Monitoring Effects of a Potential Increased Tidal Range in the Cape Fear River Ecosystem Due to Deepening Wilmington Harbor, North Carolina
Year 2: June 1, 2001–May 31, 2002

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ABSTRACT

Water levels and salinity at 12 permanent (11 surveyed using NAVD88 datum) stations were measured and compared to data collected earlier. Flooding duration and salinity of floodwater in swamps and marshes adjacent to nine of these stations were determined during two-week periods in winter-spring and in summer-fall. Analyses of porewater chloride, sulfate, and methane was performed at six substations per stations and at six depths per subsite to determine the degree, if any, that salts penetrate into marsh/swamp soils. Benthic infaunas found along the edge of the swamp/marsh have been collected since 1999 and were compared for temporal and spatial patterns with data collected in 2001-2002. The presence of epibenthic fauna (fish and crustacea) along the marsh/swamp edge were also recorded at nine of these stations.

More than 1400 tides provided a robust database from which to compare 2001-2002 with previous data. Permanent elevation monuments were stable as were most substation elevation monuments. The piling holding the instruments at Dollisons Landing became unstable during 2001-2002. The surface of the marsh/swamp at Rat Island (P12) and Prince George Creek (P14), stations located along the Northeast Cape Fear tributary of the river, appear to be subsiding, likely due to the extreme low water levels that have occurred during the past several years due to the drought.

More saline water reached farther upstream in 2001-2002 than previously measured. At Dollisons Landing (P8) in the Cape Fear River, salinity of 3.5 ppt was measured where no salinity above freshwater (<1 ppt) had been measured before. Similarly in the Northeast Cape Fear River salinity of surface water increased to 14 ppt at Fishing Creek where the maximum salinity previously recorded was 9 ppt. Water moved freely into most substations adjacent to the rivers carrying saline water all the way to the adjacent upland edge on most transects. In most cases, the absolute elevation of the water in swamps and marshes throughout each transect at high tide was the same as the elevation of water in the river, with the exception of Indian Creek (P7), the least flooded of all sites.

The three most upstream stations in the Cape Fear River had statistically greater tidal ranges in 2001-2002 than in the previous year. These likely occurred because of reduced periods of high flow in the river that tend to reduce tide range. The same phenomenon occurred on an upstream station in Town Creek most likely for the same reason. Stations in the Northeast Cape Fear River did not exhibit any significant difference in tide range between years. When the relationship between tides at the estuary mouth was compared with those at each station through regression analysis, the same pattern as previous years was found (i.e. decreased tide range with distance from the estuary mouth). The relationship between tidal ranges at the mouth of the estuary with tidal range at each station was compared through linear regression. Only three stations, Town Creek Mouth (P3), Indian Creek (P7), and Prince

George Creek (P14), were found to differ statistically between years when slopes between years were compared through Analysis of Covariance. Actual differences in slopes of regression lines between years, while significant at these three stations, were small and were lower at P2 and P14 in 2001-2002 and greater at P7. When slopes from stations that were not statistically significant were examined together with the three that were significant, there was no pattern between years for stations in either branch of the estuary. The duration of ebb and flood tides increased with distance upstream between years by 4% and 3%, respectively, but these differences were not significant. There was a change in lag time between stations this year that was inconsistent with the previous year that may reflect reduced river flow from the regional drought or some long-term harmonic.

No increase in flooding frequency was found in swamps and marshes adjacent to the river between years, but increased levels of saline water resulted in statistically more flooding by saline water and in an increase in the maximum salt level in that floodwater. The effect of increased salinity was not significant for Summer 2001 in soils even though it was higher than the previous year. By Winter 2001-2002, however, the drought-related increased salt load resulted in the conversion of soils in two swamps in the Northeast Cape Fear River from methanogenic to sulfide reducing. In two other stations along this branch of the estuary, sulfide reduction was increased. Stations along the Cape Fear River remained largely unchanged, with those farthest upstream methanogenic and those closer to the body of the estuary exhibiting mixed conditions.

A total of 134 taxa of benthic invertebrates have been identified since this portion of the study began in 1999. There has been a decline in species richness over time from 99 in 1999 to 60 in 2000 and finally 54 in 2001. Oligochaetes, the dominant taxa at most sites, decreased in Town Creek at the same time as a functional group composed of motile and sessile tube-dwelling organisms increased. Oligochaetes decreased at some stations in the Cape Fear River, but increased at others, while the motile sessile functional group generally increased. Few time-related changes of individual species or functional groups were noted at stations in the Northeast Cape Fear River.

Some differences in epifauna were noted in spring as compared to previous years. There were increased numbers of marine transients such as blue crabs, spot, menhaden, and croaker at stations in the Cape Fear and Northeast Cape Fear rivers closest to the ocean, and at Town Creek stations. These species may be responding to increased levels of saline water allowed further upstream by the drought, although effects of widening and deepening of the harbor cannot be excluded. Additional years of data during non-drought years will resolve this question.

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EXECUTIVE SUMMARY

This report summarizes monitoring efforts that began in 1999 before construction of the Wilmington Harbor deepening project began, through the beginning of construction activities, May 2002. The primary emphasis has been the identification and quantification of potential hydrological impacts identified by Corps models and on biological impacts that would likely result from these hydrologic changes.

Hydrological and chemical data were collected from 12 permanent stations located from the estuary mouth near Ft Caswell into both primary branches of the estuary (Cape Fear River and Northeast Cape Fear River) and into Town Creek, which is home to at least one rare aquatic species. Biological and biogeochemical data were gathered along the marsh/river edge and in transects adjacent to nine of these stations.

The primary emphasis of this monitoring effort has centered on the potential change of the tide as it moves up the estuary. Increased tidal height, i.e. marsh/swamp flooding, coupled with saline water could alter thousands of acres of wetlands in the upper portions of the Cape Fear Estuary.

The three stations farthest upstream in the mainstem of the Cape Fear River exhibited significantly higher tidal ranges than the previous year. No other stations were different. However, when the relationship of tide range at the mouth of the river was compared to stations upstream only the background station in the Northeast Cape Fear River and one station in the Cape Fear mainstem were significantly different than last year. These differences, while significant, were not meaningful. A severe drought is likely responsible for differences between years, a factor that reduced the overall variation in tidal range found the previous year. The asymmetry of the water level curve increased with distance from the estuary mouth, ebb/flood durations but stations were within 4% of last year despite the drought. A change in the time it takes the tide to propagate upstream was noted and will be examined in detail in future reports.

The salinity of water increased to 3.5 ppt at Dollisons Landing, a station on the Cape Fear River where salinity had not been reported before. The Northeast Cape Fear River, not protected by scheduled freshwater releases from an upstream dam, also recorded increased levels of salinity in the river with the maximum salinity 14 ppt in surface waters at Fishing Creek located about eight miles upstream of Wilmington.

