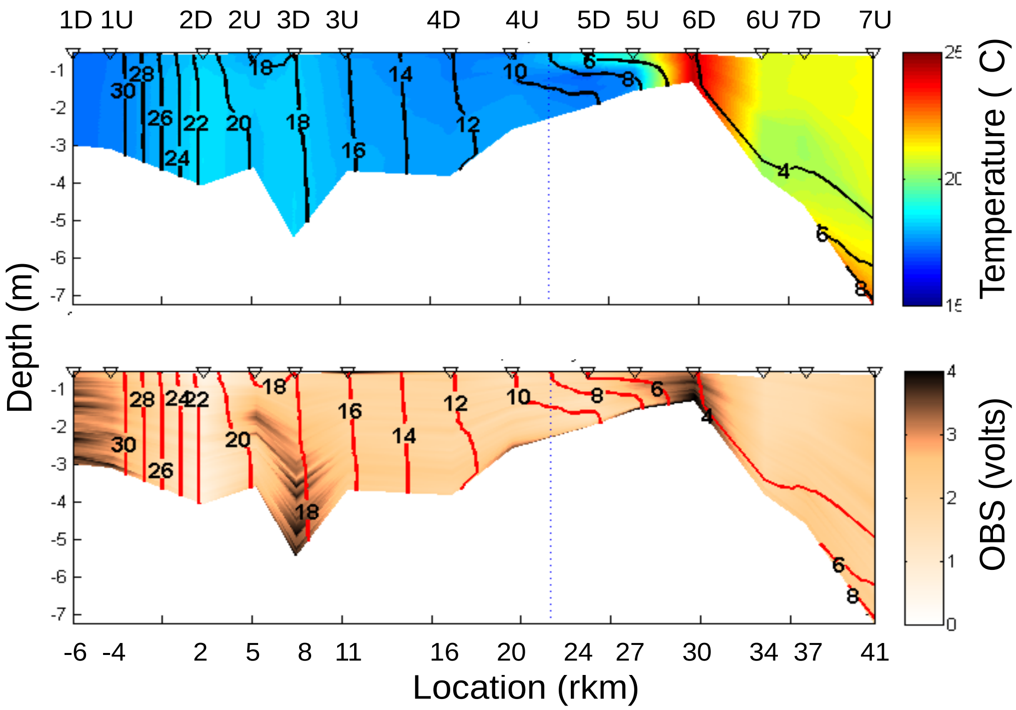


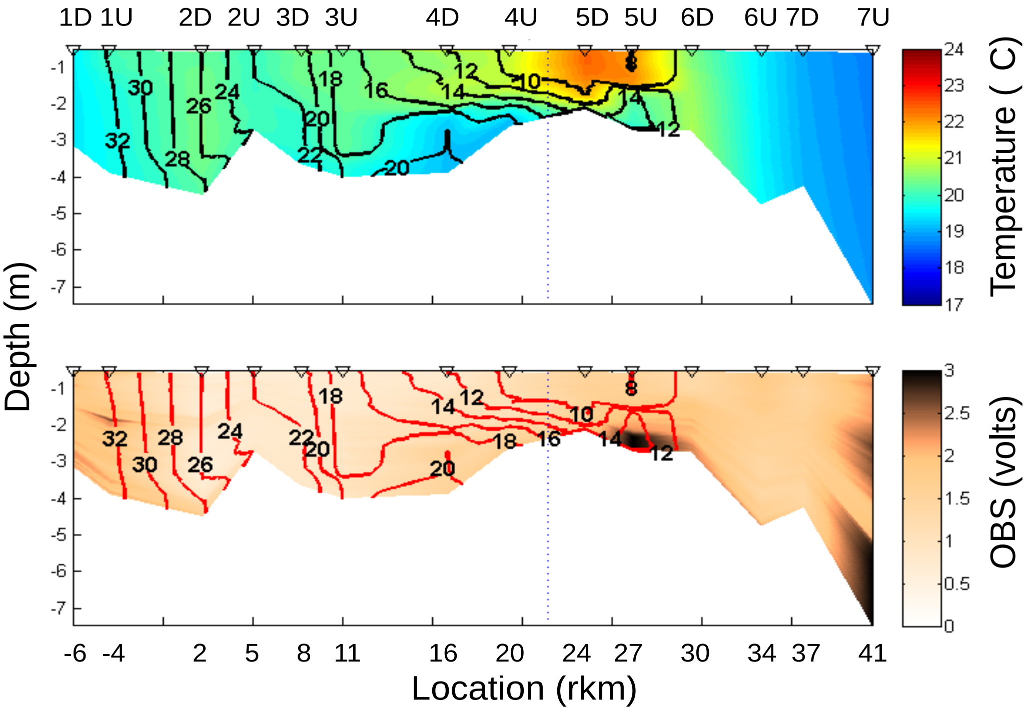
Top: Longitudinal temperature distribution with isohalines for September 2008. Bottom: Turbidity distribution (optical back scatter) with isohalines for September 2008. Stations are labeled according to site.



Top: Longitudinal temperature distribution with isohalines for October 2008. Bottom: Turbidity distribution (optical back scatter) with isohalines for October 2008. Stations are labeled according to site.



Top: Longitudinal temperature distribution with isohalines for November 2008. Bottom: Turbidity distribution (optical back scatter) with isohalines for November 2008. Stations are labeled according to site.



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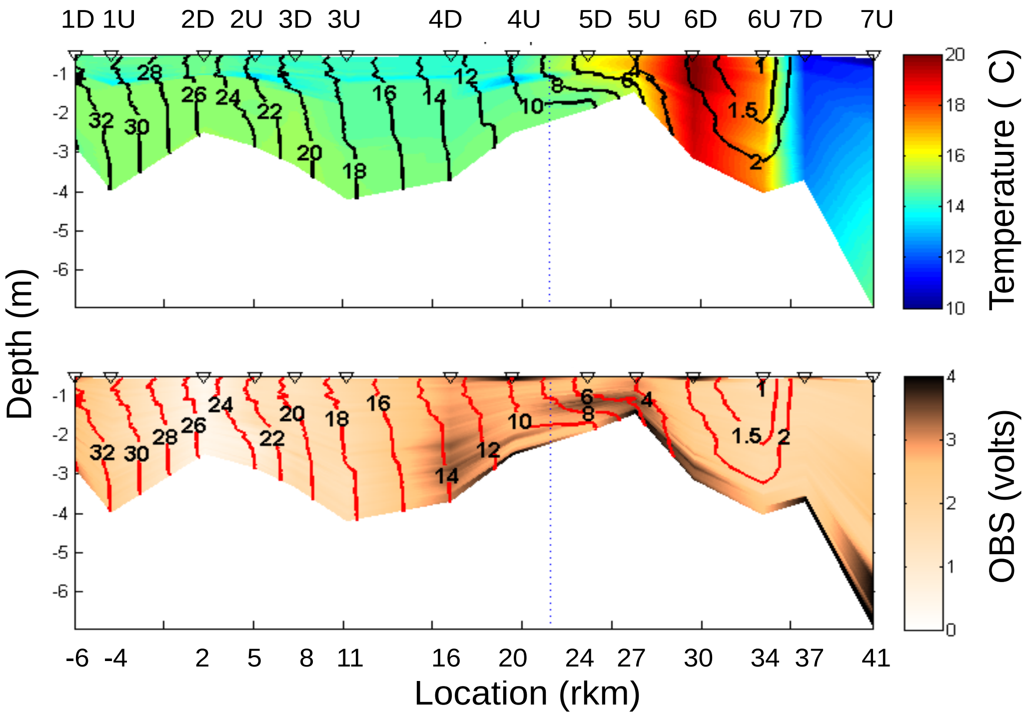

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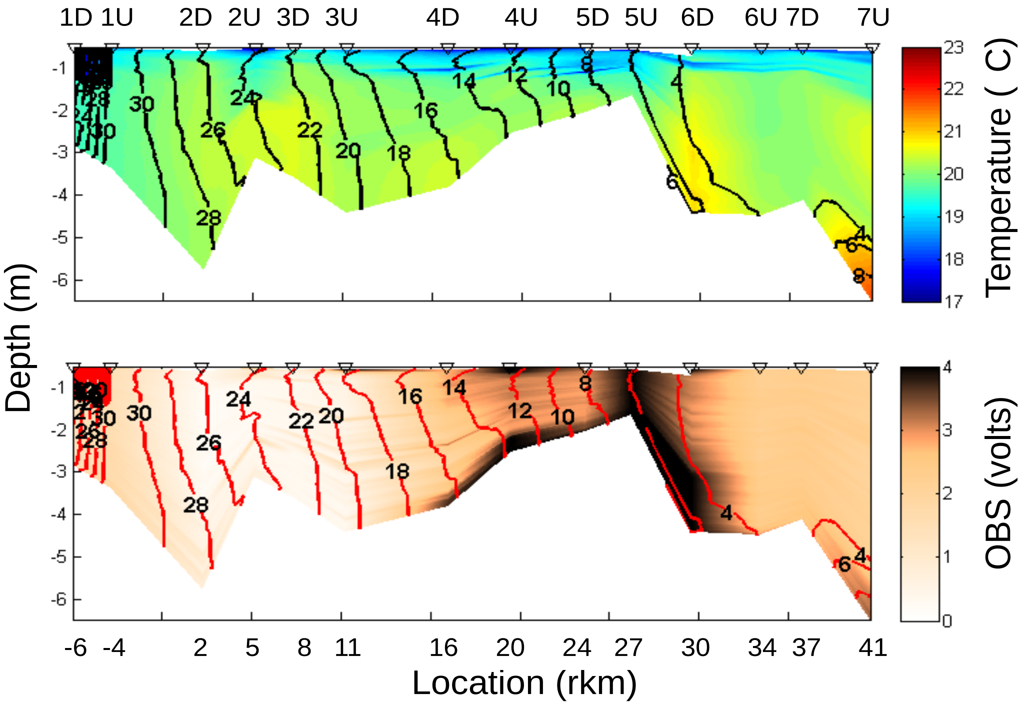

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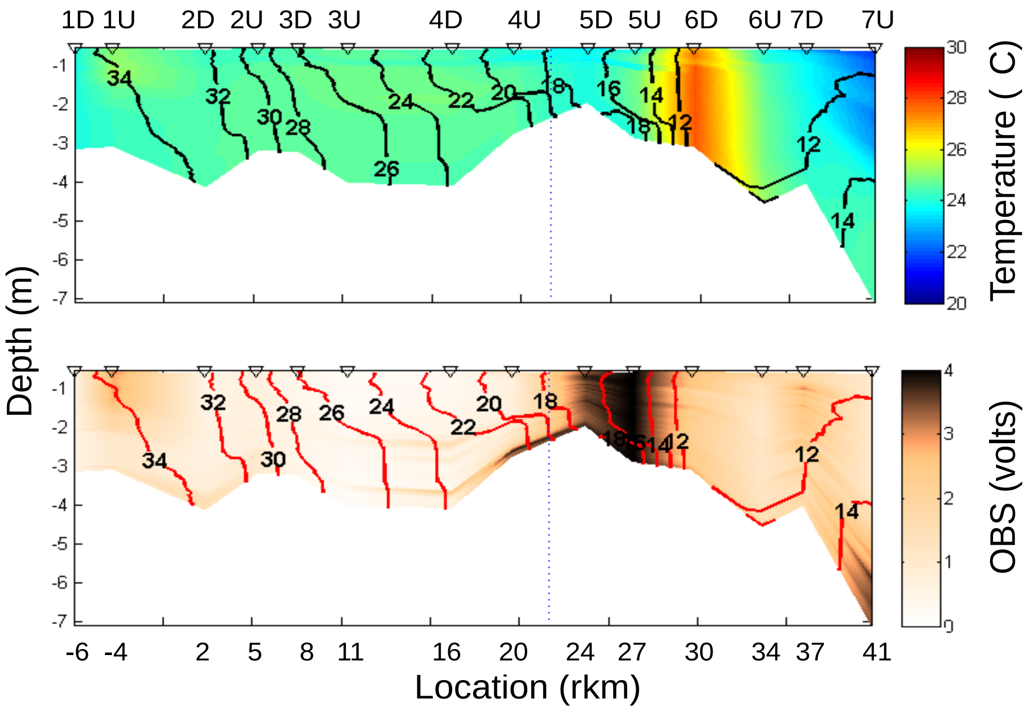
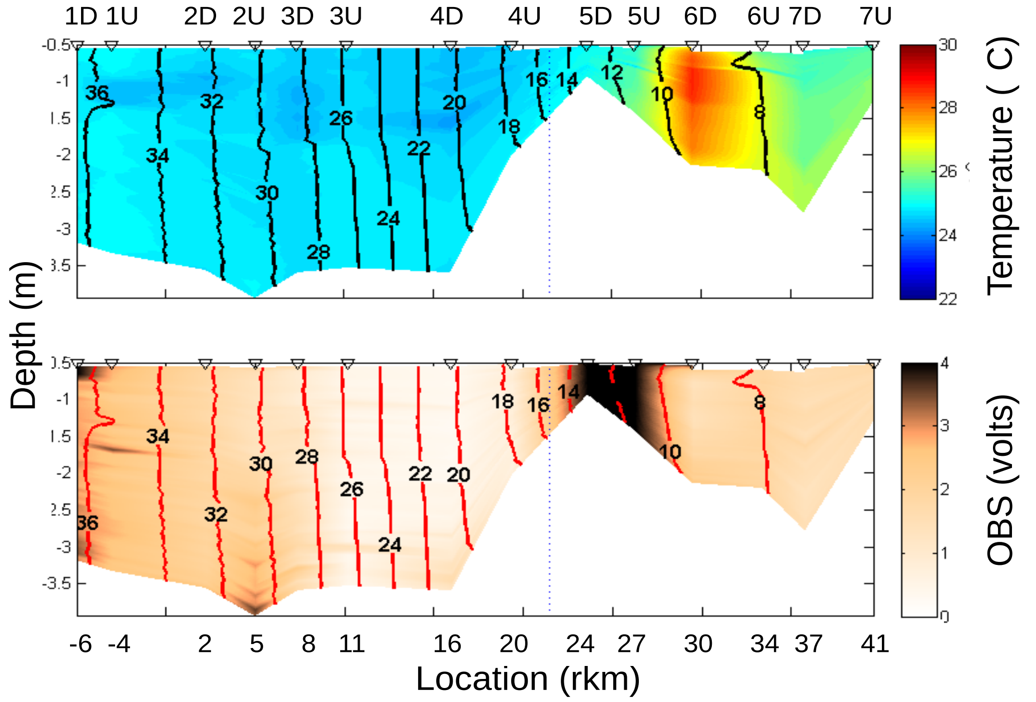


Top: Longitudinal temperature distribution with isohalines for March 2009. Bottom: Turbidity distribution (optical back scatter) with isohalines for March 2009. Stations are labeled according to site.



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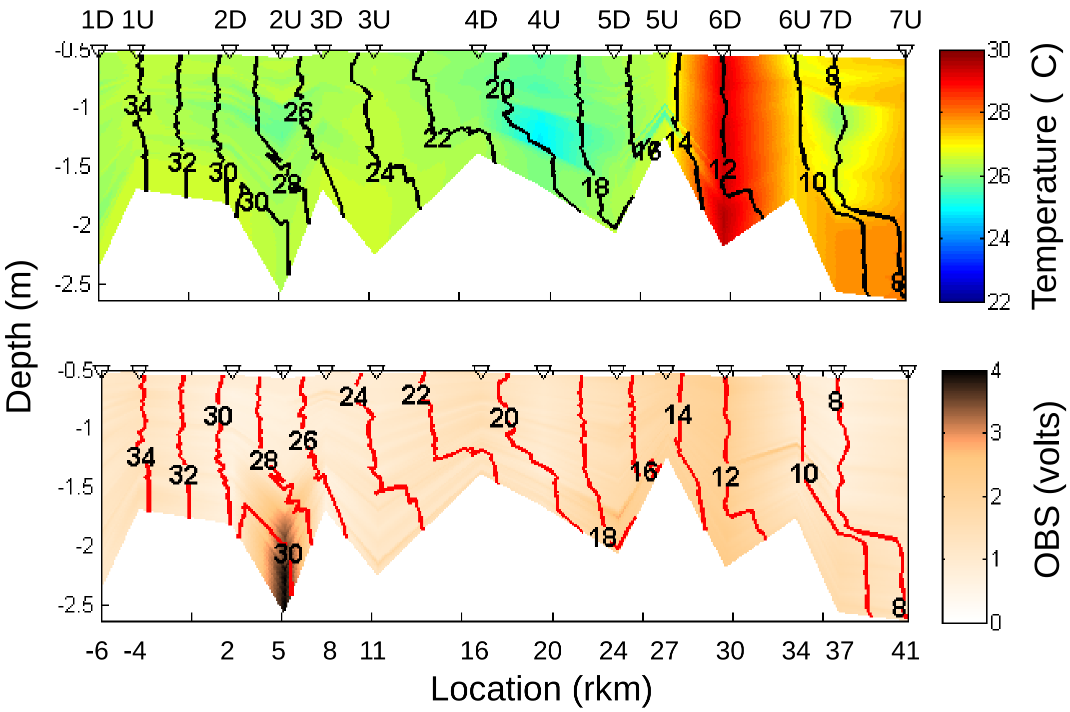
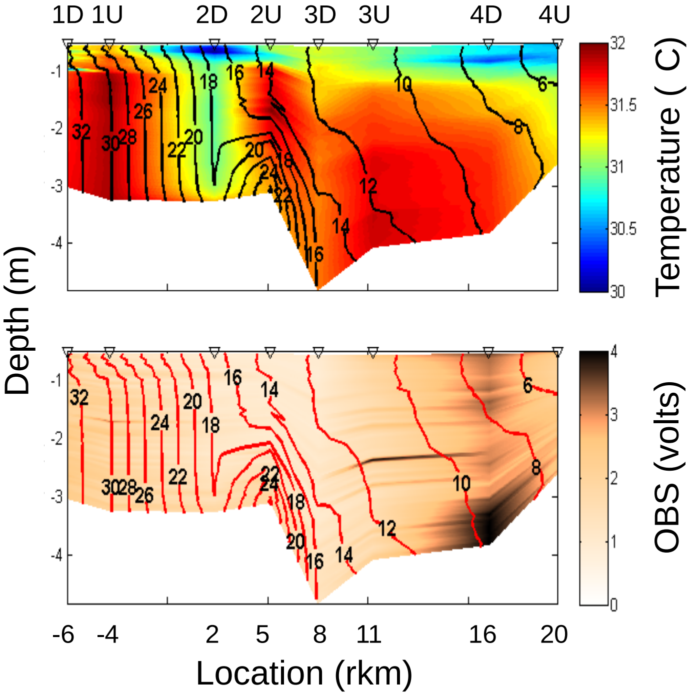
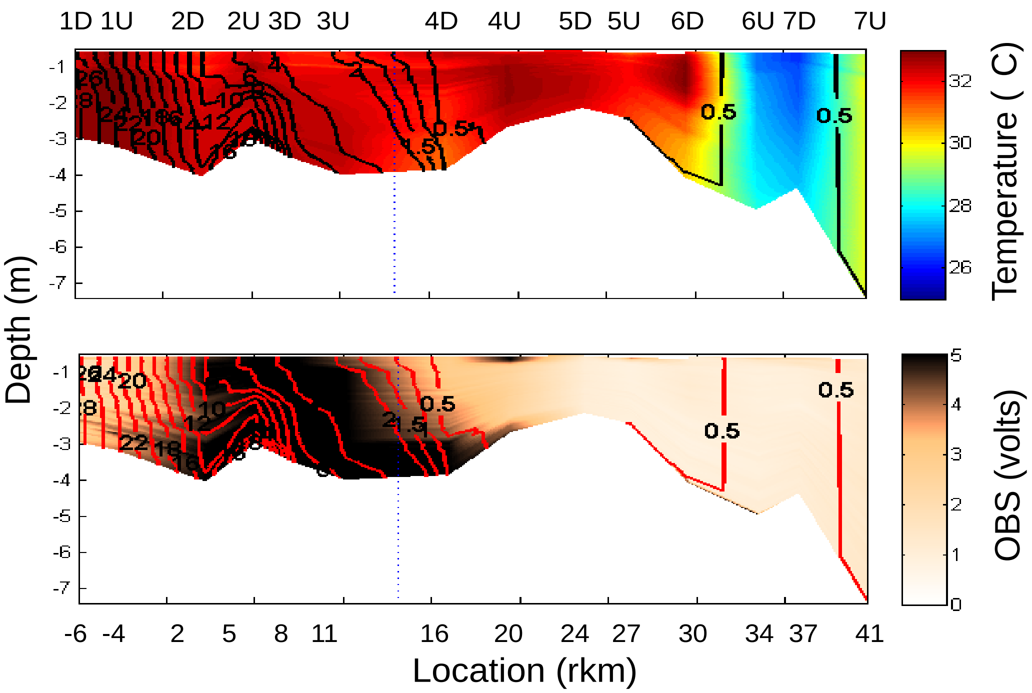


Top: Longitudinal temperature distribution with isohalines for May 2009. Bottom: Turbidity distribution (optical back scatter) with isohalines for May 2009. Stations are labeled according to site.



Top: Longitudinal temperature distribution with isohalines for June 2009. Bottom: Turbidity distribution (optical back scatter) with isohalines for June 2009. Stations are labeled according to site. Upper stations were not sampled due to instrument failure.



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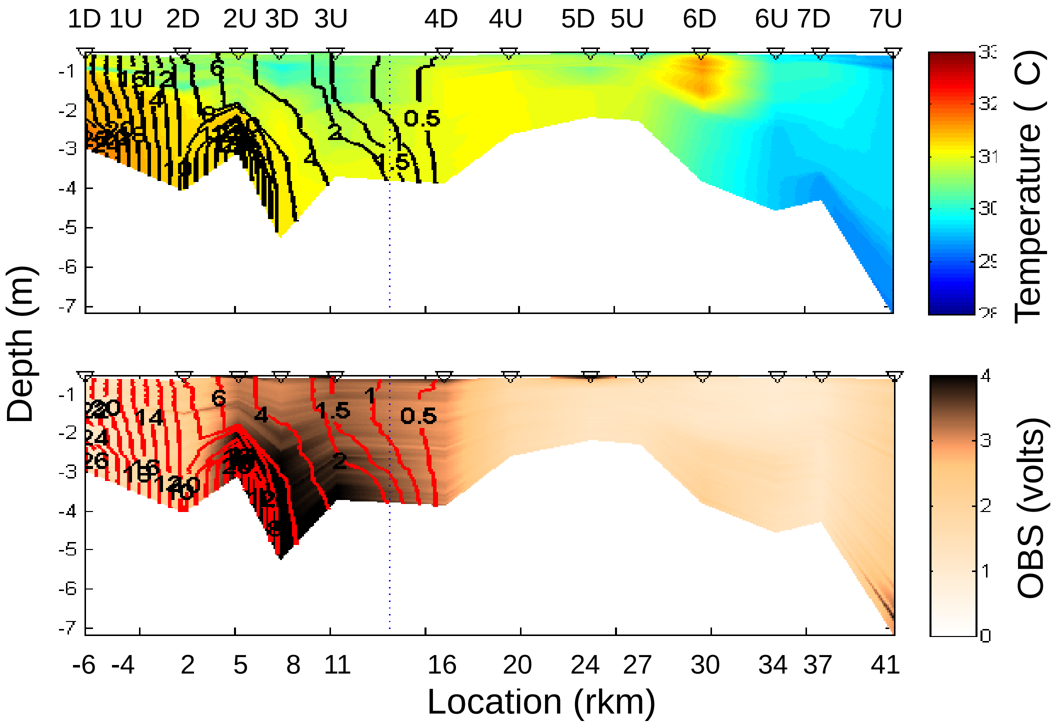

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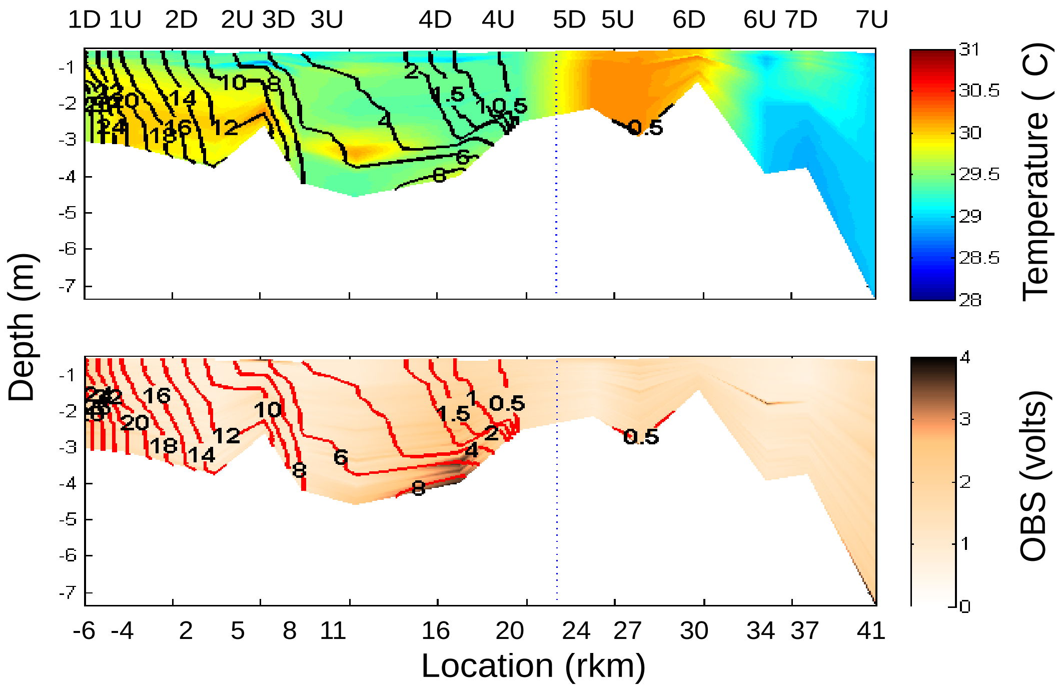

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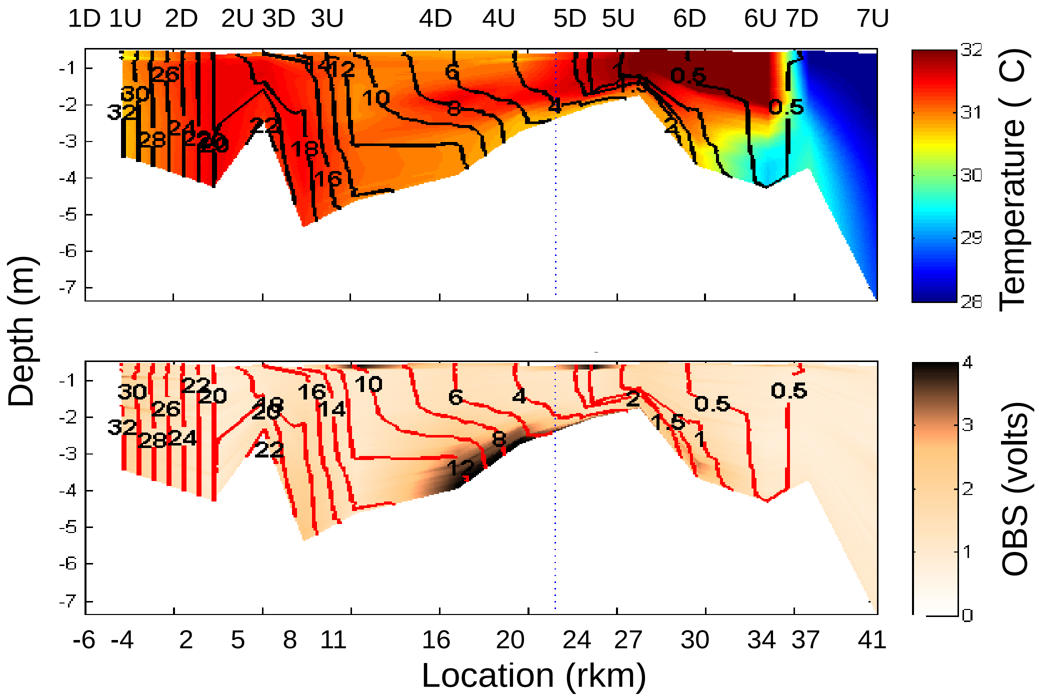

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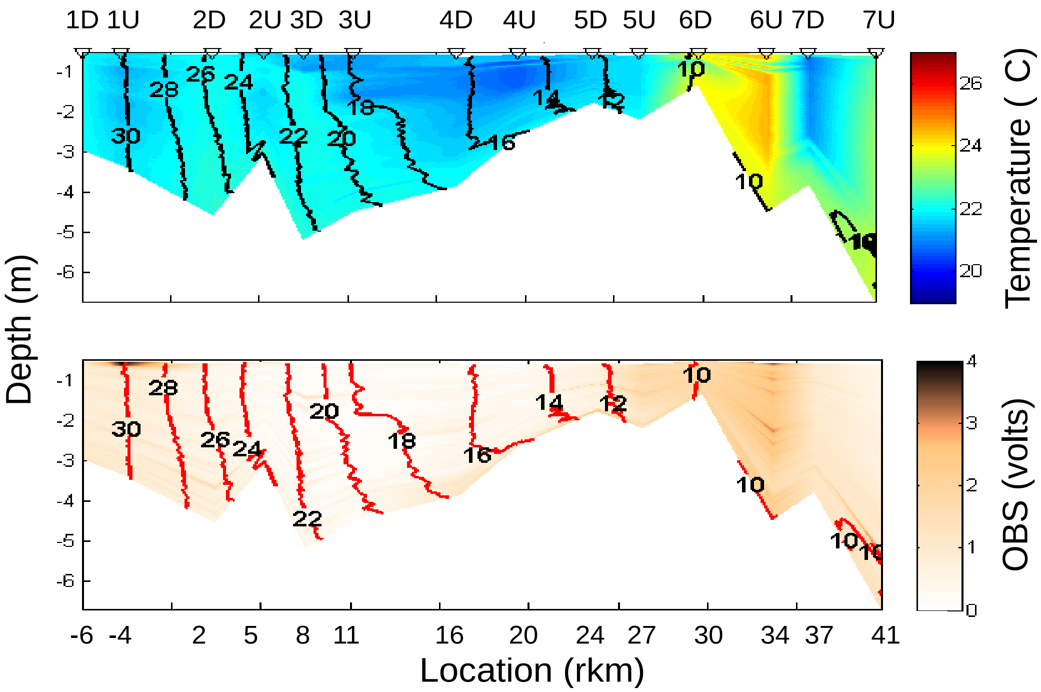

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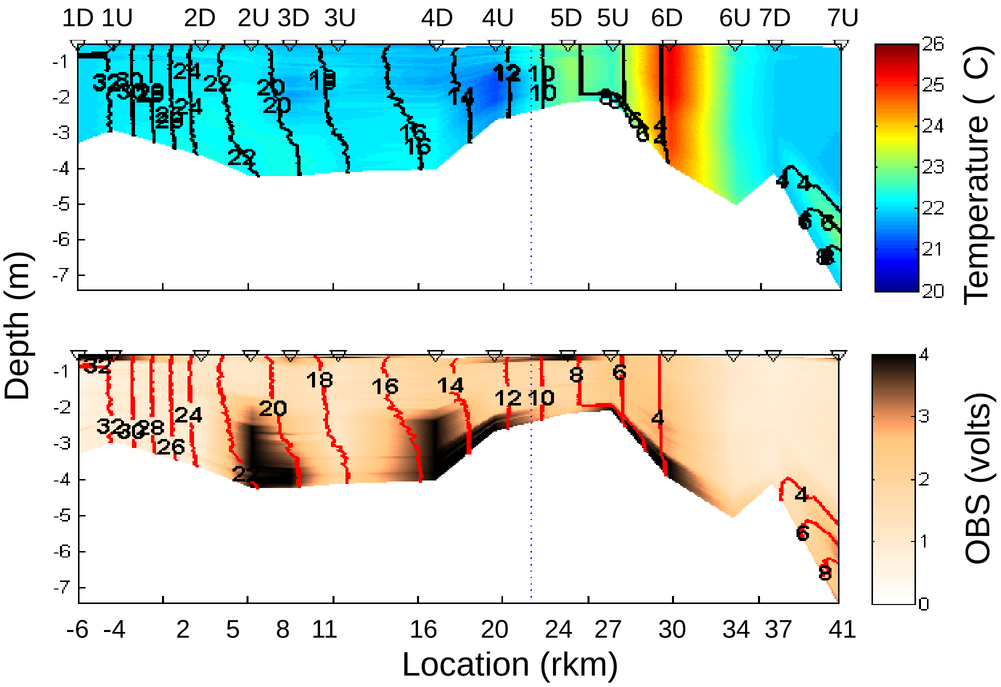

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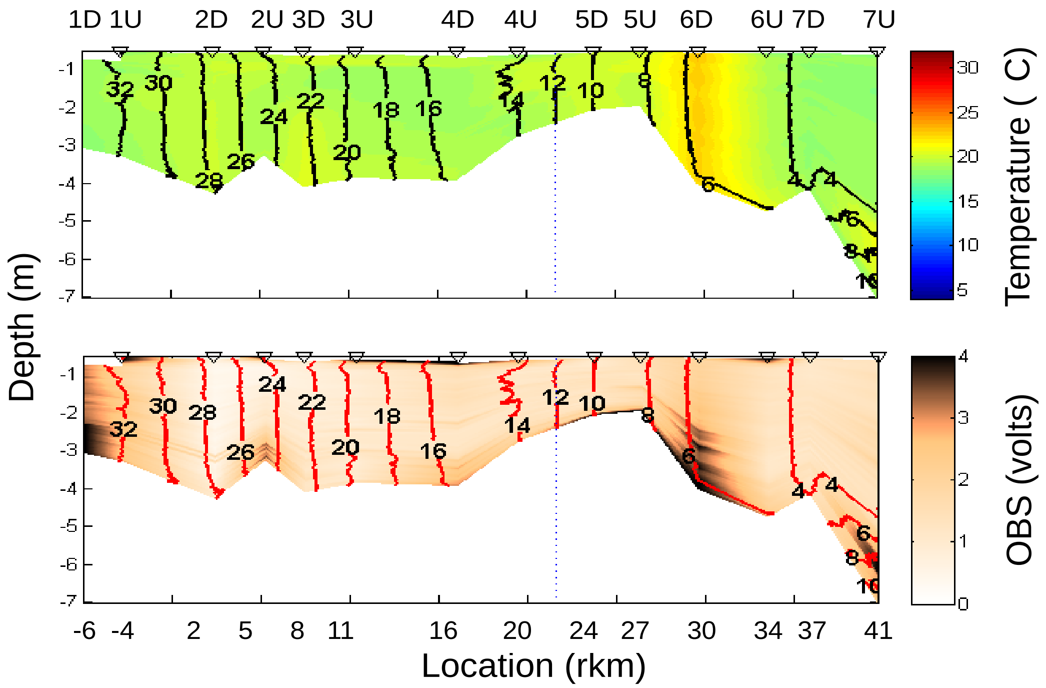

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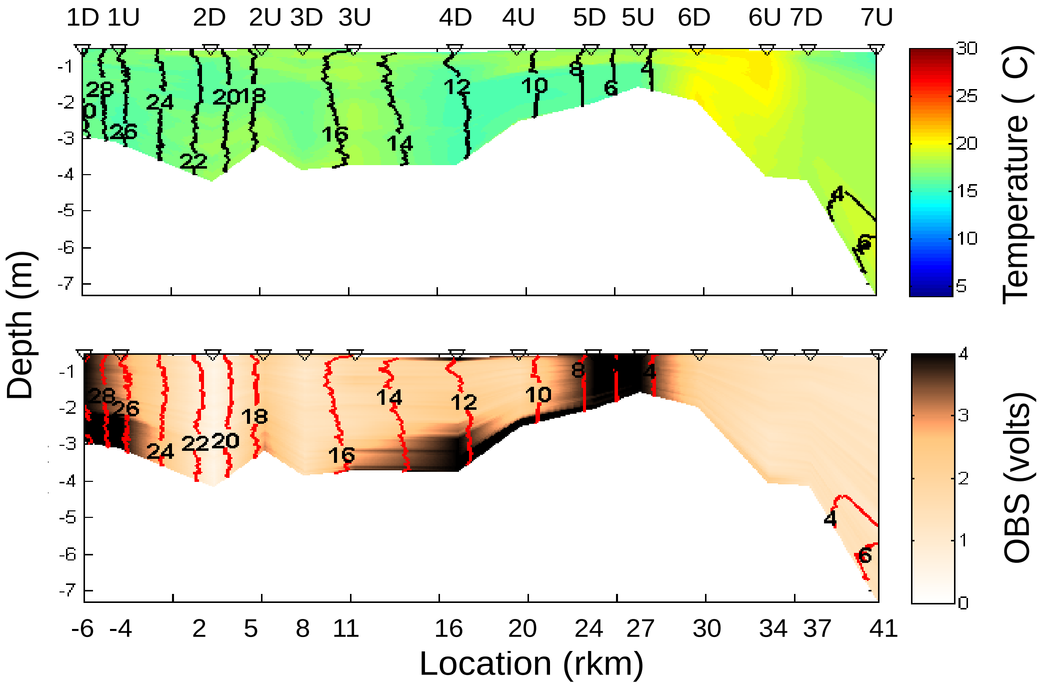

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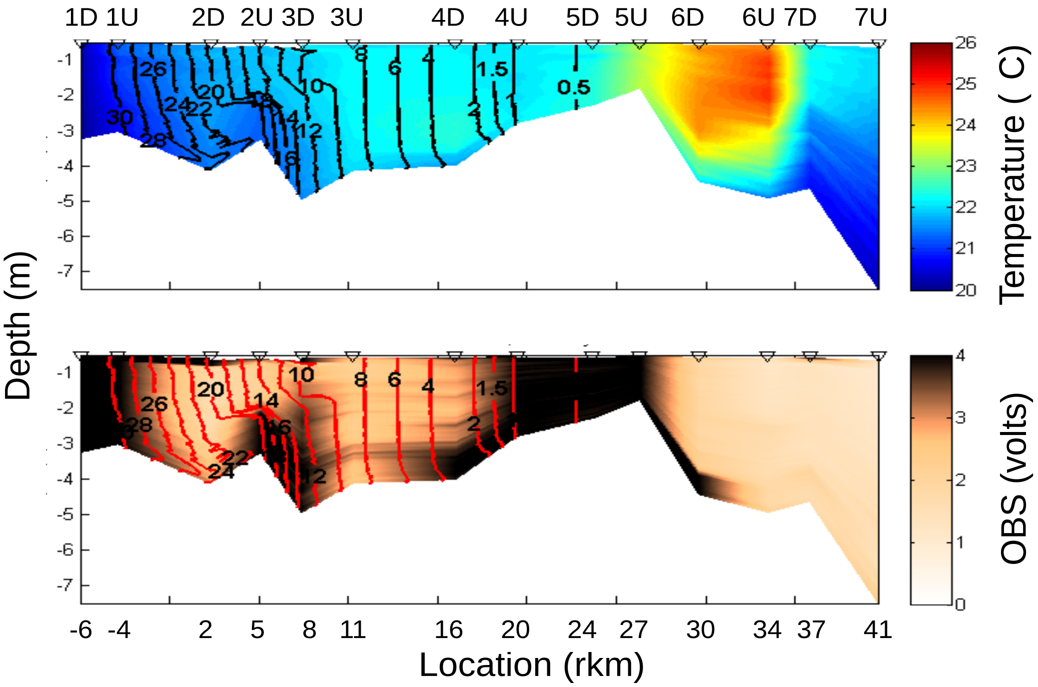

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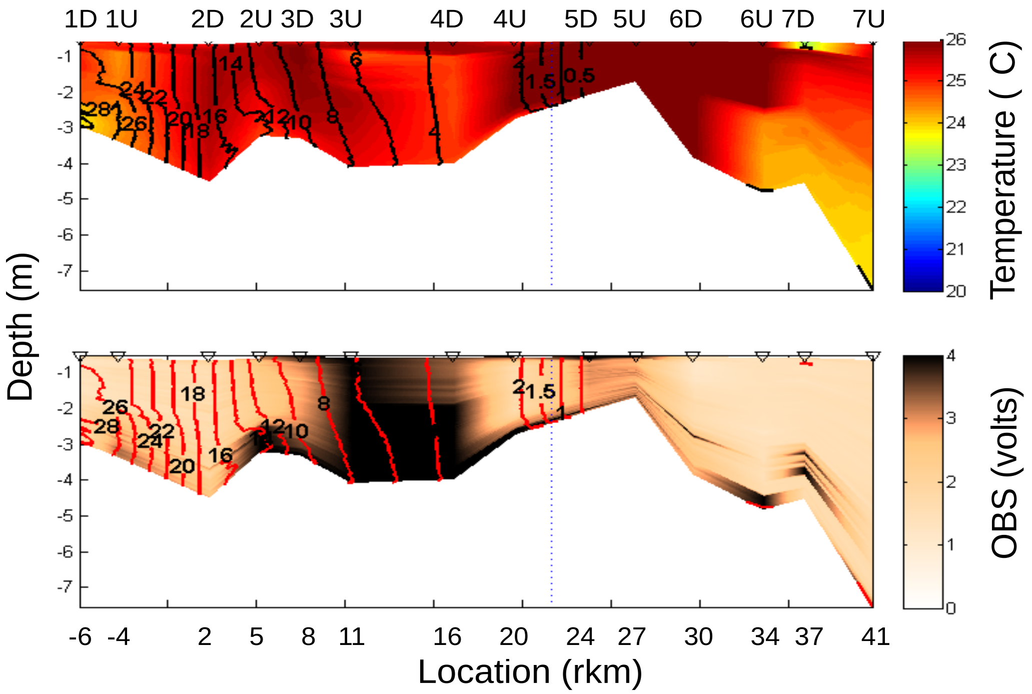