The importance of the regional drought was apparent in swamps along the Northeast Cape Fear River during Fall 2000. Even though the marshes and swamps flooded at the same frequency as last year, there were statistically more flooding events with saline water. The maximum salinity in the flooding water was also significantly higher during fall and generally reached into the backwater areas of the marsh/swamp as well as the river's edge.

More saline floodwater dramatically influenced the biogeochemical processes in swamp sediments at the two stations farthest upstream in the Northeast Cape Fear River converting them from soils that generate methane to soils that produce hydrogen sulfide, a metabolic byproduct caused by saltwater that is extremely toxic to plants and animals in freshwater soils. Areas already affected by salinity and producing sulfide, produced more of this compound as a result of higher salt content of the flood waters.

The benthic fauna (animals inhabiting the mud) along the river's edge at each station have declined in number of taxa; 99 in 1999, 60 in 2000, and 54 in 2001. There were no trends with respect to changes in populations through time and space that could be attributed to the project, although decreases in groups generally associated with fresh water at some stations may reflect drought conditions. Several species of motile fish, crabs, and shrimp utilizing the marsh/swamp edge increased in abundance in Spring 2002. However, the increased abundance of more saline species likely reflects the regional drought and the effect of more saline water farther up the estuary for longer periods of time.

1.0 STATION OPERATION

1.1 Summary

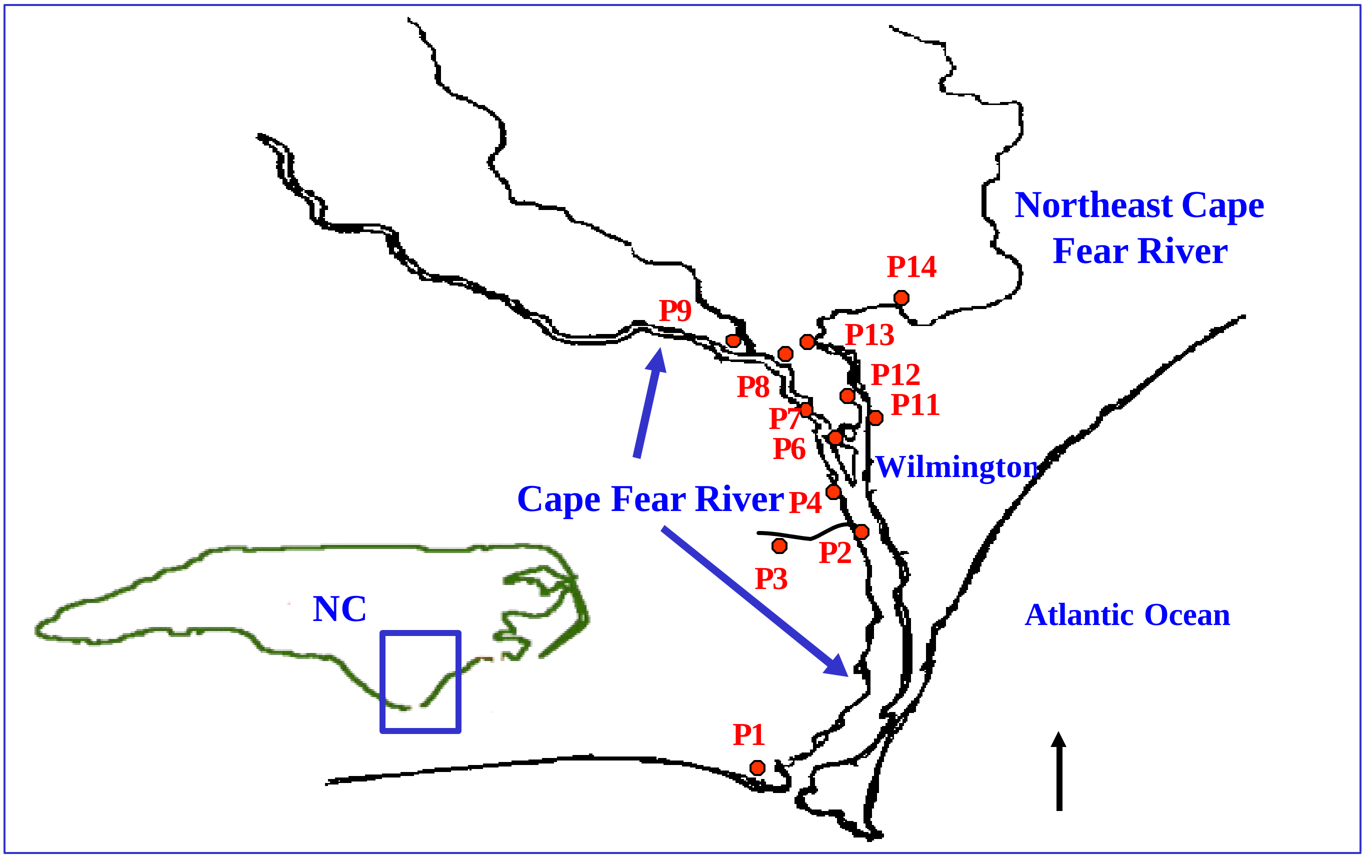
Measurement of water levels in the main channel of the Cape Fear River, the Northeast Cape Fear River, and Town Creek (Figure 1.1-1) continue to provide the data necessary to determine the impact associated with the widening and deepening project. Differences between the high and low points of each tide, referred to as ranges in this report, can be followed upstream from the base station at Ft Caswell (P1) to any individual station. Differences between stations with respect to tidal range, time to high or low tide, length of low and high tides were also determined. Comparisons of these variables before the channel is widened and deepened versus after the channel is widened and deepened will provide the statistical testing mechanism that will determine whether the project has impacted adjacent wetlands. In addition, the absolute elevation of floodwater when related to measurements of water levels at marsh/swamp substations allows the determination of both flood duration and flood depth for any tide. This report includes data collected from June 2001 through May 2002. During this period, problems of communication with instruments or minor instrument malfunction were solved as they occurred, but persistent problems included rapid water level changes, e.g., boat wakes that exceeded the ability of the water level instrumentation to track over very short time spans, and under-ranging associated with the regional drought e.g., water levels below the base of the stilling well. The latter was especially a problem during extreme astronomical low tides. As was the case last year, each tide has been examined for each station and a determination made as to whether the data collected are reliable.

Several major problems were solved during the past year and minor problems solved as they occurred. The instability of the Rat Island data collection platform described in last year's report was solved after the pilings were relocated and redesigned. This station is now fully functioning, and data from June 2001 to May 2002 are included in this reporting period.