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Appendix B

Phytoplankton abundance (cells L^{-1}) for selected samples

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	7D	6D	7U	5U	5D	6D
species\month	May_2008	June_2008	July_2008	Aug_2008	Sept_2008	Oct_2008
Actinastrum	0	0	7727	0	0	101
Amphora >30	0	0	0	68	43	0
Amphora 20-30	0	0	0	0	0	0
Anabaena	0	1416	9421	0	0	0
Apatococcus	0	24	141	0	0	110
Apedinella	0	0	0	0	0	0
Aphanocapsa	0	0	795	3105	0	0
armored auto dino >30	196	94	0	0	0	7
armored auto dino 15-20	0	0	0	0	304	0
armored auto dino 20-30	0	376	212	0	0	22
Asterocapsa	0	0	0	0	0	0
Aulacoseira coarse	0	0	0	177	196	0
Aulacoseira fine	0	0	106	177	500	55
autotrophic ciliate 10-15	0	0	7	0	0	0
autotrophic ciliate 20-30	0	0	0	0	0	0
autotrophic flagellate 10-15	196	0	0	0	0	0
autotrophic flagellate 5-10	196	0	0	0	0	0
Bacillaria paxillifer	0	0	0	0	0	0
Campylodiscus clypeus	0	0	0	0	0	0
centric >30	785	0	0	89	87	0
centric 10-15	0	94	0	0	413	0
centric 15-20	1767	94	0	89	22	0
centric 20-30	785	6	0	0	0	14
centric 5-10		0	0	0	87	0
Centritractus	0	0	0	0	0	55
Cerataulina bicornis	5498	94	0	0	0	0
Cerataulina resting spore	0	0	0	0	0	0
Chaetoceros c.f. *subtilis*	0	0	0	0	0	0
Chaetoceros compressus	0	94	0	0	0	0
Chaetoceros constrictus	41	0	0	0	0	0
Chaetoceros curvisetus	61	0	0	0	0	0
Chaetoceros karianus	0	0	0	0	0	0
Chaetoceros laciniosis	393	0	0	0	0	0
Chaetoceros lorenzianus	230	0	0	0	0	0
Chaetoceros minimus	196	0	0	0	0	0
Chaetoceros seiracanthus	0	12	0	0	0	0
Chaetoceros simplex	27	565	0	0	0	0
Chaetoceros sp.	0	12	0	0	0	0
Chaetoceros subtilis	0	565	0	0	0	0
C. subtilis var. *abnormis* f. *simplex*	1178	753	0	0	0	0
Chaetoceros tenuissimus	0	94	0	0	0	0
Chaetoceros wighamii	0	12	0	0	0	0
chlorophyte coccoid 10-15	0	94	0	0	0	0
chlorophyte coccoid 15-20	0	94	0	0	0	0
chlorophyte coccoid 20-30	0	0	0	0	0	7
chlorophyte coccoid 5-10	0	84	0	0	0	0
chlorophyte coccoid colonial <5	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	7D	6D	7U	5U	5D	6D
species\month	May_2008	June_2008	July_2008	Aug_2008	Sept_2008	Oct_2008
chlorophyte coccoid colonial 10-15	0	0	319	177	0	144
chlorophyte coccoid colonial 15-20	0	0	0	0	0	0
chlorophyte coccoid colonial 5-10	0	0	0	0	0	0
chlorophyte filamentous	0	0	318	0	0	57
chlorophyte flagellated colonial	0	0	82	181	0	0
chlorophyte triangular	0	0	0	0	22	0
Chroococcus	0	0	0	0	0	0
Chrysochromulina	0	0	0	0	22	0
Closterium	0	0	106	23	0	55
Coelastrum microporum	0	0	0	0	0	0
Coscinodiscus >80	0	0	0	0	0	0
Coscinodiscus 20-40	0	0	0	0	0	0
Coscinodiscus 40-60	0	0	0	0	0	0
Coscinodiscus 60-80	0	94	0	0	0	7
Coscinodiscus granii	0	0	0	0	0	0
Cosmarium	0	0	0	1380	0	0
cryptomonad auto 10-15		6	0	0		0
cryptomonad auto 15-20	0	0	0	0	0	0
cryptomonad auto 20-30	0	0	0	0	0	0
cyanobacteria coccoid colonial	0	565	1905	0	0	1822
cyanobacteria filament	0	3293	3070	44356		2111
Cyanotetras	0	0	0	724	0	0
Cyclotella >30	0	0	0	0	0	22
Cyclotella 10-15	0	282	0	0	0	0
Cyclotella 15-20	0	0	0	89	0	110
Cyclotella 20-30	196	0	0	0	0	0
Cyclotella 5-10	0	0	0	177	0	0
Cylindrotheca >30	0	0	0	0	0	7
Cylindrotheca 10-15	0	0	0	0	0	0
Cylindrotheca 20-30	20	6	0	0	0	0
Desmodesmus	0	0	318	1419	87	65
Diacanthos belenophorus	0	0	0	0	0	0
Dicellula	0	0	0	0	0	7
Dinophysis ovum	0	36	0	0	0	0
Diploneis	0	0	0	0	0	0
Ditylum brightwellii	0	0	0	0	0	0
Entomoneis	0	0	0	0	0	0
Eudorina	0	0	1694	0	0	0
Euglena acus	0	12	0	0	0	0
Euglena oblonga	0	0	0	0	0	0
euglenoid auto >30	7	0	0	45	0	55
euglenoid auto 10-15	0	94	0	0	0	0
euglenoid auto 15-20	0	0	0	0	0	0
euglenoid auto 20-30	0	0	0	0	0	0
Fragilaria 10-15	0	0	0	621	174	50
Fragilaria 15-20	0	0	0	0	0	0
Fragilaria 20-30	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	7D	6D	7U	5U	5D	6D
species\month	May_2008	June_2008	July_2008	Aug_2008	Sept_2008	Oct_2008
Fragilaria 5-10	0	0	0	0	0	0
Gloeocapsa	0	0	0	0	0	0
Gloeocapsopsis	0	0	0	0	0	0
Golenkinia radiata	0	0	0	0	0	0
Gonyaulax polygramma	0	94	0	0	0	0
Gonyaulax sp.	0	0	0	0	0	0
Gonyaulax spinifera	0	188	0	0	0	0
Guinardia flaccida	636	0	0	0	0	0
Gymnodinium sanguineum	0	188	0	0	0	0
Gyrosigma fasciolata	0	0	0	0	0	0
Gyrosigma/Pleurosigma	0	0	0	0	0	0
Haptophyte	0	0	7	23	0	0
Leptocylindrus danicus	7657	54	0	0	0	0
Leptocylindrus minimus	0	0	0	0	0	0
Leptocylindrus minimus thin	0	0	0	0	0	0
Mallomonas	0	0	106	23	0	497
Melosira nummuloides	0	0	0	0	0	0
Melosira varians	0	24	423	2218	0	2539
Merismopedia	0	360	0	0	783	0
Mesodinium rubrum	0	0	0	0	0	0
Microcystis	0	0	2532	0	0	0
Microspora	0	0	0	0	0	55
naked auto dino >30	0	188	106	0	0	0
naked auto dino 10-15	0	0	106	0	0	0
naked auto dino 15-20	0	94	1799	0	22	0
naked auto dino 20-30	0	0	0	0	0	0
naked auto dino 5-10	196	0	0	0	0	0
Navicula >30	0	0	0	0	0	0
Navicula 20-30	0	0	0	0	0	0
Navicula lanceolate >30	0	0	0	0	0	0
Nitzschia capitate >30	0	0	0	0	0	0
Nitzschia capitate 20-30	0	0	0	0	0	0
Nitzschia colonial	0	0	0	0	0	0
Nitzschia lanceolate >30	0	12	0	89	22	110
Nitzschia ovoid >30	0	0	0	0	0	0
Nitzschia ovoid 10-15	0	0	0	0	0	0
Nitzschia sigmoid >30	0	0	0	0	0	0
Onychonema filiforme	0	0	0	45	0	0
Pandorina	0	0	0	0	0	115
Parapedinella reticulata	0	0	0	0	0	0
Pediastrum	0	0	200	1863	0	0
pennate >100	0	0	0	0	22	0
pennate 10-20	0	188	0	0	0	0
pennate 20-40	196	6	0	23	22	221
pennate 40-80	0	0	0	89	0	7
Phacus	0	0	0	45	22	0
Phaeophyte filamentous	0	0	56101	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	7D	6D	7U	5U	5D	6D
species\month	May_2008	June_2008	July_2008	Aug_2008	Sept_2008	Oct_2008
phytoflagellate 10-15	0	0	106	266	0	276
phytoflagellate 15-20	0	0	635	0	0	276
phytoflagellate 20-30	0	6	847	89	0	0
phytoflagellate 5-10	0	0	0	0	0	0
Planktolyngbya	0	0	15772	14105	0	129
Planktothrix	0	118657	19265	1471	0	373
Platydorina	0	0	0	0	0	0
Polyedriopsis spinulosa	0	0	0	89	0	0
Prorocentrum micans	785	1694	0	0	0	0
Prorocentrum minimum	0	659	0	0	0	0
Pseudo-nitzschia brasiliana	108	0	0	0	0	0
Pseudo-nitzschia other	0	0	0	0	0	0
Pseudo-nitzschia pungens group	128800	0	0	89	0	0
Pseudostaurastrum lobulatum	0	0	0	0	0	7
Radiococcus	0	0	0	0	0	0
Rhizosolenia setigera	0	0	0	0	0	0
Scenedesmus	0	0	0	710	0	136
Scrippsiella	0	18	0	0	0	0
silicoflagellate	0	0	0	0	0	0
Skeletonema auxospore	0	0	0	0	0	0
Skeletonema grethae	0	0	0	0	0	0
Skeletonema subsalsum	8246	2352	0	2307	0	386
Skeletonema tropicum	7068	0	0	45	0	1325
Snowella	0	565	0	0	0	0
Spirogyra	0	0	0	0	65	0
Spirulina	0	0	661	0	0	0
Stanieria	0	0	0	0	1109	57
Staurastrum anatinum	0	0	15	45	0	0
Staurastrum other	0	0	0	0	0	7
Staurodesmus cuspidatus	0	0	0	23	0	0
Strombidium	0	0	0	0	0	0
Surirella	0	0	0	0	9	0
Tabularia tabulata	0	0	0	89	0	0
Terpsinoe	0	0	0	0	0	0
Thalassionema nitzschioides	0	0	0	0	0	0
Thalassiosira <10	0	0	0	0	0	0
Thalassiosira 10-20	2749	12	0	0	0	55
Thalassiosira 20-40	0	12	318	0	0	0
Thalassiosira 40-60	0	0	0	0	0	0
Trichodesmium	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	7D	5U	6U	5D	6D
species\month	Nov_2008	Dec_2008	Jan_2009	Feb_2009	Mar_2009	Apr_2009
Actinastrum	0	0	0	0	0	0
Amphora >30	0	0	0	0	17	0
Amphora 20-30	0	0	0	0	0	0
Anabaena	0	0	0	0	0	0
Apatococcus	0	0	0	0	0	0
Apedinella	0	0	0	0	0	0
Aphanocapsa	0	0	0	316	0	0
armored auto dino >30	1095	0	0	0	0	0
armored auto dino 15-20	0	0	0	0	0	0
armored auto dino 20-30	0	5	0	8	492	0
Asterocapsa	0	0	0	0	0	0
Aulacoseira coarse	0	0	0	0	0	0
Aulacoseira fine	0	73	41	173	0	2
autotrophic ciliate 10-15	0	0	0	0	0	0
autotrophic ciliate 20-30	0	0	0	0	0	0
autotrophic flagellate 10-15	0	0	0	0	0	0
autotrophic flagellate 5-10	0	0	0	0	0	0
Bacillaria paxillifer	6024	21	0	0	0	0
Campylodiscus clypeus	0	0	0	0	0	0
centric >30	0	0	0	16	123	0
centric 10-15	548	0	1029	553	0	0
centric 15-20	17524	355	882	79	246	0
centric 20-30	3833	39	0	0	123	18
centric 5-10	0	0	0	0	0	0
Centritractus	0	0	0	0	0	0
Cerataulina bicornis	4381	0	0	0	0	5
Cerataulina resting spore	38	0	0	0	0	0
Chaetoceros c.f. *subtilis*	0	0	0	869	0	0
Chaetoceros compressus	1643	0	0	0	0	0
Chaetoceros constrictus	0	0	0	0	0	0
Chaetoceros curvisetus	2738	0	0	316	0	0
Chaetoceros karianus	7667	0	0	632	0	0
Chaetoceros laciniosis	0	0	0	0	0	0
Chaetoceros lorenzianus	2190	0	0	0	0	0
Chaetoceros minimus	0	0	0	0	0	0
Chaetoceros seiracanthus	1643	0	0	0	0	0
Chaetoceros simplex	0	0	0	0	0	0
Chaetoceros sp.	226	0	0	0	0	0
Chaetoceros subtilis	0	0	0	0	0	0
C. subtilis var. *abnormis* f. *simplex*	0	0	0	0	0	0
Chaetoceros tenuissimus	0	0	0	0	0	0
Chaetoceros wighamii	0	0	0	0	0	0
chlorophyte coccoid 10-15	0	5	0	79	0	0
chlorophyte coccoid 15-20	0	0	0	0	0	0
chlorophyte coccoid 20-30	0	0	0	0	0	0
chlorophyte coccoid 5-10	0	0	0	0	0	0
chlorophyte coccoid colonial <5	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	7D	5U	6U	5D	6D
species\month	Nov_2008	Dec_2008	Jan_2009	Feb_2009	Mar_2009	Apr_2009
chlorophyte coccoid colonial 10-15	0	0	0	0	0	0
chlorophyte coccoid colonial 15-20	0	0	0	0	0	0
chlorophyte coccoid colonial 5-10	0	0	0	237	0	0
chlorophyte filamentous	0	0	0	0	0	0
chlorophyte flagellated colonial	0	0	0	0	0	0
chlorophyte triangular	0	0	0	0	0	0
Chroococcus	0	21	0	0	0	0
Chrysochromulina	0	0	0	0	0	0
Closterium	0	0	0	0	0	0
Coelastrum microporum	0	0	0	0	0	0
Coscinodiscus >80	0	0	0	0	68	0
Coscinodiscus 20-40	0	0	0	0	17	0
Coscinodiscus 40-60	0	0	0	0	0	0
Coscinodiscus 60-80	0	0	0	0	0	0
Coscinodiscus granii	0	0	0	0	861	0
Cosmarium	0	39	0	0	0	0
cryptomonad auto 10-15	0	0	0	0	369	804
cryptomonad auto 15-20	0	0	147	0	0	0
cryptomonad auto 20-30	0	0	0	8	0	0
cyanobacteria coccoid colonial	0	0	516	0	0	0
cyanobacteria filament	155521	6632	7498	1264	0	0
Cyanotetras	0	0	0	0	0	0
Cyclotella >30	0	0	0	0	0	0
Cyclotella 10-15	1095	0	147	158	0	0
Cyclotella 15-20	1643	0	1029	0	17	0
Cyclotella 20-30	3833	0	147	0	0	124
Cyclotella 5-10	0	0	0	79	0	0
Cylindrotheca >30	0	0	0	0	0	0
Cylindrotheca 10-15	0	0	0	0	0	0
Cylindrotheca 20-30	0	0	0	8	0	0
Desmodesmus	0	39	83	316	0	0
Diacanthos belenophorus	0	0	0	0	0	0
Dicellula	0	0	0	0	0	0
Dinophysis ovum	0	0	0	0	0	0
Diploneis	0	5	0	0	0	0
Ditylum brightwellii	0	0	0	0	17	0
Entomoneis	0	0	0	0	0	0
Eudorina	0	0	0	0	0	0
Euglena acus	0	0	0	0	0	0
Euglena oblonga	0	0	0	0	0	0
euglenoid auto >30	0	0	0	0	0	124
euglenoid auto 10-15	0	0	0	0	0	0
euglenoid auto 15-20	0	0	0	0	0	0
euglenoid auto 20-30	38	0	0	0	0	0
Fragilaria 10-15	0	0	0	0	0	0
Fragilaria 15-20	0	0	0	0	0	0
Fragilaria 20-30	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	7D	5U	6U	5D	6D
species\month	Nov_2008	Dec_2008	Jan_2009	Feb_2009	Mar_2009	Apr_2009
Fragilaria 5-10	0	0	0	79	0	0
Gloeocapsa	0	0	0	0	0	0
Gloeocapsopsis	0	0	0	0	0	1733
Golenkinia radiata	0	0	0	0	0	0
Gonyaulax polygramma	75	0	0	0	0	0
Gonyaulax sp.	0	0	0	0	0	124
Gonyaulax spinifera	38	0	0	0	0	18
Guinardia flaccida	0	0	0	0	0	0
Gymnodinium sanguineum	0	0	4116	0	34	1609
Gyrosigma fasciolata	0	0	0	0	0	0
Gyrosigma/Pleurosigma	0	0	0	0	0	0
Haptophyte	1095	0	0	0	0	0
Leptocylindrus danicus	0	0	0	948	0	0
Leptocylindrus minimus	0	0	0	395	984	0
Leptocylindrus minimus thin	0	0	0	0	492	0
Mallomonas	0	0	0	0	0	0
Melosira nummuloides	0	0	0	0	0	0
Melosira varians	0	0	0	711	0	0
Merismopedia	0	0	0	754	0	0
Mesodinium rubrum	0	0	147	0	123	62
Microcystis	0	0	0	4330	0	0
Microspora	0	0	0	0	0	0
naked auto dino >30	0	0	0	0	0	0
naked auto dino 10-15	0	0	0	0	0	124
naked auto dino 15-20	0	0	0	0	0	0
naked auto dino 20-30	0	16	0	0	0	0
naked auto dino 5-10	0	0	0	0	0	0
Navicula >30	548	0	0	0	0	0
Navicula 20-30	548	0	0	0	0	0
Navicula lanceolate >30	38	0	0	0	0	0
Nitzschia capitate >30	0	0	0	0	0	0
Nitzschia capitate 20-30	0	0	0	0	0	0
Nitzschia colonial	0	0	0	0	0	0
Nitzschia lanceolate >30	0	0	0	0	1	0
Nitzschia ovoid >30	0	0	0	0	0	0
Nitzschia ovoid 10-15	0	0	0	0	0	0
Nitzschia sigmoid >30	0	0	0	0	17	0
Onychonema filiforme	0	0	0	0	0	0
Pandorina	0	0	0	79	0	0
Parapedinella reticulata	0	0	0	0	0	0
Pediastrum	0	0	0	0	0	0
pennate >100	0	0	0	0	1	0
pennate 10-20	548	39	147	711	0	0
pennate 20-40	38	16	0	31	0	0
pennate 40-80	548	0	0	8	0	0
Phacus	0	0	0	0	0	0
Phaeophyte filamentous	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	7D	5U	6U	5D	6D
species\month	Nov_2008	Dec_2008	Jan_2009	Feb_2009	Mar_2009	Apr_2009
phytoflagellate 10-15	548	10	294	79	1476	0
phytoflagellate 15-20	0	21	0	79	123	0
phytoflagellate 20-30	0	0	0	0	0	0
phytoflagellate 5-10	0	0	0	0	0	62
Planktolyngbya	4928	0	0	0	0	0
Planktothrix	0	0	0	0	0	0
Platydorina	0	0	0	0	0	0
Polyedriopsis spinulosa	0	0	0	0	0	0
Prorocentrum micans	0	0	0	0	0	0
Prorocentrum minimum	0	0	0	0	1107	124
Pseudo-nitzschia brasiliana	0	0	0	0	0	0
Pseudo-nitzschia other	0	0	0	0	0	0
Pseudo-nitzschia pungens group	0	0	0	0	0	18
Pseudostaurastrum lobulatum	0	0	0	0	0	0
Radiococcus	0	0	0	0	0	0
Rhizosolenia setigera	75	0	0	0	0	0
Scenedesmus	0	0	0	0	0	0
Scrippsiella	0	0	0	0	123	248
silicoflagellate	0	0	0	0	0	0
Skeletonema auxospore	0	0	0	0	0	0
Skeletonema grethae	0	0	0	0	0	0
Skeletonema subsalsum	922614	29876	101746	164283	186275	6188
Skeletonema tropicum	0	10262	0	0	0	0
Snowella	0	0	0	1580	0	0
Spirogyra	0	0	0	0	0	0
Spirulina	0	0	0	0	0	0
Stanieria	0	0	0	0	0	0
Staurastrum anatinum	0	0	0	0	0	0
Staurastrum other	0	0	0	0	0	0
Staurodesmus cuspidatus	0	0	0	0	0	0
Strombidium	548	0	0	79	0	0
Surirella	38	0	0	0	0	0
Tabularia tabulata	0	0	0	0	0	0
Terpsinoe	0	0	0	0	1	0
Thalassionema nitzschioides	0	0	0	0	0	0
Thalassiosira <10	0	0	0	0	0	0
Thalassiosira 10-20	0	5	0	0	0	0
Thalassiosira 20-40	0	0	0	0	0	0
Thalassiosira 40-60	0	0	0	0	0	62
Trichodesmium	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	6U	6U	3U	7U	6U	5U
species\month	May_2009	June_2009	July_2009	Aug_2009	Sept_2009	Oct_2009
Actinastrum	0	2592	462	0	0	1987
Amphora >30	0	0	0	0	0	0
Amphora 20-30	0	0	0	0	6787	0
Anabaena	0	0	0	0	0	0
Apatococcus	0	0	0	0	0	0
Apedinella	0	0	0	0	0	0
Aphanocapsa	0	407	0	0	0	0
armored auto dino >30	0	0	0	1926	0	0
armored auto dino 15-20	0	0	0	0	0	0
armored auto dino 20-30	0	324	0	0	0	248
Asterocapsa	0	0	1365	0	0	0
Aulacoseira coarse	0	0	0	0	0	0
Aulacoseira fine	0	379	2622	3853	0	178150
autotrophic ciliate 10-15	0	0	0	0	0	0
autotrophic ciliate 20-30	249	0	0	0	0	0
autotrophic flagellate 10-15	0	0	0	0	0	0
autotrophic flagellate 5-10	0	0	0	0	0	0
Bacillaria paxillifer	0	0	0	0	0	0
Campylodiscus clypeus	0	0	0	0	0	0
centric >30	0	0	807	0	866	0
centric 10-15	0	972	2622	963	0	0
centric 15-20	124	0	1412	0	289	41
centric 20-30	0	0	403	0	0	81
centric 5-10	0	0	0	0	0	0
Centritractus	0	324	0	0	0	20
Cerataulina bicornis	166	0	0	0	0	0
Cerataulina resting spore	0	0	202	0	0	0
Chaetoceros c.f. *subtilis*	0	0	0	0	0	0
Chaetoceros compressus	41	0	0	0	0	0
Chaetoceros constrictus	0	0	0	0	0	0
Chaetoceros curvisetus	0	0	0	0	0	0
Chaetoceros karianus	0	0	0	0	0	0
Chaetoceros laciniosis	0	0	0	0	0	0
Chaetoceros lorenzianus	0	0	0	0	0	0
Chaetoceros minimus	0	0	0	0	0	0
Chaetoceros seiracanthus	55	0	0	0	0	0
Chaetoceros simplex	0	0	0	0	0	0
Chaetoceros sp.	0	0	40	0	0	0
Chaetoceros subtilis	663	0	0	0	0	0
C. subtilis var. *abnormis* f. *simplex*	41	0	0	0	0	0
Chaetoceros tenuissimus	0	0	0	0	0	0
Chaetoceros wighamii	0	0	0	0	0	0
chlorophyte coccoid 10-15	0	972	0	0	0	0
chlorophyte coccoid 15-20	0	0	40	0	0	0
chlorophyte coccoid 20-30	0	0	0	0	0	0
chlorophyte coccoid 5-10	0	0	3227	21782	0	0
chlorophyte coccoid colonial <5	0	3240	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	6U	6U	3U	7U	6U	5U
species\month	May_2009	June_2009	July_2009	Aug_2009	Sept_2009	Oct_2009
chlorophyte coccoid colonial 10-15	0	0	0	0	0	0
chlorophyte coccoid colonial 15-20	0	0	0	0	0	0
chlorophyte coccoid colonial 5-10	0	0	0	0	0	162
chlorophyte filamentous	0	0	0	963	0	0
chlorophyte flagellated colonial	0	0	0	0	0	0
chlorophyte triangular	0	0	0	0	0	0
Chroococcus	0	1296	0	0	0	0
Chrysochromulina	0	0	0	0	0	0
Closterium	0	70	0	963	0	0
Coelastrum microporum	0	0	0	0	0	0
Coscinodiscus >80	0	0	0	0	0	0
Coscinodiscus 20-40	0	0	0	0	0	0
Coscinodiscus 40-60	41	0	0	0	0	0
Coscinodiscus 60-80	0	0	0	0	0	0
Coscinodiscus granii	41	0	0	0	0	0
Cosmarium	0	0	0	0	0	0
cryptomonad auto 10-15	0	0	0	0	0	0
cryptomonad auto 15-20	0	0	0	0	0	0
cryptomonad auto 20-30	0	0	0	0	0	0
cyanobacteria coccoid colonial	0	26242	11900	0	18099	0
cyanobacteria filament	0	0	8107	50825	2262433	10431
Cyanotetras	0	0	0	0	0	0
Cyclotella >30	0	0	0	0	0	0
Cyclotella 10-15	0	1620	202	963	0	0
Cyclotella 15-20	0	0	0	0	0	0
Cyclotella 20-30	124	324	0	0	0	0
Cyclotella 5-10	0	0	0	0	0	0
Cylindrotheca >30	0	0	20	0	0	0
Cylindrotheca 10-15	41	0	0	0	0	0
Cylindrotheca 20-30	41	56	202	0	0	0
Desmodesmus	0	1296	807	7705	13575	41
Diacanthos belenophorus	0	14	0	0	0	0
Dicellula	0	0	0	0	0	0
Dinophysis ovum	0	0	0	0	0	0
Diploneis	41	0	0	963	0	20
Ditylum brightwellii	0	0	0	0	0	0
Entomoneis	0	0	0	0	0	0
Eudorina	0	6480	0	0	0	487
Euglena acus	0	0	0	0	0	0
Euglena oblonga	0	0	0	0	0	0
euglenoid auto >30	5	0	0	0	0	0
euglenoid auto 10-15	0	0	0	0	0	0
euglenoid auto 15-20	0	0	0	0	0	0
euglenoid auto 20-30	5	0	0	0	0	0
Fragilaria 10-15	0	0	0	0	289	0
Fragilaria 15-20	0	0	0	58086	0	0
Fragilaria 20-30	0	0	0	7261	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	6U	6U	3U	7U	6U	5U
species\month	May_2009	June_2009	July_2009	Aug_2009	Sept_2009	Oct_2009
Fragilaria 5-10	0	0	0	72607	11312	0
Gloeocapsa	0	0	161	0	0	0
Gloeocapsopsis	0	0	0	0	0	0
Golenkinia radiata	0	324	20	0	0	0
Gonyaulax polygramma	0	0	0	0	0	0
Gonyaulax sp.	0	0	0	0	0	0
Gonyaulax spinifera	290	0	0	0	0	0
Guinardia flaccida	0	0	0	0	0	0
Gymnodinium sanguineum	1408	14	0	0	0	0
Gyrosigma fasciolata	0	0	0	0	289	0
Gyrosigma/Pleurosigma	0	0	0	0	0	0
Haptophyte	0	70	0	0	0	0
Leptocylindrus danicus	0	0	0	0	0	0
Leptocylindrus minimus	0	0	0	0	0	0
Leptocylindrus minimus thin	0	0	0	0	0	1242
Mallomonas	0	1620	202	0	2262	745
Melosira nummuloides	0	0	0	0	0	20
Melosira varians	0	9395	149457	0	15837	0
Merismopedia	0	0	12707	0	0	0
Mesodinium rubrum	0	0	0	0	0	0
Microcystis	0	48920	10488	0	0	0
Microspora	0	28	0	0	0	0
naked auto dino >30	0	0	0	0	0	0
naked auto dino 10-15	0	648	0	0	289	0
naked auto dino 15-20	0	324	0	0	0	0
naked auto dino 20-30	0	0	20	0	0	0
naked auto dino 5-10	0	0	0	0	0	0
Navicula >30	0	0	0	0	0	0
Navicula 20-30	0	0	0	0	0	0
Navicula lanceolate >30	0	0	0	0	0	0
Nitzschia capitate >30	5	0	20	0	0	0
Nitzschia capitate 20-30	0	0	0	0	0	0
Nitzschia colonial	0	169	40	0	0	0
Nitzschia lanceolate >30	0	0	202	1926	0	20
Nitzschia ovoid >30	0	0	0	0	0	0
Nitzschia ovoid 10-15	0	0	0	0	0	223
Nitzschia sigmoid >30	0	0	0	0	0	20
Onychonema filiforme	0	0	0	0	0	0
Pandorina	0	0	0	0	4617	689
Parapedinella reticulata	0	0	0	0	0	20
Pediastrum	0	0	1614	2889	0	0
pennate >100	0	0	0	0	0	0
pennate 10-20	0	0	0	36304	577	0
pennate 20-40	0	0	0	0	0	101
pennate 40-80	0	0	40	0	0	0
Phacus	0	0	0	0	0	0
Phaeophyte filamentous	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	6U	6U	3U	7U	6U	5U
species\month	May_2009	June_2009	July_2009	Aug_2009	Sept_2009	Oct_2009
phytoflagellate 10-15	0	324	0	0	0	20
phytoflagellate 15-20	0	324	0	0	0	0
phytoflagellate 20-30	0	2268	20	0	0	20
phytoflagellate 5-10	0	0	0	0	0	0
Planktolyngbya	0	17495	27632	0	269230	446
Planktothrix	0	0	0	0	0	1744
Platydorina	0	13207	0	0	0	0
Polyedriopsis spinulosa	0	28	0	0	0	0
Prorocentrum micans	0	0	0	0	0	0
Prorocentrum minimum	0	0	0	0	0	0
Pseudo-nitzschia brasiliana	0	0	0	0	0	0
Pseudo-nitzschia other	0	5508	0	0	0	0
Pseudo-nitzschia pungens group	0	0	0	0	0	0
Pseudostaurastrum lobulatum	0	0	0	0	0	0
Radiococcus	0	913	60	0	0	0
Rhizosolenia setigera	0	0	0	0	0	0
Scenedesmus	0	0	462	0	0	0
Scrippsiella	0	0	0	963	0	0
silicoflagellate	0	28	0	0	0	0
Skeletonema auxospore	41	0	0	0	0	0
Skeletonema grethae	0	0	0	0	0	0
Skeletonema subsalsum	14333	0	6656	0	22624	36259
Skeletonema tropicum	0	0	0	101650	0	0
Snowella	0	20410	5244	0	0	466
Spirogyra	0	0	0	0	0	5215
Spirulina	0	0	0	0	10100	0
Stanieria	0	0	0	0	0	0
Staurastrum anatinum	0	0	0	0	0	0
Staurastrum other	0	0	0	0	0	0
Staurodesmus cuspidatus	0	0	0	0	0	0
Strombidium	0	0	0	0	0	0
Surirella	0	0	0	0	0	248
Tabularia tabulata	0	0	0	0	0	0
Terpsinoe	0	0	0	0	0	0
Thalassionema nitzschioides	0	28	0	0	0	0
Thalassiosira <10	0	1296	0	0	0	0
Thalassiosira 10-20	0	1296	0	0	0	0
Thalassiosira 20-40	124	0	0	0	0	0
Thalassiosira 40-60	0	0	0	0	0	0
Trichodesmium	0	0	0	0	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	6U	6D	7D	4D	4D
species\month	Nov_2009	Dec_2009	Jan_2010	Feb_2010	Mar_2010	Apr_2010
Actinastrum	0	0	0	0	0	0
Amphora >30	0	0	0	128	0	0
Amphora 20-30	0	41	0	0	0	0
Anabaena	0	0	0	0	0	0
Apatococcus	0	0	0	0	0	0
Apedinella	0	0	165	0	0	0
Aphanocapsa	0	0	0	0	0	0
armored auto dino >30	0	0	30	64	0	0
armored auto dino 15-20	0	0	0	0	0	1017
armored auto dino 20-30	0	12	330	128	638	1017
Asterocapsa	0	0	0	0	0	0
Aulacoseira coarse		0	0	0	0	0
Aulacoseira fine	0	0	0	19954	8300	0
autotrophic ciliate 10-15	0	0	0	0	0	0
autotrophic ciliate 20-30	0	0	0	0	0	0
autotrophic flagellate 10-15	0	0	0	0	0	0
autotrophic flagellate 5-10	0	0	0	0	0	0
Bacillaria paxillifer	0	0	119	64	0	0
Campylodiscus clypeus	0	0	0	0	0	678
centric >30	19	0	0	443	30646	678
centric 10-15	137	0	661	1774	9577	0
centric 15-20	0	290	1156	0	7023	0
centric 20-30	38	0	330	192	3192	1017
centric 5-10	0	0	0	0	0	0
Centritractus	0	0	0	0	0	0
Cerataulina bicornis	22726	83	69	0	0	0
Cerataulina resting spore	137	207	0	443	0	339
Chaetoceros c.f. *subtilis*	0	0	0	0	0	0
Chaetoceros compressus	0	0	0	0	0	0
Chaetoceros constrictus	0	0	0	0	0	0
Chaetoceros curvisetus	0	0	0	0	0	0
Chaetoceros karianus	0	0	0	0	0	0
Chaetoceros laciniosis	0	0	0	0	0	0
Chaetoceros lorenzianus	0	17	991	0	0	0
Chaetoceros minimus	0	0	0	0	0	0
Chaetoceros seiracanthus	0	0	2973	0	0	0
Chaetoceros simplex	0	0	0	0	0	0
Chaetoceros sp.	0	0	1156	0	0	0
Chaetoceros subtilis	0	0	330	0	0	0
C. subtilis var. *abnormis* f. *simplex*	0	23	30	0	0	0
Chaetoceros tenuissimus	0	0	0	0	0	0
Chaetoceros wighamii	0	0	0	0	0	0
chlorophyte coccoid 10-15	0	0	0	0	638	0
chlorophyte coccoid 15-20	0	0	0	0	0	0
chlorophyte coccoid 20-30	0	0	0	0	0	0
chlorophyte coccoid 5-10	0	0	0	0	0	0
chlorophyte coccoid colonial <5	0	0	0	5321	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	6U	6D	7D	4D	4D
species\month	Nov_2009	Dec_2009	Jan_2010	Feb_2010	Mar_2010	Apr_2010
chlorophyte coccoid colonial 10-15	0	0	0	0	0	0
chlorophyte coccoid colonial 15-20	0	17	0	0	0	0
chlorophyte coccoid colonial 5-10	0	0	0	0	0	0
chlorophyte filamentous	0	0	0	0	0	0
chlorophyte flagellated colonial	0	0	0	0	0	0
chlorophyte triangular	0	0	0	0	0	0
Chroococcus	0	0	0	0	0	0
Chrysochromulina	0	0	0	0	0	0
Closterium	0	0	0	0	0	0
Coelastrum microporum	0	0	0	0	0	5083
Coscinodiscus >80	958	0	50	0	0	0
Coscinodiscus 20-40	0	0	0	0	0	0
Coscinodiscus 40-60	0	0	59	887	0	0
Coscinodiscus 60-80	0	0	0	0	0	0
Coscinodiscus granii	0	0	0	0	0	0
Cosmarium	0	0	0	0	0	678
cryptomonad auto 10-15	411	41	330	0	0	0
cryptomonad auto 15-20	0	0	0	0	0	0
cryptomonad auto 20-30	0	0	0	0	0	0
cyanobacteria coccoid colonial	0	0	0	0	0	0
cyanobacteria filament	4655	983	3303	183132	47246	128757
Cyanotetras	0	0	0	0	0	0
Cyclotella >30	0	0	0	0	0	0
Cyclotella 10-15	0	0	0	0	2554	187
Cyclotella 15-20	0	0	826	0	0	0
Cyclotella 20-30	0	41	0	0	0	0
Cyclotella 5-10	0	0	0	3104	0	0
Cylindrotheca >30	0	0	0	0	0	140
Cylindrotheca 10-15	0	0	0	0	0	339
Cylindrotheca 20-30	0	0	0	0	0	339
Desmodesmus	0	0	0	0	0	0
Diacanthos belenophorus	0	0	0	0	0	0
Dicellula	0	0	0	0	0	0
Dinophysis ovum	0	0	0	0	0	0
Diploneis	0	0	0	0	0	0
Ditylum brightwellii	0	0	0	0	0	0
Entomoneis	0	47	0	0	0	0
Eudorina	0	0	0	0	0	0
Euglena acus	0	12	165	0	0	0
Euglena oblonga	0	0	0	0	90	0
euglenoid auto >30	0	0	0	0	0	0
euglenoid auto 10-15	0	0	0	0	0	47
euglenoid auto 15-20	0	0	0	1774	0	0
euglenoid auto 20-30	0	0	0	0	0	0
Fragilaria 10-15	0	12	0	0	0	0
Fragilaria 15-20	0	0	0	0	0	0
Fragilaria 20-30	0	0	0	447	0	0

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	6U	6D	7D	4D	4D
species\month	Nov_2009	Dec_2009	Jan_2010	Feb_2010	Mar_2010	Apr_2010
phytoflagellate 10-15	0	41	1486	0	0	339
phytoflagellate 15-20	0	0	0	0	0	0
phytoflagellate 20-30	0	0	0	0	0	0
phytoflagellate 5-10	0	0	0	0	0	0
Planktolyngbya	0	157	0	4878	0	0
Planktothrix	0	0	0	0	0	0
Platydorina	0	0	0	0	0	0
Polyedriopsis spinulosa	0	0	0	0	0	0
Prorocentrum micans	0	6	0	0	0	0
Prorocentrum minimum	0	0	1486	0	0	0
Pseudo-nitzschia brasiliana	0	0	0	0	0	0
Pseudo-nitzschia other	0	0	0	0	0	0
Pseudo-nitzschia pungens group	0	0	0	0	0	0
Pseudostaurastrum lobulatum	0	0	0	0	0	0
Radiococcus	0	0	0	0	0	0
Rhizosolenia setigera	137	0	0	0	0	0
Scenedesmus	0	0	0	0	0	0
Scrippsiella	0	0	109	0	0	0
silicoflagellate	0	0	0	0	0	0
Skeletonema auxospore	0	0	0	0	0	0
Skeletonema grethae	0	373	0	0	0	0
Skeletonema subsalsum	2601	2072	14203	32813	144931	1690646
Skeletonema tropicum	0	0	4459	0	0	0
Snowella	0	0	0	0	0	0
Spirogyra	0	0	0	0	0	0
Spirulina	0	0	0	0	0	0
Stanieria	0	0	0	0	0	0
Staurastrum anatinum	0	0	0	0	0	0
Staurastrum other	0	0	0	0	0	0
Staurodesmus cuspidatus	0	0	0	0	0	0
Strombidium	137	12	20	0	0	93
Surirella	0	0	0	64	638	0
Tabularia tabulata	0	0	0	0	0	0
Terpsinoe	0	0	0	0	0	0
Thalassionema nitzschioides	0	0	0	0	0	0
Thalassiosira <10	0	0	0	0	0	0
Thalassiosira 10-20	0	0	0	0	0	0
Thalassiosira 20-40	0	0	0	0	0	0
Thalassiosira 40-60	0	373	0	0	0	0
Trichodesmium	0	0	0	0	0	67767

Phytoplankton Appendix 1. Number of cells per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	6U	6D	7D	4D	4D
species\month	Nov_2009	Dec_2009	Jan_2010	Feb_2010	Mar_2010	Apr_2010
Fragilaria 5-10	0	0	0	0	0	0
Gloeocapsa	0	0	0	0	0	0
Gloeocapsopsis	0	0	0	0	0	0
Golenkinia radiata	0	0	0	0	0	0
Gonyaulax polygramma	0	0	0	0	0	0
Gonyaulax sp.	0	0	0	0	0	0
Gonyaulax spinifera	0	0	165	0	0	0
Guinardia flaccida	0	0	0	0	0	0
Gymnodinium sanguineum	137	41	1156	443	0	0
Gyrosigma fasciolata	0	0	0	0	0	0
Gyrosigma/Pleurosigma	0	6	0	0	0	0
Haptophyte	0	0	0	0	0	0
Leptocylindrus danicus	0	0	0	0	0	0
Leptocylindrus minimus	0	0	59	0	0	0
Leptocylindrus minimus thin	0	0	0	0	0	280
Mallomonas	0	0	0	0	0	0
Melosira nummuloides	0	0	0	128	179	0
Melosira varians	0	0	0	0	2598	0
Merismopedia	0	0	0	0	0	0
Mesodinium rubrum	0	17	0	64	0	0
Microcystis	0	0	0	0	0	0
Microspora	0	0	0	0	0	0
naked auto dino >30	0	0	0	0	0	0
naked auto dino 10-15	0	0	0	443	0	0
naked auto dino 15-20	0	0	0	0	0	0
naked auto dino 20-30	0	0	0	0	0	0
naked auto dino 5-10	0	0	0	0	0	0
Navicula >30	0	0	0	0	0	339
Navicula 20-30	0	0	0	0	638	0
Navicula lanceolate >30	0	0	0	0	0	0
Nitzschia capitate >30	0	0	10	0	0	0
Nitzschia capitate 20-30	0	41	0	0	0	0
Nitzschia colonial	0	0	0	0	0	0
Nitzschia lanceolate >30	0	0	0	887	0	0
Nitzschia ovoid >30	0	6	0	0	0	0
Nitzschia ovoid 10-15	0	0	0	0	0	0
Nitzschia sigmoid >30	0	0	0	0	90	47
Onychonema filiforme	0	0	0	0	0	0
Pandorina	0	0	0	0	0	0
Parapedinella reticulata	0	0	0	0	0	0
Pediastrum	0	0	0	0	0	0
pennate >100	0	0	0	0	0	0
pennate 10-20	274	83	0	1330	0	0
pennate 20-40	137	83	165	887	638	0
pennate 40-80	0	0	10	383	0	0
Phacus	0	0	0	0	0	0
Phaeophyte filamentous	0	0	0	0	0	0

Appendix C

Phytoplankton abundance (cell volume: μm^3) for selected samples

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	7D	6D	7U	5U	5D	6D
species\month	May_2008	June_2008	July_2008	Aug_2008	Sept_2008	Oct_2008
Actinastrum	0	0	1777980	0	0	19742
Amphora >30	0	0	0	285776	124898	0
Amphora 20-30	0	0	0	0	0	0
Anabaena	0	69515	462437	0	0	0
Apatococcus	0	9426	13851	0	0	5419
Apedinella	0	0	0	0	0	0
Aphanocapsa	0	0	39003	19052	0	0
armored auto dino >30	4065981	1047845	0	0	0	88839
armored auto dino 15-20	0	0	0	0	732309	0
armored auto dino 20-30	0	1870533	509201	0	0	132200
Asterocapsa	0	0	0	0	0	0
Aulacoseira coarse	0	0	0	97980	115291	0
Aulacoseira fine	0	0	31176	34837	85934	17613
autotrophic ciliate 10-15	0	0	2916	0	0	0
autotrophic ciliate 20-30	0	0	0	0	0	0
autotrophic flagellate 10-15	54213	0	0	0	0	0
autotrophic flagellate 5-10	19276	0	0	0	0	0
Bacillaria paxillifer	0	0	0	0	0	0
Campylodiscus clypeus	0	0	0	0	0	0
centric >30	72284	0	0	11975	8006	0
centric 10-15	0	2887	0	0	60848	0
centric 15-20	683085	13856	0	29394	1068	0
centric 20-30	2081782	1473	0	0	0	4230
centric 5-10		0	0	0	1601	0
Centritractus	0	0	0	0	0	4065
Cerataulina bicornis	25299439	810564	0	0	0	0
Cerataulina resting spore	0	0	0	0	0	0
Chaetoceros c.f. *subtilis*	0	0	0	0	0	0
Chaetoceros compressus	0	73898	0	0	0	0
Chaetoceros constrictus	24894	0	0	0	0	0
Chaetoceros curvisetus	23898	0	0	0	0	0
Chaetoceros karianus	0	0	0	0	0	0
Chaetoceros laciniosis	231309	0	0	0	0	0
Chaetoceros lorenzianus	304700	0	0	0	0	0
Chaetoceros minimus	6024	0	0	0	0	0
Chaetoceros seiracanthus	0	18851	0	0	0	0
Chaetoceros simplex	17924	346395	0	0	0	0
Chaetoceros sp.	0	18851	0	0	0	0
Chaetoceros subtilis	0	124702	0	0	0	0
C. subtilis var. *abnormis* f. *simplex*	578273	13856	0	0	0	0
Chaetoceros tenuissimus	0	36949	0	0	0	0
Chaetoceros wighamii	0	7069	0	0	0	0
chlorophyte coccoid 10-15	0	2887	0	0	0	0
chlorophyte coccoid 15-20	0	64660	0	0	0	0
chlorophyte coccoid 20-30	0	0	0	0	0	44067
chlorophyte coccoid 5-10	0	4124	0	0	0	0
chlorophyte coccoid colonial <5	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	7D	6D	7U	5U	5D	6D
species\month	May_2008	June_2008	July_2008	Aug_2008	Sept_2008	Oct_2008
chlorophyte coccoid colonial 10-15	0	0	125391	26128	0	14101
chlorophyte coccoid colonial 15-20	0	0	0	0	0	0
chlorophyte coccoid colonial 5-10	0	0	0	0	0	0
chlorophyte filamentous	0	0	187053	0	0	2820
chlorophyte flagellated colonial	0	0	4010	8887	0	0
chlorophyte triangular	0	0	0	0	8540	0
Chroococcus	0	0	0	0	0	0
Chrysochromulina	0	0	0	0	6005	0
Closterium	0	0	811863	319936	0	601548
Coelastrum microporum	0	0	0	0	0	0
Coscinodiscus >80	0	0	0	0	0	0
Coscinodiscus 20-40	0	0	0	0	0	0
Coscinodiscus 40-60	0	0	0	0	0	0
Coscinodiscus 60-80	0	15588	0	0	0	5288
Coscinodiscus granii	0	0	0	0	0	0
Cosmarium	0	0	0	1058815	0	0
cryptomonad auto 10-15		589	0	0		0
cryptomonad auto 15-20	0	0	0	0	0	0
cryptomonad auto 20-30	0	0	0	0	0	0
cyanobacteria coccoid colonial	0	5196	1461	0	0	11177
cyanobacteria filament	0	2526	14126	34021		1619
Cyanotetras	0	0	0	35548	0	0
Cyclotella >30	0	0	0	0	0	135373
Cyclotella 10-15	0	138558	0	0	0	0
Cyclotella 15-20	0	0	0	52256	0	146323
Cyclotella 20-30	12047	0	0	0	0	0
Cyclotella 5-10	0	0	0	29394	0	0
Cylindrotheca >30	0	0	0	0	0	2820
Cylindrotheca 10-15	0	0	0	0	0	0
Cylindrotheca 20-30	13443	1473	0	0	0	0
Desmodesmus	0	0	5845	209025	1601	6346
Diacanthos belenophorus	0	0	0	0	0	0
Dicellula	0	0	0	0	0	9518
Dinophysis ovum	0	1298981	0	0	0	0
Diploneis	0	0	0	0	0	0
Ditylum brightwellii	0	0	0	0	0	0
Entomoneis	0	0	0	0	0	0
Eudorina	0	0	10392	0	0	0
Euglena acus	0	18851	0	0	0	0
Euglena oblonga	0	0	0	0	0	0
euglenoid auto >30	53107	0	0	391032	0	3294968
euglenoid auto 10-15	0	25980	0	0	0	0
euglenoid auto 15-20	0	0	0	0	0	0
euglenoid auto 20-30	0	0	0	0	0	0
Fragilaria 10-15	0	0	0	381034	12009	44419
Fragilaria 15-20	0	0	0	0	0	0
Fragilaria 20-30	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	7D	6D	7U	5U	5D	6D
species\month	May_2008	June_2008	July_2008	Aug_2008	Sept_2008	Oct_2008
Fragilaria 5-10	0	0	0	0	0	0
Gloeocapsa	0	0	0	0	0	0
Gloeocapsopsis	0	0	0	0	0	0
Golenkinia radiata	0	0	0	0	0	0
Gonyaulax polygramma	0	3670632	0	0	0	0
Gonyaulax sp.	0	0	0	0	0	0
Gonyaulax spinifera	0	1154650	0	0	0	0
Guinardia flaccida	5990435	0	0	0	0	0
Gymnodinium sanguineum	0	4752539	0	0	0	0
Gyrosigma fasciolata	0	0	0	0	0	0
Gyrosigma/Pleurosigma	0	0	0	0	0	0
Haptophyte	0	0	45564	568774	0	0
Leptocylindrus danicus	8457241	42416	0	0	0	0
Leptocylindrus minimus	0	0	0	0	0	0
Leptocylindrus minimus thin	0	0	0	0	0	0
Mallomonas	0	0	113661	39992	0	164613
Melosira nummuloides	0	0	0	0	0	0
Melosira varians	0	7953	41567	255157	0	249290
Merismopedia	0	2209	0	0	38430	0
Mesodinium rubrum	0	0	0	0	0	0
Microcystis	0	0	15537	0	0	0
Microspora	0	0	0	0	0	86710
naked auto dino >30	0	1501045	1646458	0	0	0
naked auto dino 10-15	0	0	51959	0	0	0
naked auto dino 15-20	0	101032	2583673	0	38430	0
naked auto dino 20-30	0	0	0	0	0	0
naked auto dino 5-10	19276	0	0	0	0	0
Navicula >30	0	0	0	0	0	0
Navicula 20-30	0	0	0	0	0	0
Navicula lanceolate >30	0	0	0	0	0	0
Nitzschia capitate >30	0	0	0	0	0	0
Nitzschia capitate 20-30	0	0	0	0	0	0
Nitzschia colonial	0	0	0	0	0	0
Nitzschia lanceolate >30	0	74227	0	161667	21350	25742
Nitzschia ovoid >30	0	0	0	0	0	0
Nitzschia ovoid 10-15	0	0	0	0	0	0
Nitzschia sigmoid >30	0	0	0	0	0	0
Onychonema filiforme	0	0	0	59988	0	0
Pandorina	0	0	0	0	0	5641
Parapedinella reticulata	0	0	0	0	0	0
Pediastrum	0	0	118101	5555482	0	0
pennate >100	0	0	0	0	144113	0
pennate 10-20	0	209569	0	0	0	0
pennate 20-40	119269	15906	0	6665	12009	75871
pennate 40-80	0	0	0	533448	0	11281
Phacus	0	0	0	870936	1067507	0
Phaeophyte filamentous	0	0	172115	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	7D	6D	7U	5U	5D	6D
species\month	May_2008	June_2008	July_2008	Aug_2008	Sept_2008	Oct_2008
phytoflagellate 10-15	0	0	2598	58788	0	108387
phytoflagellate 15-20	0	0	707295	0	0	365806
phytoflagellate 20-30	0	1178	3787829	108867	0	0
phytoflagellate 5-10	0	0	0	0	0	0
Planktolyngbya	0	0	145161	86549	0	6346
Planktothrix	0	13105275	2127731	27078	0	9166
Platydorina	0	0	0	0	0	0
Polyedriopsis spinulosa	0	0	0	81650	0	0
Prorocentrum micans	4626183	11971409	0	0	0	0
Prorocentrum minimum	0	1163887	0	0	0	0
Pseudo-nitzschia brasiliana	26553	0	0	0	0	0
Pseudo-nitzschia other	0	0	0	0	0	0
Pseudo-nitzschia pungens group	94836753	0	0	60966	0	0
Pseudostaurastrum lobulatum	0	0	0	0	0	16922
Radiococcus	0	0	0	0	0	0
Rhizosolenia setigera	0	0	0	0	0	0
Scenedesmus	0	0	0	30483	0	5024
Scrippsiella	0	222682	0	0	0	0
silicoflagellate	0	0	0	0	0	0
Skeletonema auxospore	0	0	0	0	0	0
Skeletonema grethae	0	0	0	0	0	0
Skeletonema subsalsum	404791	64949	0	382123	0	113806
Skeletonema tropicum	1561337	0	0	71097	0	219484
Snowella	0	10392	0	0	0	0
Spirogyra	0	0	0	0	4611628	0
Spirulina	0	0	4055	0	0	0
Stanieria	0	0	0	0	435543	5641
Staurastrum anatinum	0	0	72902	53323	0	0
Staurastrum other	0	0	0	0	0	2820
Staurodesmus cuspidatus	0	0	0	138861	0	0
Strombidium	0	0	0	0	0	0
Surirella	0	0	0	0	716303	0
Tabularia tabulata	0	0	0	714167	0	0
Terpsinoe	0	0	0	0	0	0
Thalassionema nitzschioides	0	0	0	0	0	0
Thalassiosira <10	0	0	0	0	0	0
Thalassiosira 10-20	337326	3314	0	0	0	32516
Thalassiosira 20-40	0	5302	535830	0	0	0
Thalassiosira 40-60	0	0	0	0	0	0
Trichodesmium	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	7D	5U	6U	5D	6D
species\month	Nov_2008	Dec_2008	Jan_2009	Feb_2009	Mar_2009	Apr_2009
Actinastrum	0	0	0	0	0	0
Amphora >30	0	0	0	0	5824	0
Amphora 20-30	0	0	0	0	0	0
Anabaena	0	0	0	0	0	0
Apatococcus	0	0	0	0	0	0
Apedinella	0	0	0	0	0	0
Aphanocapsa	0	0	0	1939	0	0
armored auto dino >30	27525874	0	0	0	0	0
armored auto dino 15-20	0	0	0	0	0	0
armored auto dino 20-30	0	31822	0	24686	869684	0
Asterocapsa	0	0	0	0	0	0
Aulacoseira coarse	0	0	0	0	0	0
Aulacoseira fine	0	14256	22276	50916	0	
autotrophic ciliate 10-15	0	0	0	0	0	0
autotrophic ciliate 20-30	0	0	0	0	0	0
autotrophic flagellate 10-15	0	0	0	0	0	0
autotrophic flagellate 5-10	0	0	0	0	0	0
Bacillaria paxillifer	6061606	85538	0	0	0	0
Campylodiscus clypeus	0	0	0	0		0
centric >30	0	0	0	27772	15099	0
centric 10-15	15120	0	25258	20354	0	0
centric 15-20	645138	549355	32475	3877	10569	0
centric 20-30	188165	2422	0	0	6794	4339
centric 5-10	0	0	0	0	0	0
Centritractus	0	0	0	0	0	0
Cerataulina bicornis	48734774	0	0	0	0	
Cerataulina resting spore	266613	0	0	0	0	0
Chaetoceros c.f. *subtilis*	0	0	0	63971	0	0
Chaetoceros compressus	645138	0	0	0	0	0
Chaetoceros constrictus	0	0	0	0	0	0
Chaetoceros curvisetus	3150086	0	0	3877	0	0
Chaetoceros karianus	4704129	0	0	46524	0	0
Chaetoceros laciniosis	0	0	0	0	0	0
Chaetoceros lorenzianus	5927202	0	0	0	0	0
Chaetoceros minimus	0	0	0	0	0	0
Chaetoceros seiracanthus	1008028	0	0	0	0	0
Chaetoceros simplex	0	0	0	0	0	0
Chaetoceros sp.	599879	0	0	0	0	0
Chaetoceros subtilis	0	0	0	0	0	0
C. subtilis var. *abnormis* f. *simplex*	0	0	0	0	0	0
Chaetoceros tenuissimus	0	0	0	0	0	0
Chaetoceros wighamii	0	0	0	0	0	0
chlorophyte coccoid 10-15	0	2037	0	60579	0	0
chlorophyte coccoid 15-20	0	0	0	0	0	0
chlorophyte coccoid 20-30	0	0	0	0	0	0
chlorophyte coccoid 5-10	0	0	0	0	0	0
chlorophyte coccoid colonial <5	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	7D	5U	6U	5D	6D
species\month	Nov_2008	Dec_2008	Jan_2009	Feb_2009	Mar_2009	Apr_2009
chlorophyte coccoid colonial 10-15	0	0	0	0	0	0
chlorophyte coccoid colonial 15-20	0	0	0	0	0	0
chlorophyte coccoid colonial 5-10	0	0	0	11631	0	0
chlorophyte filamentous	0	0	0	0	0	0
chlorophyte flagellated colonial	0	0	0	0	0	0
chlorophyte triangular	0	0	0	0	0	0
Chroococcus	0	3437	0	0	0	0
Chrysochromulina	0	0	0	0	0	0
Closterium	0	0	0	0	0	0
Coelastrum microporum	0	0	0	0	0	0
Coscinodiscus >80	0	0	0	0	63230	0
Coscinodiscus 20-40	0	0	0	0	3328	0
Coscinodiscus 40-60	0	0	0	0	0	0
Coscinodiscus 60-80	0	0	0	0	0	0
Coscinodiscus granii	0	0	0	0	137398	0
Cosmarium	0	8720	0	0	0	0
cryptomonad auto 10-15	0	0	0	0	36237	98721
cryptomonad auto 15-20	0	0	66302	0	0	0
cryptomonad auto 20-30	0	0	0	6172	0	0
cyanobacteria coccoid colonial	0	0	3164	0	0	0
cyanobacteria filament	119283	20346	5751	15508	0	0
Cyanotetras	0	0	0	0	0	0
Cyclotella >30	0	0	0	0	0	0
Cyclotella 10-15	302408	0	4510	19385	0	0
Cyclotella 15-20	70562	0	606191	0	2496	0
Cyclotella 20-30	3010642	0	259796	0	0	6835
Cyclotella 5-10	0	0	0	36347	0	0
Cylindrotheca >30	0	0	0	0	0	0
Cylindrotheca 10-15	0	0	0	0	0	0
Cylindrotheca 20-30	0	0	0	1929	0	0
Desmodesmus	0	969	12150	38770	0	0
Diacanthos belenophorus	0	0	0	0	0	0
Dicellula	0	0	0	0	0	0
Dinophysis ovum	0	0	0	0	0	0
Diploneis	0	24440	0	0	0	0
Ditylum brightwellii	0	0	0	0	159738	0
Entomoneis	0	0	0	0	0	0
Eudorina	0	0	0	0	0	0
Euglena acus	0	0	0	0	0	0
Euglena oblonga	0	0	0	0	0	0
euglenoid auto >30	0	0	0	0	0	546765
euglenoid auto 10-15	0	0	0	0	0	0
euglenoid auto 15-20	0	0	0	0	0	0
euglenoid auto 20-30	29624	0	0	0	0	0
Fragilaria 10-15	0	0	0	0	0	0
Fragilaria 15-20	0	0	0	0	0	0
Fragilaria 20-30	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	7D	5U	6U	5D	6D
species\month	Nov_2008	Dec_2008	Jan_2009	Feb_2009	Mar_2009	Apr_2009
Fragilaria 5-10	0	0	0	8723	0	0
Gloeocapsa	0	0	0	0	0	0
Gloeocapsopsis	0	0	0	0	0	85052
Golenkinia radiata	0	0	0	0	0	0
Gonyaulax polygramma	3299336	0	0	0	0	0
Gonyaulax sp.	0	0	0	0	0	334894
Gonyaulax spinifera	947957	0	0	0	0	218706
Guinardia flaccida	0	0	0	0	0	0
Gymnodinium sanguineum	0	0	222270085	0	1830331	44424654
Gyrosigma fasciolata	0	0	0	0	0	0
Gyrosigma/Pleurosigma	0	0	0	0	0	0
Haptophyte	8944565	0	0	0	0	0
Leptocylindrus danicus	0	0	0	20354	0	0
Leptocylindrus minimus	0	0	0	26655	42276	0
Leptocylindrus minimus thin	0	0	0	0	6039	0
Mallomonas	0	0	0	0	0	0
Melosira nummuloides	0	0	0	0	0	0
Melosira varians	0	0	0	157020	0	0
Merismopedia	0	0	0	4629	0	0
Mesodinium rubrum	0	0	194847	0	905921	17086
Microcystis	0	0	0	26567	0	0
Microspora	0	0	0	0	0	0
naked auto dino >30	0	0	0	0	0	0
naked auto dino 10-15	0	0	0	0	0	27338
naked auto dino 15-20	0	0	0	0	0	0
naked auto dino 20-30	0	12220	0	0	0	0
naked auto dino 5-10	0	0	0	0	0	0
Navicula >30	913945	0	0	0	0	0
Navicula 20-30	37801	0	0	0	0	0
Navicula lanceolate >30	51841	0	0	0	0	0
Nitzschia capitate >30	0	0	0	0	0	0
Nitzschia capitate 20-30	0	0	0	0	0	0
Nitzschia colonial	0	0	0	0	0	0
Nitzschia lanceolate >30	0	0	0	0		0
Nitzschia ovoid >30	0	0	0	0	0	0
Nitzschia ovoid 10-15	0	0	0	0	0	0
Nitzschia sigmoid >30	0	0	0	0	1060760	0
Onychonema filiforme	0	0	0	0	0	0
Pandorina	0	0	0	30858	0	0
Parapedinella reticulata	0	0	0	0	0	0
Pediastrum	0	0	0	0	0	0
pennate >100	0	0	0	0		0
pennate 10-20	20161	15260	5412	26170	0	0
pennate 20-40	16663	18330	0	37030	0	0
pennate 40-80	210006	0	0	27772	0	0
Phacus	0	0	0	0	0	0
Phaeophyte filamentous	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	7D	5U	6U	5D	6D
species\month	Nov_2008	Dec_2008	Jan_2009	Feb_2009	Mar_2009	Apr_2009
phytoflagellate 10-15	20161	4073	64949	7754	36237	0
phytoflagellate 15-20	0	16293	0	2908	33972	0
phytoflagellate 20-30	0	0	0	0	0	0
phytoflagellate 5-10	0	0	0	0	0	3038
Planktolyngbya	30241	0	0	0	0	0
Planktothrix	0	0	0	0	0	0
Platydorina	0	0	0	0	0	0
Polyedriopsis spinulosa	0	0	0	0	0	0
Prorocentrum micans	0	0	0	0	0	0
Prorocentrum minimum	0	0	0	0	3478738	191368
Pseudo-nitzschia brasiliana	0	0	0	0	0	0
Pseudo-nitzschia other	0	0	0	0	0	0
Pseudo-nitzschia pungens group	0	0	0	0	0	52073
Pseudostaurastrum lobulatum	0	0	0	0	0	0
Radiococcus	0	0	0	0	0	0
Rhizosolenia setigera	214772	0	0	0	0	0
Scenedesmus	0	0	0	0	0	0
Scrippsiella	0	0	0	0	672647	972027
silicoflagellate	0	0	0	0	0	0
Skeletonema auxospore	0	0	0	0	0	0
Skeletonema grethae	0	0	0	0	0	0
Skeletonema subsalsum	152849240	8799292	19665693	18144497	30860211	593278
Skeletonema tropicum	0	7870715	0	0	0	0
Snowella	0	0	0	77541	0	0
Spirogyra	0	0	0	0	0	0
Spirulina	0	0	0	0	0	0
Stanieria	0	0	0	0	0	0
Staurastrum anatinum	0	0	0	0	0	0
Staurastrum other	0	0	0	0	0	0
Staurodesmus cuspidatus	0	0	0	0	0	0
Strombidium	11357111	0	0	2564655	0	0
Surirella	11464360	0	0	0	0	0
Tabularia tabulata	0	0	0	0	0	0
Terpsinoe	0	0	0	0		0
Thalassionema nitzschioides	0	0	0	0	0	0
Thalassiosira <10	0	0	0	0	0	0
Thalassiosira 10-20	0	891	0	0	0	0
Thalassiosira 20-40	0	0	0	0	0	0
Thalassiosira 40-60	0	0	0	0	0	7594
Trichodesmium	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	6U	6U	3U	7U	6U	5U
species\month	May_2009	June_2009	July_2009	Aug_2009	Sept_2009	Oct_2009
Actinastrum	0	111322	90622	0	0	60954
Amphora >30	0	0	0	0	0	0
Amphora 20-30	0	0	0	0	2998534	0
Anabaena	0	0	0	0	0	0
Apatococcus	0	0	0	0	0	0
Apedinella	0	0	0	0	0	0
Aphanocapsa	0	20001	0	0	0	0
armored auto dino >30	0	0	0	23828538	0	0
armored auto dino 15-20	0	0	0	0	0	0
armored auto dino 20-30	0	779253	0	0	0	672020
Asterocapsa	0	0	66982	0	0	0
Aulacoseira coarse	0	0	0	0	0	0
Aulacoseira fine	0	93106	450484	945577	0	17489783
autotrophic ciliate 10-15	0	0	0	0	0	0
autotrophic ciliate 20-30	1464073	0	0	0	0	0
autotrophic flagellate 10-15	0	0	0	0	0	0
autotrophic flagellate 5-10	0	0	0	0	0	0
Bacillaria paxillifer	0	0	0	0	0	0
Campylodiscus clypeus	0	0	0	0	0	0
centric >30	0	0	84156	0	254977	0
centric 10-15	0	214692	1287097	189115	0	0
centric 15-20	5338	0	60642	0	42496	5971
centric 20-30	0	0	27227	0	0	19903
centric 5-10	0	0	0	0	0	0
Centritractus	0	214692	0	0	0	31845
Cerataulina bicornis	3458873	0	0	0	0	0
Cerataulina resting spore	0	0	1504914	0	0	0
Chaetoceros c.f. *subtilis*	0	0	0	0	0	0
Chaetoceros compressus	32535	0	0	0	0	0
Chaetoceros constrictus	0	0	0	0	0	0
Chaetoceros curvisetus	0	0	0	0	0	0
Chaetoceros karianus	0	0	0	0	0	0
Chaetoceros laciniosis	0	0	0	0	0	0
Chaetoceros lorenzianus	0	0	0	0	0	0
Chaetoceros minimus	0	0	0	0	0	0
Chaetoceros seiracanthus	48740	0	0	0	0	0
Chaetoceros simplex	0	0	0	0	0	0
Chaetoceros sp.	0	0	3940	0	0	0
Chaetoceros subtilis	249096	0	0	0	0	0
C. subtilis var. *abnormis* f. *simplex*	763	0	0	0	0	0
Chaetoceros tenuissimus	0	0	0	0	0	0
Chaetoceros wighamii	0	0	0	0	0	0
chlorophyte coccoid 10-15	0	23855	0	0	0	0
chlorophyte coccoid 15-20	0	0	23641	0	0	0
chlorophyte coccoid 20-30	0	0	0	0	0	0
chlorophyte coccoid 5-10	0	0	59404	1069229	0	0
chlorophyte coccoid colonial <5	0	9939	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	6U	6U	3U	7U	6U	5U
species\month	May_2009	June_2009	July_2009	Aug_2009	Sept_2009	Oct_2009
chlorophyte coccoid colonial 10-15	0	0	0	0	0	0
chlorophyte coccoid colonial 15-20	0	0	0	0	0	0
chlorophyte coccoid colonial 5-10	0	0	0	0	0	7961
chlorophyte filamentous	0	0	0	585076	0	0
chlorophyte flagellated colonial	0	0	0	0	0	0
chlorophyte triangular	0	0	0	0	0	0
Chroococcus	0	15903	0	0	0	0
Chrysochromulina	0	0	0	0	0	0
Closterium	0	341390	0	661904	0	0
Coelastrum microporum	0	0	0	0	0	0
Coscinodiscus >80	0	0	0	0	0	0
Coscinodiscus 20-40	0	0	0	0	0	0
Coscinodiscus 40-60	5592	0	0	0	0	0
Coscinodiscus 60-80	0	0	0	0	0	0
Coscinodiscus granii	7880	0	0	0	0	0
Cosmarium	0	0	0	0	0	0
cryptomonad auto 10-15	0	0	0	0	0	0
cryptomonad auto 15-20	0	0	0	0	0	0
cryptomonad auto 20-30	0	0	0	0	0	0
cyanobacteria coccoid colonial	0	80510	73018	0	55528	0
cyanobacteria filament	0	0	198975	1871151	6941052	32001
Cyanotetras	0	0	0	0	0	0
Cyclotella >30	0	0	0	0	0	0
Cyclotella 10-15	0	636125	61261	472788	0	0
Cyclotella 15-20	0	0	0	0	0	0
Cyclotella 20-30	219611	397578	0	0	0	0
Cyclotella 5-10	0	0	0	0	0	0
Cylindrotheca >30	0	0	6895	0	0	0
Cylindrotheca 10-15	1271	0	0	0	0	0
Cylindrotheca 20-30	2288	16552	11138	0	0	0
Desmodesmus	0	397578	66830	756462	166585	3981
Diacanthos belenophorus	0	5517	0	0	0	0
Dicellula	0	0	0	0	0	0
Dinophysis ovum	0	0	0	0	0	0
Diploneis	48802	0	0	756462	0	44783
Ditylum brightwellii	0	0	0	0	0	0
Entomoneis	0	0	0	0	0	0
Eudorina	0	159031	0	0	0	71652
Euglena acus	0	0	0	0	0	0
Euglena oblonga	0	0	0	0	0	0
euglenoid auto >30	202182	0	0	0	0	0
euglenoid auto 10-15	0	0	0	0	0	0
euglenoid auto 15-20	0	0	0	0	0	0
euglenoid auto 20-30	18052	0	0	0	0	0
Fragilaria 10-15	0	0	0	0	254977	0
Fragilaria 15-20	0	0	0	2138459	0	0
Fragilaria 20-30	0	0	0	1960254	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	6U	6U	3U	7U	6U	5U
species\month	May_2009	June_2009	July_2009	Aug_2009	Sept_2009	Oct_2009
Fragilaria 5-10	0	0	0	12028829	3470526	0
Gloeocapsa	0	0	7880	0	0	0
Gloeocapsopsis	0	0	0	0	0	0
Golenkinia radiata	0	5964	7880	0	0	0
Gonyaulax polygramma	0	0	0	0	0	0
Gonyaulax sp.	0	0	0	0	0	0
Gonyaulax spinifera	1729436	0	0	0	0	0
Guinardia flaccida	0	0	0	0	0	0
Gymnodinium sanguineum	83655515	297940	0	0	0	0
Gyrosigma fasciolata	0	0	0	0	3187218	0
Gyrosigma/Pleurosigma	0	0	0	0	0	0
Haptophyte	0	1765571	0	0	0	0
Leptocylindrus danicus	0	0	0	0	0	0
Leptocylindrus minimus	0	0	0	0	0	0
Leptocylindrus minimus thin	0	0	0	0	0	15239
Mallomonas	0	1749343	138610	0	1776909	585160
Melosira nummuloides	0	0	0	0	0	95536
Melosira varians	0	1152976	18341137	0	2623718	0
Merismopedia	0	0	77968	0	0	0
Mesodinium rubrum	0	0	0	0	0	0
Microcystis	0	150086	8044	0	0	0
Microspora	0	60691	0	0	0	0
naked auto dino >30	0	0	0	0	0	0
naked auto dino 10-15	0	286256	0	0	1770677	0
naked auto dino 15-20	0	11927	0	0	0	0
naked auto dino 20-30	0	0	123128	0	0	0
naked auto dino 5-10	0	0	0	0	0	0
Navicula >30	0	0	0	0	0	0
Navicula 20-30	0	0	0	0	0	0
Navicula lanceolate >30	0	0	0	0	0	0
Nitzschia capitate >30	2482	0	10835	0	0	0
Nitzschia capitate 20-30	0	0	0	0	0	0
Nitzschia colonial	0	66209	15760	0	0	0
Nitzschia lanceolate >30	0	0	412119	8321077	0	111459
Nitzschia ovoid >30	0	0	0	0	0	0
Nitzschia ovoid 10-15	0	0	0	0	0	591131
Nitzschia sigmoid >30	0	0	0	0	0	75633
Onychonema filiforme	0	0	0	0	0	0
Pandorina	0	0	0	0	226647	33836
Parapedinella reticulata	0	0	0	0	0	3981
Pediastrum	0	0	79206	10637740	0	0
pennate >100	0	0	0	0	0	0
pennate 10-20	0	0	0	12028829	382466	0
pennate 20-40	0	0	0	0	0	24879
pennate 40-80	0	0	252166	0	0	0
Phacus	0	0	0	0	0	0
Phaeophyte filamentous	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	6U	6U	3U	7U	6U	5U
species\month	May_2009	June_2009	July_2009	Aug_2009	Sept_2009	Oct_2009
phytoflagellate 10-15	0	11927	0	0	0	15923
phytoflagellate 15-20	0	13915	0	0	0	0
phytoflagellate 20-30	0	4007586	15760	0	0	3981
phytoflagellate 5-10	0	0	0	0	0	0
Planktolyngbya	0	161019	339101	0	1651970	21894
Planktothrix	0	0	0	0	0	342339
Platydorina	0	777954553	0	0	0	0
Polyedriopsis spinulosa	0	11035	0	0	0	0
Prorocentrum micans	0	0	0	0	0	0
Prorocentrum minimum	0	0	0	0	0	0
Pseudo-nitzschia brasiliana	0	0	0	0	0	0
Pseudo-nitzschia other	0	439324	0	0	0	0
Pseudo-nitzschia pungens group	0	0	0	0	0	0
Pseudostaurastrum lobulatum	0	0	0	0	0	0
Radiococcus	0	44829	79787	0	0	0
Rhizosolenia setigera	0	0	0	0	0	0
Scenedesmus	0	0	203900	0	0	0
Scrippsiella	0	0	0	5909856	0	0
silicoflagellate	0	62071	0	0	0	0
Skeletonema auxospore	31772	0	0	0	0	0
Skeletonema grethae	0	0	0	0	0	0
Skeletonema subsalsum	2374544	0	326725	0	3748168	2669793
Skeletonema tropicum	0	0	0	29938420	0	0
Snowella	0	8015171	2059356	0	0	34333
Spirogyra	0	0	0	0	0	16000
Spirulina	0	0	0	0	247895	0
Stanieria	0	0	0	0	0	0
Staurastrum anatinum	0	0	0	0	0	0
Staurastrum other	0	0	0	0	0	0
Staurodesmus cuspidatus	0	0	0	0	0	0
Strombidium	0	0	0	0	0	0
Surirella	0	0	0	0	0	51372173
Tabularia tabulata	0	0	0	0	0	0
Terpsinoe	0	0	0	0	0	0
Thalassionema nitzschioides	0	75864	0	0	0	0
Thalassiosira <10	0	214692	0	0	0	0
Thalassiosira 10-20	0	572512	0	0	0	0
Thalassiosira 20-40	9150	0	0	0	0	0
Thalassiosira 40-60	0	0	0	0	0	0
Trichodesmium	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	6U	6D	7D	4D	4D
species\month	Nov_2009	Dec_2009	Jan_2010	Feb_2010	Mar_2010	Apr_2010
Actinastrum	0	0	0	0	0	0
Amphora >30	0	0	0	1143520	0	0
Amphora 20-30	0	69932	0	0	0	0
Anabaena	0	0	0	0	0	0
Apatococcus	0	0	0	0	0	0
Apedinella	0	0	3547	0	0	0
Aphanocapsa	0	0	0	0	0	0
armored auto dino >30	0	0	419915	677641	0	0
armored auto dino 15-20	0	0	0	0	0	1684036
armored auto dino 20-30	0	36536	1037711	784307	3917562	2444971
Asterocapsa	0	0	0	0	0	0
Aulacoseira coarse		0	0	0	0	0
Aulacoseira fine	0	0	0	4407668	560211	0
autotrophic ciliate 10-15	0	0	0	0	0	0
autotrophic ciliate 20-30	0	0	0	0	0	0
autotrophic flagellate 10-15	0	0	0	0	0	0
autotrophic flagellate 5-10	0	0	0	0	0	0
Bacillaria paxillifer	0	0	134140	65882	0	0
Campylodiscus clypeus	0	0	0	0	0	77964634
centric >30	9257	0	0	43533	2632602	58214
centric 10-15	4200	0	20268	54416	352581	0
centric 15-20	0	12461	49656	0	301652	0
centric 20-30	7406	0	22295	37647	176290	68609
centric 5-10	0	0	0	0	0	0
Centritractus	0	0	0	0	0	0
Cerataulina bicornis	110439503	897163	489901	0	0	0
Cerataulina resting spore	1088670	1557574	0	3308471	0	3368072
Chaetoceros c.f. *subtilis*	0	0	0	0	0	0
Chaetoceros compressus	0	0	0	0	0	0
Chaetoceros constrictus	0	0	0	0	0	0
Chaetoceros curvisetus	0	0	0	0	0	0
Chaetoceros karianus	0	0	0	0	0	0
Chaetoceros laciniosis	0	0	0	0	0	0
Chaetoceros lorenzianus	0	41103	6128979	0	0	0
Chaetoceros minimus	0	0	0	0	0	0
Chaetoceros seiracanthus	0	0	2052114	0	0	0
Chaetoceros simplex	0	0	0	0	0	0
Chaetoceros sp.	0	0	1596088	0	0	0
Chaetoceros subtilis	0	0	16214	0	0	0
C. subtilis var. *abnormis* f. *simplex*	0	2854	4374	0	0	0
Chaetoceros tenuissimus	0	0	0	0	0	0
Chaetoceros wighamii	0	0	0	0	0	0
chlorophyte coccoid 10-15	0	0	0	0	250724	0
chlorophyte coccoid 15-20	0	0	0	0	0	0
chlorophyte coccoid 20-30	0	0	0	0	0	0
chlorophyte coccoid 5-10	0	0	0	0	0	0
chlorophyte coccoid colonial <5	0	0	0	110192	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	6U	6D	7D	4D	4D
species\month	Nov_2009	Dec_2009	Jan_2010	Feb_2010	Mar_2010	Apr_2010
chlorophyte coccoid colonial 10-15	0	0	0	0	0	0
chlorophyte coccoid colonial 15-20	0	1284	0	0	0	0
chlorophyte coccoid colonial 5-10	0	0	0	0	0	0
chlorophyte filamentous	0	0	0	0	0	0
chlorophyte flagellated colonial	0	0	0	0	0	0
chlorophyte triangular	0	0	0	0	0	0
Chroococcus	0	0	0	0	0	0
Chrysochromulina	0	0	0	0	0	0
Closterium	0	0	0	0	0	0
Coelastrum microporum	0	0	0	0	0	623717
Coscinodiscus >80	235206	0	4704609	0	0	0
Coscinodiscus 20-40	0	0	0	0	0	0
Coscinodiscus 40-60	0	0	32077	5920423	0	0
Coscinodiscus 60-80	0	0	0	0	0	0
Coscinodiscus granii	0	0	0	0	0	0
Cosmarium	0	0	0	0	0	83162
cryptomonad auto 10-15	90722	5086	57003	0	0	0
cryptomonad auto 15-20	0	0	0	0	0	0
cryptomonad auto 20-30	0	0	0	0	0	0
cyanobacteria coccoid colonial	0	0	0	0	0	0
cyanobacteria filament	14280	3015	22801	561842	36237	98755
Cyanotetras	0	0	0	0	0	0
Cyclotella >30	0	0	0	0	0	0
Cyclotella 10-15	0	0	0	0	376086	164967
Cyclotella 15-20	0	0	403456	0	0	0
Cyclotella 20-30	0	32550	0	0	0	0
Cyclotella 5-10	0	0	0	514228	0	0
Cylindrotheca >30	0	0	0	0	0	54989
Cylindrotheca 10-15	0	0	0	0	0	10395
Cylindrotheca 20-30	0	0	0	0	0	66530
Desmodesmus	0	0	0	0	0	0
Diacanthos belenophorus	0	0	0	0	0	0
Dicellula	0	0	0	0	0	0
Dinophysis ovum	0	0	0	0	0	0
Diploneis	0	0	0	0	0	0
Ditylum brightwellii	0	0	0	0	0	0
Entomoneis	0	164411	0	0	0	0
Eudorina	0	0	0	0	0	0
Euglena acus	0	20551	456025	0	0	0
Euglena oblonga	0	0	0	0	1266412	0
euglenoid auto >30	0	0	0	0	0	0
euglenoid auto 10-15	0	0	0	0	0	36659
euglenoid auto 15-20	0	0	0	685637	0	0
euglenoid auto 20-30	0	0	0	0	0	0
Fragilaria 10-15	0	10276	0	0	0	0
Fragilaria 15-20	0	0	0	0	0	0
Fragilaria 20-30	0	0	0	247057	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	6U	6D	7D	4D	4D
species\month	Nov_2009	Dec_2009	Jan_2010	Feb_2010	Mar_2010	Apr_2010
Fragilaria 5-10	0	0	0	0	0	0
Gloeocapsa	0	0	0	0	0	0
Gloeocapsopsis	0	0	0	0	0	0
Golenkinia radiata	0	0	0	0	0	0
Gonyaulax polygramma	0	0	0	0	0	0
Gonyaulax sp.	0	0	0	0	0	0
Gonyaulax spinifera	0	0	2979365	0	0	0
Guinardia flaccida	0	0	0	0	0	0
Gymnodinium sanguineum	32508890	1822807	71951664	22590657	0	0
Gyrosigma fasciolata	0	0	0	0	0	0
Gyrosigma/Pleurosigma	0	114175	0	0	0	0
Haptophyte	0	0	0	0	0	0
Leptocylindrus danicus	0	0	0	0	0	0
Leptocylindrus minimus	0	0	20413	0	0	0
Leptocylindrus minimus thin	0	0	0	0	0	5155
Mallomonas	0	0	0	0	0	0
Melosira nummuloides	0	0	0	941169	4447832	0
Melosira varians	0	0	0	0	255041	0
Merismopedia	0	0	0	0	0	0
Mesodinium rubrum	0	38534	0	112940	0	0
Microcystis	0	0	0	0	0	0
Microspora	0	0	0	0	0	0
naked auto dino >30	0	0	0	0	0	0
naked auto dino 10-15	0	0	0	110192	0	0
naked auto dino 15-20	0	0	0	0	0	0
naked auto dino 20-30	0	0	0	0	0	0
naked auto dino 5-10	0	0	0	0	0	0
Navicula >30	0	0	0	0	0	280673
Navicula 20-30	0	0	0	0	141032	0
Navicula lanceolate >30	0	0	0	0	0	0
Nitzschia capitate >30	0	0	75818	0	0	0
Nitzschia capitate 20-30	0	76289	0	0	0	0
Nitzschia colonial	0	0	0	0	0	0
Nitzschia lanceolate >30	0	0	0	8184114	0	0
Nitzschia ovoid >30	0	34966	0	0	0	0
Nitzschia ovoid 10-15	0	0	0	0	0	0
Nitzschia sigmoid >30	0	0	0	0	131918	109978
Onychonema filiforme	0	0	0	0	0	0
Pandorina	0	0	0	0	0	0
Parapedinella reticulata	0	0	0	0	0	0
Pediastrum	0	0	0	0	0	0
pennate >100	0	0	0	0	0	0
pennate 10-20	6720	10172	0	40812	0	0
pennate 20-40	83162	36555	136808	2133093	1692387	0
pennate 40-80	0	0	3888	2032924	0	0
Phacus	0	0	0	0	0	0
Phaeophyte filamentous	0	0	0	0	0	0

Phytoplankton Appendix 2. Volume of cells (μm^3) per liter encountered in the 24 samples examined. The numbers following the species refer to cell sizes in micrometers.

station	5U	6U	6D	7D	4D	4D
species\month	Nov_2009	Dec_2009	Jan_2010	Feb_2010	Mar_2010	Apr_2010
phytoflagellate 10-15	0	16275	583712	0	0	259882
phytoflagellate 15-20	0	0	0	0	0	0
phytoflagellate 20-30	0	0	0	0	0	0
phytoflagellate 5-10	0	0	0	0	0	0
Planktolyngbya	0	5780	0	44893	0	0
Planktothrix	0	0	0	0	0	0
Platydorina	0	0	0	0	0	0
Polyedriopsis spinulosa	0	0	0	0	0	0
Prorocentrum micans	0	92481	0	0	0	0
Prorocentrum minimum	0	0	4669699	0	0	0
Pseudo-nitzschia brasiliana	0	0	0	0	0	0
Pseudo-nitzschia other	0	0	0	0	0	0
Pseudo-nitzschia pungens group	0	0	0	0	0	0
Pseudostaurastrum lobulatum	0	0	0	0	0	0
Radiococcus	0	0	0	0	0	0
Rhizosolenia setigera	403211	0	0	0	0	0
Scenedesmus	0	0	0	0	0	0
Scrippsiella	0	0	668268	0	0	0
silicoflagellate	0	0	0	0	0	0
Skeletonema auxospore	0	0	0	0	0	0
Skeletonema grethae	0	36619	0	0	0	0
Skeletonema subsalsum	430932	343302	871515	2416055	16007157	82989299
Skeletonema tropicum	0	0	1751137	0	0	0
Snowella	0	0	0	0	0	0
Spirogyra	0	0	0	0	0	0
Spirulina	0	0	0	0	0	0
Stanieria	0	0	0	0	0	0
Staurastrum anatinum	0	0	0	0	0	0
Staurastrum other	0	0	0	0	0	0
Staurodesmus cuspidatus	0	0	0	0	0	0
Strombidium	493934	71359	279944	0	0	2469920
Surirella	0	0	0	2117629	140922533	0
Tabularia tabulata	0	0	0	0	0	0
Terpsinoe	0	0	0	0	0	0
Thalassionema nitzschioides	0	0	0	0	0	0
Thalassiosira <10	0	0	0	0	0	0
Thalassiosira 10-20	0	0	0	0	0	0
Thalassiosira 20-40	0	0	0	0	0	0
Thalassiosira 40-60	0	43485	0	0	0	0
Trichodesmium	0	0	0	0	0	831623

Appendix D

Zooplankton Summary Catch Statistics

Table A1, page 1 of 5.

Plankton-net catch statistics (May 2008 through October 2009, n = 252 samples)

Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*Kmu* (km)	*Su* (psu)	Mean CPUE (No./10³ m³)	Max CPUE (No./10³ m³)
foraminiferans	foraminiferans	4	1	-3.6	36.3	0.17	43.13
medusa, Bougainvillia sp.	hydromedusa	626	22	-5.4	35.9	31.52	2913.71
Clytia sp.	hydromedusa	14,653	22	39.1	10.9	925.40	109555.38
medusa, Obelia sp.	hydromedusa	548	22	-3.3	30.9	27.65	2008.26
medusa, Eutima sp.	hydromedusa	1,110	37	-3.8	29.6	53.27	3444.43
Liriope tetraphylla	hydromedusa	81	9	12.4	31.3	4.83	275.78
medusa sp. a	hydromedusa	16	2	-3.9	34.1	0.84	200.08
medusa sp. d	hydromedusa	73	13	21.6	19.7	3.84	421.67
medusa sp. e	hydromedusa	248	26	-2.4	31.4	12.37	464.26
Craspedacusta sowberii	hydromedusa	52	3	32.7	10.0	2.72	496.25
siphonophores	siphonophores	33	4	-5.5	35.9	1.69	306.79
Aurelia aurita	moon jellyfish	2	2	9.0	28.1	0.12	15.67
Beroe ovata	sea walnut, ctenophore	2	1	34.4	14.1	0.21	52.92
Mnemiopsis mccradyi	comb jelly, ctenophore	7,125	30	32.7	10.4	429.83	21091.19
turbellarians	flatworms	5	2	13.8	21.2	0.28	58.93
nematodes	roundworms, threadworms	72	15	-2.4	27.0	3.87	307.43
polychaetes	sand worms, tube worms	1,935	127	6.6	26.6	114.57	4314.68
oligochaetes	freshwater worms	383	13	35.2	0.2	19.00	2941.47
hirudinoideans	leeches	7	6	31.6	2.7	0.31	23.82
gastropods, prosobranch	snails	947	69	20.4	13.3	47.50	2489.77
gastropods, opisthobranch	sea slugs	34	11	3.8	24.1	1.78	56.93
Lolliguncula brevis juveniles	bay squid	31	7	6.4	29.9	1.80	202.45
pelecypods	clams, mussels, oysters	119	27	21.9	13.8	7.83	559.92
Limulus polyphemus larvae	horsehoe crab	1	1	5.2	18.4	0.06	13.89
acari	water mites	29	15	35.8	1.0	1.39	65.03
pycnogonids	sea spiders	123	17	4.6	31.9	6.42	343.49
cladocerans, unidentified	water fleas	2	1	20.0	0.1	0.12	29.67
Latona setifera	water flea	43	11	36.5	0.4	1.93	156.34
Latonopsis fasciculata	water flea	2,745	10	40.6	7.2	135.48	33127.39
Penilia avirostris	water flea	15,270	43	-4.3	31.8	799.11	74039.22
Sida crystallina	water flea	17	7	24.9	8.8	0.83	62.19
Diaphanosoma brachyurum	water flea	136	5	37.0	0.3	7.07	1312.85
Bosmina sp.	water flea	39	4	37.9	0.3	2.01	301.96
Kurzia longirostris	water flea	1	1	26.9	0.3	0.05	12.89
Leydigia sp.	water flea	22	9	29.3	0.2	1.09	68.15
Ceridodaphnia sp.	water flea	607	16	36.1	0.3	30.94	3859.79
cladocerans, Daphnia spp.	water fleas	139,852	45	31.0	0.2	6113.73	516915.93
Simocephalus vetulus	water flea	233	28	32.3	0.5	12.50	474.71
Ilyocryptus sp.	water flea	377	14	32.6	0.2	19.97	1729.43
Psuedevadne tergestina	water flea	898	13	-5.3	28.8	42.44	7044.69
Pleopsis polyphemoides	water flea	2	1	-3.6	32.1	0.10	26.00
cirriped nauplius stage	barnacles	1,721	46	-3.6	31.2	83.59	4734.81
cirriped cypris stage	barnacles	128	13	19.9	12.3	6.55	1063.28
branchiurans, Argulus spp.	fish lice	25	23	24.4	5.8	1.22	29.73
Acartia tonsa	copepod	120,665	190	6.4	27.1	6500.92	143723.97
Centropages velificatus	copepod	1,470	42	-4.0	34.2	73.46	3921.81
Osphranticum labronectum	copepod	3	1	26.9	0.1	0.18	45.41
Diaptomus spp.	copepods	4,465	53	33.6	0.3	216.58	7061.86
Pseudodiaptomus coronatus	copepod	3,098	87	14.7	21.6	173.35	22612.47
Eucalanus sp.	copepod	12	5	-4.4	29.5	0.61	59.71
paracalanids	copepods	217	25	-1.9	31.1	11.17	940.07
Calanopia americana	copepod	857	24	0.1	21.3	45.49	3118.93
Labidocera aestiva	copepod	43,595	91	1.4	31.5	2254.50	140044.39
Labidocera acutifrons	copepod	2	1	-5.9	32.6	0.09	22.96
Eurytemora affinis	copepod	2	1	41.0	1.0	0.09	22.74
Temora turbinata	copepod	309	38	-0.1	26.6	16.47	680.08
Temora stylifera	copepod	1	1	-3.6	24.5	0.05	12.06
Temora longicornis	copepod	13	4	-4.1	24.6	0.61	59.71
unidentified freshwater cyclopoids	copepods	67	22	35.0	1.0	3.46	113.34
Cyclops spp.	copepods	20	3	37.9	0.4	0.95	124.38
Eucyclops speratus	copepod	135	19	-3.7	33.8	7.09	561.43
Macrocyclops albidus	copepods	18	6	13.6	8.0	0.98	75.68
Mesocyclops edax	copepod	21,278	79	35.6	0.5	987.02	24733.74

Table A1, page 2 of 5.

Plankton-net catch statistics (May 2008 through October 2009, n = 252 samples)

Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*Kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Mesocyclops leuckarti	copepod	8	1	41.0	0.1	0.69	173.50
Oithona spp.	copepods	544	32	3.9	28.5	30.06	1586.01
Alteutha sp.	copepod	67	10	13.9	24.2	3.50	256.48
unidentified harpacticoids	copepods	216	34	-0.4	29.4	11.20	467.29
Saphirella spp.	copepods	6	5	-4.0	22.7	0.35	34.06
siphonostomatids	parasitic copepods	164	48	3.7	27.8	8.17	204.87
Monstrilla sp.	copepod	252	35	0.0	32.1	13.56	591.35
myodocopod sp. a	ostracod, seed shrimp	5	4	20.2	11.6	0.23	24.30
Parasterope pollex	ostracod, seed shrimp	1,893	65	5.6	28.5	108.58	13615.23
Sarsiella zostericola	ostracod, seed shrimp	274	32	4.8	20.8	14.74	1951.48
ostracods, podocopid	ostracods, seed shrimps	29	12	34.0	3.7	1.63	86.75
Squilla empusa larvae	mantis shrimp	155	18	5.1	32.6	8.71	435.76
mysid sp. A	opposum shrimps, mysids	1	1	2.5	22.4	0.05	12.94
(Heteromysis sp.)	opossum shrimp, mysid	99	7	5.1	31.2	5.69	575.13
Americamysis almyra	opossum shrimp, mysid	28,362	138	29.7	5.4	1390.08	27446.24
Americamysis bahia	opossum shrimp, mysid	511	42	2.9	19.9	29.21	1737.06
unidentified Americamysis juveniles	opossum shrimps, mysids	36,014	180	29.2	6.5	1809.45	47257.92
Americamysis stucki	opossum shrimp, mysid	90	12	-0.9	27.3	4.99	421.94
Bowmaniella dissimilis	opossum shrimp, mysid	5,208	132	17.8	11.3	256.70	4368.78
Brasilomysis castroi	opossum shrimp, mysid	1	1	10.6	16.3	0.06	14.33
Mysidopsis furca	opossum shrimp, mysid	21	5	3.8	26.9	1.00	88.47
Mysidopsis mortenseni	opossum shrimp, mysid	1	1	-3.6	32.3	0.06	14.50
Spelaeomysis sp.	opossum shrimp, mysid	3	2	7.7	8.6	0.14	24.51
Taphromysis bowmani	opossum shrimp, mysid	23	13	31.5	4.5	1.12	65.03
amphipods, gammaridean	amphipods	412,464	235	8.6	11.1	20275.76	1431192.05
amphipods, caprellid	skeleton shrimps	416	51	5.2	28.7	23.82	825.35
Lestrigonus bengalensis	hyperiid amphipod	2	1	-3.6	30.1	0.10	25.46
isopod sp. a	isopod	2	1	-3.6	38.7	0.11	27.96
Cyathura polita	isopod	201	48	24.4	4.3	9.63	351.12
Xenanthura brevitelson	isopod	7	4	8.6	16.5	0.31	34.66
Anopsilana jonesi	isopod	58	14	32.7	13.6	3.65	312.21
cymothoid sp. a (Lironeca) juveniles	isopod	290	77	21.7	12.8	15.09	496.25
Cassidinidea ovalis	isopod	18	11	27.7	6.8	0.84	52.62
Sphaeromatinae	isopods	46	7	2.8	29.2	2.69	436.05
Harrieta faxoni	isopod	79	13	13.3	22.5	4.38	320.37
Sphaeroma quadridentata	isopod	3	2	9.8	27.3	0.16	30.33
Sphaeroma terebrans	isopod	2	1	30.2	5.1	0.10	24.74
Gnathia sp. larvae	isopod	1	1	7.7	23.4	0.05	12.21
Munna reynoldsi	isopod	79	21	-0.1	31.8	3.88	204.87
Edotia triloba	isopod	8,889	130	24.5	10.1	449.71	19548.87
Erichsonella attenuata	isopod	100	38	6.7	22.3	5.08	188.01
Hoplomachus propinquus	tanaid	1	1	2.5	8.8	0.05	11.52
Hargeria rapax	tanaid	2,868	63	5.4	22.9	137.58	4875.23
Sinelobus stanfordi	tanaid	7	6	21.0	9.8	0.34	26.34
Apseudes sp.	tanaid	289	17	6.2	25.8	16.63	2099.47
cumaceans	cumaceans	167,177	178	13.1	22.4	9369.28	452677.51
penaeid mysis larvae	penaeid shrimps	7	2	-4.3	11.6	0.44	75.78
penaeid postlarvae	penaeid shrimps	86	11	-5.0	27.0	4.06	479.32
penaeid metamorphs	penaeid shrimps	649	60	2.2	17.7	32.83	971.68
Farfantepenaeus duorarum juveniles	pink shrimp	38	25	12.4	9.4	1.90	65.72
Trachypenaeopsis mobilispinus juveniles	shrimps	5	1	-5.9	33.4	0.26	65.77
Lucifer faxoni juveniles and adults	shrimp	26,765	92	-3.3	32.5	1361.73	32530.03
Lucifer faxoni mysis	shrimp	41	12	-4.3	34.5	2.10	91.84
shrimps, unidentified postlarvae	shrimps	24	6	-2.3	29.6	1.12	97.74
decapod zoeae	crab larvae	943,417	221	8.2	25.2	49480.46	818828.25
decapod megalopae	post-zoea crab larvae	10,308	142	4.8	21.0	510.37	15664.45
decapod mysis	shrimp larvae	286,668	182	7.0	30.4	16085.32	644584.99
Leptochela serratorbita postlarvae	combclaw shrimp	4	1	-5.9	36.5	0.19	48.87
Palaemon floridanus postlarvae	Florida grass shrimp	1,613	31	2.1	28.9	79.30	4465.37
Periclimenes longicaudatus juveniles	longtail grass shrimp	6	2	3.5	20.1	0.26	42.45
Periclimenes spp. postlarvae	shrimps	6	4	-0.5	22.6	0.35	43.41
Periclimenes spp. juveniles	shrimps	46	12	0.6	20.8	2.42	189.45
Palaemonetes paludosus juveniles	grass shrimp	94	4	2.5	19.9	3.98	923.27

Table A1, page 3 of 5.

Plankton-net catch statistics (May 2008 through October 2009, n = 252 samples)

Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*Kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Palaemonetes pugio juveniles	daggerblade grass shrimp	33	14	6.7	15.4	1.64	95.73
Palaemonetes pugio adults	daggerblade grass shrimp	2	2	16.5	4.5	0.09	11.72
Palaemonetes spp. postlarvae	grass shrimps	6,204	108	11.0	29.4	375.65	64714.38
Palaemonetes spp. juveniles	grass shrimps	3	1	34.4	0.1	0.20	49.66
Palaemonetes vulgaris juveniles	grass shrimp	1	1	2.5	28.0	0.05	11.45
alphaeid postlarvae	snapping shrimps	12,097	86	6.5	30.2	680.57	23929.75
alphaeid juveniles	snapping shrimps	37	7	-1.5	23.2	1.89	279.50
Alpheus estuariensis juveniles	snapping shrimp	4	3	1.9	18.4	0.19	22.88
Hippolyte zostericola postlarvae	zostera shrimp	4,650	88	-0.7	28.2	233.86	11108.56
Hippolyte zostericola juveniles	zostera shrimp	99	23	-2.6	29.4	5.07	152.67
Hippolyte zostericola adults	zostera shrimp	15	4	-4.4	24.1	0.83	108.89
Latreutes parvulus postlarvae	sargassum shrimp	136	2	8.7	33.7	7.93	1293.23
Tozeuma carolinense postlarvae	arrow shrimp	952	35	-1.2	33.4	47.73	2227.15
Tozeuma carolinense juveniles	arrow shrimp	82	12	-4.7	25.4	4.26	352.41
Ogyrides alphaerostris postlarvae	estuarine longeye shrimp	4	2	5.8	30.6	0.21	40.06
processid postlarvae	night shrimps	3,321	65	-1.4	32.2	167.56	14100.31
processid juveniles	night shrimps	1	1	2.5	22.4	0.05	12.94
Ambidexter symmetricus juveniles	shrimp	16	9	-0.3	25.4	0.80	45.90
Upogebia spp. postlarvae	mud shrimps	29,179	75	4.1	30.8	1514.83	40144.04
Upogebia spp. juveniles	mud shrimps	212	21	5.7	27.9	11.46	1104.45
Euceramus praelongus juveniles	olivepit porcelain crab	18	3	-2.5	33.1	0.88	131.54
Petrolisthes armatus juveniles	porcelain crab	174	13	-1.6	32.8	7.98	679.32
Crab, Emerita sp. juveniles	mole crab	65	3	7.6	34.5	3.66	801.24
paguroid megalops larvae	hermit crabs	7,514	47	-2.8	31.4	394.06	50837.08
paguroid juveniles	hermit crabs	188	24	-3.0	30.5	9.81	626.11
Portunus sp. juveniles	swimming crab	9	2	-5.1	31.5	0.49	81.67
xanthid juveniles	mud crabs	4	2	2.4	10.9	0.23	43.72
Pinnixa sayana juveniles	pea crab	1	1	-3.6	14.6	0.06	14.57
Uca spp. juveniles	fiddler crabs	1	1	16.2	28.9	0.06	14.03
ephemeropteran larvae	mayflies	256	34	25.0	0.6	13.89	1498.29
odonates, anisopteran larvae	dragonflies	6	6	30.5	0.2	0.30	14.89
odonates, zygopteran larvae	damselflies	27	9	23.6	0.1	1.46	133.02
hemipterans, corixid adults	water boatmen	19	8	23.6	0.8	1.08	94.38
hemipterans, corixid juveniles	water boatmen	2	2	28.5	0.2	0.09	11.55
coleopterans, dytiscid adults	predaceous diving beetles	1	1	34.4	5.7	0.05	11.50
coleopterans, curculionid adults	beetles	1	1	26.9	14.1	0.05	11.90
coleopterans, elmid larvae	riffle beetles	1	1	41.0	0.5	0.05	11.83
coleopterans, elmid adults	riffle beetles	4	4	31.3	4.2	0.18	11.95
dipterans, pupae	flies, mosquitoes	3,898	89	36.3	0.7	185.60	4883.81
dipterans, tabanid larvae	deer flies	2	1	20.0	5.9	0.09	23.82
dipterans, ceratopogonid larvae	biting midges	7	5	31.3	2.0	0.36	29.77
dipteran, Chaoborus punctipennis larvae	phantom midge	25,046	94	36.0	0.4	1220.03	57030.33
dipterans, chironomid larvae	midges	72	32	32.0	2.1	3.90	198.64
trichopteran larvae	caddisflies	11	6	30.5	0.3	0.70	82.54
brachiopod, Glottidia pyramidata larvae	lamp shell	7	2	-5.9	33.2	0.35	48.87
chaetognaths, sagittid	arrow worms	55,660	128	6.0	27.8	3136.78	78078.57
ascidiacean larvae	tunicate larvae	24	2	2.5	31.2	1.48	342.61
appendicularian, Oikopleura dioica	larvacean	54,511	69	11.3	24.8	3468.74	259900.09
Elops saurus postflexion larvae	ladyfish	26	10	23.6	10.5	1.22	126.03
Myrophis punctatus juveniles	speckled worm eel	1	1	5.2	24.2	0.04	11.18
clupeid eggs	herrings	1,308	31	3.9	30.9	71.00	6317.69
clupeid preflexion larvae	herrings	615	25	3.6	29.7	34.88	1694.17
Brevoortia spp. postflexion larvae	menhaden	21	11	21.9	11.4	0.98	79.37
Brevoortia spp. metamorphs	menhaden	2	2	-4.8	31.7	0.10	13.15
Harengula jaguana eggs	scaled sardine	1	1	2.5	36.9	0.06	15.16
Harengula jaguana flexion larvae	scaled sardine	1	1	2.5	36.9	0.06	15.16
Harengula jaguana postflexion larvae	scaled sardine	4	1	-3.6	38.7	0.22	55.92
Harengula jaguana metamorphs	scaled sardine	1	1	5.2	35.6	0.06	14.53
Harengula jaguana juveniles	scaled sardine	3	3	6.7	17.6	0.16	14.61
Opisthonema oglinum flexion larvae	Atlantic thread herring	23	7	8.1	29.4	1.19	97.74
Opisthonema oglinum postflexion larvae	Atlantic thread herring	22	5	9.1	28.0	1.09	88.64
Opisthonema oglinum juveniles	Atlantic thread herring	2	1	10.6	3.9	0.09	22.56
Sardinella aurita flexion larvae	Spanish sardine	8	3	-4.4	33.6	0.43	54.44

Table A1, page 4 of 5.