A second major problem was an apparent clock reset that occurred during the downloading procedure from June to October 2001. After extensive discussion with UNIDATA and other telecommunications experts, it was determined that the placement of a cellular phone tower on the UNCW campus was likely interfering with data downloading via cellular modems. The location of the downloading computer was changed in October 2001 and the clock-resets ceased to occur. As a result of this problem, DCP clocks are now synchronized with the U.S. atomic clock after every download event.

A final problem was the instability of the DCP platform at P8 (Dollisons Landing). In late Spring 2002, data review indicated periodic jumps in the water level. During the QA/QC procedure, it was determined that the stilling well walls were interfering with the rise and fall of the floats because the piling was no longer plumb. In June 2002, efforts were made to straighten and reinforce this piling. These efforts included the installation of a chain and cable that are affixed to the shore and apply

Figure 1.1-1. General location of stations in the Cape Fear Basin watershed. Stations are designated as follows: P1 - Fort Caswell, P2 - Outer Town Creek, P3 - Inner Town Creek, P4 - Corps Yard, P6 - Eagle Island, P7 - Indian Creek, P8 - Dollison's Landing, P9 - Black River, P11 - Smith Creek, P12 - Rat Island, P13 - Fishing Creek, and P14 - Prince George Creek.



tension to the piling thus keeping it vertical. This is only a temporary solution, but appears to have corrected the immediate problem

Table 1.2-1 provides a general summary of data loss that affects statistical analysis for present and future comparisons. There were ample data available for all analyses at all sites except Rat Island (P7), where data were unavailable for most of the first year. Statistical comparisons will be available between years for this station next year.

1.2 Methodology

Water level is sampled by a UNIDATA shaft-encoded water level recorder housed in an aluminum stilling well at 1-second intervals. A UNIDATA Starlogger records the average, maximum and minimum values every 3 minutes. Conductivity and temperature are also sampled by a UNIDATA conductivity instrument and recorded by the Starlogger every 3 minutes. Data are downloaded to a PC housed in the laboratory every 2 weeks via modem. In instances when the modem has not functioned properly, technicians on site download data loggers using a laptop. Preliminary data quality review consists of visually reviewing data for major problems (e.g. float hang-ups in the stilling well, data transmission errors, large jumps/shifts in water level, loss of data) within 2-3 days of download. This process is done so that any major problem identified can be rectified immediately. Data are then compiled into files each of which contains 1 month of data for each station. Data files are then sorted at 6 minutes intervals and the resulting data set is stored for subsequent data analysis. Specific problems associated with the equipment and data acquisition are described below for each station. The following terms used in this section of the report describe general mechanisms through which data are lost or compromised.

Loss at Station P1: Because the response of each variable upstream is related to the base station at Ft Caswell (P1), the loss of a variable from P1 during a particular tide means that there is no means of comparison with other stations. Reasons for data loss at P1 as well as other stations are: 1) **QA/QC Procedure**, which refers to tides that were removed from the data set when measurements coincided with QA/QC and equipment maintenance procedures. In these instances, recorded water levels were inaccurate due to cleaning the water level float, removing/replacing the water level recorder, replacing the beaded cable, or performing a field reset when in-situ observations of water level were inconsistent with water levels reported by the data logger. 2) **Under Ranging Events** refers to tides that were removed from the data set when the actual water level fell below the elevation of the stilling well cap. In these instances, the instruments were unable to detect the minimum water level. 3) **Absence of Data** refers to tides that were lost when the data were not recorded by the data logger or were not transmitted properly via the modem or PC download process. 4) **Freezing** of surface water in the stilling well prohibited the float from following the rise and fall of the tides and these tides were removed. Freezing, while a problem in previous years, did not occur during this reporting period and is not included in Table 1.2-1. 5) **Mechanical Errors** refer to tides removed from the data set during the data review process because of likely mechanical malfunction. Mechanical malfunctions were suspected when the plotted data exhibited misshapen curves, large jumps, and flat lines (i.e. hang-ups).

Table 1.2-1. Percentages of tides unavailable for analysis and reasons for loss. Detailed descriptions of "loss" categories are listed in Section 1.2 above.

Station Number	% Tides Lost to Loss At Station P1	%Tides Lost due to QA/QC	%Tides Lost to Under-ranging Events	% Tides Lost to Absence of Data	% Tides Lost to Mechanical Errors	Total % Lost Tides
P1	N/A	0	0.0	0.9	7.6	8.5
P2	8.5	0	0.0	0.4	4.0	12.9
P3	8.5	0	0.0	0.0	2.4	10.9
P4	8.5	0	0.0	0.2	0.0	8.7
P6	8.5	0	0.0	9.1	1.2	18.8
P7	8.5	0	4.8	5.5	0.0	18.8
P8	8.5	0	0.9	5.9	9.3	24.5
P9	8.5	0	0.0	6.5	3.3	18.2
P11	8.5	0	0.9	0.9	1.5	11.8
P12	8.5	0	0.0	9.1	0.0	17.5
P13	8.5	0	0.0	0.1	0.0	8.5
P14	8.5	0	0.0	19.2	0.0	27.6

1.3 Ft Caswell (P1)

Ft Caswell is the most important station because this station experiences amplitude changes that are essentially oceanic tides. All upstream water levels are related to this station. This station functioned well during the reporting period. The total percentage of lost tides at this station from June 2001 to May 2002 (8.5%) was comparable to losses reported between October 2000 and May 2001 (8.9%). Communication problems necessitated manual downloading on several occasions with loss of data on one occasion. Data collected at this station still show irregularities in the shape of the water level curves. In most cases, the lack of a smooth curve does not affect the reported minimum and maximum water level values (i.e. reported tidal range). While we have not been able to identify the cause of the fluctuations, they constitute a minor problem and have not led to any major data losses. Biofouling continues to be a minor problem for the conductivity (salinity) probe, especially when larvae are recruiting into the estuary. Monthly QA/QC checks and cleaning of probes, when needed, has limited the effects of this problem on data.

1.4 Town Creek Mouth (P2)

Water level curves at this station are no longer smooth. Increased boat traffic associated with the dredging operation and monitoring efforts and the build up of a sand bar adjacent to the station has reduced data quality in some instances. Large jumps in the data or poorly defined maximum and minimum values were removed during initial data review and account for approximately 4% of the data loss at this station. Data for these tides are omitted in analyses. The site continues to be affected by excrement from pelicans, terns, and gulls that covers the solar cell and increases corrosion of the metal components of the structure.

Water relatively high in salinity at this site affected the beaded cables, necessitating their replacement. Biofouling is also a problem at this station, but is identified and corrected each month (if present) during monthly QA/QC checks. The conductivity probe was covered with barnacles in October 2001 and was replaced during routine monthly QA/QC inspection.