Plankton-net catch statistics (May 2008 through October 2009, n = 252 samples)

Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*Kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Sardinella aurita postflexion larvae	Spanish sardine	9	4	8.5	30.6	0.52	80.03
Anchoa spp. preflexion larvae	anchovies	18,940	127	11.6	23.9	1246.57	81346.98
Anchoa spp. flexion larvae	anchovies	858	70	13.2	19.0	45.94	1239.34
Anchoa hepsetus eggs	striped anchovy	114	11	12.4	24.9	6.17	946.75
Anchoa hepsetus postflexion larvae	striped anchovy	2	1	5.2	14.5	0.11	27.10
Anchoa hepsetus adults	striped anchovy	1	1	24.2	13.0	0.05	12.46
Anchoa mitchilli eggs	bay anchovy	59,180	46	16.2	19.5	3024.18	274794.27
Anchoa mitchilli postflexion larvae	bay anchovy	2,570	94	14.6	22.2	143.08	9668.61
Anchoa mitchilli juveniles	bay anchovy	1,374	115	29.8	11.1	73.51	3430.90
Anchoa mitchilli adults	bay anchovy	387	75	30.3	4.6	19.33	607.28
Notemigonus crysoleucas preflexion larvae	golden shiner	3	1	41.0	0.2	0.13	32.22
Hoplosternum littorale juveniles	brown hoplo catfish	2	2	38.1	0.1	0.15	21.69
Liposarcus spp. juveniles	suckermouth catfish	6	5	36.4	0.2	0.32	26.26
Opsanus beta juveniles	gulf toadfish	7	4	5.5	0.2	0.39	40.96
Labidesthes sicculus preflexion larvae	brook silverside	1	1	41.0	7.4	0.05	12.36
Labidesthes sicculus flexion larvae	brook silverside	1	1	41.0	7.4	0.05	12.36
Membras martinica preflexion larvae	rough silverside	9	5	14.9	16.2	0.49	59.17
Membras martinica flexion larvae	rough silverside	3	1	2.5	30.3	0.17	42.55
Membras martinica juveniles	rough silverside	6	5	27.2	5.8	0.30	24.88
Membras martinica adults	rough silverside	4	4	13.5	9.5	0.19	12.21
Menidia spp. preflexion larvae	silversides	26	19	21.9	3.9	1.21	63.50
Menidia spp. flexion larvae	silversides	1	1	41.0	0.3	0.05	12.59
Menidia spp. juveniles	silversides	15	13	31.4	3.4	0.75	26.66
Gambusia holbrooki juveniles	eastern mosquitofish	6	6	37.8	0.2	0.34	21.69
Synodus foetens postflexion larvae	inshore lizardfish	2	2	-0.4	28.6	0.10	12.48
Hippocampus erectus juveniles	lined seahorse	11	6	1.5	35.1	0.62	45.49
Hippocampus zosterae juveniles	dwarf seahorse	1	1	-3.6	27.3	0.05	12.15
Cosmocampus hildebrandi juveniles	dwarf pipefish	28	16	29.9	5.2	1.31	54.98
Syngnathus floridae juveniles	dusky pipefish	1	1	26.9	6.5	0.05	12.92
Syngnathus louisianae juveniles	chain pipefish	39	19	20.4	17.0	2.10	61.78
Syngnathus scovelli juveniles	gulf pipefish	104	41	9.2	21.6	5.46	97.74
Syngnathus scovelli adults	gulf pipefish	1	1	20.0	1.6	0.05	12.95
Prionotus spp. postflexion larvae	searobins	1	1	-3.6	14.6	0.06	14.57
Mugil cephalus juveniles	striped mullet	4	4	23.2	9.9	0.19	12.48
fish eggs, percomorph	sciaenid eggs (primarily)	88,022	98	15.2	24.9	5319.30	214589.22
Lepomis macrochirus juveniles	bluegill	6	3	35.6	0.1	0.43	49.66
Lepomis spp. juveniles	sunfishes	2	2	35.7	0.3	0.09	12.45
Chloroscombrus chrysurus preflexion larvae	Atlantic bumper	33	5	-5.5	30.8	1.60	191.07
Chloroscombrus chrysurus flexion larvae	Atlantic bumper	12	2	-5.9	27.2	0.54	100.32
Chloroscombrus chrysurus postflexion larvae	Atlantic bumper	4	2	16.9	24.5	0.23	48.67
Chloroscombrus chrysurus juveniles	Atlantic bumper	1	1	10.6	0.9	0.05	12.40
Oligoplites saurus preflexion larvae	leatherjack	15	4	3.8	22.6	0.73	79.59
Oligoplites saurus flexion larvae	leatherjack	7	2	0.2	23.4	0.32	45.90
Oligoplites saurus postflexion larvae	leatherjack	1	1	-3.6	19.9	0.06	16.02
Oligoplites saurus juveniles	leatherjack	3	3	4.7	16.6	0.16	13.98
Uraspis secunda juveniles	cottonmouth jack	1	1	10.6	27.1	0.05	13.65
Lutjanus griseus juveniles	gray snapper	1	1	-5.9	29.2	0.05	13.36
Eucinostomus spp. postflexion larvae	mojarras	14	6	-0.2	20.9	0.66	72.91
Eucinostomus spp. juveniles	mojarras	6	2	-4.3	15.1	0.39	85.15
Eugerres plumieri postflexion larvae	striped mojarra	11	3	14.4	29.6	0.69	97.34
gerreid preflexion larvae	mojjaras	689	35	5.5	30.1	36.77	1096.00
gerreid flexion larvae	mojjaras	9	3	13.7	27.6	0.56	97.34
Archosargus probatocephalus postflexion larvae	sheepshead	1	1	-3.6	32.1	0.05	13.00
Archosargus probatocephalus juveniles	sheepshead	39	7	-1.5	30.7	2.09	263.85
Bairdiella chrysoura preflexion larvae	silver perch	91	12	-1.2	28.5	4.43	588.98
Bairdiella chrysoura flexion larvae	silver perch	7	3	3.5	22.6	0.37	46.72
Bairdiella chrysoura postflexion larvae	silver perch	12	5	10.8	17.7	0.62	52.62
Bairdiella chrysoura juveniles	silver perch	2	1	30.2	19.3	0.15	36.69
Cynoscion arenarius preflexion larvae	sand seatrout	124	15	7.8	25.5	8.68	957.41
Cynoscion arenarius flexion larvae	sand seatrout	10	4	-1.8	17.6	0.50	55.74
Cynoscion arenarius postflexion larvae	sand seatrout	41	10	7.5	11.8	2.27	197.03
Cynoscion arenarius juveniles	sand seatrout	7	6	31.5	7.9	0.37	25.54
Cynoscion nebulosus preflexion larvae	spotted seatrout	142	18	-3.3	28.1	6.75	378.70

Table A1, page 5 of 5.

Plankton-net catch statistics (May 2008 through October 2009, n = 252 samples)

Organisms are listed in phylogenetic order.

Taxon	Common Name	Number Collected	Collection Frequency	*Kmu* (km)	*Su* (psu)	Mean CPUE (No./10^3 m^3)	Max CPUE (No./10^3 m^3)
Cynoscion nebulosus flexion larvae	spotted seatrout	6	2	-0.2	20.7	0.27	35.12
Cynoscion nebulosus postflexion larvae	spotted seatrout	6	3	0.6	19.0	0.29	35.12
Leiostomus xanthurus postflexion larvae	spot	4	1	-3.6	36.3	0.17	43.13
Menticirrhus spp. preflexion larvae	kingfishes	389	31	4.1	28.1	20.90	620.16
Menticirrhus spp. postflexion larvae	kingfishes	9	4	2.8	21.4	0.46	46.72
Pogonias cromis postflexion larvae	black drum	6	3	-3.1	10.3	0.37	45.47
Pogonias cromis juveniles	black drum	2	1	-5.9	14.6	0.14	34.06
Chaetodipterus faber preflexion larvae	Atlantic spadefish	25	9	-1.4	31.4	1.40	93.44
Chasmodes saburrae flexion larvae	Florida blenny	215	28	8.2	27.1	11.94	607.42
Chasmodes saburrae postflexion larvae	Florida blenny	178	25	7.9	27.8	9.62	310.65
Chasmodes saburrae juveniles	Florida blenny	2	1	-3.6	27.3	0.10	24.30
Lupinoblennius nicholsi flexion larvae	highfin blenny	1	1	-3.6	32.3	0.06	14.50
Lupinoblennius nicholsi postflexion larvae	highfin blenny	6	2	13.3	24.0	0.34	47.00
blenniid preflexion larvae	blennies	1,653	106	6.3	26.9	84.74	2522.12
Bathygobius soporator preflexion larvae	frillfin goby	377	39	11.0	23.7	20.68	784.02
Bathygobius soporator flexion larvae	frillfin goby	64	15	7.2	24.0	3.16	93.67
Bathygobius soporator postflexion larvae	frillfin goby	26	8	3.0	25.2	1.28	58.93
Gobionellus spp. flexion larvae	gobies	1	1	2.5	14.3	0.05	12.56
Gobionellus spp. postflexion larvae	gobies	2	1	-3.6	27.3	0.10	24.30
Gobiosoma bosc juveniles	naked goby	19	9	35.3	0.8	0.95	54.48
Gobiosoma robustum juveniles	code goby	1	1	10.6	3.9	0.04	11.28
Gobiosoma spp. postflexion larvae	gobies	2,008	97	16.8	19.4	109.53	3846.58
Microgobius gulosus juveniles	clown goby	92	17	38.5	1.4	5.01	642.24
Microgobius gulosus adults	clown goby	1	1	34.4	0.2	0.05	13.20
Microgobius spp. flexion larvae	gobies	105	36	17.9	15.7	5.57	131.75
Microgobius spp. postflexion larvae	gobies	285	43	22.9	11.5	14.57	456.57
Microgobius thalassinus juveniles	green goby	2	2	12.0	0.1	0.12	14.78
gobiid preflexion larvae	gobies	2,685	158	9.9	23.6	144.21	2079.93
gobiid flexion larvae	gobies	851	82	8.1	24.2	44.02	1190.38
gobiid postflexion larvae	gobies	2	1	-5.9	14.6	0.14	34.06
Gobiesox strumosus preflexion larvae	skilletfish	130	35	2.1	28.7	6.45	194.06
Gobiesox strumosus flexion larvae	skilletfish	11	8	18.5	16.2	0.60	61.48
Gobiesox strumosus postflexion larvae	skilletfish	8	2	28.4	11.5	0.44	61.48
Achirus lineatus preflexion larvae	lined sole	96	16	-4.3	29.6	4.68	222.94
Achirus lineatus flexion larvae	lined sole	25	8	-3.2	28.1	1.21	89.18
Achirus lineatus postflexion larvae	lined sole	6	2	-4.6	32.4	0.32	46.60
Trinectes maculatus preflexion larvae	hogchoker	148	33	-0.3	26.3	7.46	286.60
Trinectes maculatus flexion larvae	hogchoker	20	9	24.2	14.7	1.05	86.96
Trinectes maculatus postflexion larvae	hogchoker	43	22	16.9	14.9	2.14	101.79
Trinectes maculatus juveniles	hogchoker	98	32	33.7	3.7	4.92	167.67
Trinectes maculatus adults	hogchoker	1	1	24.2	0.2	0.06	15.06
Symphurus plagiusa postflexion larvae	blackcheek tonguefish	5	1	-5.9	33.4	0.26	65.77
Symphurus plagiusa juveniles	blackcheek tonguefish	5	3	-2.9	16.2	0.28	43.72
Chilomycterus schoepfi preflexion larvae	striped burrfish	6	1	-5.9	36.6	0.29	73.25
Chilomycterus schoepfi juveniles	striped burrfish	2	2	-3.6	17.0	0.11	15.16
Sphoeroides spp. preflexion larvae	puffers	2	1	-3.6	38.7	0.11	27.96
tetraodontid preflexion larvae	puffers	92	10	0.4	32.9	4.89	466.85
tetraodontid postflexion larvae	puffers	1	1	16.2	28.9	0.06	14.03
unidentified preflexion larvae	fish	11	4	-5.0	32.7	0.55	59.71

Appendix E

Month-specific Zooplankton Catch

Table A2. Page 1 of 7.

Plankton net catch by month (May 2008 to October 2009). Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (14)	Feb (14)	Mar (14)	Apr (14)	May (28)	Jun (28)	Jul (28)	Aug (28)	Sep (28)	Oct (28)	Nov (14)	Dec (14)
foraminiferans	foraminiferans				4								
medusa, Bougainvillia sp.	hydromedusa			44	235	218	47	29	34	10	2	7	
Clytia sp.	hydromedusa	3				1821	12795	11	5		5	13	
medusa, Obelia sp.	hydromedusa			19	31	39	311	13	44	4	6	81	
medusa, Eutima sp.	hydromedusa			11	120	26	351	111	29	325	107	30	
Liriope tetraphylla	hydromedusa					81							
medusa sp. a	hydromedusa			15								1	
medusa sp. d	hydromedusa	1		36		11	3	6				16	
medusa sp. e	hydromedusa			16	57	22	38	13	8	14	65	15	
Craspedacusta sowberii	hydromedusa				39	13							
siphonophores	siphonophores			25	8								
Aurelia aurita	moon jellyfish						2						
Beroe ovata	sea walnut, ctenophore					2							
Mnemiopsis mccradyi	comb jelly, ctenophore	3	3	282	5259	1228	350						
turbellarians	flatworms					4						1	
nematodes	roundworms, threadworms		2	2		33	12	5	13			4	1
polychaetes	sand worms, tube worms	85	91	85	47	436	606	126	166	59	81	93	60
oligochaetes	freshwater worms								54	329			
hirudinoideans	leeches	1	1				4		1				
gastropods, prosobranch	snails	220	8	5	100	140	26	67	98	128	5	106	44
gastropods, opisthobranch	sea slugs	2	9		1	3	4					15	
Lolliguncula brevis juveniles	bay squid		2			6	23						
pelecypods	clams, mussels, oysters	10		2		24	5	8	19	3	12	28	8
Limulus polyphemus larvae	horsehoe crab											1	
acari	water mites					1	6	3	6	11	2		
pycnogonids	sea spiders			5	79	28	9		2				
cladocerans, unidentified	water fleas								2				
Latona setifera	water flea	2					5	2		8	26		
Latonopsis fasciculata	water flea					2681		2	61		1		
Penilia avirostris	water flea	51		2	151	211	6818	813	6687	427	77	33	
Sida crystallina	water flea						3	2		10	2		
Diaphanosoma brachyurum	water flea							134	2				
Bosmina sp.	water flea							39					
Kurzia longirostris	water flea							1					
Leydigia sp.	water flea						1		6	15			
Ceridodaphnia sp.	water flea						34	458	8	107			
cladocerans, Daphnia spp.	water fleas					713	323	138423	93	125	175		
Simocephalus vetulus	water flea					1	30	29	109	63	1		
Ilyocryptus sp.	water flea						13	18	92	254			
Pseudevadne tergestina	water flea	15					22	29	820	10	2		
Pleopsis polyphemoides	water flea		2										
cirriped nauplius stage	barnacles	2	586	4	4	18	1	35	65	11	787	206	2
cirriped cypris stage	barnacles		1			5	3		7		5	106	1
branchiurans, Argulus spp.	fish lice					2	2	5	4	3	6	2	1
Acartia tonsa	copepod	1721	8727	27977	30183	13936	15806	4412	1868	208	2556	13097	174
Centropages velificatus	copepod	6		175	554	383	20	3	2	73	220	34	
Osphranticum labronectum	copepod								3				
Diaptomus spp.	copepods	10				29	305	2385	75	1632	27		2

Table A2. Page 2 of 7.

Plankton net catch by month (May 2008 to October 2009). Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (14)	Feb (14)	Mar (14)	Apr (14)	May (28)	Jun (28)	Jul (28)	Aug (28)	Sep (28)	Oct (28)	Nov (14)	Dec (14)
Pseudodiaptomus coronatus	copepod	15	110	102	2289	246	66	23	48	11	39	113	36
Eucalanus sp.	copepod	2						5			5		
paracalanids	copepods		24	78	17	7	50	21	9	1	3	6	1
Calanopia americana	copepod				4	3	51	5	5	211	516	62	
Labidocera aestiva	copepod	12	118	14831	7956	10259	3869	247	3121	1522	1538	101	21
Labidocera acutifrons	copepod										2		
Eurytemora affinis	copepod	2											
Temora turbinata	copepod	5	2	60	37		8	8	7	30	24	127	1
Temora stylifera	copepod							1					
Temora longicornis	copepod							5	5	3			
unidentified freshwater cyclopoids	copepods	1				7	9	32	14		4		
Cyclops spp.	copepods						2			18			
Eucyclops speratus	copepod	6	4	76	9	11		4			2	21	2
Macrocyclops albidus	copepods		1	3		1			8	5			
Mesocyclops edax	copepod	2521	80			302	2937	5405	3255	5493	1272	5	8
Mesocyclops leuckarti	copepod								8				
Oithona spp.	copepods	1	123	113	158	80		15	34	6	7	7	
Alteutha sp.	copepod		17	4			46						
unidentified harpacticoids	copepods		13	49	40	57		16	22	1	6	2	10
Saphirella spp.	copepods	1							2	1			2
siphonostomatids	parasitic copepods	2	8	5	50	31	16	10	5	3	13	20	1
Monstrilla sp.	copepod		31	37	1	62	42	17	3	6	50		3
myodocopod sp. a	ostracod, seed shrimp							2	3				
Parasterope pollex	ostracod, seed shrimp	71	73	31	42	160	1221	145	3	6	3	84	54
Sarsiella zostericola	ostracod, seed shrimp		5	6	8	36	42	157	5	1	4	3	7
ostracods, podocopid	ostracods, seed shrimps			5				3	9		7	5	
Squilla empusa larvae	mantis shrimp			47	26	64	18						
mysid sp. A	opposum shrimps, mysids										1		
(Heteromysis sp.)	opossum shrimp, mysid	1				18	80						
Americamysis almyra	opossum shrimp, mysid	4578	1956	2322	4097	808	2269	6372	559	506	334	1717	2844
Americamysis bahia	opossum shrimp, mysid	155	10	1		28	54	48	112	6	34	63	
unidentified Americamysis juveniles	opossum shrimps, mysids	3475	3584	3140	5124	1558	1543	10353	488	383	379	3276	2711
Americamysis stucki	opossum shrimp, mysid	2				9				6	1	72	
Bowmaniella dissimilis	opossum shrimp, mysid	540	174	223	315	366	483	557	110	1166	409	466	399
Brasilomysis castroi	opossum shrimp, mysid											1	
Mysidopsis furca	opossum shrimp, mysid	10	5	2	4								
Mysidopsis mortenseni	opossum shrimp, mysid	1											
Spelaeomysis sp.	opossum shrimp, mysid								2		1		
Taphromysis bowmani	opossum shrimp, mysid	1				2	8		3	2	5	2	
amphipods, gammaridean	amphipods	2554	6488	3701	22771	18387	14219	10364	115691	12766	193584	1117	10822
amphipods, caprellid	skeleton shrimps	1	44	17	49	144	114	17	10	10	8		2
Lestrigonus bengalensis	hyperiid amphipod										2		
isopod sp. a	isopod					2							
Cyathura polita	isopod	1	4	1	19	8	16	58	27	53	9	3	2
Xenanthura brevitelson	isopod		2				3			2			
Anopsilana jonesi	isopod				1	35	9	7	3			3	
cymothoid sp. a (Lironeca) juveniles	isopod	12	23	10	61	61	18	60	15	5	4	13	8
Cassidinidea ovalis	isopod	1			4		1	4	2	1	4		1

Table A2. Page 3 of 7.

Plankton net catch by month (May 2008 to October 2009). Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (14)	Feb (14)	Mar (14)	Apr (14)	May (28)	Jun (28)	Jul (28)	Aug (28)	Sep (28)	Oct (28)	Nov (14)	Dec (14)
Sphaeromatinae	isopods						38	8					
Harrieta faxoni	isopod	2			21	28	5	19		4			
Sphaeroma quadridentata	isopod					2		1					
Sphaeroma terebrans	isopod												2
Gnathia sp. larvae	isopod												1
Munna reynoldsi	isopod		8	9	19	10	7			1	2	4	19
Edotia triloba	isopod	124	270	367	2779	2030	495	987	350	810	454	137	86
Erichsonella attenuata	isopod	1	7	7	11	13	24	25	1	3	5	2	1
Hoplomachus propinquus	tanaid								1				
Hargeria rapax	tanaid	25	594	293	331	331	697	327		9	12	95	154
Sinelobus stanfordi	tanaid			2						2	1		2
Apseudes sp.	tanaid					33	197	54	5				
cumaceans	cumaceans	10766	33461	75597	19568	11156	10282	1206	1940	162	522	1629	888
penaeid mysis larvae	penaeid shrimps								7				
penaeid postlarvae	penaeid shrimps				4	3	8	2	2	50	17		
penaeid metamorphs	penaeid shrimps				4	9	236	99	147	101	28	25	
Farfantepenaeus duorarum juveniles	pink shrimp	1				2	2	13	3	10	1	5	1
Trachypenaeopsis mobilispinus juveniles	shrimps						5						
Lucifer faxoni juveniles and adults	shrimp	37	259	36	3855	3392	5930	2064	182	345	7465	2939	261
Lucifer faxoni mysis	shrimp	1		4	8	7	3				12	4	2
shrimps, unidentified postlarvae	shrimps				12		10				2		
decapod zoeae	crab larvae	11312	55985	111677	150715	151848	268812	81869	30444	30158	33670	14034	2893
decapod megalopae	post-zoea crab larvae	1		405	622	647	2932	2342	994	1936	213	210	6
decapod mysis	shrimp larvae	176	5911	25106	27568	128860	84892	4428	5329	440	3272	536	150
Leptochela serratorbita postlarvae	combclaw shrimp				4								
Palaemon floridanus postlarvae	Florida grass shrimp			128	671	211	534	5	25		38	1	
Periclimenes longicaudatus juveniles	longtail grass shrimp										6		
Periclimenes spp. postlarvae	shrimps					2				4			
Periclimenes spp. juveniles	shrimps	3		3						13	12	15	
Palaemonetes paludosus juveniles	grass shrimp			1						4	87	2	
Palaemonetes pugio juveniles	daggerblade grass shrimp	1	1					5		9	1	15	1
Palaemonetes pugio adults	daggerblade grass shrimp								1	1			
Palaemonetes spp. postlarvae	grass shrimps	2	13	226	125	4544	883	52	227	29	56	42	5
Palaemonetes spp. juveniles	grass shrimps								3				
Palaemonetes vulgaris juveniles	grass shrimp												1
alphaeid postlarvae	snapping shrimps	3	61	2866	1373	3791	2781	172	489	402	135	24	
alphaeid juveniles	snapping shrimps					3		25	1	8			
Alpheus estuariensis juveniles	snapping shrimp									1	3		
Hippolyte zostericola postlarvae	zostera shrimp	31	252	698	157	194	1624	246	544	241	121	483	59
Hippolyte zostericola juveniles	zostera shrimp	7	7	18	2	1	7	5	10	1	8	20	13
Hippolyte zostericola adults	zostera shrimp								3			12	
Latreutes parvulus postlarvae	sargassum shrimp					136							
Tozeuma carolinense postlarvae	arrow shrimp	2		9	375	121	396	26	15			8	
Tozeuma carolinense juveniles	arrow shrimp							39	10	5	13	15	
Ogyrides alphaerostris postlarvae	estuarine longeye shrimp			3	1								
processid postlarvae	night shrimps	3	4	277	397	275	1671	42	115	89	224	220	4
processid juveniles	night shrimps										1		
Ambidexter symmetricus juveniles	shrimp				1	1	4	4		2		4	

Table A2. Page 4 of 7.

Plankton net catch by month (May 2008 to October 2009). Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (14)	Feb (14)	Mar (14)	Apr (14)	May (28)	Jun (28)	Jul (28)	Aug (28)	Sep (28)	Oct (28)	Nov (14)	Dec (14)
Upogebia spp. postlarvae	mud shrimps	1	49	4777	6902	7680	6697	2005	483	370	191	24	
Upogebia spp. juveniles	mud shrimps			4	15	90	38	29	5	31			
Euceramus praelongus juveniles	olivepit porcelain crab				8		10						
Petrolisthes armatus juveniles	porcelain crab				112		47	3		11	1		
Crab, Emerita sp. juveniles	mole crab					65							
paguroid megalops larvae	hermit crabs	12	69	770	1374	17	310	66	26	49	25	4796	
paguroid juveniles	hermit crabs			20	9		30	34		5	16	74	
Portunus sp. juveniles	swimming crab											9	
xanthid juveniles	mud crabs									4			
Pinnixa sayana juveniles	pea crab									1			
Uca spp. juveniles	fiddler crabs					1							
ephemeropteran larvae	mayflies						3	17	179	23	33	1	
odonates, anisopteran larvae	dragonflies								2	4			
odonates, zygopteran larvae	damselflies							4	19	4			
hemipterans, corixid adults	water boatmen								13	1	5		
hemipterans, corixid juveniles	water boatmen							1	1				
coleopterans, dytiscid adults	predaceous diving beetles												1
coleopterans, curculionid adults	beetles												1
coleopterans, elmid larvae	riffle beetles										1		
coleopterans, elmid adults	riffle beetles							1	1		1		1
dipterans, pupae	flies, mosquitoes	43	26	2		127	143	963	890	1163	484	33	24
dipterans, tabanid larvae	deer flies						2						
dipterans, ceratopogonid larvae	biting midges			1						3	3		
dipteran, Chaoborus punctipennis larvae	phantom midge	53	7		242	26	1848	12060	4090	4923	1769	13	15
dipterans, chironomid larvae	midges	2	1	1			10	12	22	18	5		1
trichopteran larvae	caddisflies		1				1		8	1			
brachiopod, Glottidia pyramidata larvae	lamp shell				4			3					
chaetognaths, sagittid	arrow worms	987	2738	4049	9562	16241	5129	2417	206	563	3690	8472	1606
ascidiacean larvae	tunicate larvae					2	22						
appendicularian, Oikopleura dioica	larvacean	15	640	266	7786	39593	24	255	1243	621	1271	2791	6
Elops saurus postflexion larvae	ladyfish	18	4	4									
Myrophis punctatus juveniles	speckled worm eel		1										
clupeid eggs	herrings			70	528	401	220	19	26	8	36		
clupeid preflexion larvae	herrings			82	63	419	39	8				4	
Brevoortia spp. postflexion larvae	menhaden	7	13	1									
Brevoortia spp. metamorphs	menhaden						2						
Harengula jaguana eggs	scaled sardine					1							
Harengula jaguana flexion larvae	scaled sardine					1							
Harengula jaguana postflexion larvae	scaled sardine					4							
Harengula jaguana metamorphs	scaled sardine					1							
Harengula jaguana juveniles	scaled sardine	2							1				
Opisthonema oglinum flexion larvae	Atlantic thread herring				12	8	3						
Opisthonema oglinum postflexion larvae	Atlantic thread herring				12	7	3						
Opisthonema oglinum juveniles	Atlantic thread herring							2					
Sardinella aurita flexion larvae	Spanish sardine			3		1						4	
Sardinella aurita postflexion larvae	Spanish sardine	1				7				1			
Anchoa spp. preflexion larvae	anchovies	5	295	1927	996	11507	2268	862	788	69	174	49	
Anchoa spp. flexion larvae	anchovies	1		3	53	206	479	69	32	7	8		

Table A2. Page 5 of 7.

Plankton net catch by month (May 2008 to October 2009). Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (14)	Feb (14)	Mar (14)	Apr (14)	May (28)	Jun (28)	Jul (28)	Aug (28)	Sep (28)	Oct (28)	Nov (14)	Dec (14)
Anchoa hepsetus eggs	striped anchovy		19	87	6	2							
Anchoa hepsetus postflexion larvae	striped anchovy							2					
Anchoa hepsetus adults	striped anchovy				1								
Anchoa mitchilli eggs	bay anchovy		3137	19495	23138	1498	11906				6		
Anchoa mitchilli postflexion larvae	bay anchovy				84	1024	1139	208	18	19	24	54	
Anchoa mitchilli juveniles	bay anchovy	13	2		39	497	193	191	92	126	84	122	15
Anchoa mitchilli adults	bay anchovy	42	36	9	8	5	16	53	20	75	22	92	9
Notemigonus crysoleucas preflexion larvae	golden shiner							3					
Hoplosternum littorale juveniles	brown hoplo catfish								2				
Liposarcus spp. juveniles	suckermouth catfish							5	1				
Opsanus beta juveniles	gulf toadfish								7				
Labidesthes sicculus preflexion larvae	brook silverside					1							
Labidesthes sicculus flexion larvae	brook silverside					1							
Membras martinica preflexion larvae	rough silverside			5						3	1		
Membras martinica flexion larvae	rough silverside					3							
Membras martinica juveniles	rough silverside	1				1		1		3			
Membras martinica adults	rough silverside		2					1		1			
Menidia spp. preflexion larvae	silversides	1		1			1	1	1	16	3	1	1
Menidia spp. flexion larvae	silversides							1					
Menidia spp. juveniles	silversides				2		2	2	3		3	2	1
Gambusia holbrooki juveniles	eastern mosquitofish							2	3		1		
Synodus foetens postflexion larvae	inshore lizardfish	1					1						
Hippocampus erectus juveniles	lined seahorse	1			1	8		1					
Hippocampus zosterae juveniles	dwarf seahorse							1					
Cosmocampus hildebrandi juveniles	dwarf pipefish	1		1		2		2	6	10	3		3
Syngnathus floridae juveniles	dusky pipefish		1										
Syngnathus louisianae juveniles	chain pipefish		1	8		10	8	6	2	3		1	
Syngnathus scovelli juveniles	gulf pipefish	7	1		21	18	12	19	2	20		2	2
Syngnathus scovelli adults	gulf pipefish							1					
Prionotus spp. postflexion larvae	searobins									1			
Mugil cephalus juveniles	striped mullet	3	1										
fish eggs, percomorph	sciaenid eggs (primarily)	5	2906	12315	16449	46765	8686	309	302	112	154	1	18
Lepomis macrochirus juveniles	bluegill								6				
Lepomis spp. juveniles	sunfishes							1		1			
Chloroscombrus chrysurus preflexion larvae	Atlantic bumper					3	6	16	6		2		
Chloroscombrus chrysurus flexion larvae	Atlantic bumper							3		9			
Chloroscombrus chrysurus postflexion larvae	Atlantic bumper					3				1			
Chloroscombrus chrysurus juveniles	Atlantic bumper									1			
Oligoplites saurus preflexion larvae	leatherjack						14	1					
Oligoplites saurus flexion larvae	leatherjack						7						
Oligoplites saurus postflexion larvae	leatherjack									1			
Oligoplites saurus juveniles	leatherjack					1		1	1				
Uraspis secunda juveniles	cottonmouth jack						1						
Lutjanus griseus juveniles	gray snapper							1					
Eucinostomus spp. postflexion larvae	mojarras							12	1	1			
Eucinostomus spp. juveniles	mojarras								5			1	
Eugerres plumieri postflexion larvae	striped mojarra			2		9							
gerreid preflexion larvae	mojjaras		25	182	111	251	65	5	31	18	1		

Table A2. Page 6 of 7.

Plankton net catch by month (May 2008 to October 2009). Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (14)	Feb (14)	Mar (14)	Apr (14)	May (28)	Jun (28)	Jul (28)	Aug (28)	Sep (28)	Oct (28)	Nov (14)	Dec (14)
gerreid flexion larvae	mojjaras			2		6				1			
Archosargus probatocephalus postflexion larv	sheepshead		1										
Archosargus probatocephalus juveniles	sheepshead	33											6
Bairdiella chrysoura preflexion larvae	silver perch			4	5	9	19	3	51				
Bairdiella chrysoura flexion larvae	silver perch						6	1					
Bairdiella chrysoura postflexion larvae	silver perch				4		3	5					
Bairdiella chrysoura juveniles	silver perch					2							
Cynoscion arenarius preflexion larvae	sand seatrout					69	5	8		41	1		
Cynoscion arenarius flexion larvae	sand seatrout								3	6	1		
Cynoscion arenarius postflexion larvae	sand seatrout	1			4			1	13	6	16		
Cynoscion arenarius juveniles	sand seatrout				1	1	1		1			3	
Cynoscion nebulosus preflexion larvae	spotted seatrout			2	1	11	55	26	32	15			
Cynoscion nebulosus flexion larvae	spotted seatrout						3			3			
Cynoscion nebulosus postflexion larvae	spotted seatrout						3	2		1			
Leiostomus xanthurus postflexion larvae	spot				4								
Menticirrhus spp. preflexion larvae	kingfishes		1	38	58	167	26	42	18	34	1	4	
Menticirrhus spp. postflexion larvae	kingfishes						3	2	3	1			
Pogonias cromis postflexion larvae	black drum								6				
Pogonias cromis juveniles	black drum								2				
Chaetodipterus faber preflexion larvae	Atlantic spadefish		2	2		2	14			5			
Chasmodes saburrae flexion larvae	Florida blenny		9	108	33	24	38			1	1	1	
Chasmodes saburrae postflexion larvae	Florida blenny		6	58	47	27	35	1	3	1			
Chasmodes saburrae juveniles	Florida blenny							2					
Lupinoblennius nicholsi flexion larvae	highfin blenny	1											
Lupinoblennius nicholsi postflexion larvae	highfin blenny				3		3						
blenniid preflexion larvae	blennies	44	342	446	360	161	130	31	20	53	36	19	11
Bathygobius soporator preflexion larvae	frillfin goby			130	91	43	65	8	29	8	1	2	
Bathygobius soporator flexion larvae	frillfin goby			10	15	11	19	3	3	3			
Bathygobius soporator postflexion larvae	frillfin goby					11	8	1	3	3			
Gobionellus spp. flexion larvae	gobies							1					
Gobionellus spp. postflexion larvae	gobies							2					
Gobiosoma bosc juveniles	naked goby						3	4	12				
Gobiosoma robustum juveniles	code goby							1					
Gobiosoma spp. postflexion larvae	gobies	5		57	361	228	1027	242	33	35	9	11	
Microgobius gulosus juveniles	clown goby					8	5	61	17			1	
Microgobius gulosus adults	clown goby									1			
Microgobius spp. flexion larvae	gobies	1	1	6	4	26	45	3		13	6		
Microgobius spp. postflexion larvae	gobies			3	24	24	157	59	4	9	3	2	
Microgobius thalassinus juveniles	green goby								2				
gobiid preflexion larvae	gobies	35	86	641	336	407	634	257	77	75	72	30	35
gobiid flexion larvae	gobies	9	7	60	119	102	393	86	13	30	25	6	1
gobiid postflexion larvae	gobies								2				
Gobiesox strumosus preflexion larvae	skilletfish	8	53	27	14	7				1	8	5	7
Gobiesox strumosus flexion larvae	skilletfish	1	1	5	1	1						2	
Gobiesox strumosus postflexion larvae	skilletfish			8									
Achirus lineatus preflexion larvae	lined sole				8	4	18	20	24	20	2		
Achirus lineatus flexion larvae	lined sole					1	7	2	5	9	1		
Achirus lineatus postflexion larvae	lined sole						3			3			

Table A2. Page 7 of 7.

Plankton net catch by month (May 2008 to October 2009). Number of monthly samples is indicated in parentheses.

Taxon	Common Name	Jan (14)	Feb (14)	Mar (14)	Apr (14)	May (28)	Jun (28)	Jul (28)	Aug (28)	Sep (28)	Oct (28)	Nov (14)	Dec (14)
Trinectes maculatus preflexion larvae	hogchoker					20	30	47	3	27	21		
Trinectes maculatus flexion larvae	hogchoker					9	2	3		1	5		
Trinectes maculatus postflexion larvae	hogchoker				9	2	13	3	1	5	9	1	
Trinectes maculatus juveniles	hogchoker				1	7	13	13	23	3	22	13	3
Trinectes maculatus adults	hogchoker									1			
Symphurus plagiusa postflexion larvae	blackcheek tonguefish						5						
Symphurus plagiusa juveniles	blackcheek tonguefish									4		1	
Chilomycterus schoepfi preflexion larvae	striped burrfish						6						
Chilomycterus schoepfi juveniles	striped burrfish								2				
Sphoeroides spp. preflexion larvae	puffers					2							
tetraodontid preflexion larvae	puffers			78	7	7							
tetraodontid postflexion larvae	puffers					1							
unidentified preflexion larvae	fish		2			1	3	5					

Appendix F

Location-specific Zooplankton Catch

Table A3, page 1 of 6. Location specific plankton-net catch .

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	-5.9	-3.6	2.5	5.2	7.7	10.6	16.2	20.0	24.2	26.9	30.2	34.4	37.1	41.0
foraminiferans	foraminiferans	0.00	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
medusa, Bougainvillia sp.	hydromedusa	391.16	38.03	10.56	0.81	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Clytia sp.	hydromedusa	18.47	3.12	3.80	4.75	0.00	2.67	5.46	9.91	0.00	0.00	21.62	499.99	4892.76	7492.99
medusa, Obelia sp.	hydromedusa	153.43	184.46	27.29	10.02	4.62	0.00	7.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
medusa, Eutima sp.	hydromedusa	408.78	251.29	48.07	11.65	3.34	17.52	4.38	0.00	0.74	0.00	0.00	0.00	0.00	0.00
Liriope tetraphylla	hydromedusa	4.52	9.32	7.58	6.46	0.00	0.00	10.13	15.32	4.21	9.03	1.02	0.00	0.00	0.00
medusa sp. a	hydromedusa	11.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	0.00
medusa sp. d	hydromedusa	2.22	8.52	11.99	0.00	0.73	1.25	0.79	0.00	0.00	0.00	0.00	0.00	3.55	24.73
medusa sp. e	hydromedusa	82.00	58.87	4.77	10.82	8.59	2.67	0.00	5.41	0.00	0.00	0.00	0.00	0.00	0.00
Craspedacusta sowberii	hydromedusa	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	27.57	2.94	0.00	7.55
siphonophores	siphonophores	19.76	3.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Aurelia aurita	moon jellyfish	0.00	0.00	0.00	0.00	0.87	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Beroe ovata	sea walnut, ctenophore	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.94	0.00	0.00
Mnemiopsis mccradyi	comb jelly, ctenophore	0.00	0.00	1.93	30.62	0.00	47.38	254.52	69.98	226.72	874.07	562.95	1766.68	1505.89	676.95
turbellarians	flatworms	0.00	0.00	0.00	0.00	0.00	3.27	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00
nematodes	roundworms, threadworms	22.58	28.30	0.00	0.00	0.00	0.00	0.00	0.84	0.00	0.00	0.00	1.72	0.00	0.69
polychaetes	sand worms, tube worms	394.92	368.58	107.16	84.89	155.81	143.52	21.55	47.61	7.29	10.60	4.06	242.22	4.03	11.81
oligochaetes	freshwater worms	0.00	0.00	0.00	0.00	0.00	0.00	2.46	4.95	17.48	22.64	5.30	8.07	168.00	37.11
hirudinoideans	leeches	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32	0.00	0.00	1.24	0.00	0.00	1.84
gastropods, prosobranch	snails	114.55	44.78	48.11	7.29	3.66	4.63	54.12	36.23	65.85	4.79	43.85	24.01	13.35	199.85
gastropods, opisthobranch	sea slugs	6.04	2.55	4.36	3.11	2.44	1.59	4.79	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lolliguncula brevis juveniles	bay squid	0.00	0.00	12.33	2.23	2.61	5.70	2.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00
pelecypods	clams, mussels, oysters	2.23	1.45	0.00	0.00	28.81	13.14	0.79	0.00	6.59	0.00	18.15	35.84	0.65	1.92
Limulus polyphemus larvae	horsehoe crab	0.00	0.00	0.00	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
acari	water mites	0.00	0.00	0.00	0.00	0.00	0.00	0.82	2.47	0.00	0.68	0.74	0.00	3.26	11.51
pycnogonids	sea spiders	14.08	10.54	29.33	11.97	14.26	0.00	2.34	0.00	0.00	0.00	0.00	7.32	0.00	0.00
cladocerans, unidentified	water fleas	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65	0.00	0.00	0.00	0.00	0.00	0.00
Latona setifera	water flea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.47	11.92	7.01	6.67
Latonopsis fasciculata	water flea	0.00	0.00	0.00	0.00	0.00	0.00	0.82	18.13	10.49	9.05	0.00	5.52	12.25	1840.41
Penilia avirostris	water flea	3753.31	7339.76	35.61	37.08	12.27	9.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sida crystallina	water flea	2.03	0.00	0.00	1.27	0.00	0.00	0.00	0.00	0.00	2.18	0.66	0.00	1.95	3.45
Diaphanosoma brachyurum	water flea	0.00	0.00	0.00	0.00	0.00	1.50	0.00	0.00	0.00	0.00	3.62	4.15	72.94	16.78
Bosmina sp.	water flea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.87	0.00	4.84	3.65	16.78
Kurzia longirostris	water flea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00
Leydigia sp.	water flea	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.41	3.75	1.28	0.00	1.20	2.68
Ceridodaphnia sp.	water flea	0.00	0.00	0.00	0.00	0.00	0.00	1.64	2.47	0.00	43.94	14.71	36.09	255.89	78.35
cladocerans, Daphnia spp.	water fleas	0.00	0.00	0.00	0.00	4.93	26.57	38.75	8194.81	22353.78	7559.79	828.09	12337.70	28956.69	5291.06
Simocephalus vetulus	water flea	0.00	0.00	0.00	0.00	0.73	0.00	3.24	26.37	17.48	15.06	9.23	20.27	30.18	52.50
Ilyocryptus sp.	water flea	0.00	0.00	0.00	0.00	0.00	0.00	3.28	17.31	38.29	17.72	12.83	101.60	53.82	34.74
Pseudevadne tergestina	water flea	437.08	155.92	0.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pleopsis polyphemoides	water flea	0.00	1.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cirriped nauplius stage	barnacles	515.24	586.49	5.69	3.88	13.84	23.90	1.58	9.06	1.47	7.13	0.00	0.00	0.58	1.42
cirriped cypris stage	barnacles	17.76	3.42	0.00	0.00	0.00	0.00	3.49	0.00	0.00	59.07	0.00	4.58	0.71	2.61
branchiurans, Argulus spp.	fish lice	0.00	0.67	0.60	0.66	1.32	0.69	1.27	2.17	0.00	0.78	2.61	1.26	4.33	0.66
Acartia tonsa	copepod	18586.50	11202.27	7164.24	5632.92	7360.71	15619.07	15957.53	7656.74	480.15	416.10	413.22	291.17	152.74	79.53
Centropages velificatus	copepod	631.84	272.79	45.02	53.67	16.28	8.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Osphranticum labronectum	copepod	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.52	0.00	0.00	0.00	0.00
Diaptomus spp.	copepods	0.00	0.00	0.72	0.00	0.00	2.19	117.81	56.95	145.86	401.69	267.16	570.58	893.83	575.28
Pseudodiaptomus coronatus	copepod	39.03	66.73	20.88	40.29	83.32	434.75	1522.52	51.30	46.00	23.87	53.83	36.69	3.71	3.95
Eucalanus sp.	copepod	5.66	2.12	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
paracalanids	copepods	60.38	65.53	7.87	2.55	1.55	9.26	7.59	1.68	0.00	0.00	0.00	0.00	0.00	0.00
Calanopia americana	copepod	79.85	248.15	175.93	61.39	51.76	11.87	7.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Labidocera aestiva	copepod	5467.25	12734.90	4394.56	2090.22	731.88	2679.70	1038.73	2418.86	0.00	3.42	0.00	0.00	2.07	1.42

Table A3, page 2 of 6. Location specific plankton-net catch .

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	-5.9	-3.6	2.5	5.2	7.7	10.6	16.2	20.0	24.2	26.9	30.2	34.4	37.1	41.0
Labidocera acutifrons	copepod	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eurytemora affinis	copepod	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.26
Temora turbinata	copepod	77.08	75.66	16.90	20.60	8.59	16.27	0.79	11.78	1.47	1.42	0.00	0.00	0.00	0.00
Temora stylifera	copepod	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Temora longicornis	copepod	5.17	2.06	1.28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
unidentified freshwater cyclopoids	copepods	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.21	4.26	6.78	7.76	13.54	12.90
Cyclops spp.	copepods	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.26	0.00	0.00	0.00	5.19	6.91
Eucyclops speratus	copepod	50.89	39.64	1.99	0.00	0.66	6.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Macrocyclops albidus	copepods	0.00	0.00	3.12	2.23	0.00	3.44	0.00	0.00	0.68	4.20	0.00	0.00	0.00	0.00
Mesocyclops edax	copepod	0.00	0.00	36.41	3.98	41.11	8.19	125.80	258.37	304.69	661.91	1273.97	2744.50	4146.08	4213.23
Mesocyclops leuckarti	copepod	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.64
Oithona spp.	copepods	140.31	88.19	3.90	7.36	0.66	73.28	52.33	52.79	0.00	0.00	2.04	0.00	0.00	0.00
Alteutha sp.	copepod	0.00	2.89	0.00	4.35	5.29	4.33	17.14	14.25	0.74	0.00	0.00	0.00	0.00	0.00
unidentified harpacticoids	copepods	66.82	50.92	4.75	16.34	2.63	0.00	3.64	0.00	3.60	2.80	4.07	0.00	0.58	0.60
Saphirella spp.	copepods	4.26	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
siphonostomatids	parasitic copepods	9.98	41.00	10.99	17.10	12.00	7.69	3.03	8.28	0.74	0.90	2.64	0.00	0.00	0.00
Monstrilla sp.	copepod	35.89	44.81	92.73	8.75	2.40	2.60	0.00	2.70	0.00	0.00	0.00	0.00	0.00	0.00
myodocopod sp. a	ostracod, seed shrimp	0.00	1.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.58	0.61
Parasterope pollex	ostracod, seed shrimp	29.16	187.60	200.81	181.21	799.80	54.86	60.64	0.75	2.98	0.00	0.00	0.00	1.65	0.66
Sarsiella zostericola	ostracod, seed shrimp	4.30	17.62	13.72	140.08	10.84	16.16	2.15	0.75	0.74	0.00	0.00	0.00	0.00	0.00
ostracods, podocopid	ostracods, seed shrimps	0.00	0.00	0.00	0.00	0.00	0.70	0.00	0.82	3.69	0.00	3.30	1.46	3.44	9.42
Squilla empusa larvae	mantis shrimp	31.30	4.04	12.52	6.13	37.05	14.76	0.78	15.32	0.00	0.00	0.00	0.00	0.00	0.00
mysid sp. A	opposum shrimps, mysids	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
(Heteromysis sp.)	opossum shrimp, mysid	0.00	0.81	22.20	35.99	19.15	1.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Americamysis almyra	opossum shrimp, mysid	2.71	15.16	298.67	342.84	523.53	767.63	550.35	1151.33	1115.95	637.73	5151.32	3267.56	2765.28	2871.09
Americamysis bahia	opossum shrimp, mysid	99.53	47.90	80.52	46.57	74.57	11.13	45.95	2.08	0.00	0.71	0.00	0.00	0.00	0.00
unidentified Americamysis juveniles	opossum shrimps, mysids	38.66	102.63	149.71	553.95	722.52	1117.41	642.72	659.04	3093.45	1422.07	6066.30	4257.78	3308.92	3197.09
Americamysis stucki	opossum shrimp, mysid	23.44	24.07	1.99	5.33	9.97	5.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bowmaniella dissimilis	opossum shrimp, mysid	24.50	25.99	400.11	276.45	384.47	709.70	370.65	56.47	57.01	62.28	588.11	265.94	246.83	125.30
Brasilomysis castroi	opossum shrimp, mysid	0.00	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mysidopsis furca	opossum shrimp, mysid	0.00	2.40	4.35	4.92	0.00	2.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mysidopsis mortenseni	opossum shrimp, mysid	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Spelaeomysis sp.	opossum shrimp, mysid	0.00	0.00	0.00	0.00	1.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Taphromysis bowmani	opossum shrimp, mysid	0.00	0.81	0.00	0.77	0.00	0.00	0.00	0.00	0.00	2.52	2.41	2.47	1.82	4.90
amphipods, gammaridean	amphipods	820.19	2718.66	47107.32	58113.62	57022.28	94438.14	6060.19	5180.03	1739.67	718.78	5280.80	2057.11	1025.58	1578.27
amphipods, caprellid	skeleton shrimps	42.00	55.33	44.76	57.41	31.69	35.73	56.66	6.07	2.23	0.90	0.00	0.62	0.00	0.00
Lestrigonus bengalensis	hyperiid amphipod	0.00	1.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
isopod sp. a	isopod	0.00	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cyathura polita	isopod	0.00	0.00	17.78	2.86	0.58	0.00	0.74	2.43	25.08	33.83	36.84	9.02	2.55	3.07
Xenanthura brevitelson	isopod	0.00	0.00	2.51	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60
Anopsilana jonesi	isopod	1.89	1.35	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	4.22	19.27	19.99	3.67
cymothoid sp. a (Lironeca) juveniles	isopod	6.74	15.20	17.73	7.42	6.98	13.39	7.51	5.81	8.42	12.96	60.28	22.88	15.04	10.89
Cassidinidea ovalis	isopod	0.00	0.00	0.00	0.00	0.68	0.00	2.92	0.00	0.00	3.24	0.61	0.00	2.46	1.92
Sphaeromatinae	isopods	0.00	3.38	24.92	5.95	3.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harrieta faxoni	isopod	1.86	11.07	17.95	3.23	3.02	2.67	0.00	0.00	0.71	0.00	0.00	17.80	0.00	3.05
Sphaeroma quadridentata	isopod	0.00	0.00	1.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.00	0.00	0.00
Sphaeroma terebrans	isopod	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.37	0.00	0.00	0.00
Gnathia sp. larvae	isopod	0.00	0.00	0.00	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Munna reynoldsi	isopod	5.20	33.32	1.94	7.91	3.80	0.00	0.00	0.00	0.00	0.00	0.69	1.46	0.00	0.00
Edotia triloba	isopod	1.86	2.72	6.59	37.44	556.60	478.21	654.03	811.47	166.89	576.86	1993.28	382.13	186.45	441.42
Erichsonella attenuata	isopod	0.00	4.64	10.18	22.88	19.85	8.79	1.56	0.65	1.68	0.90	0.00	0.00	0.00	0.00
Hoplomachus propinquus	tanaid	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hargeria rapax	tanaid	2.03	21.17	762.92	528.79	299.78	289.06	18.36	0.00	3.35	0.00	0.00	0.62	0.00	0.00

Table A3, page 3 of 6. Location specific plankton-net catch .

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	-5.9	-3.6	2.5	5.2	7.7	10.6	16.2	20.0	24.2	26.9	30.2	34.4	37.1	41.0
Sinelobus stanfordi	tanaid	0.00	0.00	0.58	0.00	0.00	1.38	0.00	0.66	0.00	0.00	0.69	1.46	0.00	0.00
Apseudes sp.	tanaid	4.73	6.02	22.78	49.56	135.37	14.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
cumaceans	cumaceans	593.18	1680.59	5475.80	7768.22	25417.10	32022.94	41196.21	2808.03	1906.59	1483.19	9777.29	718.50	255.93	66.39
penaeid mysis larvae	penaeid shrimps	1.89	4.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
penaeid postlarvae	penaeid shrimps	43.53	10.00	3.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
penaeid metamorphs	penaeid shrimps	77.77	73.99	102.14	127.05	36.96	30.39	7.22	0.72	0.00	0.68	2.69	0.00	0.00	0.00
Farfantepenaeus duorarum juveniles	pink shrimp	0.74	0.81	2.39	3.48	7.74	3.39	1.65	1.44	0.71	0.00	1.34	1.31	1.65	0.00
Trachypenaeopsis mobilispinus juveniles	shrimps	3.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lucifer faxoni juveniles and adults	shrimp	8223.14	8032.81	1359.70	806.69	362.04	210.06	13.99	50.41	0.00	3.42	0.00	0.00	0.67	1.32
Lucifer faxoni mysis	shrimp	20.53	6.44	1.65	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
shrimps, unidentified postlarvae	shrimps	6.15	5.65	0.00	3.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
decapod zoeae	crab larvae	166114.20	117315.14	69928.18	42275.55	44806.02	57840.04	22048.52	16770.87	27047.40	3888.72	47716.05	20350.19	48520.82	8104.80
decapod megalopae	post-zoea crab larvae	1308.93	2008.15	771.46	973.56	352.83	495.42	209.94	271.10	28.55	16.64	202.69	217.11	186.47	102.36
decapod mysis	shrimp larvae	32964.71	11790.86	24760.00	25591.61	48076.92	40749.22	3065.38	37535.83	223.59	63.12	134.95	124.58	59.08	54.60
Leptochela serratorbita postlarvae	combclaw shrimp	2.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Palaemon floridanus postlarvae	Florida grass shrimp	206.00	168.32	308.28	180.74	106.90	122.99	16.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Periclimenes longicaudatus juveniles	longtail grass shrimp	0.00	0.00	2.36	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Periclimenes spp. postlarvae	shrimps	2.41	0.81	0.84	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Periclimenes spp. juveniles	shrimps	0.00	13.12	16.84	1.47	2.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Palaemonetes paludosus juveniles	grass shrimp	0.00	0.00	55.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Palaemonetes pugio juveniles	daggerblade grass shrimp	0.00	4.86	9.73	4.56	0.64	0.00	0.00	0.00	0.00	0.00	0.00	1.24	0.63	1.30
Palaemonetes pugio adults	daggerblade grass shrimp	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.00	0.00
Palaemonetes spp. postlarvae	grass shrimps	71.88	206.75	120.65	204.22	253.73	3695.39	75.34	434.18	20.38	14.04	25.59	29.23	40.53	67.16
Palaemonetes spp. juveniles	grass shrimps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.76	0.00	0.00
Palaemonetes vulgaris juveniles	grass shrimp	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
alphaeid postlarvae	snapping shrimps	1161.17	722.30	1406.33	1593.67	1066.74	1987.21	421.56	1156.76	1.68	2.42	3.06	0.00	3.72	1.31
alphaeid juveniles	snapping shrimps	0.00	21.23	1.98	0.60	0.00	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Alpheus estuariensis juveniles	snapping shrimp	0.00	0.81	0.59	1.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hippolyte zostericola postlarvae	zostera shrimp	1009.29	1259.07	301.28	173.75	151.90	251.58	67.42	38.08	3.28	1.81	0.61	0.00	0.67	15.35
Hippolyte zostericola juveniles	zostera shrimp	18.12	40.18	6.26	3.00	1.32	1.30	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hippolyte zostericola adults	zostera shrimp	6.05	4.84	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Latreutes parvulus postlarvae	sargassum shrimp	0.00	0.00	0.00	0.00	71.85	39.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tozeuma carolinense postlarvae	arrow shrimp	211.64	166.95	230.57	24.40	6.09	25.65	2.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tozeuma carolinense juveniles	arrow shrimp	31.06	27.80	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ogyrides alphaerostris postlarvae	estuarine longeye shrimp	0.00	0.00	0.00	2.23	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
processid postlarvae	night shrimps	1149.87	475.20	295.77	125.51	68.70	111.53	85.25	31.36	0.82	1.81	0.00	0.00	0.00	0.00
processid juveniles	night shrimps	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Ambidexter symmetricus juveniles	shrimp	0.00	7.02	1.98	0.81	0.66	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upogebia spp. postlarvae	mud shrimps	3860.16	3414.50	3502.49	2288.76	3385.61	2047.97	331.44	2374.58	0.74	0.00	0.00	0.00	0.00	1.40
Upogebia spp. juveniles	mud shrimps	6.86	26.41	35.24	3.23	18.18	61.36	6.40	2.70	0.00	0.00	0.00	0.00	0.00	0.00
Euceramus praelongus juveniles	olivepit porcelain crab	7.31	2.40	0.00	0.00	2.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Petrolisthes armatus juveniles	porcelain crab	26.14	53.96	14.16	11.49	0.00	3.09	2.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Crab, Emerita sp. juveniles	mole crab	0.00	0.00	0.00	4.04	44.51	2.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
paguroid megalops larvae	hermit crabs	3126.23	1033.72	659.94	246.50	403.98	42.44	3.29	0.71	0.00	0.00	0.00	0.00	0.00	0.00
paguroid juveniles	hermit crabs	59.68	52.67	11.70	6.54	0.66	6.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Portunus sp. juveniles	swimming crab	4.54	2.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
xanthid juveniles	mud crabs	0.00	2.43	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00
Pinnixa sayana juveniles	pea crab	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uca spp. juveniles	fiddler crabs	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ephemeropteran larvae	mayflies	0.00	0.00	0.00	0.00	0.73	2.20	36.13	84.07	0.00	10.52	10.84	5.36	13.09	31.52
odonates, anisopteran larvae	dragonflies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65	0.00	0.00	0.65	0.00	0.63	1.30
odonates, zygopteran larvae	damselflies	0.00	0.00	0.00	0.00	0.00	0.00	7.39	6.59	0.00	1.50	0.00	0.62	1.89	2.41
hemipterans, corixid adults	water boatmen	0.00	0.00	0.00	0.60	0.00	0.00	1.64	4.12	6.03	0.00	0.74	0.67	0.00	1.31

Table A3, page 4 of 6. Location specific plankton-net catch .

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

		Location (km from mouth)													
Description	Common Name	-5.9	-3.6	2.5	5.2	7.7	10.6	16.2	20.0	24.2	26.9	30.2	34.4	37.1	41.0
hemipterans, corixid juveniles	water boatmen	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.60	0.00	0.00	0.00
coleopterans, dytiscid adults	predaceous diving beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.00	0.00
coleopterans, curculionid adults	beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.00
coleopterans, elmid larvae	riffle beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66
coleopterans, elmid adults	riffle beetles	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.62	0.62	0.00	0.66
dipterans, pupae	flies, mosquitoes	0.80	0.71	3.79	4.58	15.09	10.73	27.89	16.85	29.71	60.33	195.22	681.71	528.07	1022.89
dipterans, tabanid larvae	deer flies	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.32	0.00	0.00	0.00	0.00	0.00	0.00
dipterans, ceratopogonid larvae	biting midges	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.65	0.00	0.75	0.00	0.67	0.00	2.02
dipteran, Chaoborus punctipennis larvae	phantom midge	8.48	5.54	35.50	39.54	56.24	16.75	67.50	261.89	551.21	425.28	1853.67	3682.38	3488.37	6588.09
dipterans, chironomid larvae	midges	0.00	0.00	2.33	0.00	0.73	0.59	0.00	2.98	2.61	3.39	5.80	13.53	14.26	8.40
trichopteran larvae	caddisflies	0.00	0.00	0.00	0.00	0.00	0.00	1.64	1.65	0.00	0.00	0.65	0.00	5.20	0.67
brachiopod, Glottidia pyramidata larvae	lamp shell	4.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
chaetognaths, sagittid	arrow worms	9376.98	5413.52	3070.62	4891.25	4180.66	6280.99	5501.39	3578.18	136.26	1242.94	173.74	41.99	6.12	20.32
ascidiacean larvae	tunicate larvae	0.00	0.00	20.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
appendicularian, Oikopleura dioica	larvacean	3016.81	2241.09	1425.75	10782.96	1332.65	5821.61	9309.40	14449.46	156.01	21.19	2.51	2.94	0.00	0.00
Elops saurus postflexion larvae	ladyfish	0.00	0.00	0.54	1.32	0.00	2.93	0.00	0.65	0.00	7.00	1.38	1.99	0.00	1.26
Myrophis punctatus juveniles	speckled worm eel	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
clupeid eggs	herrings	113.38	204.29	139.52	111.53	59.23	366.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
clupeid preflexion larvae	herrings	111.94	29.12	89.31	54.74	78.27	104.74	20.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Brevoortia spp. postflexion larvae	menhaden	1.57	0.00	1.08	0.62	0.00	0.00	0.81	0.00	0.66	2.55	5.10	0.00	0.69	0.67
Brevoortia spp. metamorphs	menhaden	0.73	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harengula jaguana eggs	scaled sardine	0.00	0.00	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harengula jaguana flexion larvae	scaled sardine	0.00	0.00	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harengula jaguana postflexion larvae	scaled sardine	0.00	3.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harengula jaguana metamorphs	scaled sardine	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Harengula jaguana juveniles	scaled sardine	0.00	0.81	0.00	0.00	0.68	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Opisthonema oglinum flexion larvae	Atlantic thread herring	5.43	2.40	2.60	0.00	0.78	0.00	0.00	2.70	0.00	0.00	0.00	0.00	1.42	1.37
Opisthonema oglinum postflexion larvae	Atlantic thread herring	2.71	1.55	7.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.43
Opisthonema oglinum juveniles	Atlantic thread herring	0.00	0.00	0.00	0.00	0.00	1.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sardinella aurita flexion larvae	Spanish sardine	5.25	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sardinella aurita postflexion larvae	Spanish sardine	0.00	0.00	1.28	0.00	1.56	4.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anchoa spp. preflexion larvae	anchovies	950.53	554.97	934.10	1790.09	1407.80	3497.84	6076.67	1328.32	167.11	291.24	336.58	90.34	22.86	3.53
Anchoa spp. flexion larvae	anchovies	13.28	44.30	81.93	62.36	65.34	113.25	70.03	32.28	43.97	32.62	48.33	23.79	1.65	10.09
Anchoa hepsetus eggs	striped anchovy	3.66	2.17	7.31	0.00	5.29	12.47	52.60	2.85	0.00	0.00	0.00	0.00	0.00	0.00
Anchoa hepsetus postflexion larvae	striped anchovy	0.00	0.00	0.00	1.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Anchoa hepsetus adults	striped anchovy	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00
Anchoa mitchilli eggs	bay anchovy	9.52	23.20	135.87	2148.51	1668.73	10108.77	3614.06	24302.72	131.84	3.70	3.46	109.74	55.14	23.31
Anchoa mitchilli postflexion larvae	bay anchovy	58.07	94.48	143.75	129.49	176.04	356.38	130.01	592.03	113.81	20.62	50.59	60.13	43.49	34.24
Anchoa mitchilli juveniles	bay anchovy	3.02	9.83	21.51	40.56	35.29	30.21	20.37	24.38	33.77	14.50	298.10	144.56	159.73	193.29
Anchoa mitchilli adults	bay anchovy	0.00	5.62	7.71	3.02	1.28	0.00	2.35	5.67	9.88	79.65	14.71	64.69	39.55	36.46
Notemigonus crysoleucas preflexion larvae	golden shiner	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.79
Hoplosternum littorale juveniles	brown hoplo catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.00	1.20
Liposarcus spp. juveniles	suckermouth catfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.62	2.61	0.70
Opsanus beta juveniles	gulf toadfish	0.00	0.00	2.28	0.80	1.62	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Labidesthes sicculus preflexion larvae	brook silverside	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69
Labidesthes sicculus flexion larvae	brook silverside	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69
Membras martinica preflexion larvae	rough silverside	0.00	0.81	0.00	0.00	1.21	0.00	4.10	0.00	0.00	0.00	0.00	0.00	0.00	0.71
Membras martinica flexion larvae	rough silverside	0.00	0.00	2.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Membras martinica juveniles	rough silverside	0.00	0.00	0.00	0.00	0.64	0.00	0.00	0.84	0.00	1.39	0.00	0.00	0.00	1.38
Membras martinica adults	rough silverside	0.00	0.00	0.00	0.63	0.67	0.00	0.67	0.00	0.68	0.00	0.00	0.00	0.00	0.00
Menidia spp. preflexion larvae	silversides	0.00	0.00	1.30	0.00	0.61	4.22	1.27	1.45	1.28	1.40	2.03	0.00	0.00	3.40
Menidia spp. flexion larvae	silversides	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
Menidia spp. juveniles	silversides	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.64	0.00	3.49	0.65	1.24	0.61	3.04

Table A3, page 5 of 6. Location specific plankton-net catch .

Data are presented as mean number per 1,000 cubic meters.

Organisms are listed in phylogenetic order.

Description	Common Name	Location (km from mouth)													
		-5.9	-3.6	2.5	5.2	7.7	10.6	16.2	20.0	24.2	26.9	30.2	34.4	37.1	41.0
Gambusia holbrooki juveniles	eastern mosquitofish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.54	1.26	1.90
Synodus foetens postflexion larvae	inshore lizardfish	0.00	0.64	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hippocampus erectus juveniles	lined seahorse	0.00	3.03	2.53	2.42	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hippocampus zosterae juveniles	dwarf seahorse	0.00	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cosmocampus hildebrandi juveniles	dwarf pipefish	0.00	1.37	0.00	0.69	0.00	0.00	0.00	0.00	0.82	3.34	0.69	6.34	1.89	3.18
Syngnathus floridae juveniles	dusky pipefish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00
Syngnathus louisianae juveniles	chain pipefish	3.85	3.26	2.57	0.00	0.68	0.73	3.29	0.00	0.00	0.00	0.00	5.94	4.18	4.95
Syngnathus scovelli juveniles	gulf pipefish	18.14	7.91	10.18	7.64	4.62	5.72	4.04	0.72	0.71	3.00	1.39	4.97	4.62	2.80
Syngnathus scovelli adults	gulf pipefish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00
Prionotus spp. postflexion larvae	searobins	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mugil cephalus juveniles	striped mullet	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.64	0.63	0.68	0.00	0.00
fish eggs, percomorph	sciaenid eggs (primarily)	1240.97	3377.07	1768.32	2630.03	4083.64	4079.15	30022.39	23677.13	2604.91	130.36	13.20	353.15	422.27	67.60
Lepomis macrochirus juveniles	bluegill	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.87	0.00	0.00	2.76	0.00	2.41
Lepomis spp. juveniles	sunfishes	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.63	0.00
Chloroscombrus chrysurus preflexion larvae	Atlantic bumper	18.22	4.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloroscombrus chrysurus flexion larvae	Atlantic bumper	7.56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chloroscombrus chrysurus postflexion larvae	Atlantic bumper	0.00	0.00	0.58	0.00	0.00	0.00	0.00	2.70	0.00	0.00	0.00	0.00	0.00	0.00
Chloroscombrus chrysurus juveniles	Atlantic bumper	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oligoplites saurus preflexion larvae	leatherjack	3.65	0.67	0.00	0.00	0.00	5.94	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oligoplites saurus flexion larvae	leatherjack	0.00	2.55	0.00	1.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oligoplites saurus postflexion larvae	leatherjack	0.00	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Oligoplites saurus juveniles	leatherjack	0.00	0.78	0.00	0.00	0.73	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Uraspis secunda juveniles	cottonmouth jack	0.00	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lutjanus griseus juveniles	gray snapper	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus spp. postflexion larvae	mojarras	1.99	4.05	0.70	0.66	0.00	1.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eucinostomus spp. juveniles	mojarras	4.73	0.00	0.00	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Eugerres plumieri postflexion larvae	striped mojarra	0.00	0.00	1.65	0.00	0.00	2.67	0.00	5.41	0.00	0.00	0.00	0.00	0.00	0.00
gerreid preflexion larvae	mojjaras	73.80	61.67	104.90	8.92	65.07	128.14	26.76	45.59	0.00	0.00	0.00	0.00	0.00	0.00
gerreid flexion larvae	mojjaras	0.80	0.00	1.65	0.00	0.00	0.00	0.00	5.41	0.00	0.00	0.00	0.00	0.00	0.00
Archosargus probatocephalus postflexion larv	sheepshead	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Archosargus probatocephalus juveniles	sheepshead	14.66	1.61	10.81	0.70	0.68	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bairdiella chrysoura preflexion larvae	silver perch	38.78	4.46	2.77	3.83	0.66	8.25	3.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bairdiella chrysoura flexion larvae	silver perch	0.00	0.00	4.52	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bairdiella chrysoura postflexion larvae	silver perch	0.00	0.00	0.60	0.00	3.25	1.88	2.92	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bairdiella chrysoura juveniles	silver perch	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.04	0.00	0.00	0.00
Cynoscion arenarius preflexion larvae	sand seatrout	33.53	0.81	5.47	3.83	14.02	6.55	54.00	3.36	0.00	0.00	0.00	0.00	0.00	0.00
Cynoscion arenarius flexion larvae	sand seatrout	3.10	2.53	0.58	0.00	0.00	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cynoscion arenarius postflexion larvae	sand seatrout	1.86	12.57	0.69	1.27	0.67	0.63	10.52	0.00	0.00	0.68	2.83	0.00	0.00	0.00
Cynoscion arenarius juveniles	sand seatrout	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.00	0.00	0.00	1.02	1.26	1.42	0.77
Cynoscion nebulosus preflexion larvae	spotted seatrout	43.37	34.48	12.28	0.63	3.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cynoscion nebulosus flexion larvae	spotted seatrout	1.86	0.00	0.00	1.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Cynoscion nebulosus postflexion larvae	spotted seatrout	0.00	2.16	0.00	1.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Leiostomus xanthurus postflexion larvae	spot	0.00	2.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Menticirrhus spp. preflexion larvae	kingfishes	76.49	14.68	52.62	43.39	26.25	37.75	24.00	17.40	0.00	0.00	0.00	0.00	0.00	0.00
Menticirrhus spp. postflexion larvae	kingfishes	0.00	2.06	2.60	0.00	0.00	1.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pogonias cromis postflexion larvae	black drum	1.89	2.53	0.00	0.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pogonias cromis juveniles	black drum	1.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chaetodipterus faber preflexion larvae	Atlantic spadefish	7.02	3.48	7.42	1.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chasmodes saburrae flexion larvae	Florida blenny	13.06	10.87	35.35	4.95	3.50	56.22	33.55	8.97	0.00	0.00	0.00	0.00	0.00	0.71
Chasmodes saburrae postflexion larvae	Florida blenny	14.57	9.39	11.11	2.23	29.66	36.79	24.61	6.27	0.00	0.00	0.00	0.00	0.00	0.00
Chasmodes saburrae juveniles	Florida blenny	0.00	1.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lupinoblennius nicholsi flexion larvae	highfin blenny	0.00	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Lupinoblennius nicholsi postflexion larvae	highfin blenny	0.00	0.00	0.00	0.00	2.61	0.00	0.00	2.21	0.00	0.00	0.00	0.00	0.00	0.00

Table A3, page 6 of 6. Location specific plankton-net catch .

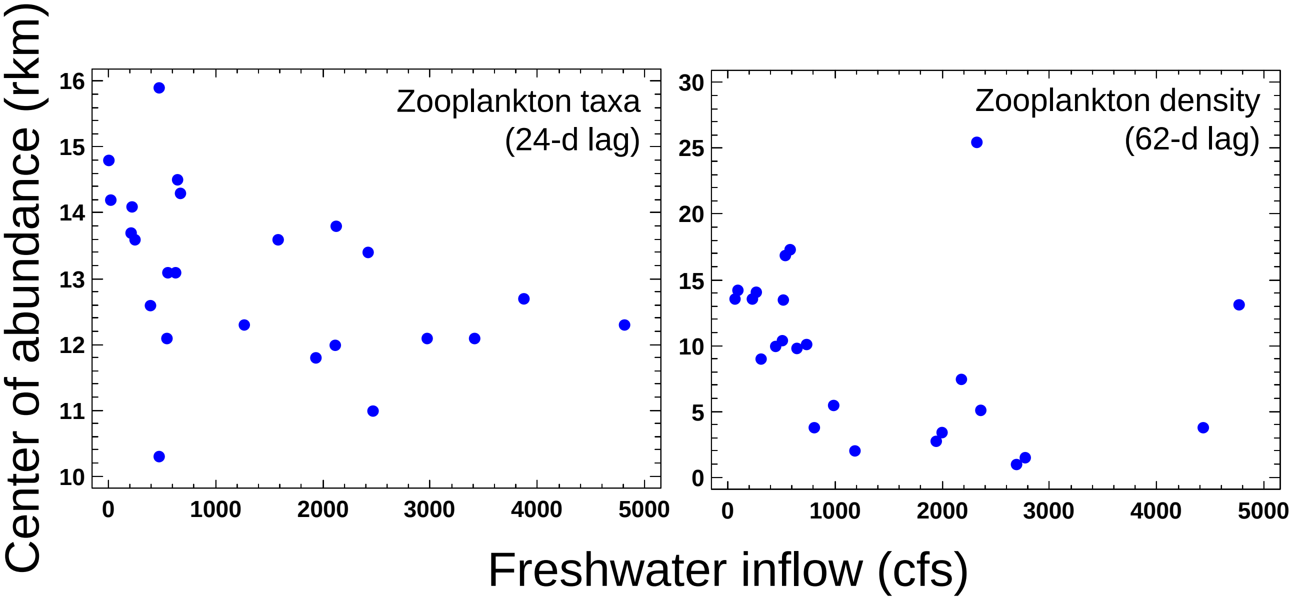
Data are presented as mean number per 1,000 cubic meters.

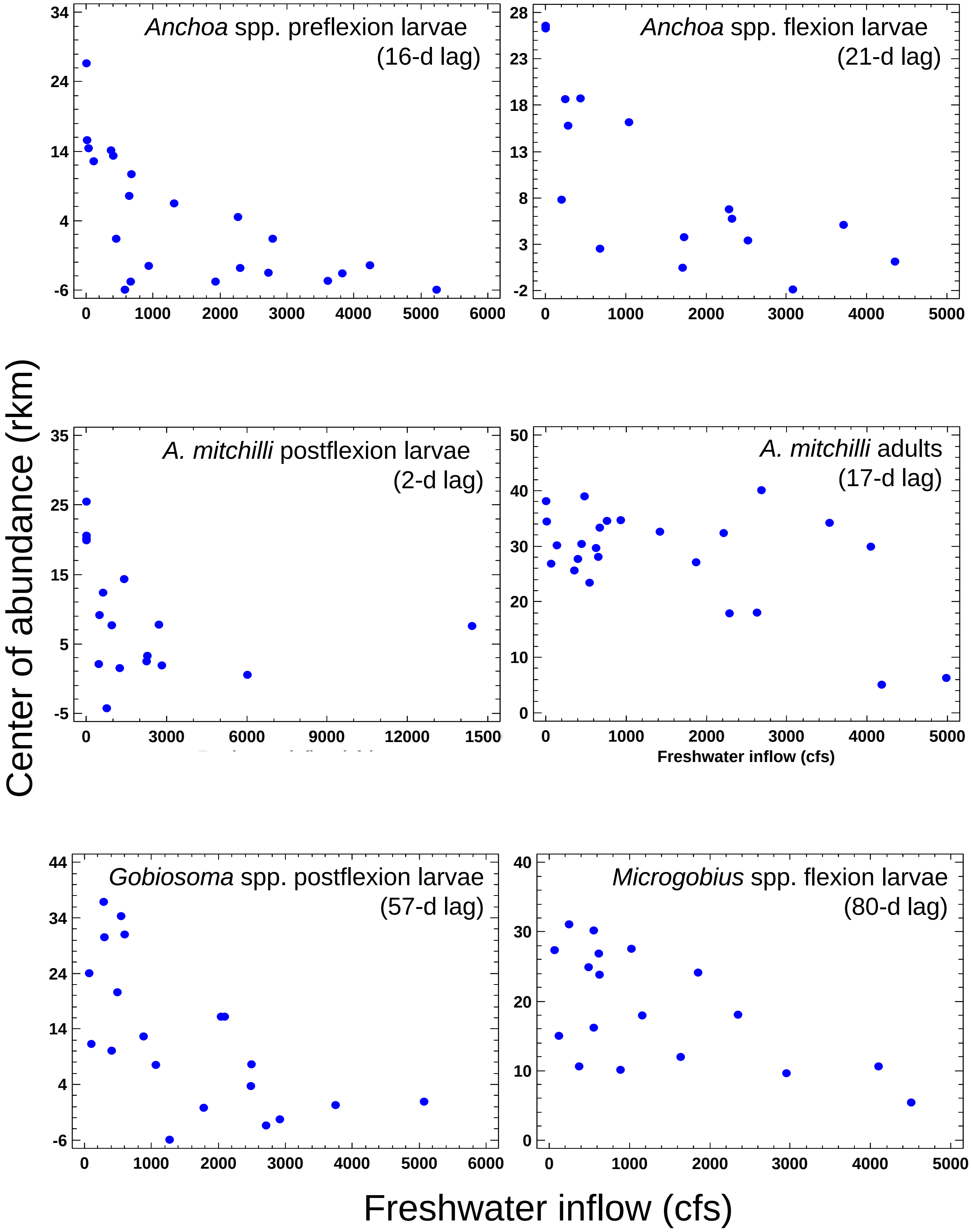
Organisms are listed in phylogenetic order.

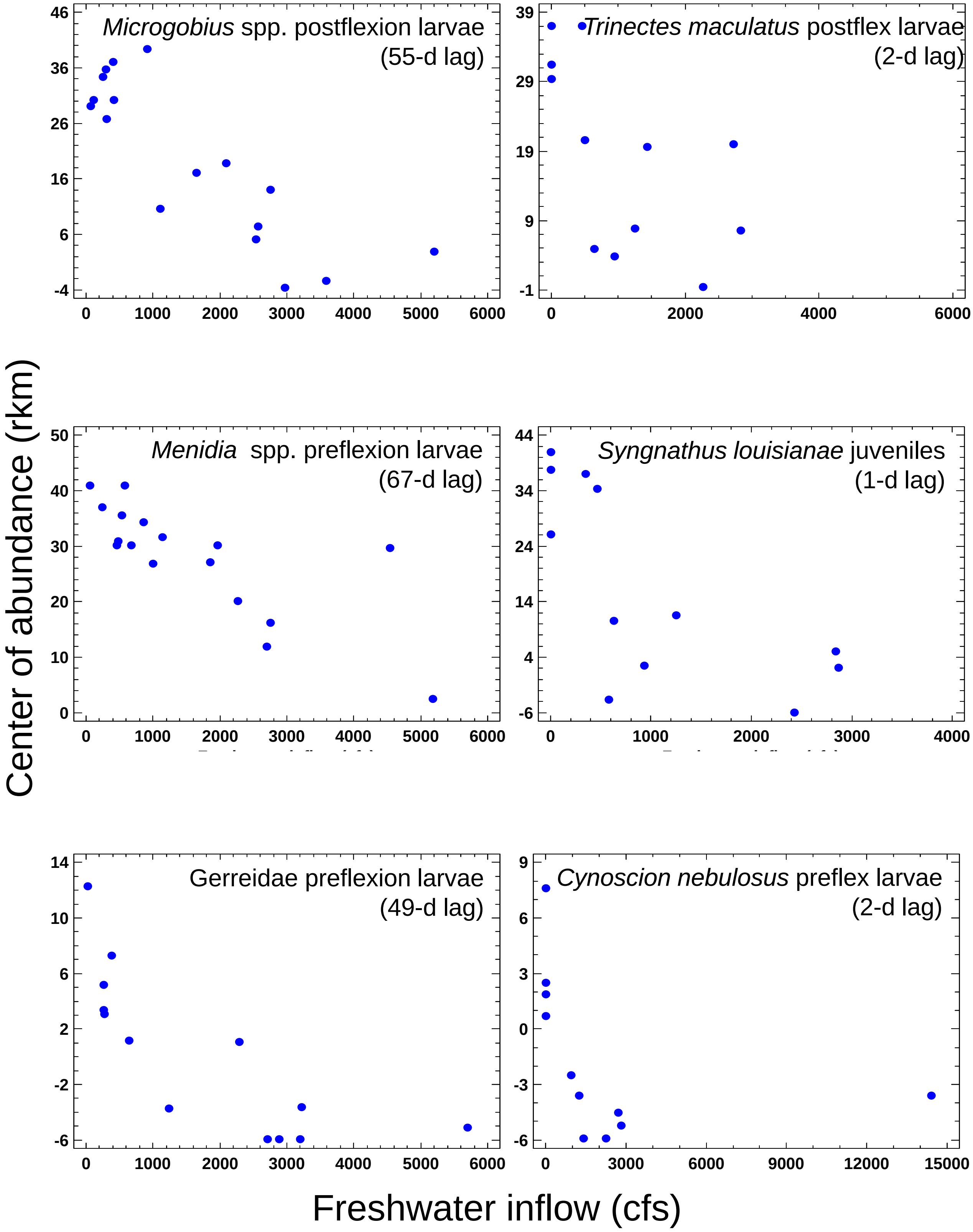
		Location (km from mouth)													
Description	Common Name	-5.9	-3.6	2.5	5.2	7.7	10.6	16.2	20.0	24.2	26.9	30.2	34.4	37.1	41.0
blenniid preflexion larvae	blennies	76.37	88.87	329.56	194.26	87.36	235.14	118.88	35.31	2.67	7.88	4.58	1.97	1.40	2.03
Bathygobius soporator preflexion larvae	frillfin goby	31.21	13.28	14.22	9.84	12.96	73.75	78.74	49.52	2.46	0.00	1.34	1.46	0.00	0.71
Bathygobius soporator flexion larvae	frillfin goby	4.50	9.06	0.00	7.76	4.23	5.94	3.29	9.44	0.00	0.00	0.00	0.00	0.00	0.00
Bathygobius soporator postflexion larvae	frillfin goby	3.81	2.73	1.93	0.00	6.14	3.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gobionellus spp. flexion larvae	gobies	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gobionellus spp. postflexion larvae	gobies	0.00	1.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gobiosoma bosc juveniles	naked goby	0.00	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00	0.00	1.99	2.76	4.00	3.73
Gobiosoma robustum juveniles	code goby	0.00	0.00	0.00	0.00	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gobiosoma spp. postflexion larvae	gobies	57.00	134.82	276.03	219.32	107.22	122.16	21.99	6.87	2.12	15.27	53.17	78.84	141.76	296.83
Microgobius gulosus juveniles	clown goby	0.00	0.00	0.00	0.00	0.81	0.00	0.00	0.00	1.75	0.00	0.83	10.31	10.50	45.94
Microgobius gulosus adults	clown goby	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73	0.00	0.00
Microgobius spp. flexion larvae	gobies	0.00	0.71	0.72	8.45	9.69	19.98	5.93	10.19	2.97	1.36	2.04	7.32	1.65	6.90
Microgobius spp. postflexion larvae	gobies	0.72	3.58	9.33	24.10	32.76	24.04	8.95	2.70	1.49	0.72	3.71	8.53	13.34	70.01
Microgobius thalassinus juveniles	green goby	0.00	0.00	0.00	0.00	0.81	0.00	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00
gobiid preflexion larvae	gobies	216.92	256.80	231.41	296.04	195.15	226.15	174.96	78.71	22.97	34.88	76.57	37.58	63.55	107.31
gobiid flexion larvae	gobies	39.39	140.34	75.78	105.07	79.01	47.34	36.39	10.50	3.66	4.10	10.56	2.39	5.43	56.28
gobiid postflexion larvae	gobies	1.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Gobiesox strumosus preflexion larvae	skilletfish	24.23	6.14	29.81	10.80	6.17	9.37	1.60	1.38	0.82	0.00	0.00	0.00	0.00	0.00
Gobiesox strumosus flexion larvae	skilletfish	0.65	0.00	0.66	0.00	0.66	0.00	1.46	0.00	1.48	3.42	0.00	0.00	0.00	0.00
Gobiesox strumosus postflexion larvae	skilletfish	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.42	2.77	0.00	0.00	0.00
Achirus lineatus preflexion larvae	lined sole	44.31	13.95	5.12	1.56	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Achirus lineatus flexion larvae	lined sole	8.16	4.61	4.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Achirus lineatus postflexion larvae	lined sole	1.86	2.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Trinectes maculatus preflexion larvae	hogchoker	49.25	16.77	11.88	6.53	7.07	3.90	5.64	3.37	0.00	0.00	0.00	0.00	0.00	0.00
Trinectes maculatus flexion larvae	hogchoker	0.00	0.00	0.70	0.00	0.64	2.83	3.66	0.00	0.00	0.00	1.99	0.00	0.00	4.83
Trinectes maculatus postflexion larvae	hogchoker	3.13	0.00	3.10	5.53	0.68	1.32	2.24	1.21	1.49	0.00	6.39	1.72	2.36	0.77
Trinectes maculatus juveniles	hogchoker	0.00	0.00	0.00	0.00	1.34	0.00	1.48	2.16	4.59	0.84	13.83	15.45	9.55	19.69
Trinectes maculatus adults	hogchoker	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.00	0.00	0.00	0.00	0.00
Symphurus plagiusa postflexion larvae	blackcheek tonguefish	3.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Symphurus plagiusa juveniles	blackcheek tonguefish	0.76	2.43	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chilomycterus schoepfi preflexion larvae	striped burrfish	4.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Chilomycterus schoepfi juveniles	striped burrfish	0.00	1.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sphoeroides spp. preflexion larvae	puffers	0.00	1.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
tetraodontid preflexion larvae	puffers	27.89	7.90	9.90	14.11	0.00	2.93	5.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00
tetraodontid postflexion larvae	puffers	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00
unidentified preflexion larvae	fish	6.86	0.00	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Appendix G

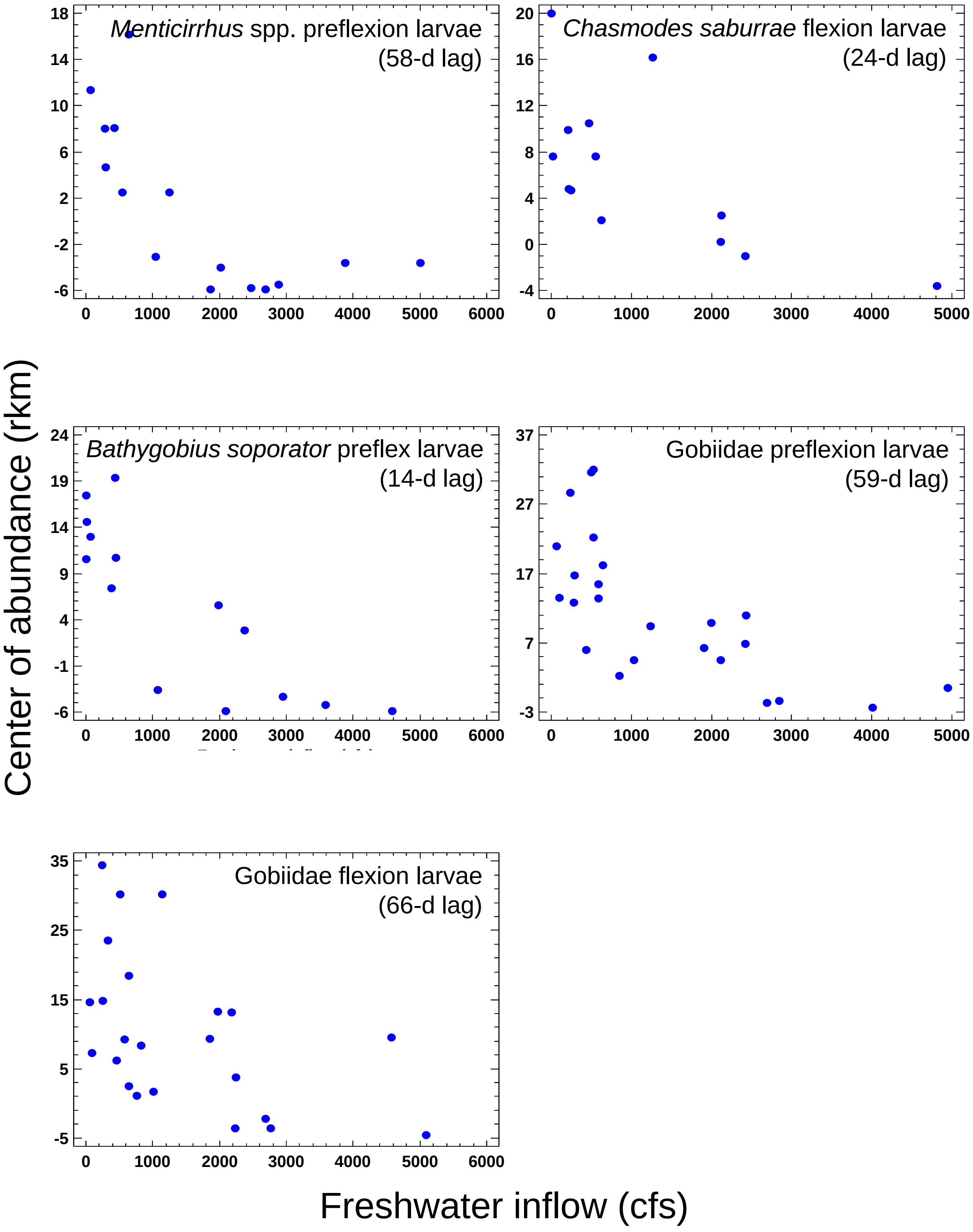
Location (center of abundance) responses to inflow

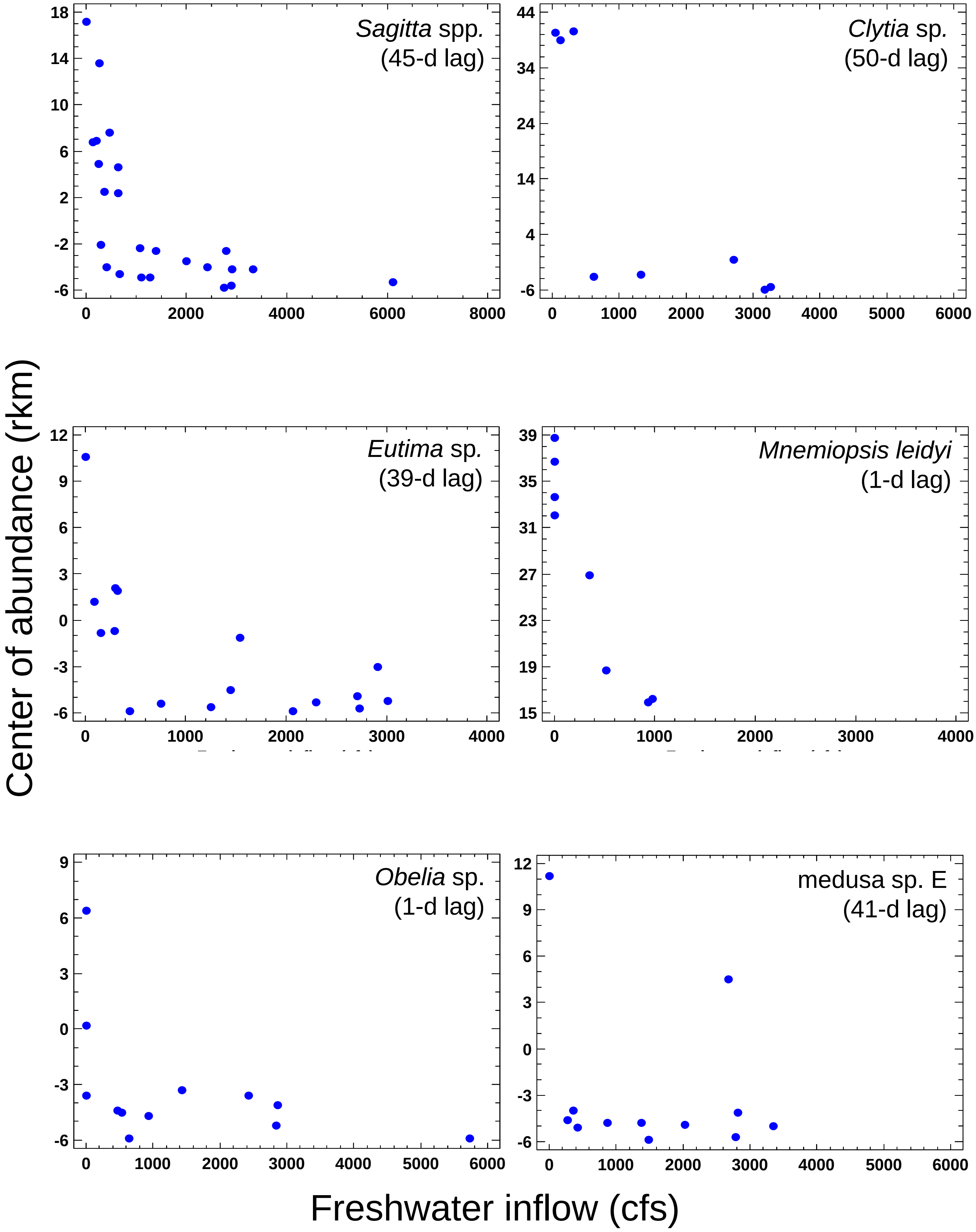

Center of abundance (rkm)
Zooplankton taxa
(24-d lag)
16
15
14
13
12
11
10
0
1000
2000
3000
4000
5000
Zooplankton density
(62-d lag)
30
25
20
15
10
5
0
0
1000
2000
3000
4000
5000
Freshwater inflow (cfs)

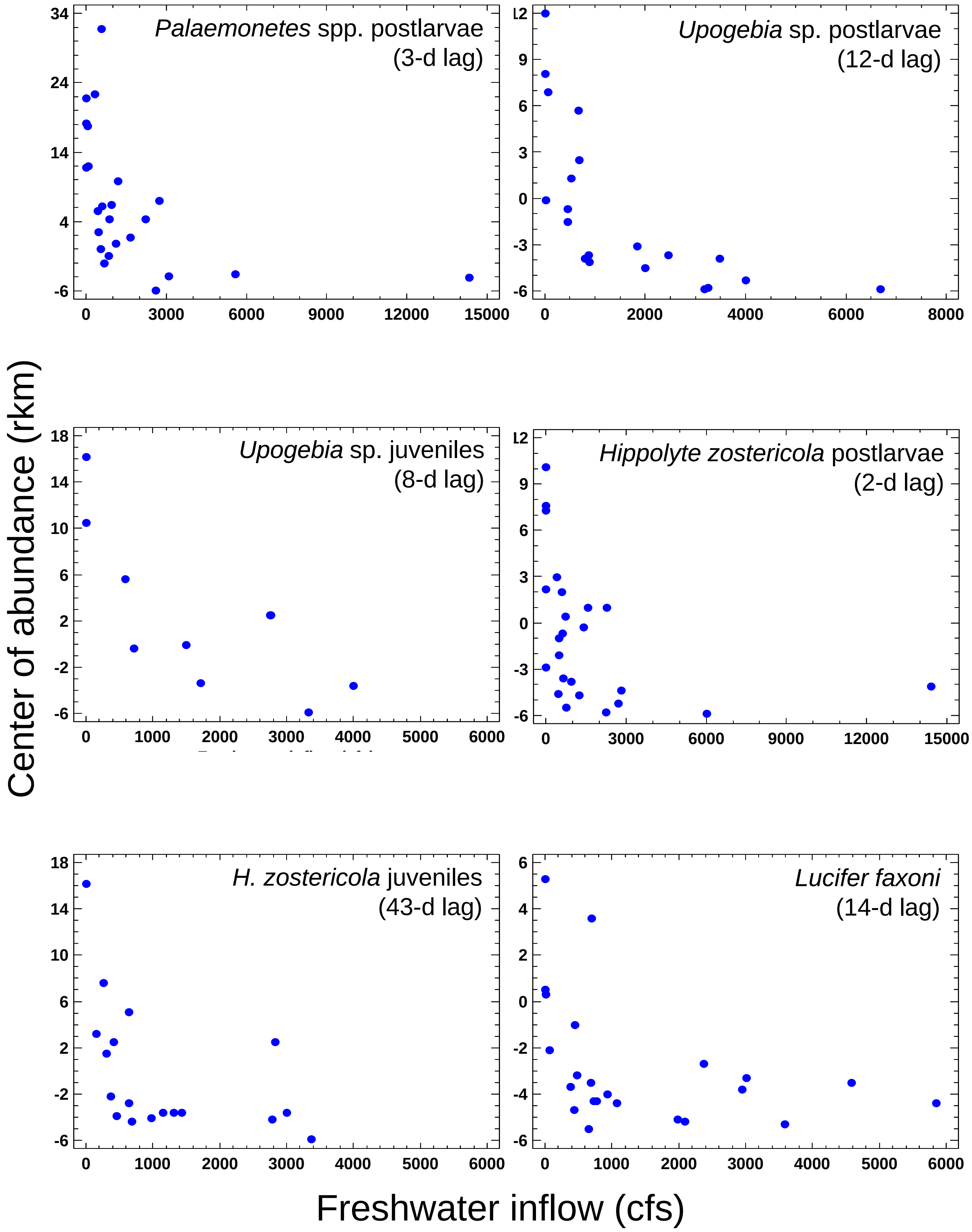

Anchoa spp. preflexion larvae
(16-d lag)
34
24
14
4
-6
0
1000
2000
3000
4000
5000
6000
Anchoa spp. flexion larvae
(21-d lag)
28
23
18
13
8
3
-2
0
1000
2000
3000
4000
5000
A. mitchilli postflexion larvae
(2-d lag)
35
25
15
5
-5
0
3000
6000
9000
12000
1500
A. mitchilli adults
(17-d lag)
50
40
30
20
10
0
0
1000
2000
3000
4000
5000
Freshwater inflow (cfs)
Gobiosoma spp. postflexion larvae
(57-d lag)
44
34
24
14
4
-6
0
1000
2000
3000
4000
5000
6000
Microgobius spp. flexion larvae
(80-d lag)
40
30
20
10
0
0
1000
2000
3000
4000
5000
Center of abundance (rkm)
Freshwater inflow (cfs)

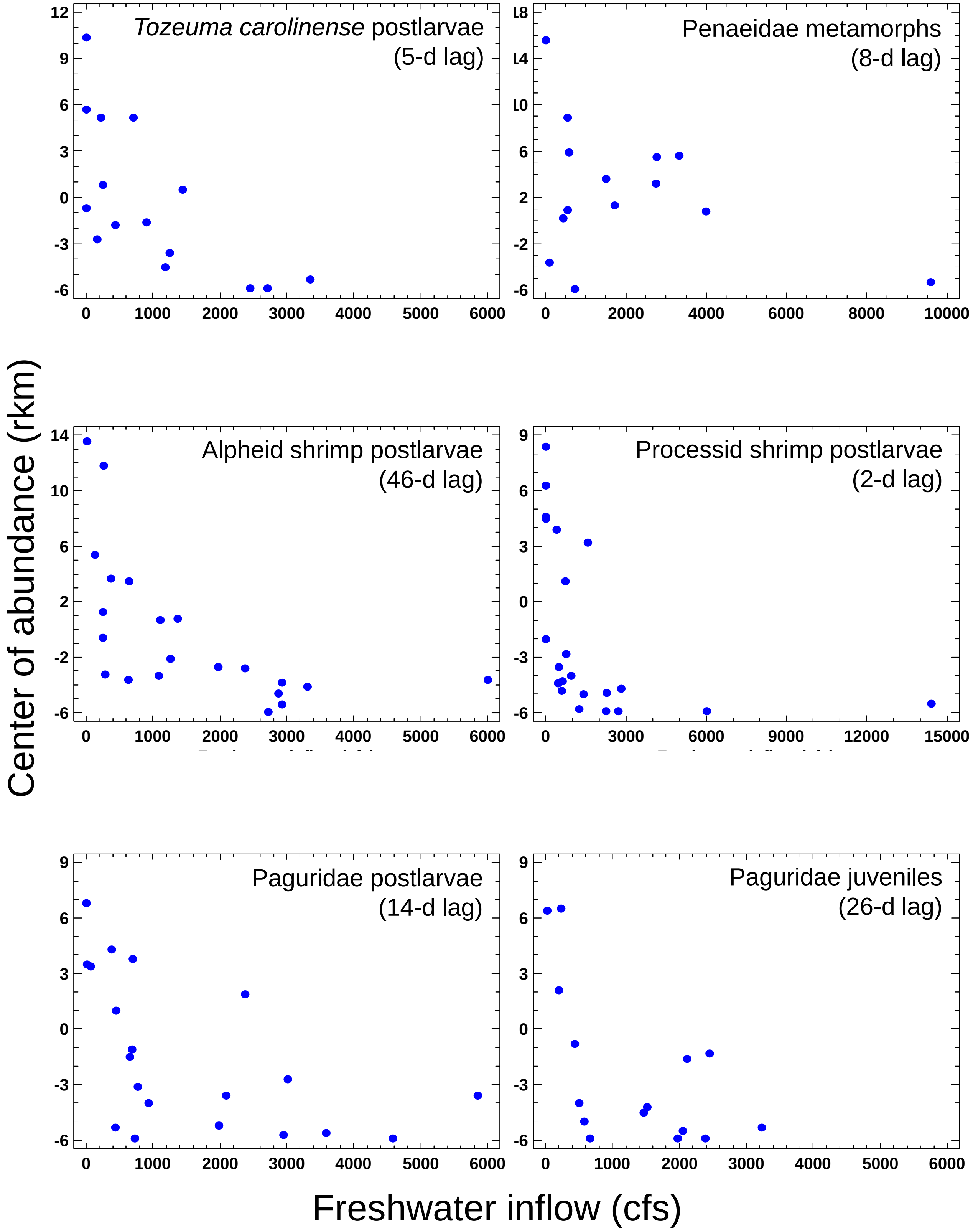


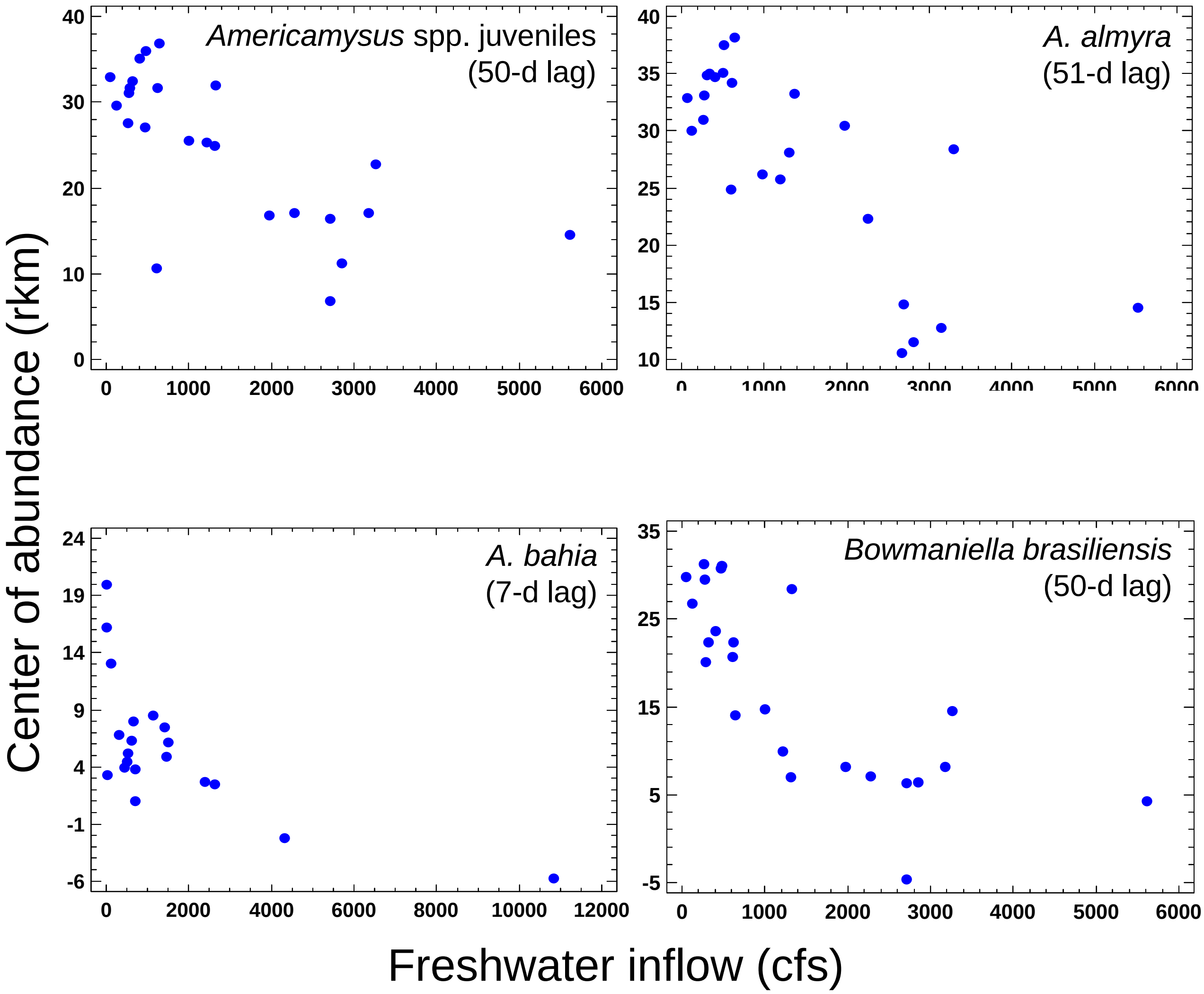
Microgobius spp. postflexion larvae (55-d lag)
46
36
26
16
6
-4
0
1000
2000
3000
4000
5000
6000
Trinectes maculatus postflex larvae (2-d lag)
39
29
19
9
-1
0
2000
4000
6000
Menidia spp. preflexion larvae (67-d lag)
50
40
30
20
10
0
0
1000
2000
3000
4000
5000
6000
Syngnathus louisianae juveniles (1-d lag)
44
34
24
14
4
-6
0
1000
2000
3000
4000
Gerreidae preflexion larvae (49-d lag)
14
10
6
2
-2
-6
0
1000
2000
3000
4000
5000
6000
Cynoscion nebulosus preflex larvae (2-d lag)
9
6
3
0
-3
-6
0
3000
6000
9000
12000
15000
Center of abundance (rkm)
Freshwater inflow (cfs)