1.5 Inner Town Creek (P3)

This station has had few problems and continues to generate smooth tidal curves. The restricted and protected nature of this site continues to protect it from large waves and wakes. This site is subject to rapid increases in the average water level during local rain events, which quickly return to normal because of the restricted drainage basin of Town Creek.

1.6 Corps Yard (P4)

NOAA operates the tidal gauge at this site and data are available at their website after curve-smoothing procedures are applied. The UNCW conductivity/salinity gauges located at this site have operated with no problems over the reporting period.

1.7 Eagle Island (P6)

In Summer 2001, lightning damaged this station leading to data loss. There were also some mechanical problems with this station as well as flat-lining.

1.8 Indian Creek (P7)

This DCP and associated stilling well are set higher than others along the Cape Fear River and therefore, this site has been subject to a relatively high percentage of lost tides due to underranging. This year, underranging was especially problematic due to low water levels in the river associated with drought conditions and low discharge upstream. As a result, we have lost a significant proportion (18.8%) of all potential range values for statistical analyses. Loss of either a high tide or low tide point results in the loss of two range values (preceding and following range).

1.9 Dollisons Landing (P8)

Stability has become a problem at this site. In Spring 2002, initial data review revealed jumps in the data indicative of float hang-ups. In addition, during QA/QC visits there was a discrepancy in the measured water level versus the instrument level and the water level recorder was reset. Eventually, the piling was shown to no longer be vertical. On each occasion the direction of the error was the same, i.e. water level was higher on the water level instrument. Plans have been made to stabilize this DCP with batter piles.

1.10 Black River (P9)

Located on a quiet slough at the confluence of the Cape Fear and Black Rivers, this station had few problems from waves and has provided one of the most complete data sets.

1.11 Smith Creek (P11)

Shoaling adjacent to the DCP continues to be a problem at this site. This station does not record the lowest low tides (flat lines) and is affected by waves on occasion. There have also been several float hang-ups.

1.12 Rat Island (P12)

No data were reported in Year 1 for this site. Since the piling was redesigned and relocated, this station has experienced few problems.

1.13 Fishing Creek (P13)

There have been few problems at this site.

1.14 Prince George Creek (P14)

This site experienced extensive data loss this year (27.6%) due mostly to equipment problems, transmission difficulties, and human error in October-December 2001, and again in early May 2002.

2.0 MONUMENT AND STATION SURVEY VERIFICATION

2.1 Summary

Elevations of substations were compared to those established at Data Collection Platforms (DCPs) using water level at high tide as a flat plane. The piling supporting the DCP appears to be sinking relative to substations at P3, Inner Town Creek. The piling supporting the DCP at Dollisons landing has become unstable. The upper substations at P11, Smith Creek, are also exhibiting unexpected differences from the water level of the DCP reflecting either movement of the marsh surface upward caused by the growth of dense root mats or the inadequacy of this technique in a dense marsh. The Rat Island (P12) marsh/swamp surface appears to be sinking, but all benchmarks reflected their original elevation.

Substation 1 at Prince George Creek (P14) is subsiding based on elevation surveys. Future analyses can accommodate elevation change as long as it is known. Similar analyses will accompany each annual report.

2.2 Marsh/Swamp Flood Tide Level versus River Water Level

This analysis compared the water level on the marsh at substations with water levels during the same tide in the river. While approximate, this approach along with annual surveying of some stations, will allow the detection of changes in marsh surface elevation and/or changes in the level of the DCP caused by piles slowly sinking. During Fall 2000, PVC elevation markers had not been placed at each substation. It is clear from data after that date that use of the stable PVC benchmarks versus the marsh/swamp surface at each substation is a superior method of determining flood levels.

The three highest tides at substation 1 during each two-week water level monitoring period (Fall & Spring) were used. The average water level during these three tides at each substation was compared with average water levels from the DCP during the same three tides. These differences are expressed in tables as the average deviation. Positive values indicate that water level at the DCP (River) were higher than the substation. The primary purpose was to identify substations whose elevation survey was inaccurate or substations that were subsiding. In all cases, substation 1 is located close enough to the DCP for water to act as a level plane. Although wave action had the potential for altering this flat plane, the stilling well on the DCP and vegetation near each substation act to minimize wave effects. Substations further from the river may not attain the same flooding level as those closer to the river because of rough topography or distance from the flooding source. Substations close to uplands were also influenced by streams, seepage and floodwater not related to tides. Substation elevation also varied greatly so that a tide, which flooded one substation to a depth of six inches above the marsh surface, might flood only one inch above the surface at another.

Substations at Station P3 (Inner Town Creek) were uniformly receiving less flooding through time (Table 2.2-1). It is unlikely that this trend was caused by subsidence across the entire marsh surface. The more likely cause is the sinking of the pile on which the DCP was located. Also note that substation 6 appeared to be flooded less in Fall 2000 and Spring 2001, but flooded to a higher depth Fall 2001 and Spring 2002. This substation is along the upland boundary so less flooding is expected as was reflected in Fall 2000 data. Vegetatively, this substation is changing from woody swamp vegetation to a *Phragmites*– dominated marsh, which may explain the odd behavior of this subsite.

The station at Eagle Island was resurveyed last year (Hackney et al. 2001). Equipment failure at the DCP during a portion of the two-week marsh water level study prevented a Fall 2001 comparison. No patterns of change through time or along the transect were apparent (Table 2.2-2). This station and substations was surveyed in 2001 and found to be stable.

Indian Creek (P7) has a very direct connection to the river. Low water levels during Spring 2002 sampling led to an inability to calculate flooding levels. Elevations at substations were very stable Spring 2001 and Fall 2001 and this DCP and substations appear to be very stable. (Table 2.2-3).

Similarly, Dollisons Landing (P8) did not flood during the two-week flooding study so there are no data for Spring 2002. Based on Fall 2001 data, substations were stable (Table 2.2-4). However, the piling on which the DCP is located has become unstable and is leaning. Plans have been made to stabilize this DCP.

The uppermost site in the Cape Fear River is Black River (P9). With water flowing onto this site from the Cape Fear River and Black River large variations in water level may exist along this transect. This method is likely not reliable for this station given both the large topographic relief along the transect and flooding at high tide from both rivers (Table 2.2-5).

Smith Creek (P11) is located on the edge of an old dredge disposal area and much of the transect is underlain by sandy substrate. Water levels at substation 1 were near levels at the DCP (Table 2.2-6). Vegetation is extremely dense with detritus covering much of the marsh surface. Water levels at substations farther from the water's edge varied. This likely reflects the baffling effect of vegetation slowing water into or out of each site, preventing the full expression of a tide from reaching each substation. Even during winter the huge accumulation of biomass at this site can alter water flux. Substations at this site will be followed in the future because PVC benchmarks required at this station were short reflecting the dense sandy base upon which this transect is located. *Phragmites* occupies the majority of the upper subsites and the dense root mat produced by this species has the potential to move both wells and PVC benchmarks.