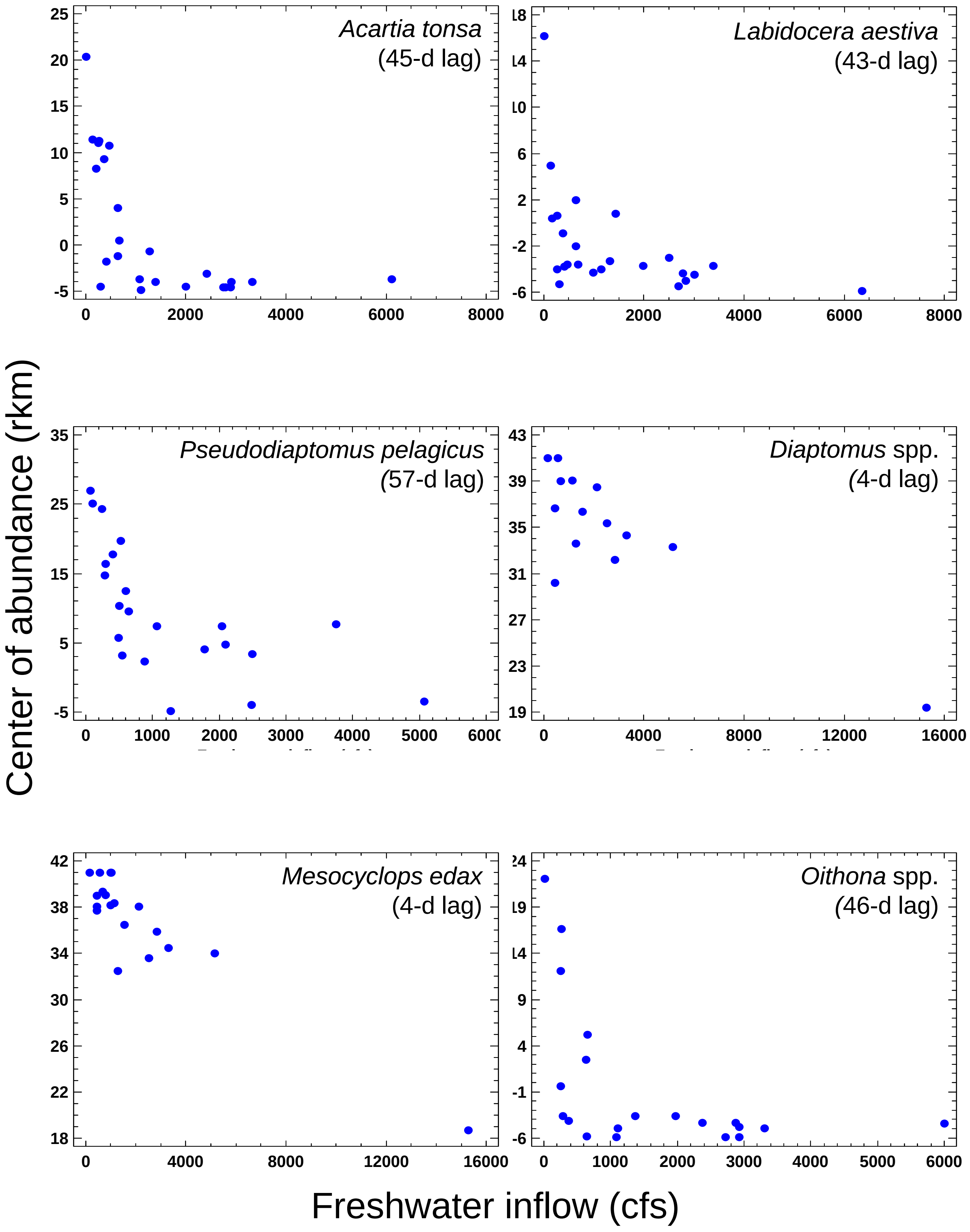

Center of abundance (rkm)
Freshwater inflow (cfs)
Menticirrhus spp. preflexion larvae
(58-d lag)
18
14
10
6
2
-2
-6
0
1000
2000
3000
4000
5000
6000
Chasmodes saburrae flexion larvae
(24-d lag)
20
16
12
8
4
0
-4
0
1000
2000
3000
4000
5000
Bathygobius soporator preflex larvae
(14-d lag)
24
19
14
9
4
-1
-6
0
1000
2000
3000
4000
5000
6000
Gobiidae preflexion larvae
(59-d lag)
37
27
17
7
-3
0
1000
2000
3000
4000
5000
Gobiidae flexion larvae
(66-d lag)
35
25
15
5
-5
0
1000
2000
3000
4000
5000
6000

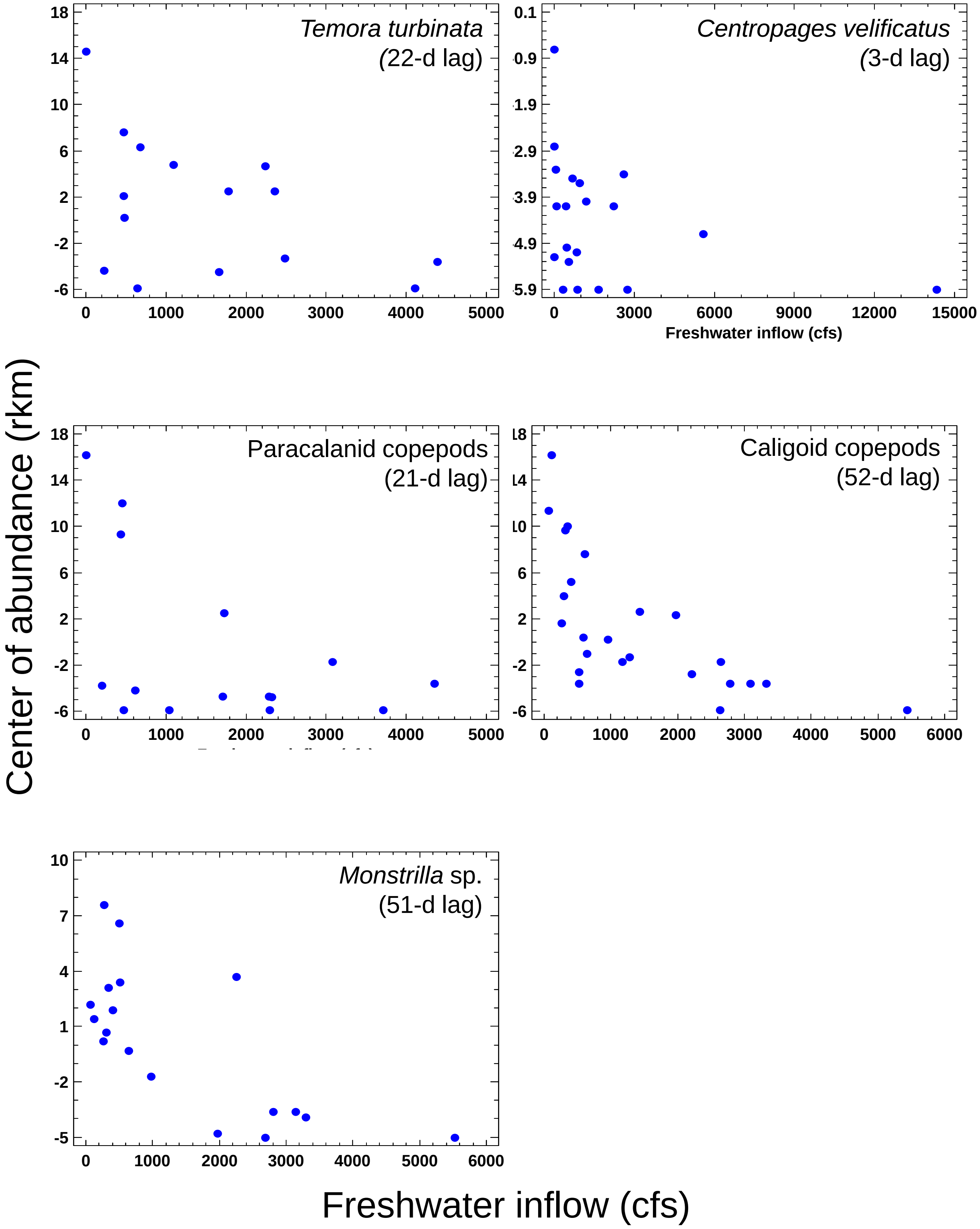

Center of abundance (rkm)
Freshwater inflow (cfs)
Sagitta spp.
(45-d lag)
18
14
10
6
2
-2
-6
0
2000
4000
6000
8000
Clytia sp.
(50-d lag)
44
34
24
14
4
-6
0
1000
2000
3000
4000
5000
6000
Eutima sp.
(39-d lag)
12
9
6
3
0
-3
-6
0
1000
2000
3000
4000
Mnemiopsis leidyi
(1-d lag)
39
35
31
27
23
19
15
0
1000
2000
3000
4000
Obelia sp.
(1-d lag)
9
6
3
0
-3
-6
0
1000
2000
3000
4000
5000
6000
medusa sp. E
(41-d lag)
12
9
6
3
0
-3
-6
0
1000
2000
3000
4000
5000
6000

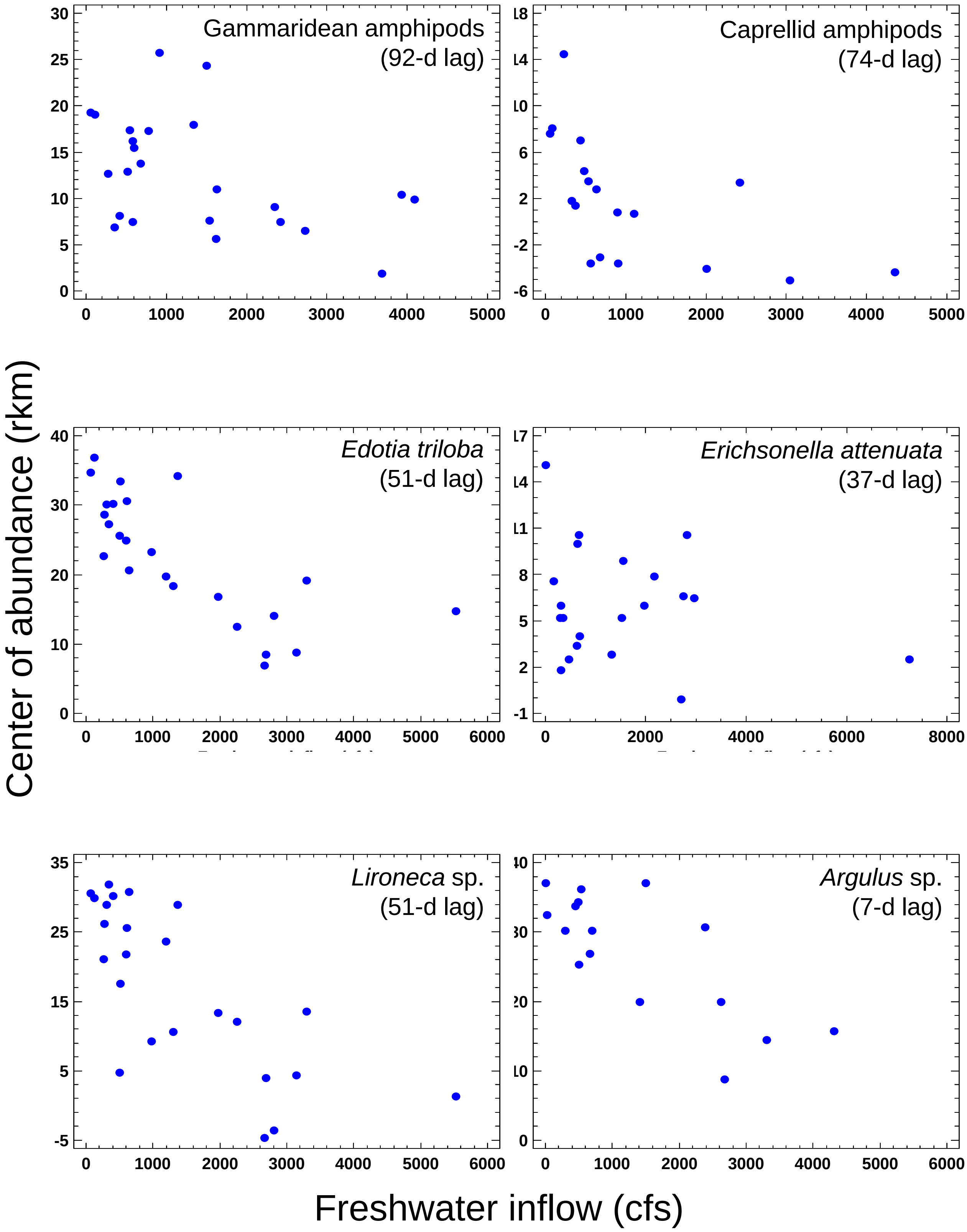

Center of abundance (rkm)
Freshwater inflow (cfs)
Palaemonetes spp. postlarvae
(3-d lag)
34
24
14
4
-6
0
3000
6000
9000
12000
15000
Upogebia sp. postlarvae
(12-d lag)
12
9
6
3
0
-3
-6
0
2000
4000
6000
8000
Upogebia sp. juveniles
(8-d lag)
18
14
10
6
2
-2
-6
0
1000
2000
3000
4000
5000
6000
Hippolyte zostericola postlarvae
(2-d lag)
12
9
6
3
0
-3
-6
0
3000
6000
9000
12000
15000
H. zostericola juveniles
(43-d lag)
18
14
10
6
2
-2
-6
0
1000
2000
3000
4000
5000
6000
Lucifer faxoni
(14-d lag)
6
4
2
0
-2
-4
-6
0
1000
2000
3000
4000
5000
6000

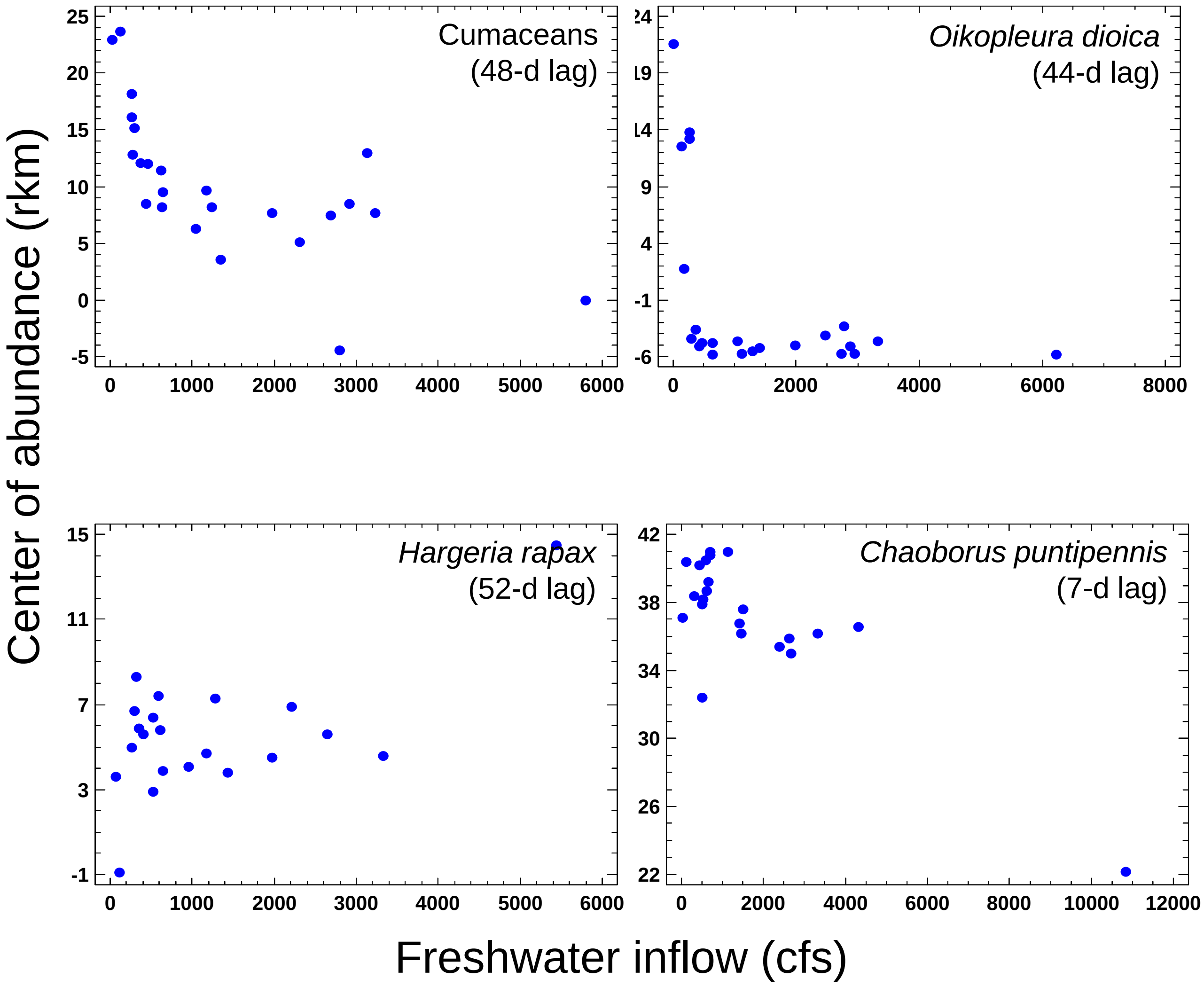

Tozeuma carolinense postlarvae
(5-d lag)
Penaeidae metamorphs
(8-d lag)
Alpheid shrimp postlarvae
(46-d lag)
Processid shrimp postlarvae
(2-d lag)
Paguridae postlarvae
(14-d lag)
Paguridae juveniles
(26-d lag)
Center of abundance (rkm)
Freshwater inflow (cfs)
12
9
6
3
0
-3
-6
18
14
10
6
2
-2
-6
14
10
6
2
-2
-6
9
6
3
0
-3
-6
0
1000
2000
3000
4000
5000
6000
8000
9000
10000
12000
15000


Center of abundance (rkm)
Freshwater inflow (cfs)
Americamysus spp. juveniles
(50-d lag)
40
30
20
10
0
0
1000
2000
3000
4000
5000
6000
A. almyra
(51-d lag)
40
35
30
25
20
15
10
0
1000
2000
3000
4000
5000
6000
A. bahia
(7-d lag)
24
19
14
9
4
-1
-6
0
2000
4000
6000
8000
10000
12000
Bowmaniella brasiliensis
(50-d lag)
35
25
15
5
-5
0
1000
2000
3000
4000
5000
6000


Acartia tonsa
(45-d lag)
Labidocera aestiva
(43-d lag)
Pseudodiaptomus pelagicus
(57-d lag)
Diaptomus spp.
(4-d lag)
Mesocyclops edax
(4-d lag)
Oithona spp.
(46-d lag)
Center of abundance (rkm)
Freshwater inflow (cfs)
25
20
15
10
5
0
-5
18
14
10
6
2
-2
-6
35
25
15
5
-5
43
39
35
31
27
23
19
42
38
34
30
26
22
18
24
19
14
9
4
-1
-6
0
2000
4000
6000
8000
1000
3000
5000
12000
16000

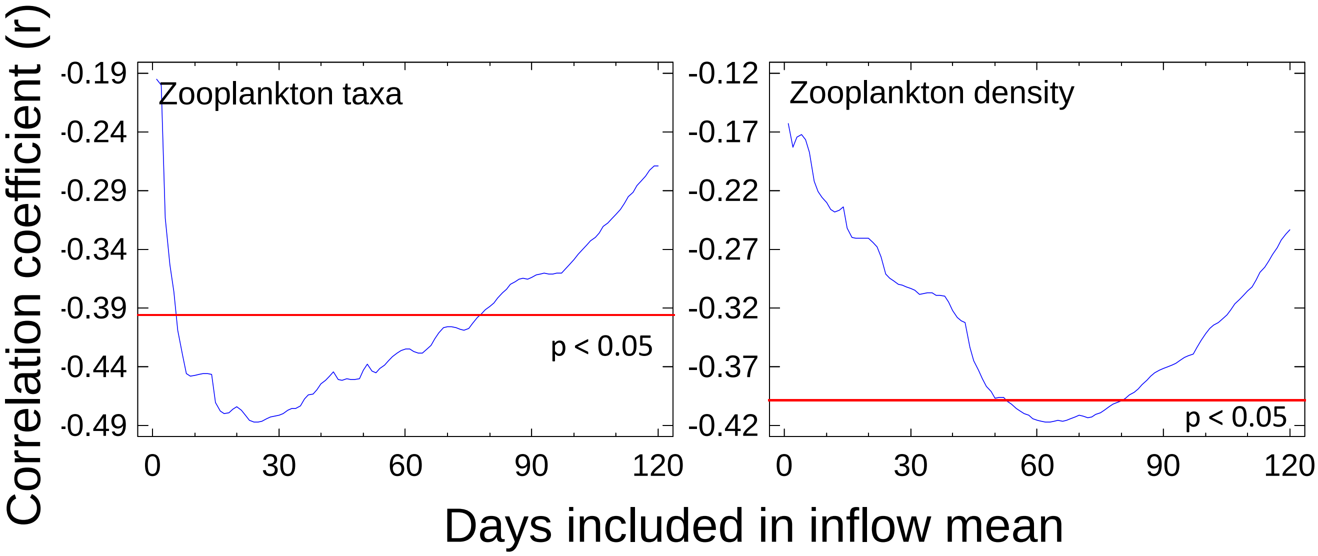

Temora turbinata
(22-d lag)
Centropages velificatus
(3-d lag)
Paracalanid copepods
(21-d lag)
Caligoid copepods
(52-d lag)
Monstrilla sp.
(51-d lag)
18
14
10
6
2
-2
-6
0.1
0.9
1.9
2.9
3.9
4.9
5.9
0
1000
2000
3000
4000
5000
6000
9000
12000
15000
7
4
1
-5
Freshwater inflow (cfs)
Center of abundance (rkm)
Freshwater inflow (cfs)

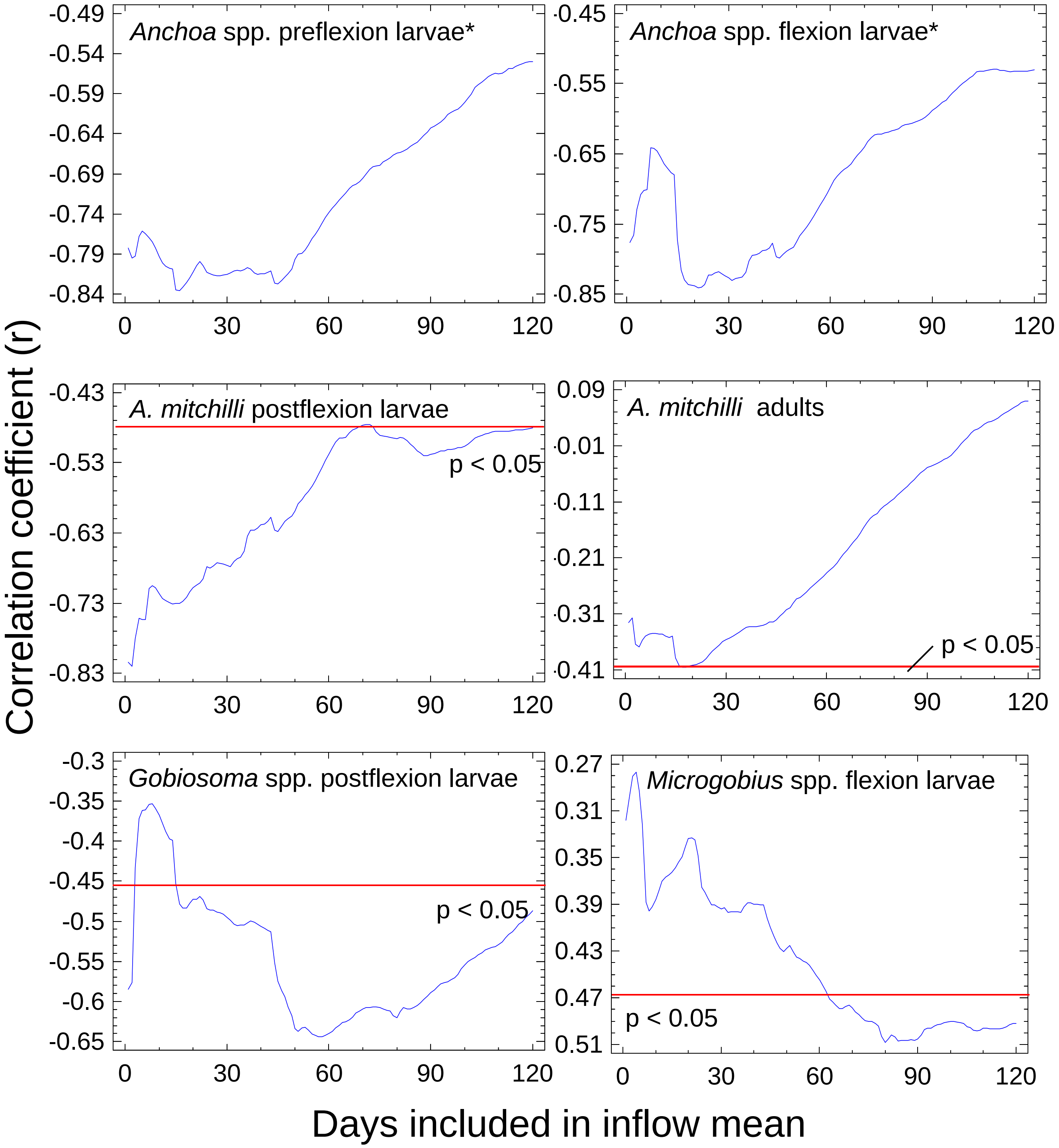

Gammaridean amphipods
(92-d lag)
Caprellid amphipods
(74-d lag)
Edotia triloba
(51-d lag)
Erichsonella attenuata
(37-d lag)
Lironeca sp.
(51-d lag)
Argulus sp.
(7-d lag)
Center of abundance (rkm)
Freshwater inflow (cfs)
30
25
20
15
10
5
0
18
14
10
6
2
-2
-6
0
1000
2000
3000
4000
5000
40
30
20
10
0
17
14
11
8
5
2
-1
6000
8000
35
25
15
5
-5
40
30
20
10
0


Center of abundance (rkm)
Freshwater inflow (cfs)
Cumaceans
(48-d lag)
25
20
15
10
5
0
-5
0
1000
2000
3000
4000
5000
6000
Oikopleura dioica
(44-d lag)
24
19
14
9
4
-1
-6
0
2000
4000
6000
8000
Hargeria rapax
(52-d lag)
15
11
7
3
-1
0
1000
2000
3000
4000
5000
6000
Chaoborus puntipennis
(7-d lag)
42
38
34
30
26
22
0
2000
4000
6000
8000
10000
12000

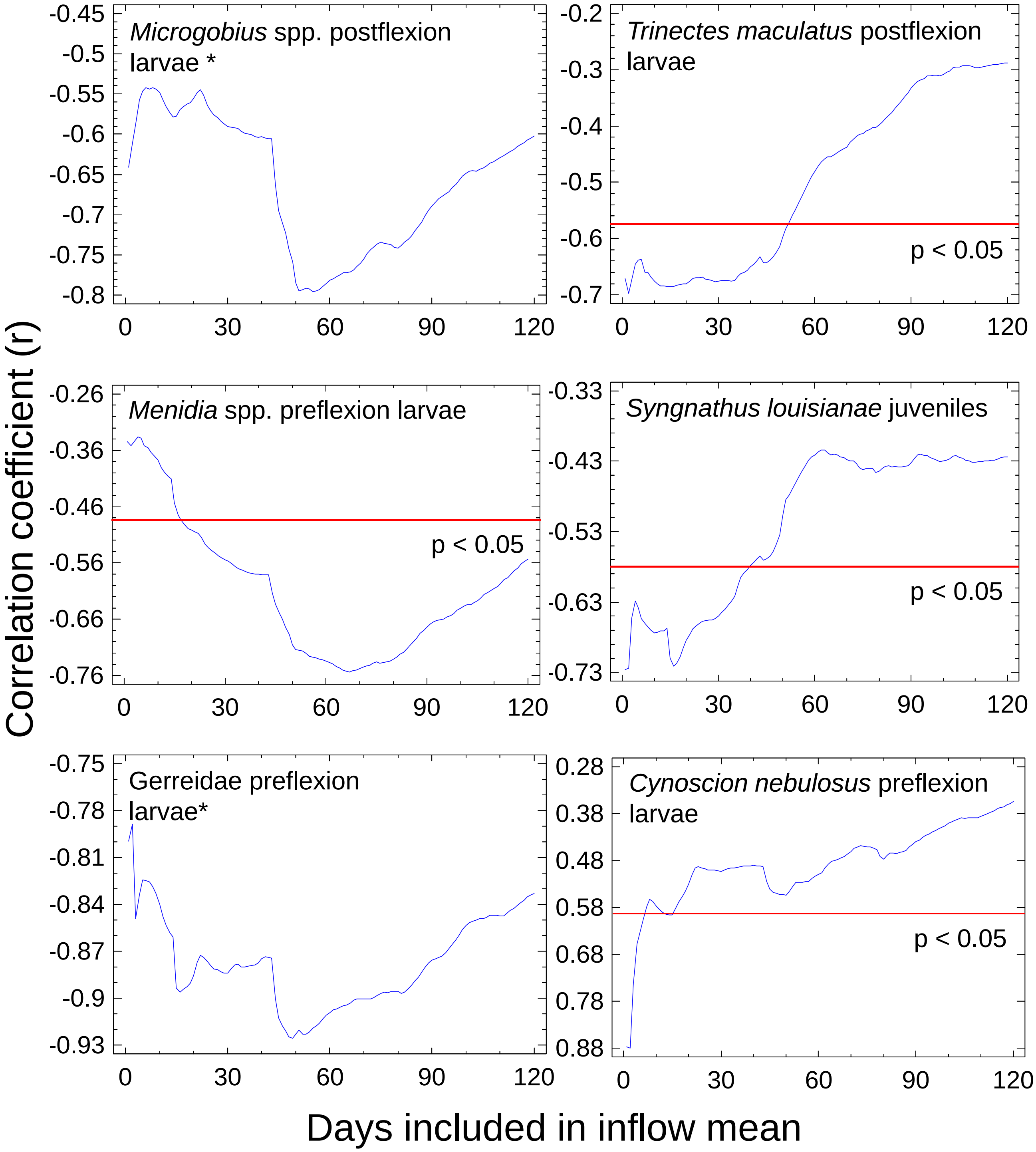
Appendix H

Correlation coefficients vs. lag time for relationships between center of abundance and inflow

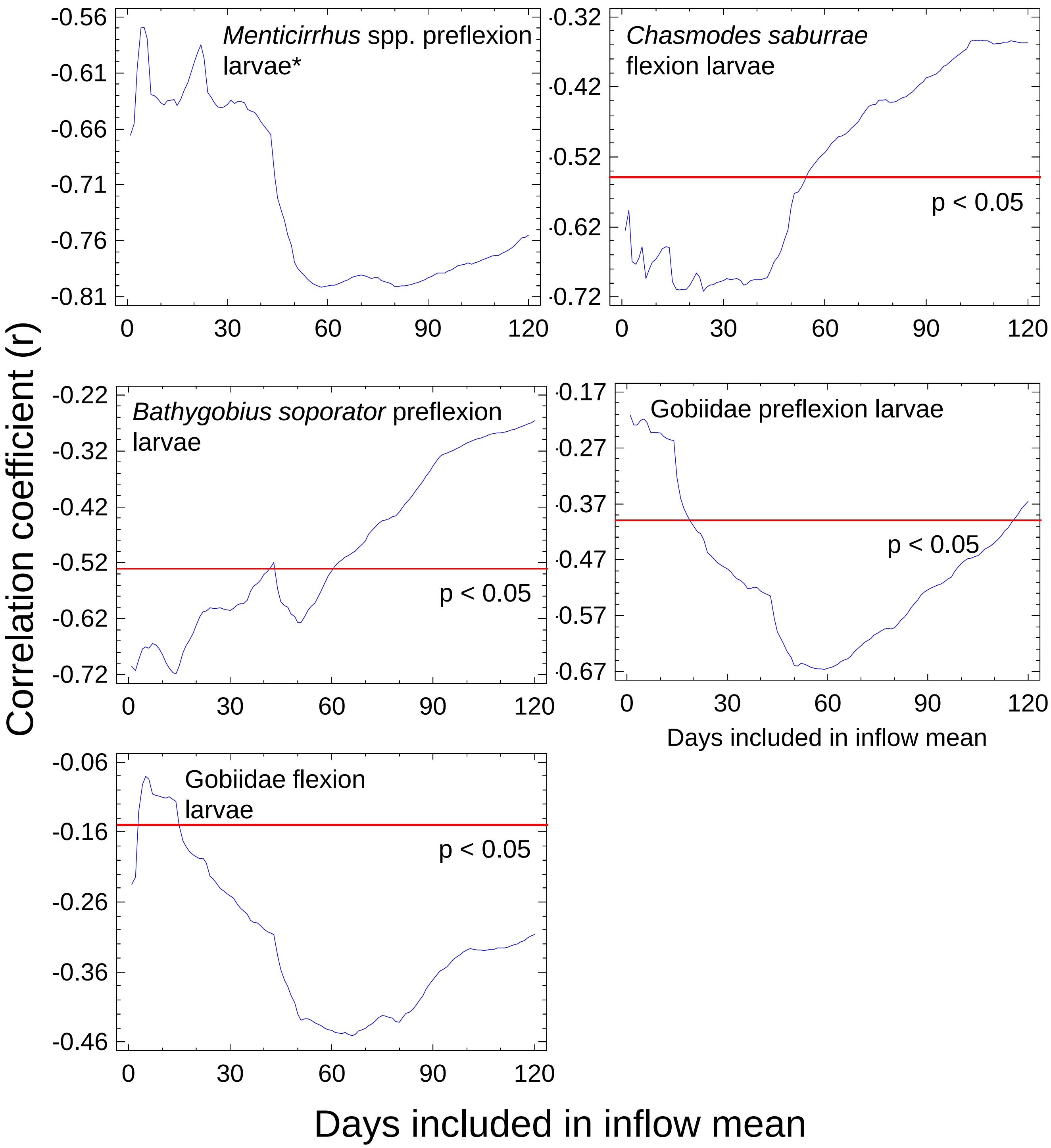

Correlation coefficient (r)
Zooplankton taxa
-0.19
-0.24
-0.29
-0.34
-0.39
-0.44
-0.49
p < 0.05
Zooplankton density
-0.12
-0.17
-0.22
-0.27
-0.32
-0.37
-0.42
p < 0.05
0
30
60
90
120
Days included in inflow mean



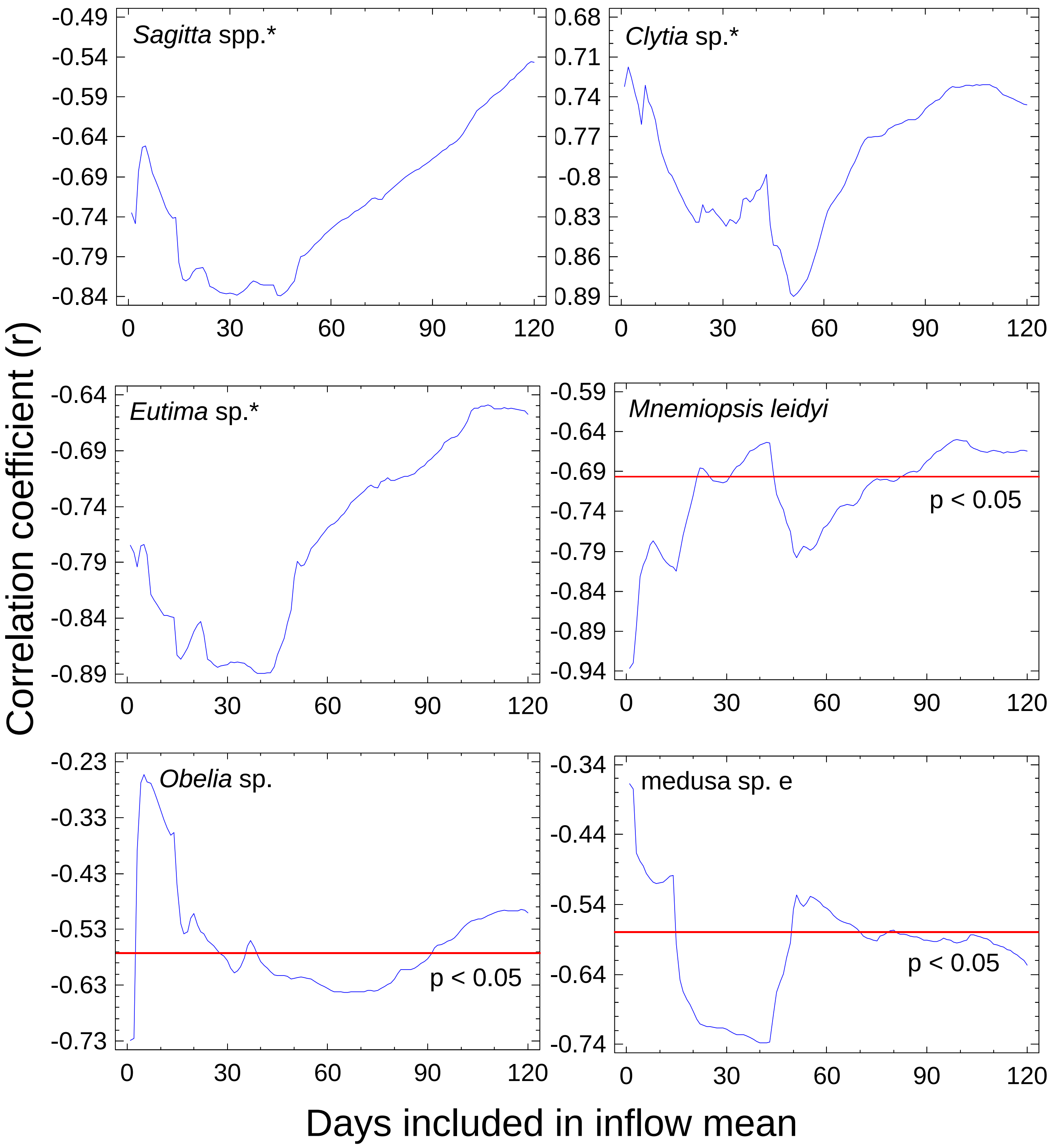
* All r values significant at $p < 0.05$



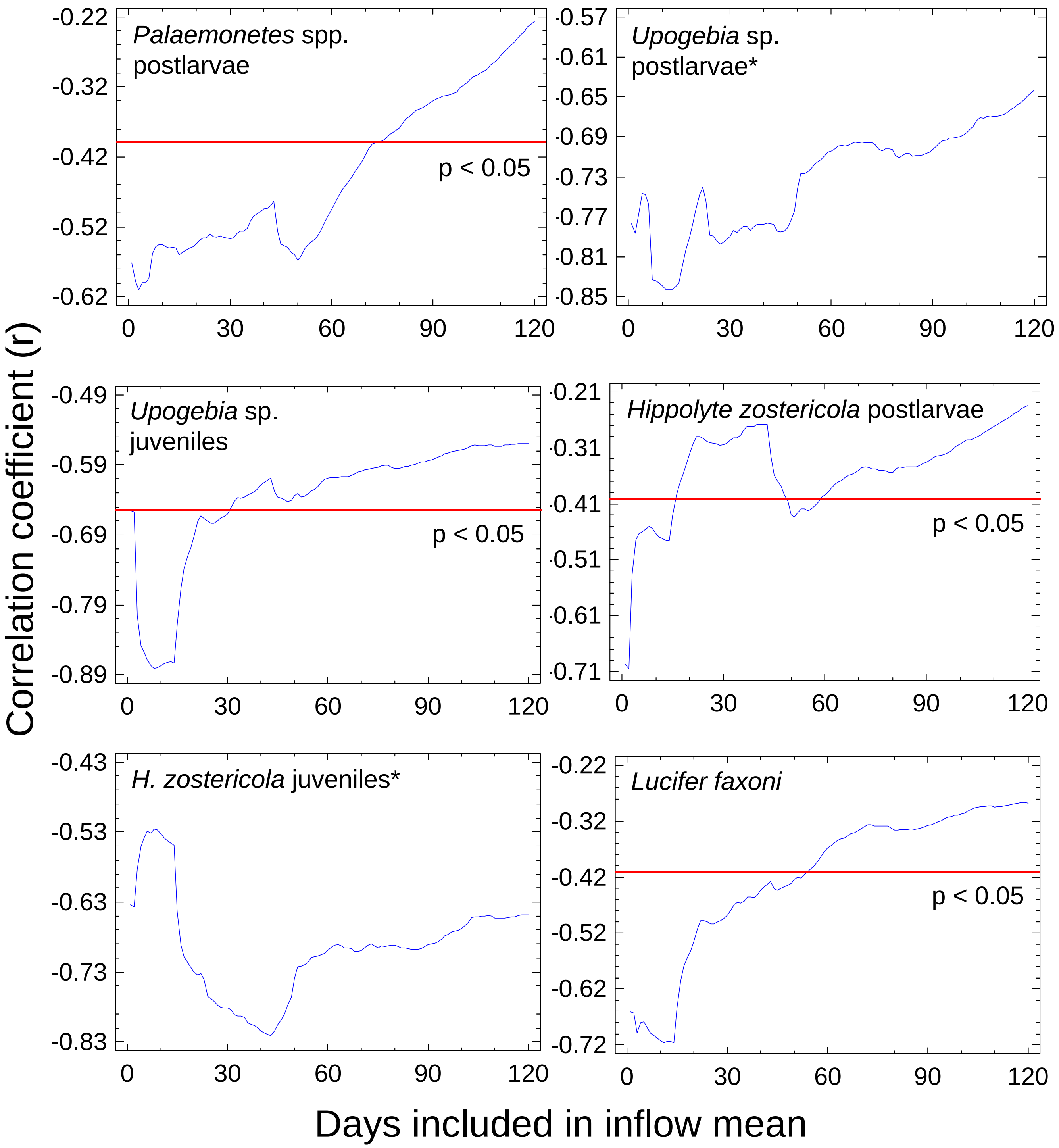
* All r values significant at $p < 0.05$



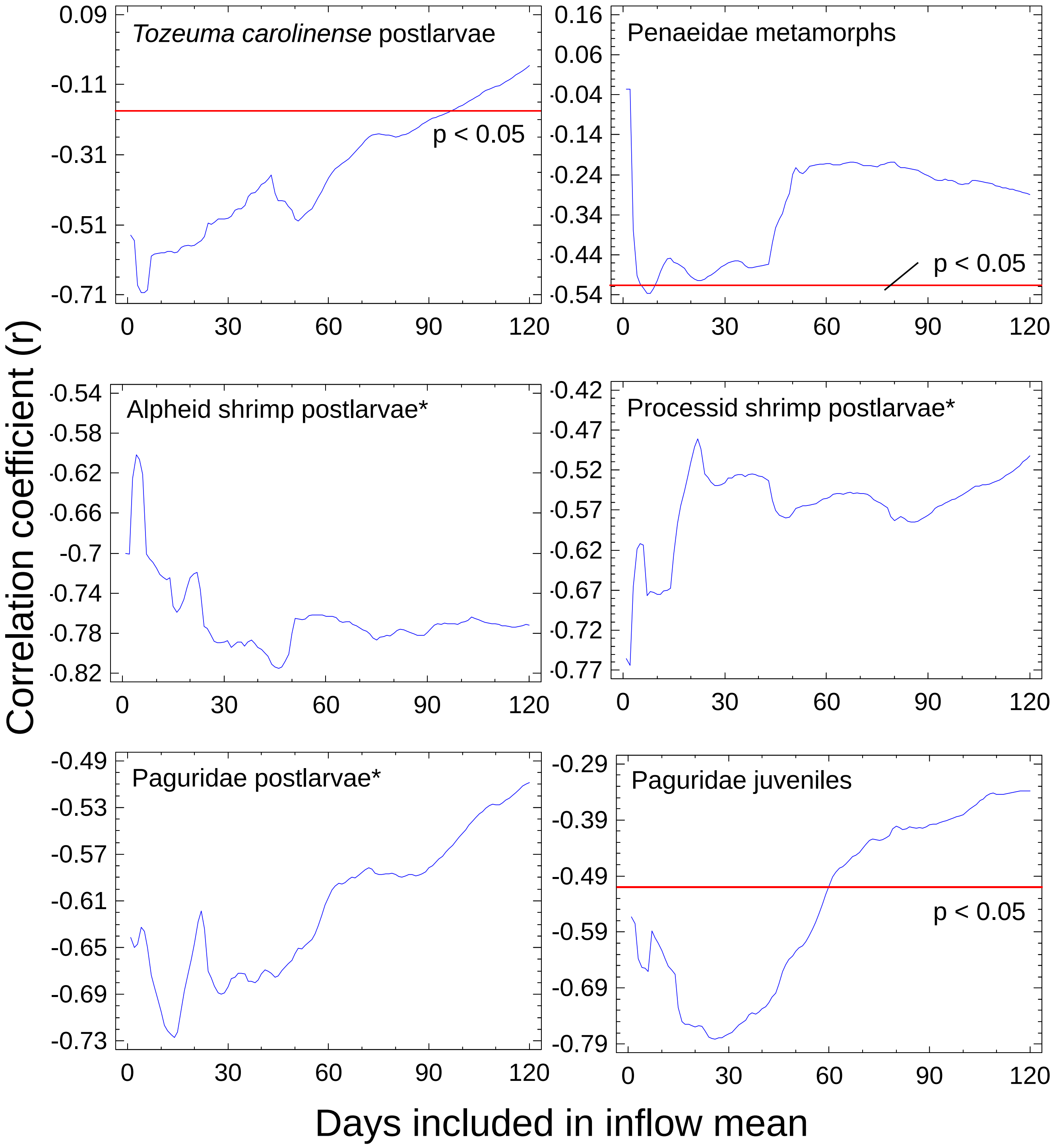
* All r values significant at $p < 0.05$