The DCP at Rat Island (P12) was not stabilized until May 2001, so only one year of data was available. Water levels in the river at high tide were similar to water levels at all substations except at interior substations (Table 2.2-7). This station will be watched closely as the marsh surface appears to be sinking, not just near substations, but in the entire marsh/swamp. At some sites where permanent structures or old tree stumps are located, the surface has dropped 6-10 inches. There is also erosion occurring along the river's edge.

Small creeks penetrate deep into the swamp in which the transect at Fishing Creek (P13) extends. Based on flooding levels at substations relative to the DCP at this site (Table 2.2-8), these creeks are efficient at allowing each tide to penetrate the entire length of this 1100 ft plus transect. Even substations near the upland edge flood to the same level as the river.

The uppermost station on the Northeast Cape Fear River is Prince George Creek (P14). It also has the lowest average surface elevation of substations along this transect. As a consequence, wave action at substation 1 is a problem. During weekends, high levels of boat traffic produce almost constant wakes. With the exception of substation 1 near the river, water levels along this transect largely reflects those of the river (Table 2.2-9).

Table 2.2-1. A comparison of the maximum water level at the DCP in the river at Town Creek (P3) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river.

P03	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	1.13	1.23	1.37	1.22
Difference between DCP and Substation 1 (ft)	0.68	0.21	-0.27	-0.16
Difference between DCP and Substation 2 (ft)	0.64	0.17	-0.17	-0.11
Difference between DCP and Substation 3 (ft)	0.72	0.20	-0.23	-0.11
Difference between DCP and Substation 4 (ft)	1.64	1.14	-0.24	0.04
Difference between DCP and Substation 5 (ft)	0.58	0.13	-0.15	-0.07
Difference between DCP and Substation 6 (ft)	2.86	2.26	-2.41	-2.34

Table 2.2-2. A comparison of the maximum water level at the DCP in the river at Eagle Island (P6) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river. NC = No corresponding DCP data,

P06	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	2.28	3.14	NC	2.25
Difference between DCP and Substation 1 (ft)	0.49	-0.34	NC	0.15
Difference between DCP and Substation 2 (ft)	0.57	-0.14	NC	-0.01
Difference between DCP and Substation 3 (ft)	0.68	-0.17	NC	-0.11
Difference between DCP and Substation 4 (ft)	0.59	-0.28	NC	-0.07
Difference between DCP and Substation 5 (ft)	0.87	0.16	NC	-0.30
Difference between DCP and Substation 6 (ft)	0.48	-0.28	NC	0.16

Table 2.2-3. A comparison of the maximum water level at the DCP in the river at Indian Creek (P7) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river. NC = No corresponding DCP data.

P07	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	2.47	2.40	2.76	NC
Difference between DCP and Substation 1 (ft)	0.30	0	-0.12	NC
Difference between DCP and Substation 2 (ft)	0.29	-0.03	-0.10	NC
Difference between DCP and Substation 3 (ft)	0.20	0.04	-0.04	NC
Difference between DCP and Substation 4 (ft)	0.54	0.20	-0.09	NC
Difference between DCP and Substation 5 (ft)	0.14	0.006	-0.03	NC
Difference between DCP and Substation 6 (ft)	0.02	-0.02	0.02	NC

Table 2.2-4 A comparison of the maximum water level at the DCP in the river at Dollisons Landing (P8) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river. NC = No corresponding DCP data.

P08	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	2.68	3.15	2.83	NC
Difference between DCP and Substation 1 (ft)	0.27	0.39	0.09	NC
Difference between DCP and Substation 2 (ft)	0.23	0.47	0.02	NC
Difference between DCP and Substation 3 (ft)	0.33	0.48	-0.12	NC
Difference between DCP and Substation 4 (ft)	0.14	0.46	0.10	NC
Difference between DCP and Substation 5 (ft)	0.24	0.44	0.10	NC
Difference between DCP and Substation 6 (ft)	0.19	0.51	0.11	NC

Table 2.2-5. A comparison of the maximum water level at the DCP in the river at Black River (P9) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river. ND = No data.

P09	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	2.34	2.83	2.38	2.24
Difference between DCP and Substation 1 (ft)	0.22	0.32	ND	-0.09
Difference between DCP and Substation 2 (ft)	ND	1.07	-0.48	-0.003
Difference between DCP and Substation 3 (ft)	-1.09	-0.56	-0.52	0.03
Difference between DCP and Substation 4 (ft)	0.12	0.18	-0.48	0.43
Difference between DCP and Substation 5 (ft)	0.10	0.30	-0.49	0.32
Difference between DCP and Substation 6 (ft)	0.16	0.19	-0.51	0.38

Table 2.2-6. A comparison of the maximum water level at the DCP in the river at Smith Creek (P11) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river.

P11	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	3.02	3.04	2.79	3.49
Difference between DCP and Substation 1 (ft)	0.1	-0.20	0.04	0.07
Difference between DCP and Substation 2 (ft)	0.08	-0.18	0.01	0.34
Difference between DCP and Substation 3 (ft)	0.11	-0.20	0.17	0.43
Difference between DCP and Substation 4 (ft)	0.03	-0.18	0.18	0.39
Difference between DCP and Substation 5 (ft)	0.05	-0.15	0.16	0.39
Difference between DCP and Substation 6 (ft)	0.11	-0.17	0.11	0.36

Table 2.2-7. A comparison of the maximum water level at the DCP in the river at Rat Island (P12) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river. NC = No corresponding DCP data

P12	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	NC	NC	2.54	2.77
Difference between DCP and Substation 1 (ft)	NC	NC	0.30	-0.17
Difference between DCP and Substation 2 (ft)	NC	NC	0.15	-0.11
Difference between DCP and Substation 3 (ft)	NC	NC	0.14	-0.14
Difference between DCP and Substation 4 (ft)	NC	NC	0.22	-0.07
Difference between DCP and Substation 5 (ft)	NC	NC	0.13	0
Difference between DCP and Substation 6 (ft)	NC	NC	-0.11	-0.17

Table 2.2-8. A comparison of the maximum water level at the DCP in the river at Fishing Creek (P13) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river.

P13	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	2.18	2.16	1.93	2.24
Difference between DCP and Substation 1 (ft)	0.12	-0.08	-0.05	0.01
Difference between DCP and Substation 2 (ft)	0.73	-0.09	-0.03	-0.04
Difference between DCP and Substation 3 (ft)	0.18	-0.16	-0.11	-0.15
Difference between DCP and Substation 4 (ft)	0.07	-0.18	-0.03	-0.14
Difference between DCP and Substation 5 (ft)	0.11	-0.14	-0.02	0.06
Difference between DCP and Substation 6 (ft)	0.07	-0.17	0.02	0.06

Table 2.2-9. A comparison of the maximum water level at the DCP in the river at Prince George Creek (P14) with the maximum water levels recorded during the three highest tides at substations adjacent to the DCP. Each value is the mean of the replicates. Negative values occur when water levels at substations were higher that levels recorded in the river. NC= No DCP data.

P14	Fall '00	Spring '01	Fall '01	Spring '02
Highest Tide of Three Replicates per Season (ft)	1.56	2.10	NC	1.50
Difference between DCP and Substation 1 (ft)	0.24	0.20	NC	-0.27
Difference between DCP and Substation 2 (ft)	0.23	-0.15	NC	-0.07
Difference between DCP and Substation 3 (ft)	0.17	0.13	NC	-0.05
Difference between DCP and Substation 4 (ft)	0.14	0.04	NC	-0.07
Difference between DCP and Substation 5 (ft)	0.17	0.13	NC	-0.09
Difference between DCP and Substation 6 (ft)	0.17	0.17	NC	0.14

2.3 Survey Elevation Verification

Each year a small subset of stations is examined and elevation of DCP and substation 1 verified using standard optical survey equipment. This survey is not used to reset elevations previously established by certified surveyors, but to verify that elevations were relatively stable.

The Rat Island (P12) station DCP was reset last year after pilings failed. This is the only DCP elevation not established by a certified surveyor. In 2001 an elevation was established based on the established transect benchmark. The piling was checked this year and was .06 ft different than last year. This is within the 0.1 ft criteria established to determine if there has been vertical movement. Substation 1 was also stable (+0.06) of the established elevation.

The DCP at Fishing Creek (P13) is extremely stable and was 0.01ft from the elevation established at the beginning of the study. Substation 1 at this transect exhibited the same variation.

The uppermost station on the Northeast Cape Fear River is Prince George Creek (P14). The DCP was also very stable here (+0.01 ft). The elevation at substation 1, however, was 0.14 ft lower than the original survey. Water levels at substation 1 were 0.27 ft higher than the DCP during the two-week study of flooding (See Table 2.2-9) suggesting that this substation and the swamp adjacent to the river may be experiencing some loss of elevation. The channel adjacent to this transect is very deep and there may be some slumping of the swamp adjacent to the river. The large quantity of woody debris in the swamp sediments may have prevented the PVC benchmark at substation 1 from reaching resistance in stable sediments below those of the swamp.

3.0 RIVER WATER LEVEL/SALINITY MONITORING

3.1 Summary

More than 1,400 tide ranges measured between 1 June 2001 and 31 May 2002 comprise the database for water level comparisons between the 11 DCP stations and for temporal changes in water level at 10 of the 11 stations. An adequate data base was not available for Rat Island (P12) prior to May 2001 because of an unstable piling. The existing database allowed an analysis of changes in tidal amplitude as well as changes of ebb and flood duration between 2000-2001 and 2001-2002 for 10 of the 11 stations. The correlation of tidal range from the base station at Ft Caswell with the predicted tidal range was excellent and virtually unchanged from last year. As was the case in 2000-2001, tidal range at stations within the estuary were fairly constant, but were higher than tidal ranges measured at upstream stations. Most upstream sites and the inner Town Creek station (P3) continue to be affected by freshwater flow, but to a lesser degree than last year because of decreased rainfall and drought conditions in the watershed. Significant differences in yearly mean tidal ranges occurred at the three upstream Cape Fear River mainstem stations. Mean tidal range at estuary and Northeast Cape Fear River stations did not differ significantly between years. With the exception of two stations (P7 and P11), no significant difference in mean monthly maximum or minimum water levels were observed. Comparisons of the regression slopes when tidal range at each site was regressed against P1 tidal range, yielded no significant differences between years with the exception of P7 and P14. At these stations, however, the difference in the magnitude of the slope was very small and is likely not meaningful given the variability in the tidal range data.

The asymmetry of the water level curve increased with distance from the river mouth, but showed no appreciable difference in shape when compared to curves generated in 2000-2001. The duration of the ebb tide continues to increase with distance upstream and shows little change from mean durations reported earlier (less than 3% and 4% change for flood and ebb durations, respectively). The relationship between tidal range at Ft Caswell and other stations differed from station to station, but was generally related to distance from the ocean and freshwater flow. Reductions in upstream discharge and rainfall have reduced the variation in tidal range documented in 2000-2001.

Even though a significant increase in tidal range was measured at all of the upstream mainstem Cape Fear River stations, we can not attribute this to dredging at this time because 1) lack of difference in the yearly regressions against the P1 base station, 2) no evidence of tidal range amplification in the Northeast Cape Fear River, and 3) inconsistencies in the tidal lag data. During the next year we will begin to statistically examine tidal lag between stations, constrain the chronology of observed changes, and relate significant changes in lag time to specific events associated with the dredging and widening project.

In 2000-2001, salinity did not exceed 1 ppt at stations upstream of Eagle Island on the Cape Fear River because of the continuous release of freshwater upstream. During this reporting period, however, upstream releases in the Cape Fear River had been reduced and salinities as high as 3.5 ppt were measured at P8. In the Northeast Cape Fear River, salinities exceeding 14 ppt were measured at Fishing Creek, 8 miles north of Point Peter. Maximum salinities reported for this site in 2000-2001 were slightly more than 9 ppt.

3.2 Database

Water level, conductivity, and temperature data collected at DCP stations from June 2001 through May 2002 are incorporated in this report. To date, approximately 1400 tides have been analyzed for all 11 DCP stations. Specific problems associated with each station have been described in Section 1 of this report. Table 1.2-1 summarizes the percentage of tides unavailable for analysis.

3.3 Data Analyses Methods

Maximum, minimum, average water level and conductivity/ temperature were recorded every 3 minutes. The final data set used for analyses consists of 3-minute averages of water level and conductivity collected every 6 minutes. The 6-minute means were plotted after each two-week interval and the resulting curves visually inspected by a senior analyst for quality control purposes. Suspect data, such as outliers or data points that deviate from a smooth curve, were discarded. Unreliable data, such as those collected during periods of mechanical malfunction, equipment maintenance, under-ranging events, and freezing events, were also removed. The remaining data were then filtered to extract the maximum and minimum water levels associated with each tidal event. For this report, a tidal event consists of one high water/low water pair.