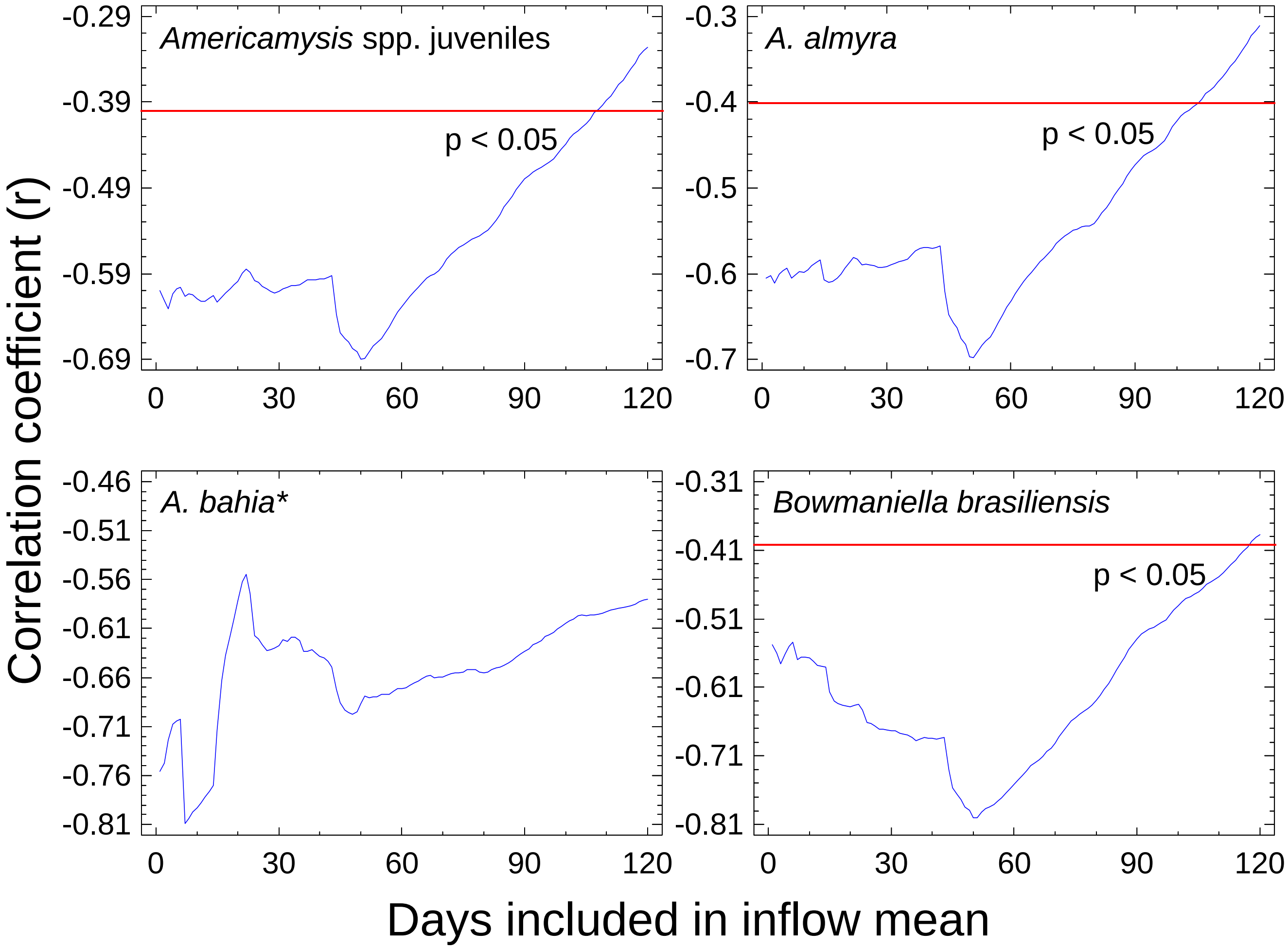
* All r values significant at $p < 0.05$



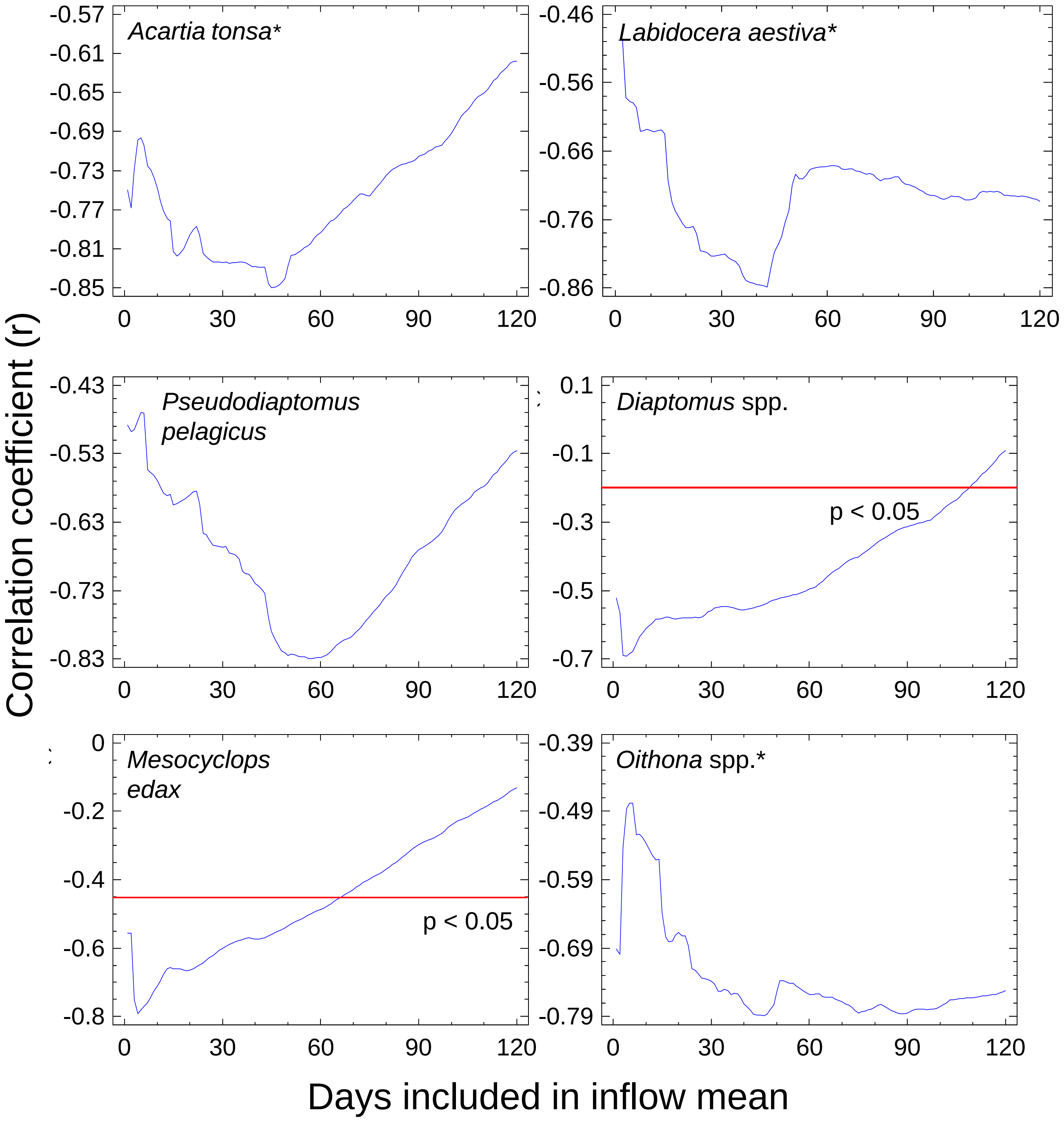
* All r values significant at $p < 0.05$



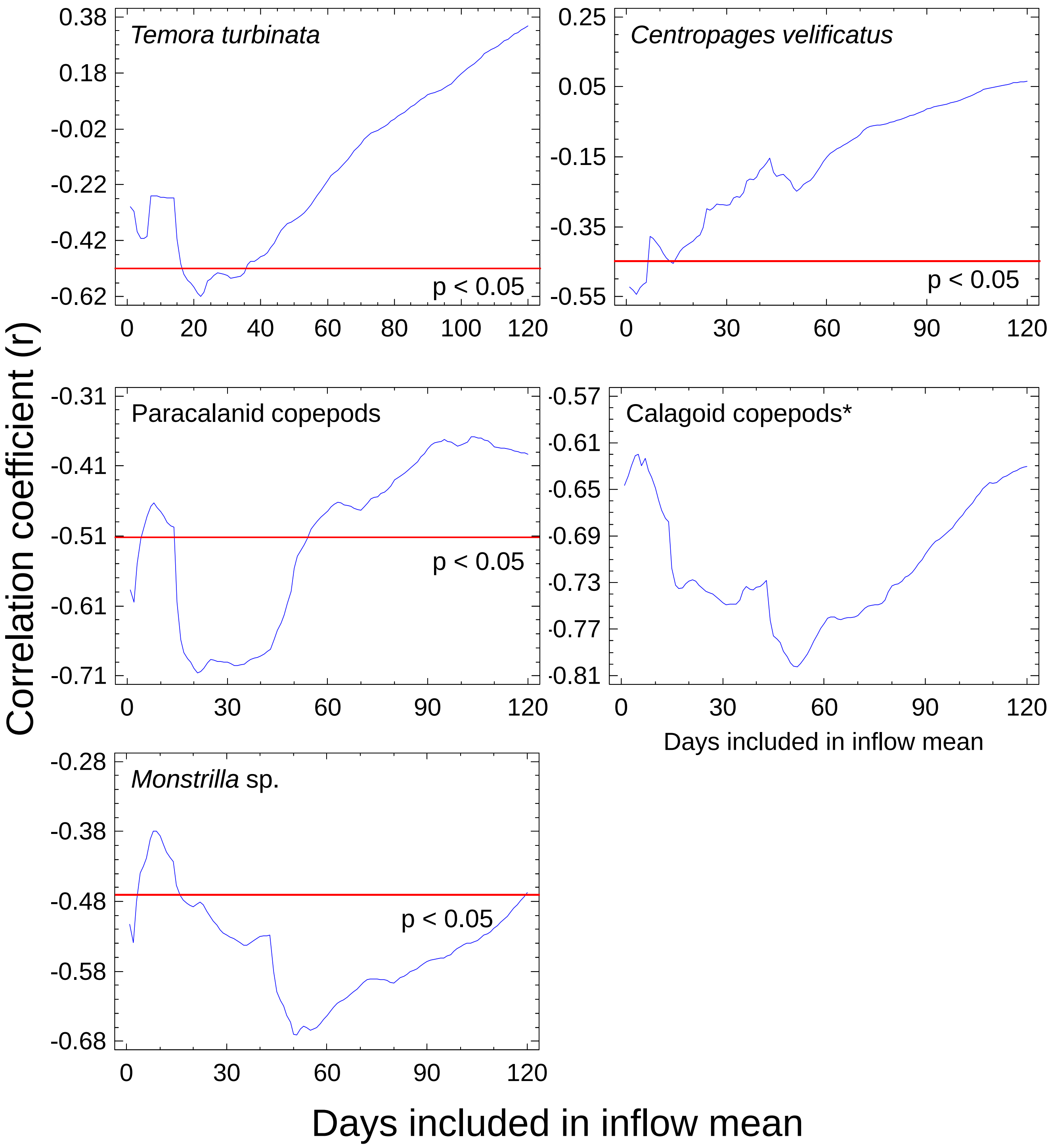
* All r values significant at $p < 0.05$



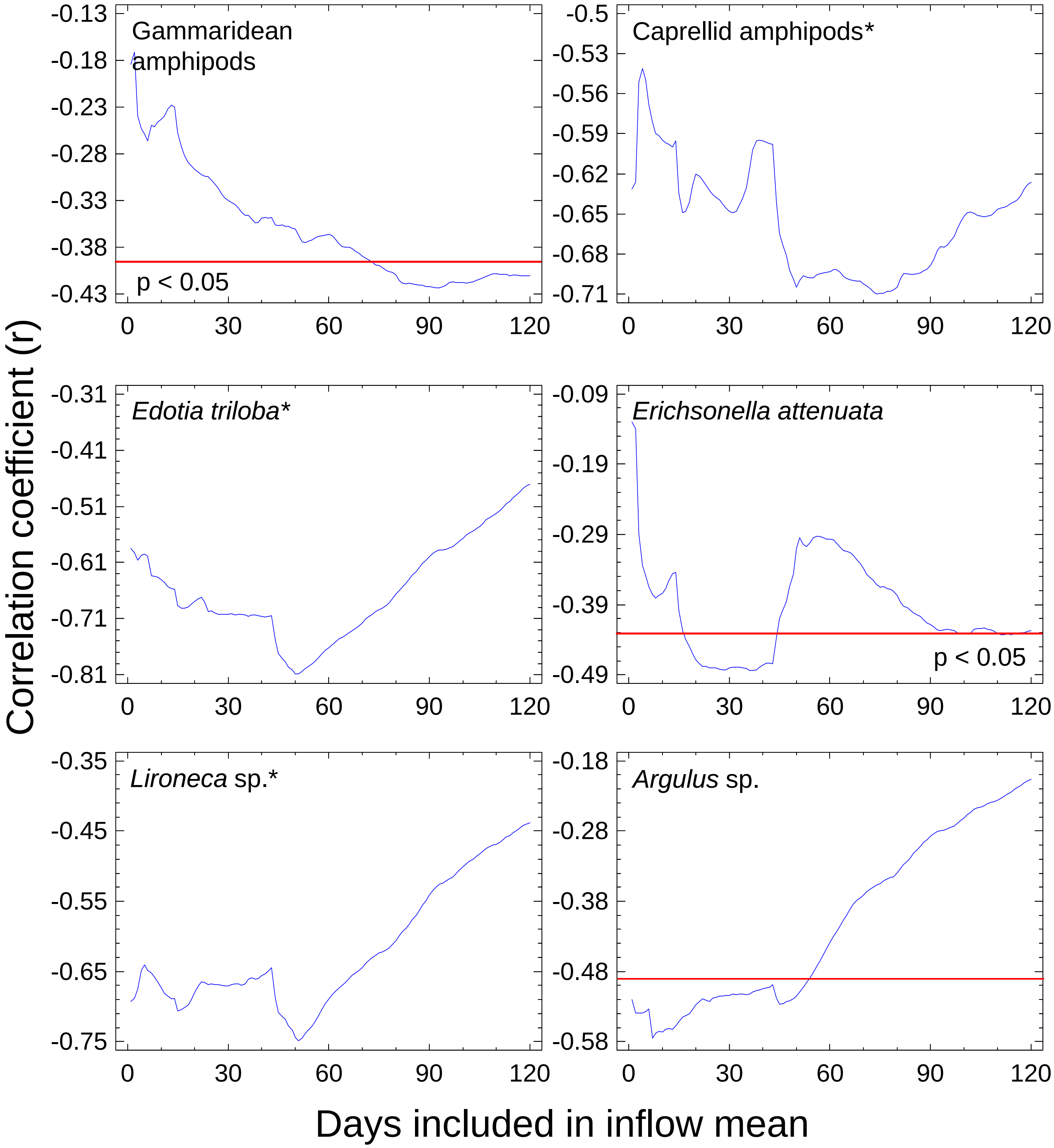
* All r values significant at $p < 0.05$



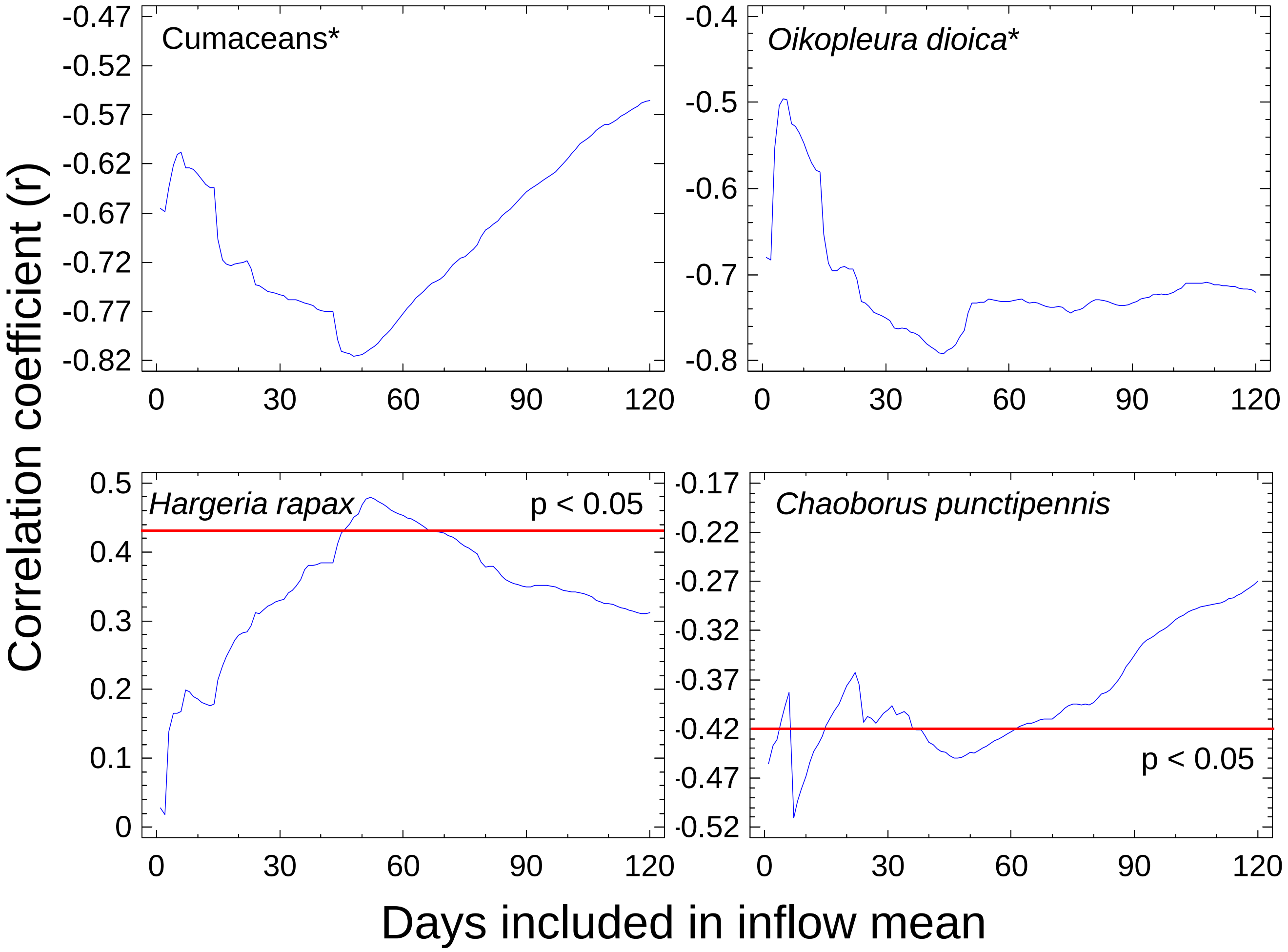
* All r values significant at $p < 0.05$



* All r values significant at $p < 0.05$



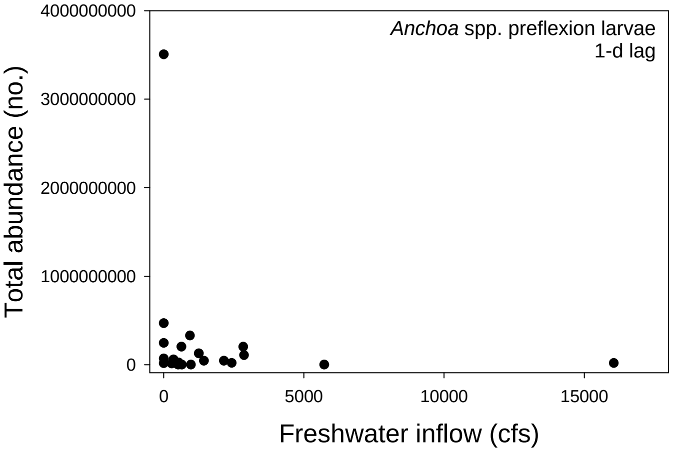
* All r values significant at $p < 0.05$

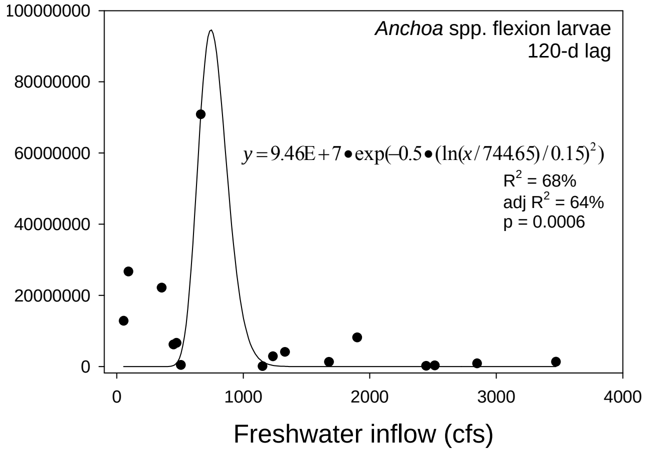


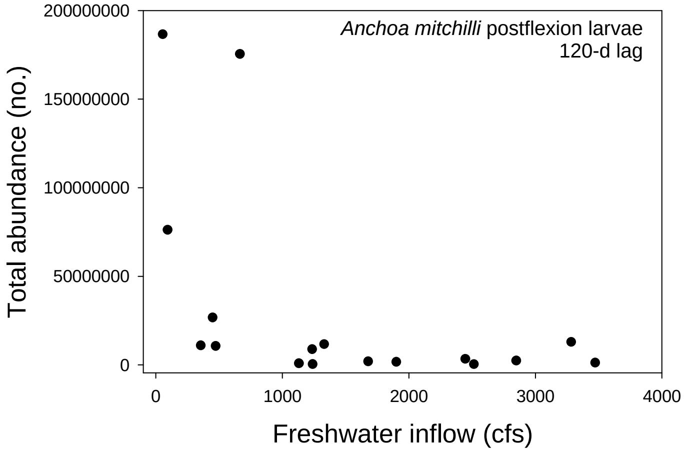
* All r values significant at $p < 0.05$

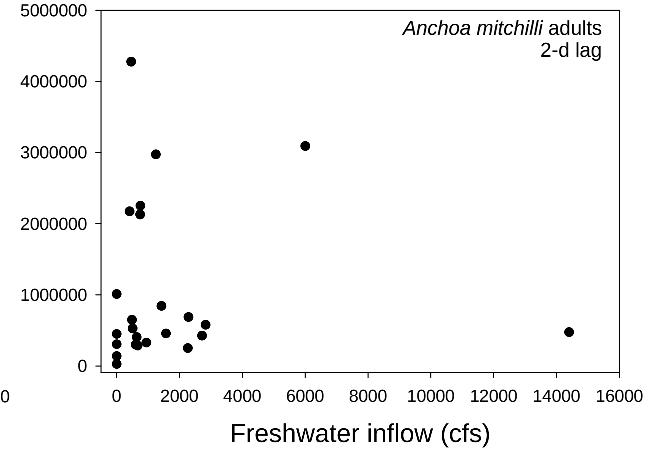
Appendix I

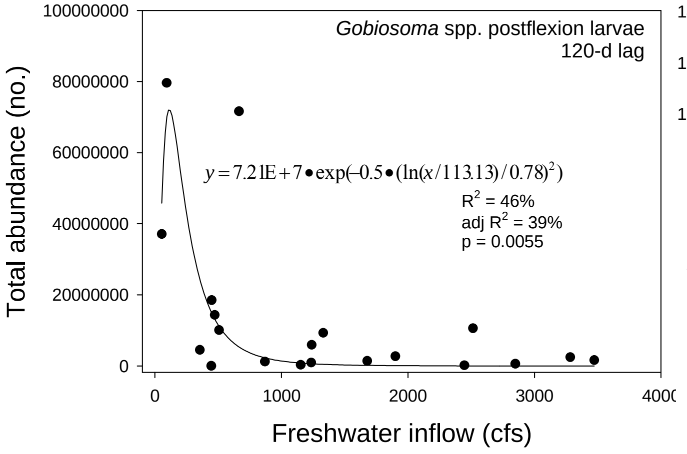
Total organism abundance responses to inflow

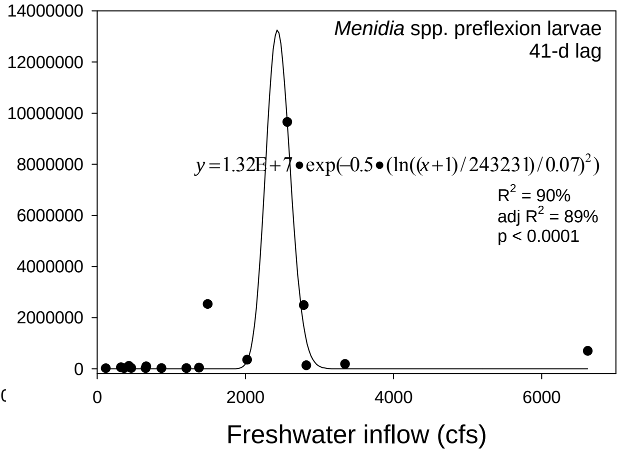

Anchoa spp. preflexion larvae
1-d lag
Total abundance (no.)
4000000000
3000000000
2000000000
1000000000
0
0
5000
10000
15000
Freshwater inflow (cfs)

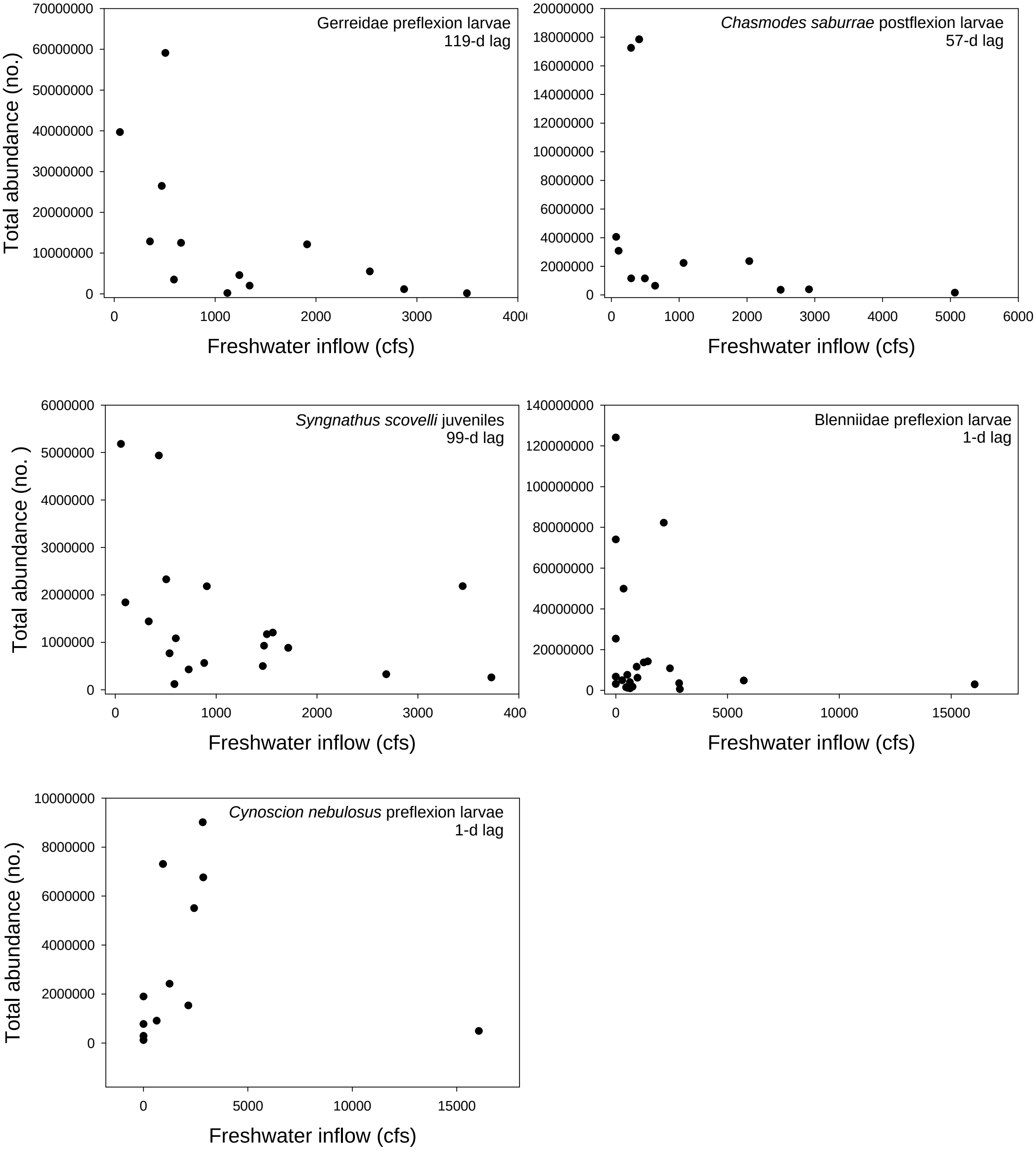

Anchoa spp. flexion larvae
120-d lag
$y = 9.46E+7 \bullet \exp(-0.5 \bullet (\ln(x/744.65)/0.15)^2)$
R^2 = 68%
adj R^2 = 64%
p = 0.0006
100000000
80000000
60000000
40000000
20000000
0
0
1000
2000
3000
4000
Freshwater inflow (cfs)

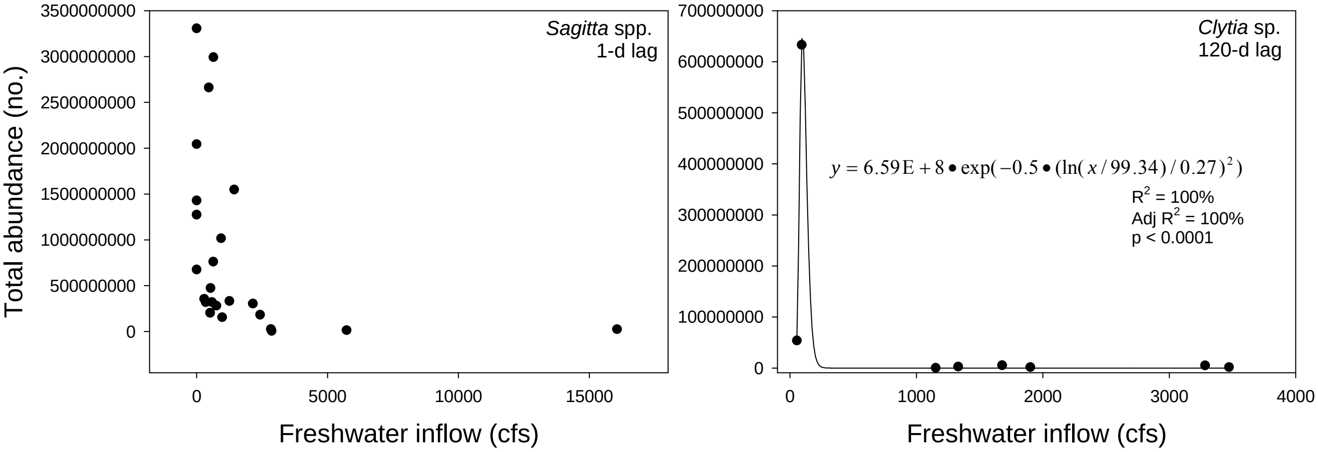

Anchoa mitchilli postflexion larvae
120-d lag
Total abundance (no.)
200000000
150000000
100000000
50000000
0
0
1000
2000
3000
4000
Freshwater inflow (cfs)

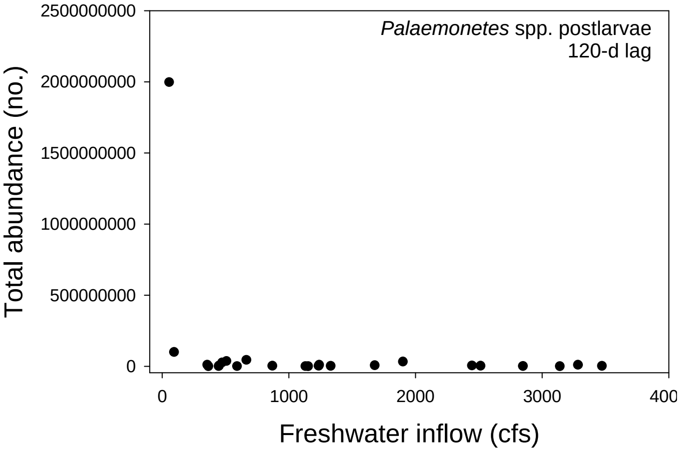

Anchoa mitchilli adults
2-d lag
5000000
4000000
3000000
2000000
1000000
0
0
2000
4000
6000
8000
10000
12000
14000
16000
Freshwater inflow (cfs)

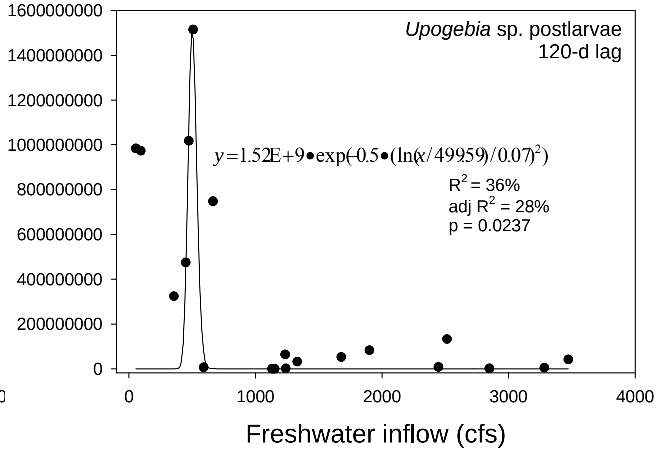

Gobiosoma spp. postflexion larvae
120-d lag
$y = 7.21E+7 \bullet \exp(-0.5 \bullet (\ln(x/113.13)/0.78)^2)$
R^2 = 46%
adj R^2 = 39%
p = 0.0055
Total abundance (no.)
100000000
80000000
60000000
40000000
20000000
0
0
1000
2000
3000
4000
Freshwater inflow (cfs)

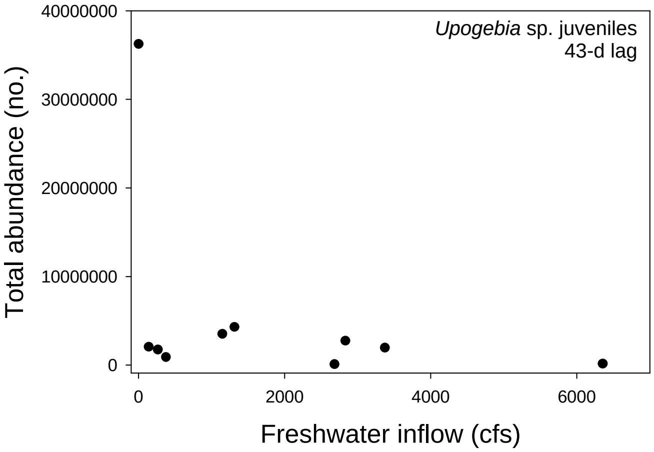

Menidia spp. preflexion larvae
41-d lag
$y = 1.32E+7 \bullet \exp(-0.5 \bullet (\ln((x+1)/2432.31)/0.07)^2)$
R^2 = 90%
adj R^2 = 89%
p < 0.0001
14000000
12000000
10000000
8000000
6000000
4000000
2000000
0
0
2000
4000
6000
Freshwater inflow (cfs)

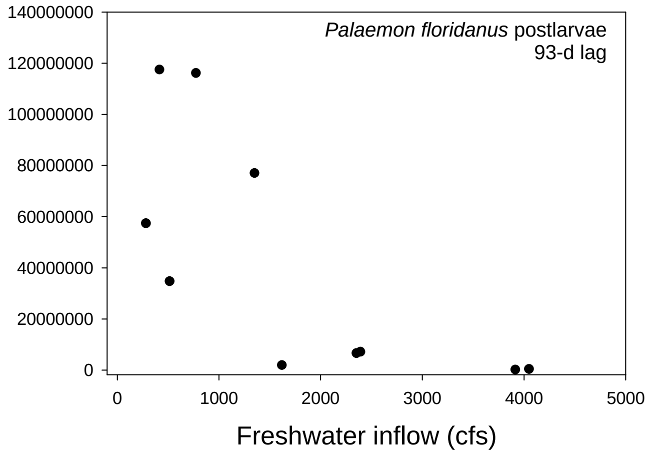

Gerreidae preflexion larvae
119-d lag
Total abundance (no.)
Freshwater inflow (cfs)
0
10000000
20000000
30000000
40000000
50000000
60000000
70000000
0
1000
2000
3000
400
Chasmodes saburrae postflexion larvae
57-d lag
0
2000000
4000000
6000000
8000000
10000000
12000000
14000000
16000000
18000000
20000000
0
1000
2000
3000
4000
5000
6000
Freshwater inflow (cfs)
Syngnathus scovelli juveniles
99-d lag
Total abundance (no.)
0
1000000
2000000
3000000
4000000
5000000
6000000
0
1000
2000
3000
400
Freshwater inflow (cfs)
Blenniidae preflexion larvae
1-d lag
0
20000000
40000000
60000000
80000000
100000000
120000000
140000000
0
5000
10000
15000
Freshwater inflow (cfs)
Cynoscion nebulosus preflexion larvae
1-d lag
Total abundance (no.)
0
2000000
4000000
6000000
8000000
10000000
0
5000
10000
15000
Freshwater inflow (cfs)

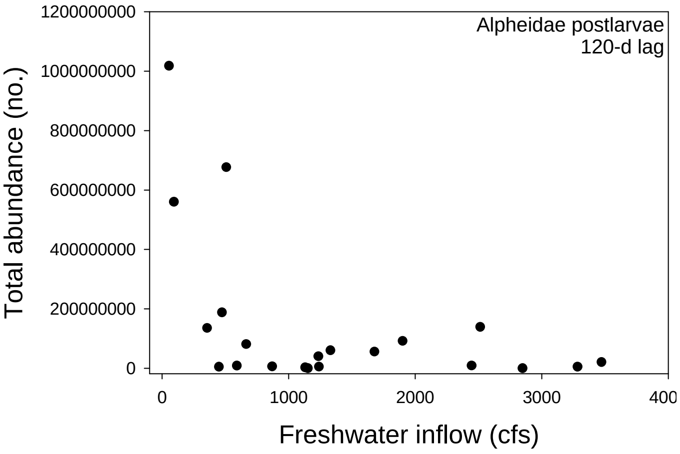

Total abundance (no.)
3500000000
3000000000
2500000000
2000000000
1500000000
1000000000
500000000
0
0
5000
10000
15000
Freshwater inflow (cfs)
Sagitta spp.
1-d lag
700000000
600000000
500000000
400000000
300000000
200000000
100000000
0
0
1000
2000
3000
4000
Freshwater inflow (cfs)
Clytia sp.
120-d lag
$y = 6.59\mathrm{E}+8 \bullet \exp(-0.5 \bullet (\ln(x/99.34)/0.27)^2)$
R^2 = 100%
Adj R^2 = 100%
$p < 0.0001$

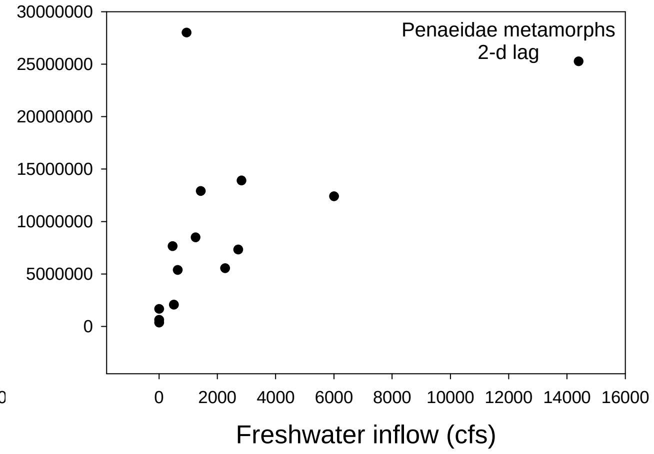

Palaemonetes spp. postlarvae
120-d lag
Total abundance (no.)
2500000000
2000000000
1500000000
1000000000
500000000
0
0
1000
2000
3000
400
Freshwater inflow (cfs)

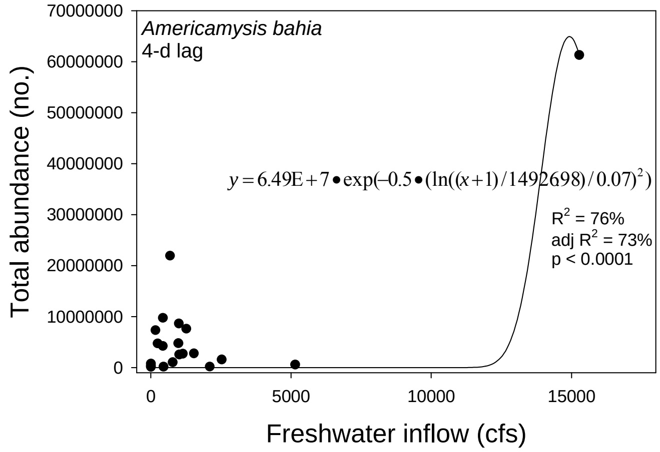

Upogebia sp. postlarvae
120-d lag
$y = 1.52E+9 \bullet \exp(-0.5 \bullet (\ln(x/499.59)/0.07)^2)$
R^2 = 36%
adj R^2 = 28%
p = 0.0237
1600000000
1400000000
1200000000
1000000000
800000000
600000000
400000000
200000000
0
0
1000
2000
3000
4000
Freshwater inflow (cfs)

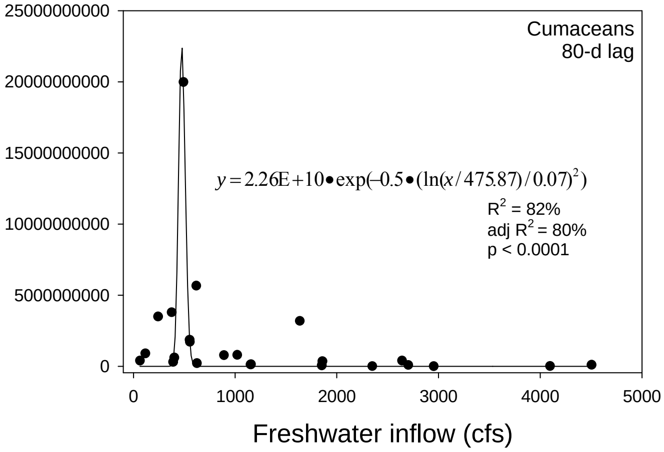

Upogebia sp. juveniles
43-d lag
Total abundance (no.)
40000000
30000000
20000000
10000000
0
0
2000
4000
6000
Freshwater inflow (cfs)

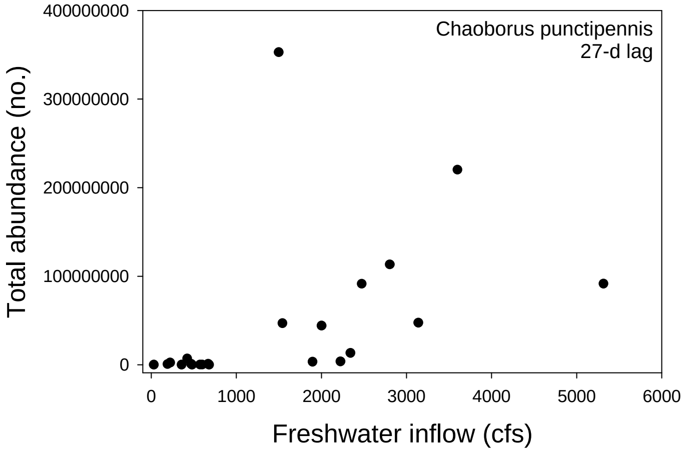

Palaemon floridanus postlarvae
93-d lag
140000000
120000000
100000000
80000000
60000000
40000000
20000000
0
0
1000
2000
3000
4000
5000
Freshwater inflow (cfs)

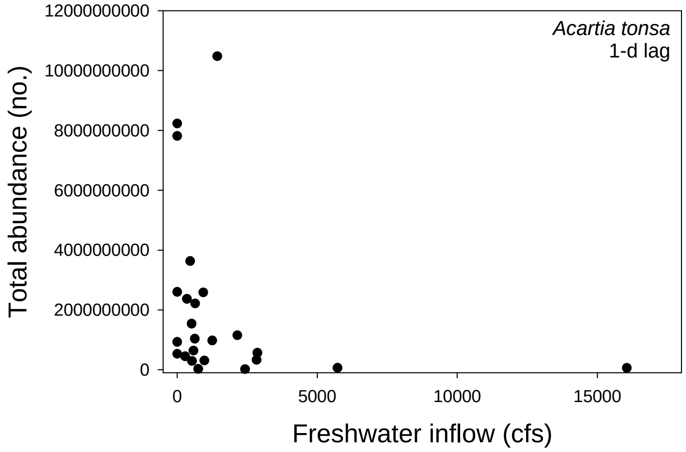

Alpheidae postlarvae
120-d lag
Total abundance (no.)
1200000000
1000000000
800000000
600000000
400000000
200000000
0
0
1000
2000
3000
400
Freshwater inflow (cfs)


Penaeidae metamorphs
2-d lag
30000000
25000000
20000000
15000000
10000000
5000000
0
0
2000
4000
6000
8000
10000
12000
14000
16000
Freshwater inflow (cfs)

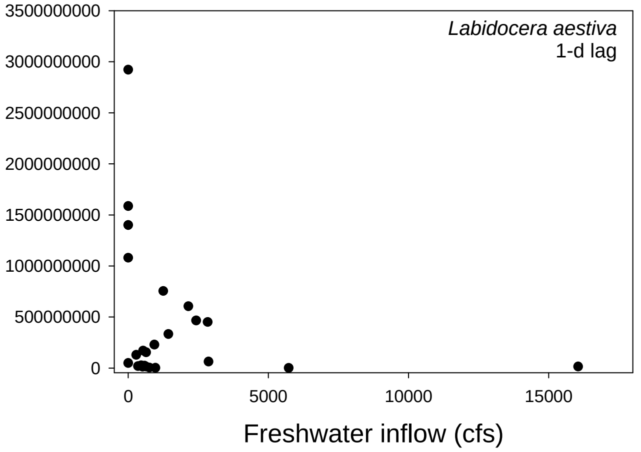

Americamysis bahia
4-d lag
y = 6.49E+7 • exp(–0.5 • (ln((x+1)/1492698)/0.07)^2)
R^2 = 76%
adj R^2 = 73%
p < 0.0001
Total abundance (no.)
0
10000000
20000000
30000000
40000000
50000000
60000000
70000000
Freshwater inflow (cfs)
0
5000
10000
15000


Cumaceans
80-d lag
y = 2.26E+10 • exp(–0.5 • (ln(x/475.87)/0.07)^2)
R^2 = 82%
adj R^2 = 80%
p < 0.0001
0
5000000000
10000000000
15000000000
20000000000
25000000000
Freshwater inflow (cfs)
0
1000
2000
3000
4000
5000

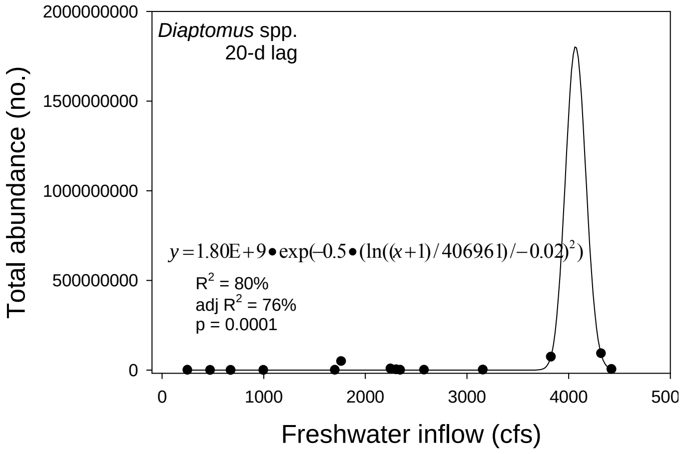

Chaoborus punctipennis
27-d lag
Total abundance (no.)
0
100000000
200000000
300000000
400000000
Freshwater inflow (cfs)
0
1000
2000
3000
4000
5000
6000



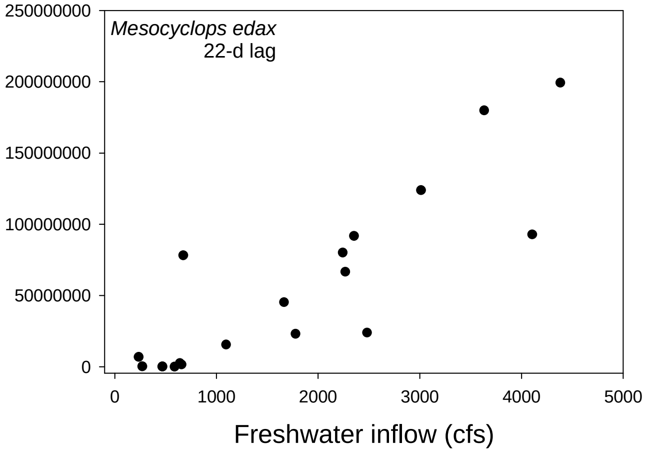
Acartia tonsa
1-d lag
Total abundance (no.)
12000000000
10000000000
8000000000
6000000000
4000000000
2000000000
0
0
5000
10000
15000
Freshwater inflow (cfs)