The high and low water values contained in the final data set were used to determine the mean tidal range, the duration of flooding, and the duration of ebbing for each site. These data were also used to compute tidal lags between sites. The mean tidal range was computed from the difference in water level between each high and low tide-event for each station. The tidal range for each of the 1409 measured tides for each station during the study period is provided in Appendix A. Statistical differences between the range values for stations upstream, before versus after channel deepening for a specified tidal change at the river mouth (P1) will ultimately be used to determine if the project has altered the flooding regimen upstream. Monthly mean tidal ranges, maximum/minimum water level, and maximum/minimum salinity values for each station are given in Table 3.3-1. Yearly mean tidal ranges for this reporting period and for the period of October 2000 - May 2001 are shown in Figure 3.3-1. A Wilcoxon rank-sum test was used to compare yearly means for each station and significant differences ($P<0.05$) are denoted by asterisks in Figure 3-3.1. Mean tidal ranges in the estuary (stations P1, P2, and P4) during this reporting period were not significantly different from the means reported in 2000-2001. This year's mean tidal ranges for upriver stations in the Cape Fear River (P7-P9) were significantly higher ($P<0.05$) than ranges reported for the last monitoring period. Yearly mean tidal ranges for stations in the Northeast Cape Fear (P11, P13, and P14) were not significantly different.

Table 3.3-1. Monthly maximum, minimum, and range of salinity values for each station. Monthly maximum, minimum, and range of water level for each station are also given. All water levels are relative to NAVD88 with the exception of P4 (USACE yard), which is relative to MSL. ND indicated no data available for month.

		Salinity (ppt)			Water Level (ft)		
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P1	2001-Jun	32.2	19.0	13.2	2.40	-3.99	6.39
	2001-Jul	34.6	20.3	14.3	3.23	-4.05	7.28
	2001-Aug	39.2	15.1	24.1	2.20	-4.47	6.67
	2001-Sep	34.5	19.1	15.4	3.44	-3.55	6.99
	2001-Oct	37.3	17.0	20.3	2.77	-4.03	6.80
	2001-Nov	35.5	18.8	16.7	2.46	-3.89	6.35
	2001-Dec	35.0	16.3	18.7	2.28	-4.21	6.49
	2002-Jan	32.7	14.6	18.1	2.35	-4.78	7.13
	2002-Feb	36.2	14.1	22.1	2.20	-4.95	7.15
	2002-Mar	31.8	14.7	17.2	3.04	-4.80	7.84
	2002-Apr	26.3	15.1	11.3	2.61	-4.37	6.98
	2002-May	28.2	16.2	12.0	2.84	-4.18	7.02
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P2	2001-Jun	21.7	0.2	21.5	3.33	-2.80	6.13
	2001-Jul	20.5	1.3	19.2	3.81	-2.79	6.60
	2001-Aug	17.8	0.2	17.6	3.16	-2.88	6.04
	2001-Sep	19.3	0.1	19.2	3.94	-2.32	6.26
	2001-Oct	21.5	2.0	19.5	3.40	-2.53	5.93
	2001-Nov	24.6	13.1	11.5	2.98	-2.70	5.68
	2001-Dec	15.9	0.1	15.8	3.14	-3.80	6.94
	2002-Jan	14.7	0.9	13.8	2.85	-3.80	6.65
	2002-Feb	15.2	0	15.2	3.05	-2.87	5.92
	2002-Mar	16.9	0.2	16.7	3.95	-2.88	6.83
	2002-Apr	15.1	1.2	15.1	3.41	-2.76	6.17
	2002-May	22.3	9.5	12.8	3.58	-2.80	6.38
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P3	2001-Jun	13.6	0	13.6	3.71	-2.23	5.94

Table 3.3-1. continued

Site	Month	Salinity (ppt) Maximum	Minimum	Range	Water Level (ft) Maximum	Minimum	Range
	2001-Jul	16.1	0.1	16.0	1.92	-2.25	4.17
	2001-Aug	8.0	0	8.0	1.64	-1.99	3.63
	2001-Sep	15.0	0.1	14.9	2.05	-1.54	3.59
	2001-Oct	19.1	2.3	16.8	1.80	-1.71	3.51
	2001-Nov	20.2	3.3	16.9	2.06	-2.17	4.23
	2001-Dec	18.2	0.4	17.8	1.48	-2.56	4.04
	2002-Jan	17.6	0.1	17.5	1.32	-3.05	4.37
	2002-Feb	10.7	0	10.7	1.43	-3.04	3.04
	2002-Mar	9.6	0	9.6	1.87	-2.74	4.61
	2002-Apr	13.0	0	13.0	1.58	-2.43	4.01
	2002-May	21.7	1.8	19.9	1.65	-2.44	4.09
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P4	2001-Jun	10.1	0.1	10.0	5.56	-0.55	6.11
	2001-Jul	15.4	0.5	14.9	5.95	-0.56	6.51
	2001-Aug	8.8	0.6	8.2	5.45	-0.46	5.91
	2001-Sep	10.7	1.5	9.2	6.12	-0.11	6.23
	2001-Oct	12.1	8.2	3.9	5.00	-0.27	5.27
	2001-Nov	13.3	11.4	1.9	5.17	-0.51	5.68
	2001-Dec	11.5	9.6	1.9	5.18	-1.01	6.19
	2002-Jan	6.5	1.0	5.5	5.07	-1.28	6.35
	2002-Feb	5.8	0.5	5.3	5.55	-1.42	6.97
	2002-Mar	3.6	1.4	2.2	5.56	-1.37	6.93
	2002-Apr	5.4	2.0	3.4	5.58	-0.59	6.17
	2002-May	12.4	5.1	7.3	5.60	-0.56	6.16
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P6	2001-Jun	13.1	0	13.1	3.00	-2.84	5.84
	2001-Jul	14.5	0.1	14.4	3.31	-2.93	6.24
	2001-Aug	9.9	0.1	9.8	2.94	-2.75	5.69
	2001-Sep	ND	ND	ND	ND	ND	ND
	2001-Oct	18.2	0.3	17.84	3.08	-2.59	5.67
	2001-Nov	19.7	0.1	19.6	2.6	-2.85	5.45
	2001-Dec	18.2	0.4	17.8	2.64	-3.38	6.02
	2002-Jan	18.4	0	18.4	1.32	-3.05	4.37
	2002-Feb	11.4	0.1	11.3	2.66	-3.57	6.23
	2002-Mar	7.9	0.1	7.8	3.45	-3.53	6.98
	2002-Apr	9.1	0.1	9.0	3.06	-3.00	6.06
	2002-May	18.7	0.1	18.6	3.12	-3.09	6.21
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P7	2001-Jun	0.1	0.1	0	2.88	-2.31	5.19
	2001-Jul	0.2	0.1	0.1	5.19	-2.55	5.63
	2001-Aug	0.2	0	0.2	2.81	-2.28	5.09
	2001-Sep	0.1	0	0.1	3.28	-2.16	5.44
	2001-Oct	0.7	0.1	0.6	2.90	-2.22	5.12
	2001-Nov	3.2	0.1	3.1	2.53	-2.40	4.93
	2001-Dec	0.7	0.1	0.6	2.58	-2.41	4.99
	2002-Jan	0.2	0.1	0.1	2.51	-2.47	4.98
	2002-Feb	0.2	0.1	0.1	2.69	-2.45	5.14
	2002-Mar	0.1	0	0.1	3.32	-2.45	5.77
	2002-Apr	0.1	0.1	0	3.00	-2.16	5.16
	2002-May	3.5	0.1	3.4	2.9	-2.40	5.30
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P8	2001-Jun	ND	ND	ND	3.17	-1.48	4.65
	2001-Jul	0.1	0	0.1	3.25	-2.07	5.32
	2001-Aug	0.1	0	0.1	3.11	-1.67	4.78
	2001-Sep	0.1	0	0.1	3.23	-1.66	4.89
	2001-Oct	0.3	0	0.3	2.97	-1.70	4.67
	2001-Nov	0.5	0	0.5	2.62	-2.06	4.68
	2001-Dec	0.3	0.1	0.2	4.32	-2.48	6.80
	2002-Jan	0.4	0	0.4	3.50	-2.81	6.31
	2002-Feb	0.1	0	0.1	4.96	-2.00	6.96
	2002-Mar	0.1	0	0.1	4.72	-2.29	7.01
	2002-Apr	0.1	0	0.1	2.63	-1.85	4.48
	2002-May	1.6	0.1	1.5	2.38	-2.43	4.81