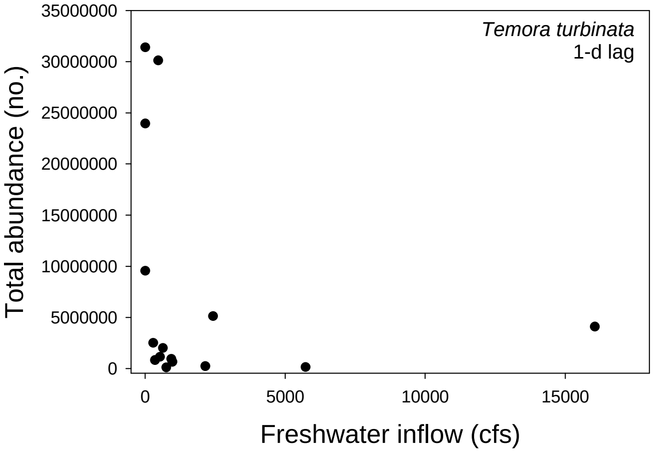
Labidocera aestiva
1-d lag
3500000000
3000000000
2500000000
2000000000
1500000000
1000000000
500000000
0
0
5000
10000
15000
Freshwater inflow (cfs)



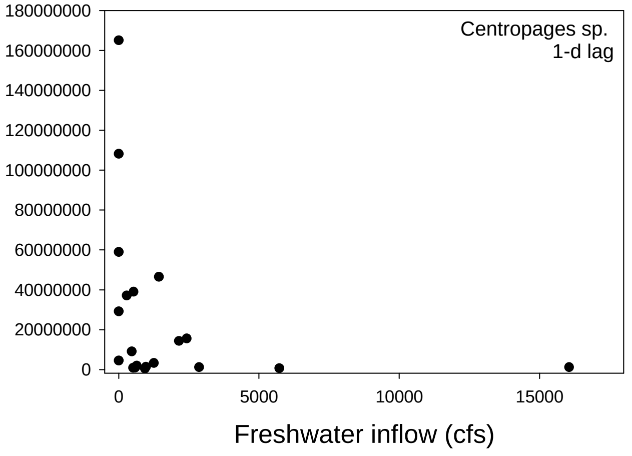
Diaptomus spp.
20-d lag
Total abundance (no.)
2000000000
1500000000
1000000000
500000000
0
$y = 1.80E+9 \bullet \exp(-0.5 \bullet (\ln((x+1)/4069.61)/-0.02)^2)$
R^2 = 80%
adj R^2 = 76%
p = 0.0001
0
1000
2000
3000
4000
500
Freshwater inflow (cfs)



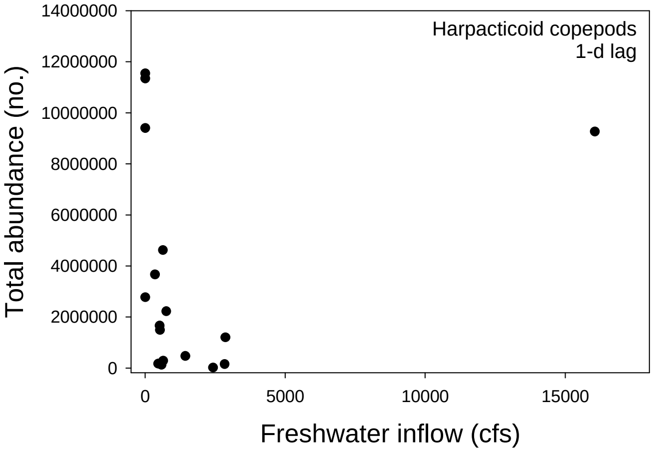
Mesocyclops edax
22-d lag
250000000
200000000
150000000
100000000
50000000
0
0
1000
2000
3000
4000
5000
Freshwater inflow (cfs)

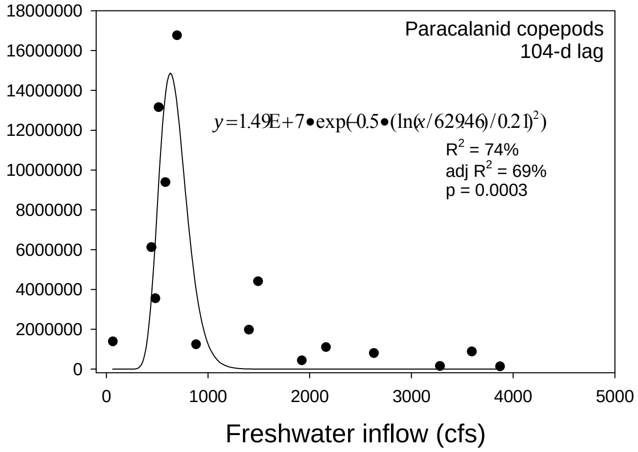


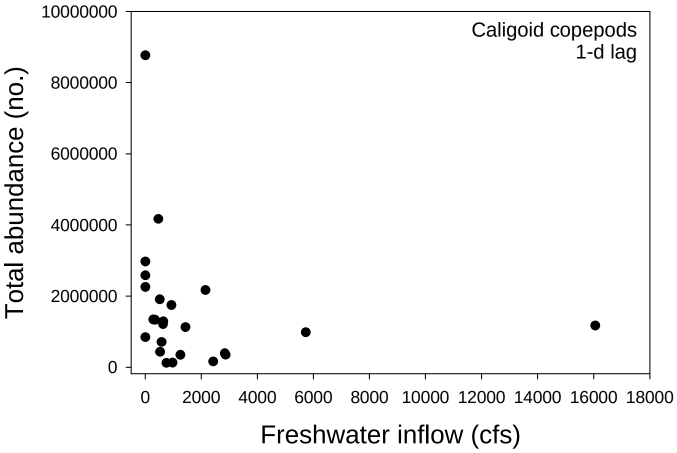
Temora turbinata
1-d lag
Total abundance (no.)
35000000
30000000
25000000
20000000
15000000
10000000
5000000
0
0
5000
10000
15000
Freshwater inflow (cfs)

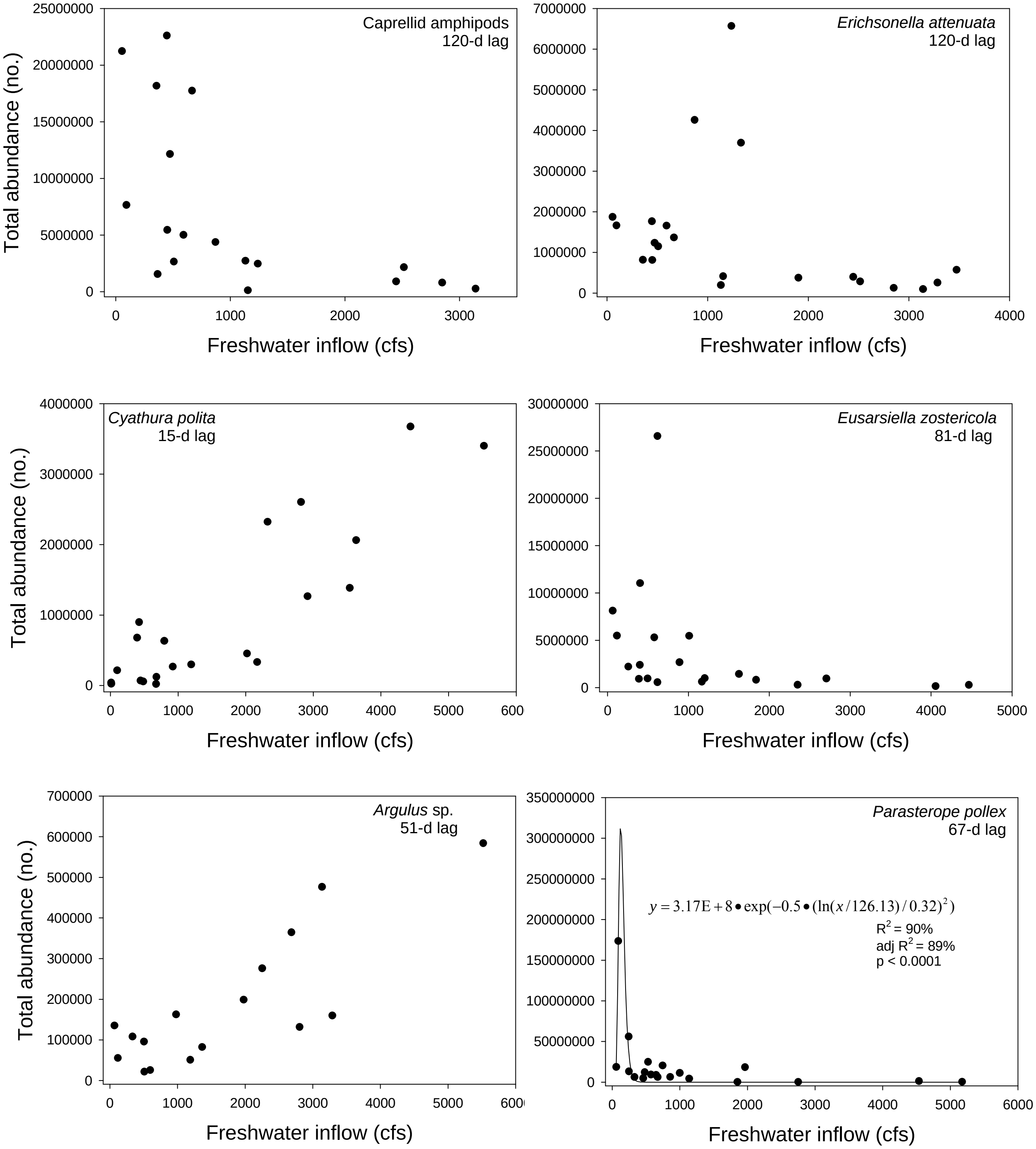


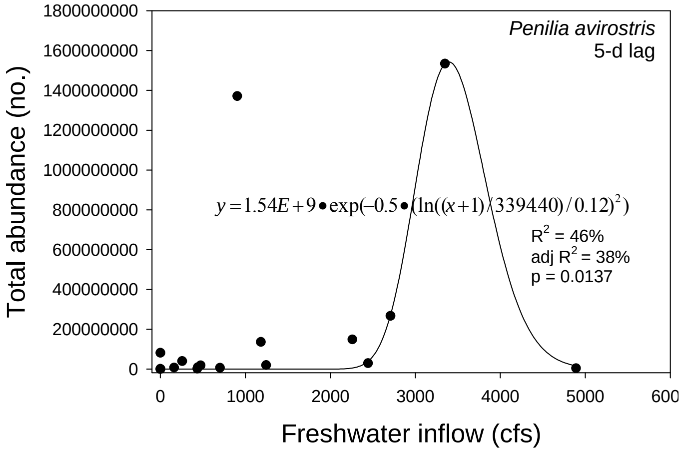
Centropages sp.
1-d lag
180000000
160000000
140000000
120000000
100000000
80000000
60000000
40000000
20000000
0
0
5000
10000
15000
Freshwater inflow (cfs)

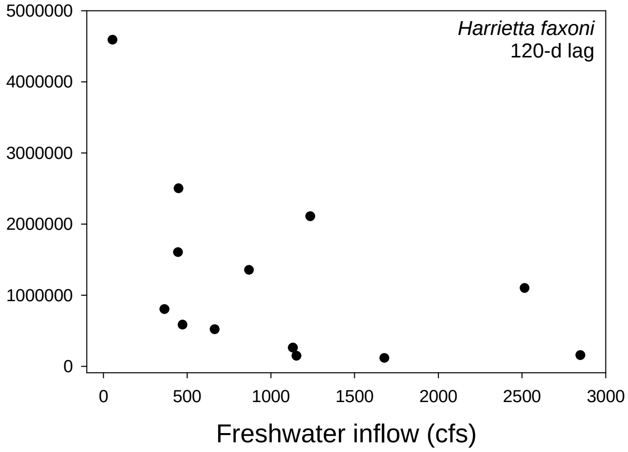

Harpacticoid copepods
1-d lag
Total abundance (no.)
14000000
12000000
10000000
8000000
6000000
4000000
2000000
0
0
5000
10000
15000
Freshwater inflow (cfs)


Paracalanid copepods
104-d lag
$y = 1.49E+7 \bullet \exp(-0.5 \bullet (\ln(x/629.46)/0.21)^2)$
R^2 = 74%
adj R^2 = 69%
p = 0.0003
18000000
16000000
14000000
12000000
10000000
8000000
6000000
4000000
2000000
0
0
1000
2000
3000
4000
5000
Freshwater inflow (cfs)


Caligoid copepods
1-d lag
Total abundance (no.)
10000000
8000000
6000000
4000000
2000000
0
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Freshwater inflow (cfs)

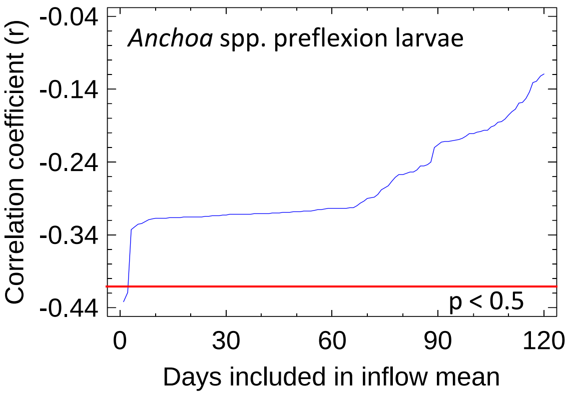

Caprellid amphipods
120-d lag
Erichsonella attenuata
120-d lag
Cyathura polita
15-d lag
Eusarsiella zostericola
81-d lag
Argulus sp.
51-d lag
Parasterope pollex
67-d lag
y = 3.17E + 8 • exp(−0.5 • (ln(x / 126.13) / 0.32)^2)
R^2 = 90%
adj R^2 = 89%
p < 0.0001
Total abundance (no.)
Freshwater inflow (cfs)
25000000
20000000
15000000
10000000
5000000
0
1000
2000
3000
7000000
6000000
5000000
4000000
3000000
2000000
1000000
4000
30000000
25000000
20000000
15000000
10000000
5000000
350000000
300000000
250000000
200000000
150000000
100000000
50000000
700000
600000
500000
400000
300000
200000
100000
5000
600
6000

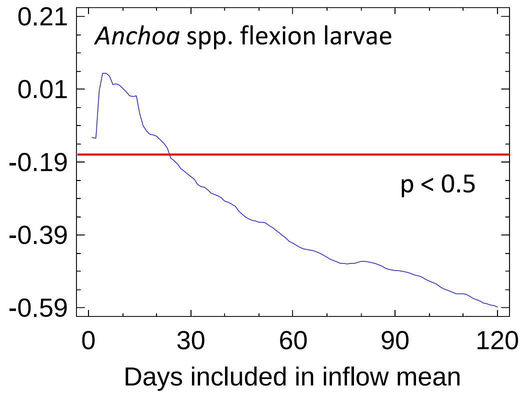

Penilia avirostris
5-d lag
Total abundance (no.)
1800000000
1600000000
1400000000
1200000000
1000000000
800000000
600000000
400000000
200000000
0
$y = 1.54E+9 \bullet \exp(-0.5 \bullet (\ln((x+1)/339440)/0.12)^2)$
R^2 = 46%
adj R^2 = 38%
p = 0.0137
0
1000
2000
3000
4000
5000
600
Freshwater inflow (cfs)

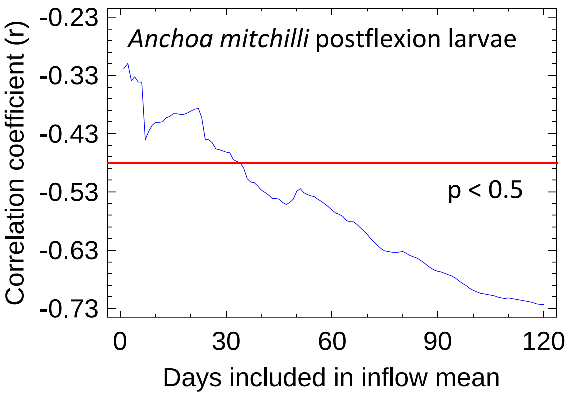

Harrietta faxoni
120-d lag
5000000
4000000
3000000
2000000
1000000
0
0
500
1000
1500
2000
2500
3000
Freshwater inflow (cfs)

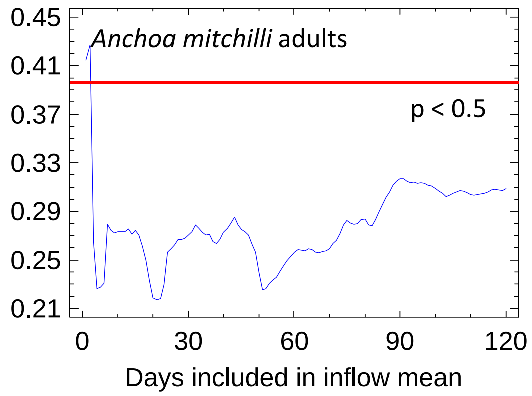
Appendix J

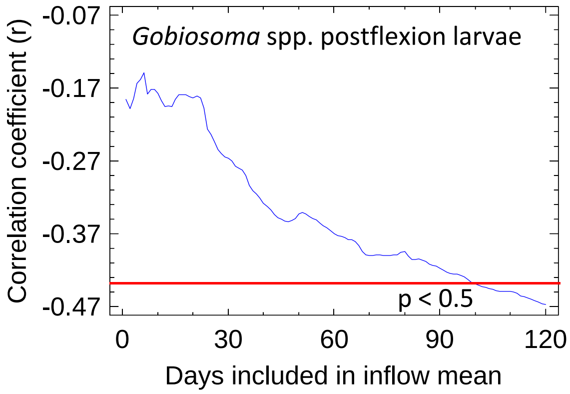
Correlation coefficients vs. lag time for relationships between total abundance and inflow

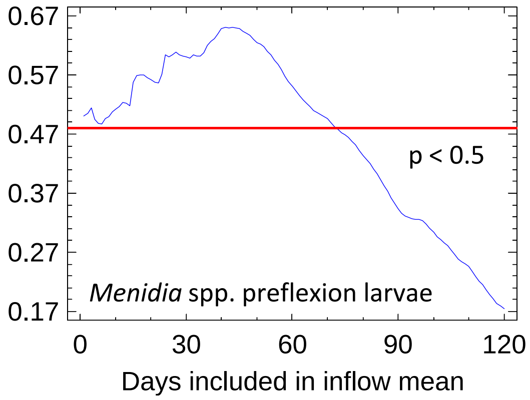

Anchoa spp. preflexion larvae
Correlation coefficient (r)
-0.04
-0.14
-0.24
-0.34
-0.44
p < 0.5
0
30
60
90
120
Days included in inflow mean

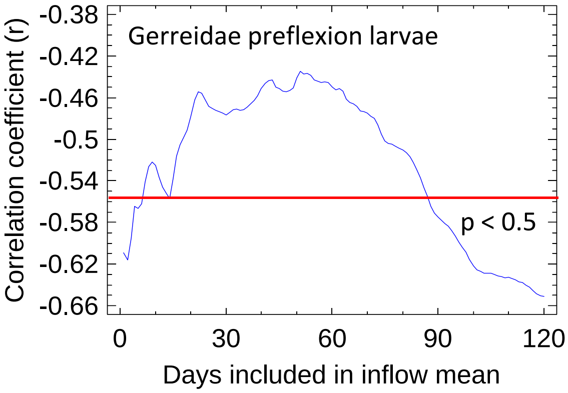

Anchoa spp. flexion larvae
0.21
0.01
-0.19
-0.39
-0.59
p < 0.5
0
30
60
90
120
Days included in inflow mean

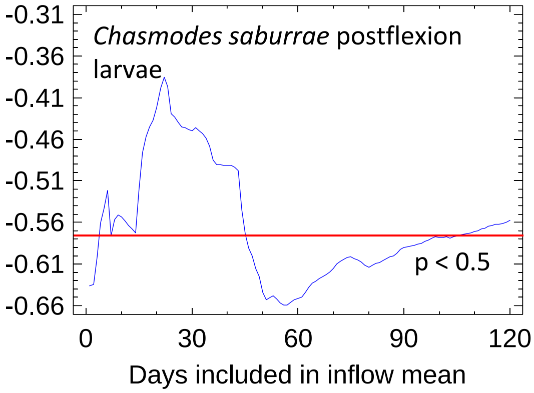

Anchoa mitchilli postflexion larvae
Correlation coefficient (r)
-0.23
-0.33
-0.43
-0.53
-0.63
-0.73
p < 0.5
0
30
60
90
120
Days included in inflow mean

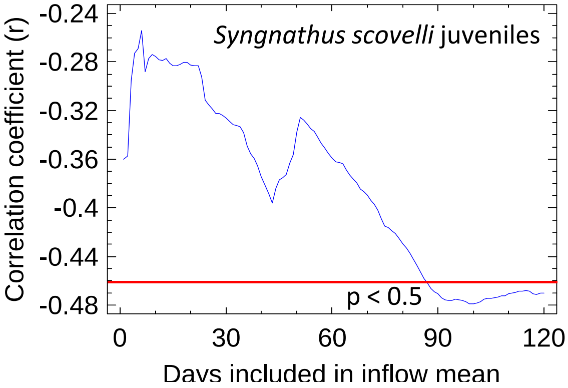

Anchoa mitchilli adults
0.45
0.41
0.37
0.33
0.29
0.25
0.21
p < 0.5
0
30
60
90
120
Days included in inflow mean

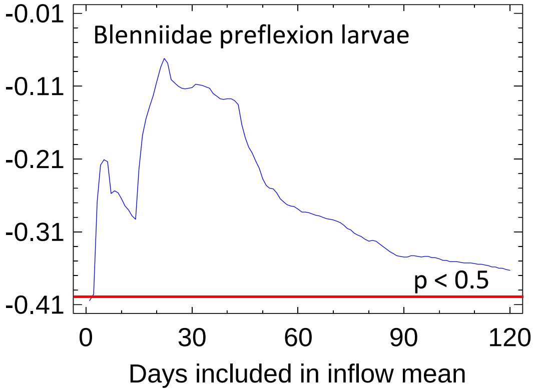

Gobiosoma spp. postflexion larvae
Correlation coefficient (r)
-0.07
-0.17
-0.27
-0.37
-0.47
p < 0.5
0
30
60
90
120
Days included in inflow mean

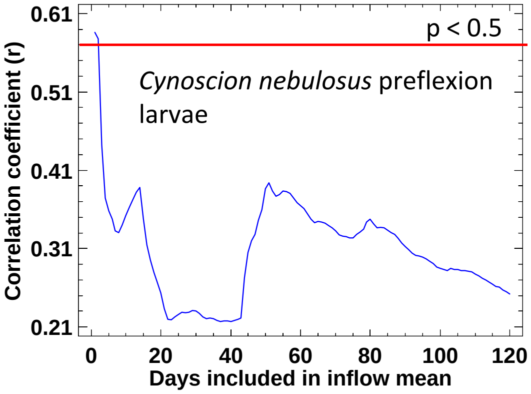

0.67
0.57
0.47
0.37
0.27
0.17
p < 0.5
Menidia spp. preflexion larvae
0
30
60
90
120
Days included in inflow mean

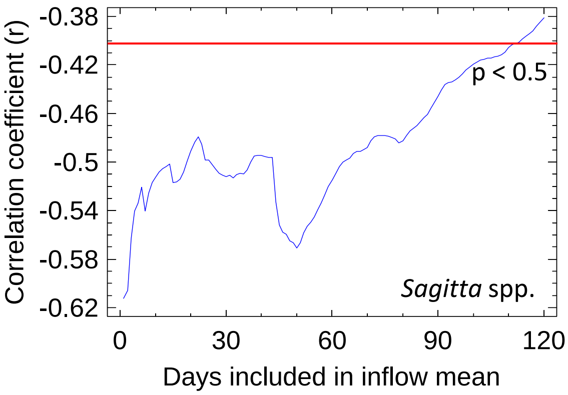

Gerreidae preflexion larvae
Correlation coefficient (r)
-0.38
-0.42
-0.46
-0.5
-0.54
-0.58
-0.62
-0.66
p < 0.5
0
30
60
90
120
Days included in inflow mean

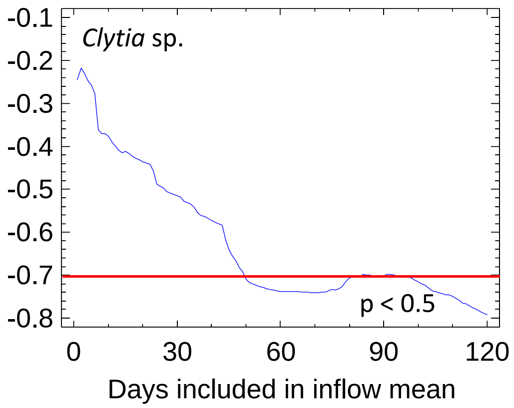

Chasmodes saburrae postflexion larvae
-0.31
-0.36
-0.41
-0.46
-0.51
-0.56
-0.61
-0.66
p < 0.5
0
30
60
90
120
Days included in inflow mean

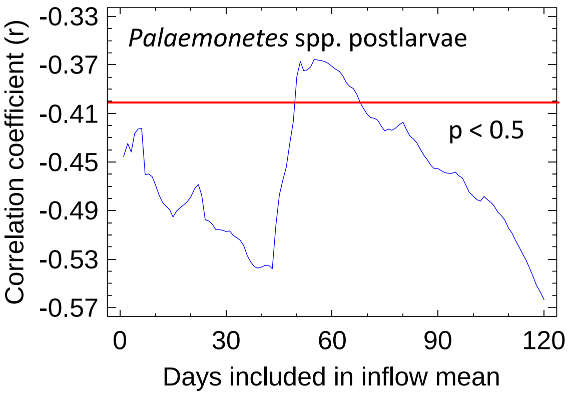

Syngnathus scovelli juveniles
Correlation coefficient (r)
-0.24
-0.28
-0.32
-0.36
-0.4
-0.44
-0.48
p < 0.5
0
30
60
90
120
Days included in inflow mean

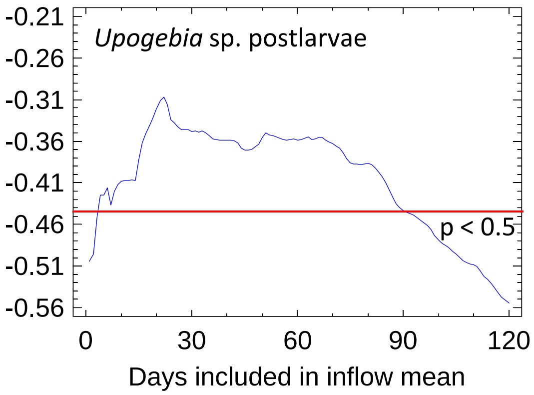

Blenniidae preflexion larvae
-0.01
-0.11
-0.21
-0.31
-0.41
p < 0.5
0
30
60
90
120
Days included in inflow mean

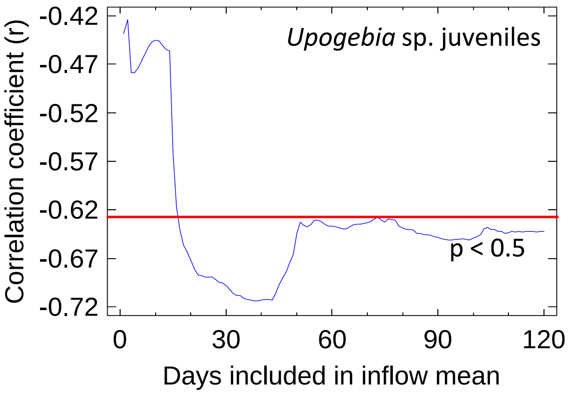

Cynoscion nebulosus preflexion larvae
Correlation coefficient (r)
0.61
0.51
0.41
0.31
0.21
p < 0.5
0
20
40
60
80
100
120
Days included in inflow mean

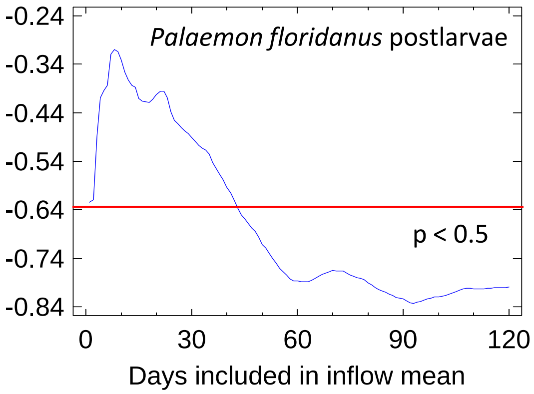

Correlation coefficient (r)
-0.38
-0.42
-0.46
-0.5
-0.54
-0.58
-0.62
p < 0.5
Sagitta spp.
0
30
60
90
120
Days included in inflow mean

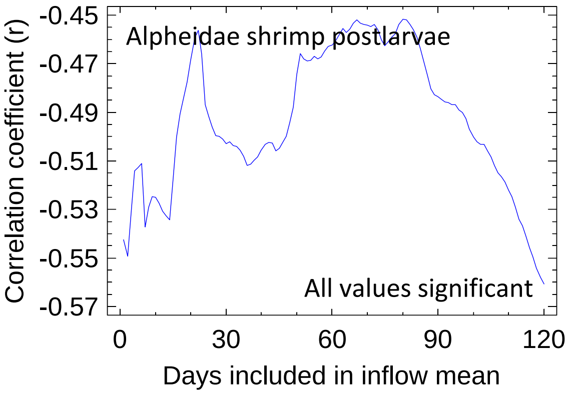

-0.1
-0.2
-0.3
-0.4
-0.5
-0.6
-0.7
-0.8
Clytia sp.
p < 0.5
0
30
60
90
120
Days included in inflow mean

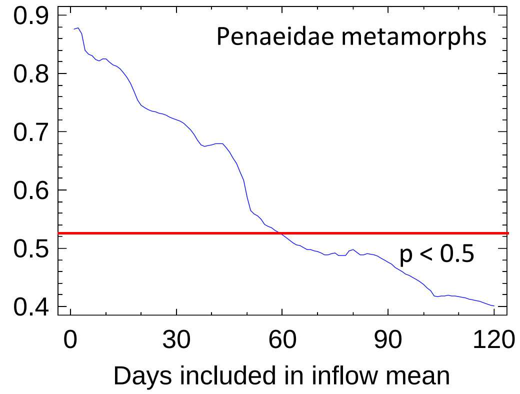

Palaemonetes spp. postlarvae
p < 0.5
Correlation coefficient (r)
-0.33
-0.37
-0.41
-0.45
-0.49
-0.53
-0.57
0
30
60
90
120
Days included in inflow mean

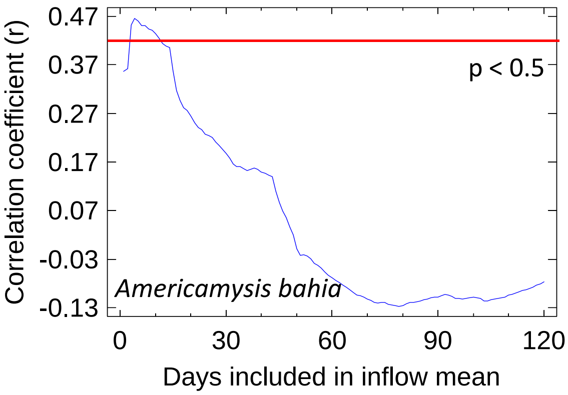

Upogebia sp. postlarvae
p < 0.5
-0.21
-0.26
-0.31
-0.36
-0.41
-0.46
-0.51
-0.56
0
30
60
90
120
Days included in inflow mean


Upogebia sp. juveniles
p < 0.5
Correlation coefficient (r)
-0.42
-0.47
-0.52
-0.57
-0.62
-0.67
-0.72
0
30
60
90
120
Days included in inflow mean

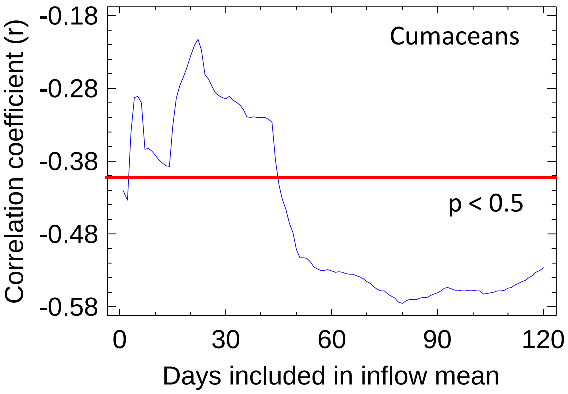

Palaemon floridanus postlarvae
p < 0.5
-0.24
-0.34
-0.44
-0.54
-0.64
-0.74
-0.84
0
30
60
90
120
Days included in inflow mean


Alpheidae shrimp postlarvae
All values significant
Correlation coefficient (r)
-0.45
-0.47
-0.49
-0.51
-0.53
-0.55
-0.57
0
30
60
90
120
Days included in inflow mean

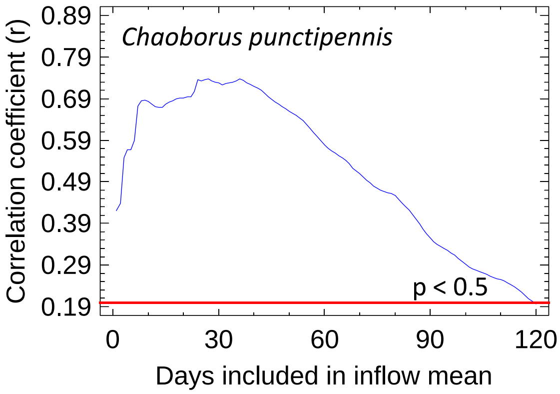

Penaeidae metamorphs
p < 0.5
0.9
0.8
0.7
0.6
0.5
0.4
0
30
60
90
120
Days included in inflow mean



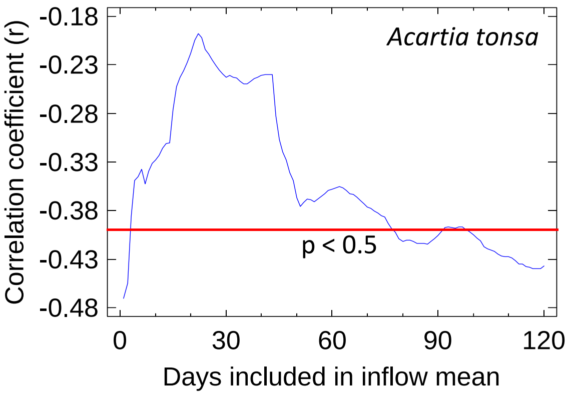
Correlation coefficient (r)
0.47
0.37
0.27
0.17
0.07
-0.03
-0.13
p < 0.5
Americamysis bahia
0
30
60
90
120
Days included in inflow mean

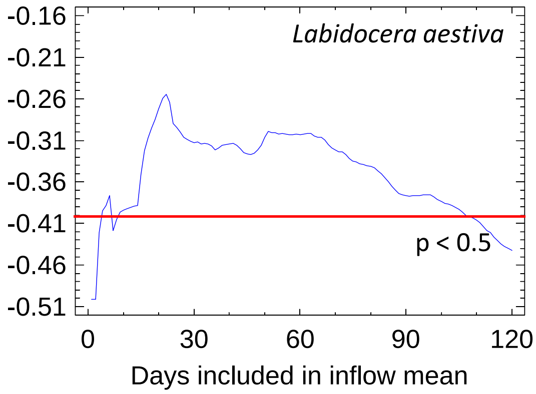


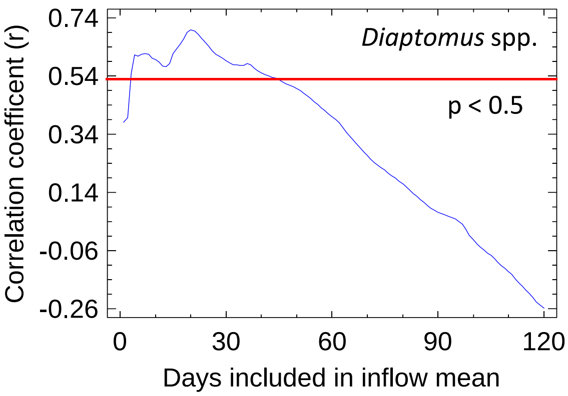
Correlation coefficient (r)
-0.18
-0.28
-0.38
-0.48
-0.58
Cumaceans
p < 0.5
0
30
60
90
120
Days included in inflow mean

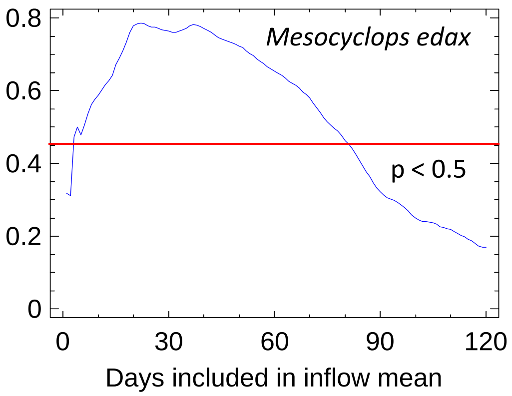


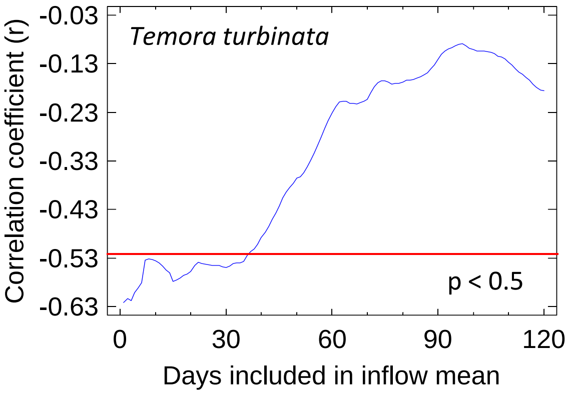
Correlation coefficient (r)
0.89
0.79
0.69
0.59
0.49
0.39
0.29
0.19
Chaoborus punctipennis
p < 0.5
0
30
60
90
120
Days included in inflow mean

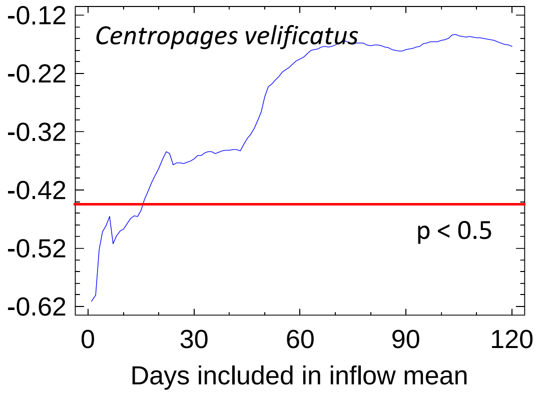

Acartia tonsa
Correlation coefficient (r)
-0.18
-0.23
-0.28
-0.33
-0.38
-0.43
-0.48
p < 0.5
0
30
60
90
120
Days included in inflow mean

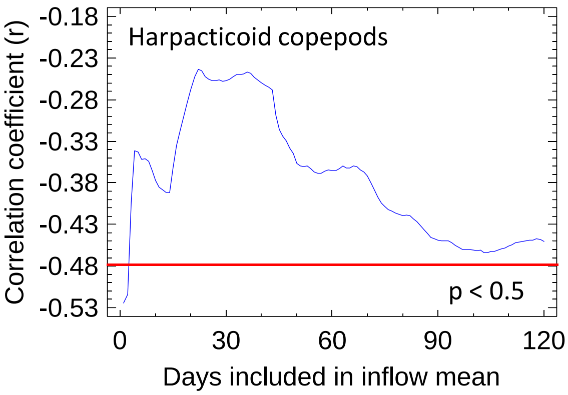

Labidocera aestiva
-0.16
-0.21
-0.26
-0.31
-0.36
-0.41
-0.46
-0.51
p < 0.5
0
30
60
90
120
Days included in inflow mean

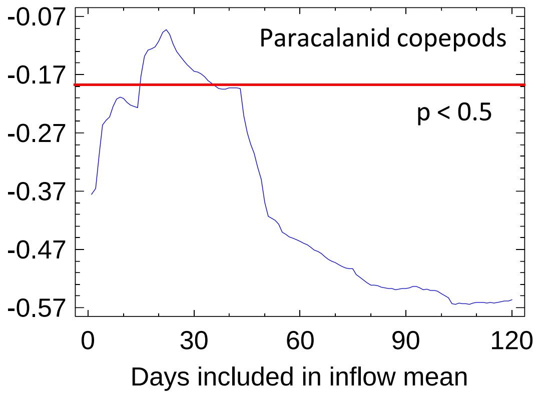

Diaptomus spp.
Correlation coefficent (r)
0.74
0.54
0.34
0.14
-0.06
-0.26
p < 0.5
0
30
60
90
120
Days included in inflow mean

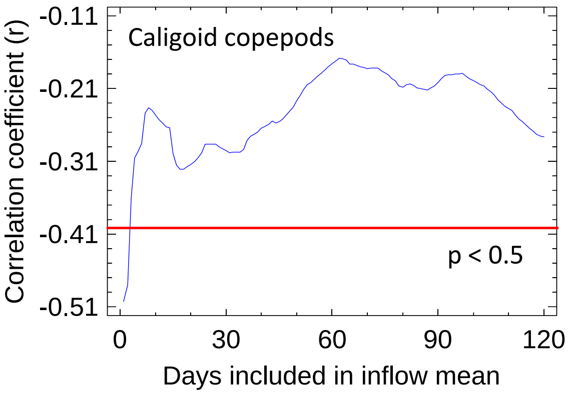

Mesocyclops edax
0.8
0.6
0.4
0.2
0
p < 0.5
0
30
60
90
120
Days included in inflow mean

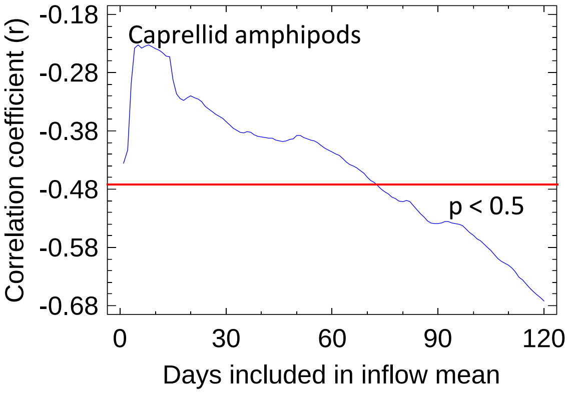

Temora turbinata
Correlation coefficient (r)
-0.03
-0.13
-0.23
-0.33
-0.43
-0.53
-0.63
p < 0.5
0
30
60
90
120
Days included in inflow mean

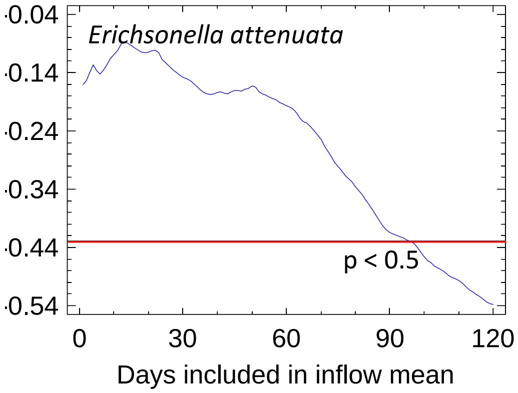

Centropages velificatus
-0.12
-0.22
-0.32
-0.42
-0.52
-0.62
p < 0.5
0
30
60
90
120
Days included in inflow mean

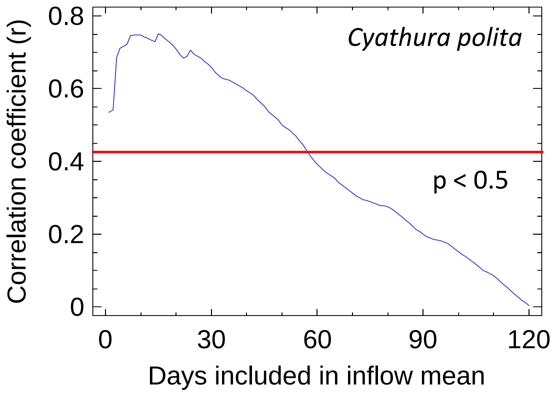

Harpacticoid copepods
p < 0.5
Correlation coefficient (r)
-0.18
-0.23
-0.28
-0.33
-0.38
-0.43
-0.48
-0.53
0
30
60
90
120
Days included in inflow mean

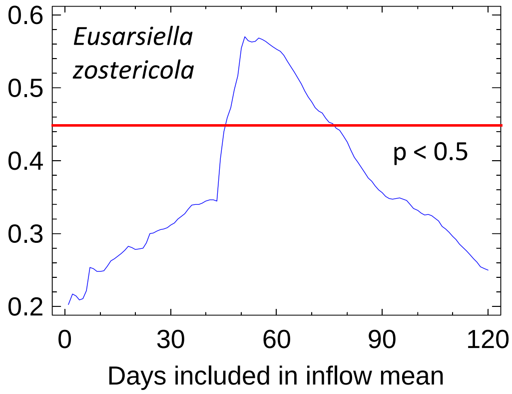

Paracalanid copepods
p < 0.5
-0.07
-0.17
-0.27
-0.37
-0.47
-0.57
0
30
60
90
120
Days included in inflow mean

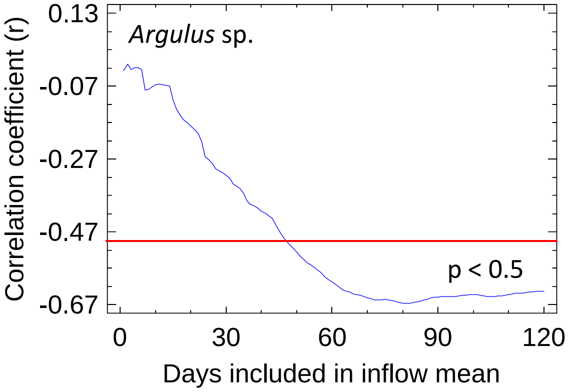

Caligoid copepods
p < 0.5
Correlation coefficient (r)
-0.11
-0.21
-0.31
-0.41
-0.51
0
30
60
90
120
Days included in inflow mean

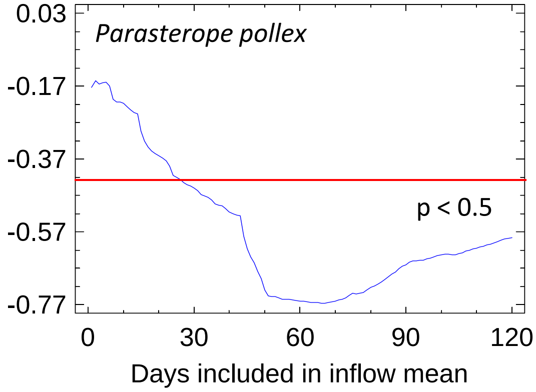

Caprellid amphipods
Correlation coefficient (r)
-0.18
-0.28
-0.38
-0.48
-0.58
-0.68
p < 0.5
0
30
60
90
120
Days included in inflow mean

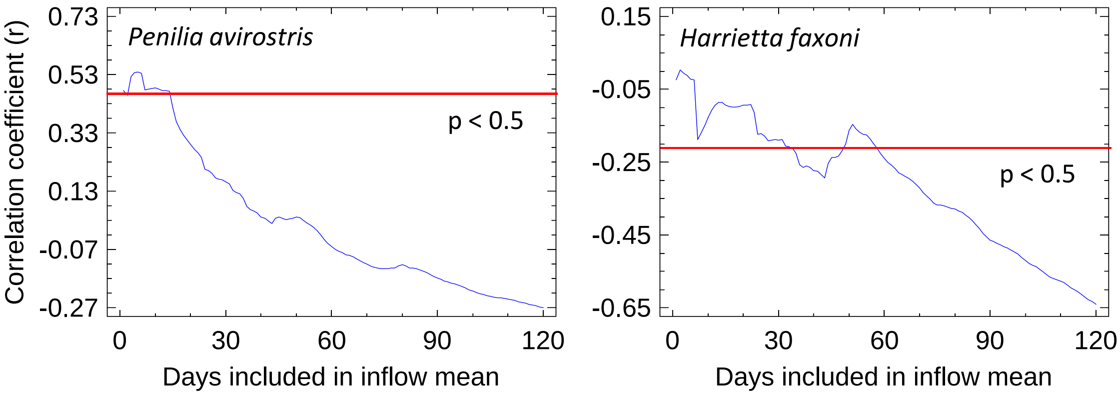

Erichsonella attenuata
-0.04
-0.14
-0.24
-0.34
-0.44
-0.54
p < 0.5
0
30
60
90
120
Days included in inflow mean


Cyathura polita
Correlation coefficient (r)
0.8
0.6
0.4
0.2
0
p < 0.5
0
30
60
90
120
Days included in inflow mean


Eusarsiella zostericola
0.6
0.5
0.4
0.3
0.2
p < 0.5
0
30
60
90
120
Days included in inflow mean


Argulus sp.
Correlation coefficient (r)
0.13
-0.07
-0.27
-0.47
-0.67
p < 0.5
0
30
60
90
120
Days included in inflow mean


Parasterope pollex
0.03
-0.17
-0.37
-0.57
-0.77
p < 0.5
0
30
60
90
120
Days included in inflow mean


Correlation coefficient (r)
Penilia avirostris
0.73
0.53
0.33
0.13
-0.07
-0.27
p < 0.5
0
30
60
90
120
Days included in inflow mean
Harrietta faxoni
0.15
-0.05
-0.25
-0.45
-0.65
p < 0.5
0
30
60
90
120
Days included in inflow mean