Table 3.3-1. concluded

		Salinity (ppt)			Water Level (ft)		
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P9	2001-Jun	0.1	0	0.1	2.37	-1.98	4.35
	2001-Jul	0.1	0	0.1	2.29	-2.34	4.63
	2001-Aug	0.1	0	0.1	2.29	-2.34	4.63
	2001-Sep	0.1	0	0.1	2.48	-2.05	4.53
	2001-Oct	0.1	0	0.1	2.19	-2.04	4.23
	2001-Nov	0.1	0	0.1	3.28	-2.54	5.82
	2001-Dec	0.1	0.1	0	2.20	-2.76	4.96
	2002-Jan	0.1	0	0.1	2.51	-3.20	5.71
	2002-Feb	0.1	0	0.1	2.28	-2.93	5.21
	2002-Mar	0.1	0	0.1	3.08	-2.98	6.06
	2002-Apr	0.1	0	0.1	2.89	-2.00	4.89
	2002-May	0.1	0	0.1	2.65	-2.39	5.04
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P11	2001-Jun	6.0	0.1	5.9	5.06	-2.67	7.73
	2001-Jul	11.5	0.1	11.4	3.28	-2.87	6.15
	2001-Aug	11.6	0.1	11.5	2.89	-2.65	5.54
	2001-Sep	12.9	0.1	12.8	3.53	-2.37	5.90
	2001-Oct	14.8	3.8	11.0	3.09	-2.50	5.59
	2001-Nov	15.9	4.0	11.9	3.29	-2.54	5.83
	2001-Dec	17.7	4.3	13.4	2.65	-3.15	5.80
	2002-Jan	17.2	0.2	17.0	2.52	-3.20	5.72
	2002-Feb	10.2	0.1	10.1	2.76	-3.22	5.98
	2002-Mar	7.1	0.1	7.0	3.78	-3.01	6.79
	2002-Apr	8.5	0.1	8.4	3.39	-2.51	5.90
	2002-May	12.7	0.6	12.1	3.34	-2.49	5.83
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P12	2001-Jun	11.6	0	11.6	2.70	-2.39	5.09
	2001-Jul	12.4	0.1	12.3	3.18	-2.35	5.53
	2001-Aug	11.0	0.1	10.9	2.6	-2.27	4.87
	2001-Sep	2.2	0.1	2.1	ND	ND	ND
	2001-Oct	17.0	2.3	14.7	2.65	-2.30	4.95
	2001-Nov	18.8	2.8	16.0	2.26	-2.63	4.89
	2001-Dec	17.8	3.8	14.0	2.31	-3.08	5.39
	2002-Jan	18.1	0.1	18.0	2.16	-3.41	5.57
	2002-Feb	10.4	0.1	10.3	2.39	-3.50	5.89
	2002-Mar	6.8	0.1	6.7	2.96	-3.36	6.32
	2002-Apr	7.9	0.1	7.8	2.67	-2.64	5.31
	2002-May	19.2	0.1	19.1	2.59	-2.89	5.48
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P13	2001-Jun	5.2	0	5.2	2.32	-2.02	4.34
	2001-Jul	9.1	0.1	9.0	2.50	-2.41	4.91
	2001-Aug	3.3	0.1	3.2	2.18	-2.12	4.30
	2001-Sep	6.6	0.1	6.5	2.63	-1.80	4.43
	2001-Oct	11.6	0.2	11.4	2.35	-1.94	4.29
	2001-Nov	12.5	1.2	11.3	1.98	-2.24	4.22
	2001-Dec	11.1	1.1	10.0	2.04	-2.70	4.74
	2002-Jan	10.2	0.1	10.1	1.88	-3.08	4.96
	2002-Feb	1.6	0.1	1.5	2.16	-3.06	5.22
	2002-Mar	1.5	0.1	1.4	2.66	-2.90	5.56
	2002-Apr	1.8	0.1	1.7	2.45	-2.25	4.70
	2002-May	14.1	0.1	14.0	2.32	-2.5	4.82
Site	Month	Maximum	Minimum	Range	Maximum	Minimum	Range
P14	2001-Jun	0.3	0	0.3	1.9	-1.33	3.23
	2001-Jul	1.3	0.1	1.2	2.0	-1.85	3.85
	2001-Aug	0.3	0.1	0.2	1.83	-1.61	3.44
	2001-Sep	0.1	0.1	0	2.08	-1.17	3.25
	2001-Oct	0.1	0.1	0	1.92	-0.27	2.19
	2001-Nov	ND	ND	ND	ND	ND	ND
	2001-Dec	1.8	0.1	1.7	1.67	-2.06	3.73
	2002-Jan	0.9	0.1	0.8	1.48	-2.47	3.95
	2002-Feb	0.1	0.1	0	1.76	-2.30	4.06
	2002-Mar	0.1	0	0.1	2.16	-2.14	4.30
	2002-Apr	0.1	0.1	0	2.08	-1.66	3.74
	2002-May	1.9	0.1	1.8	1.84	-1.88	3.72

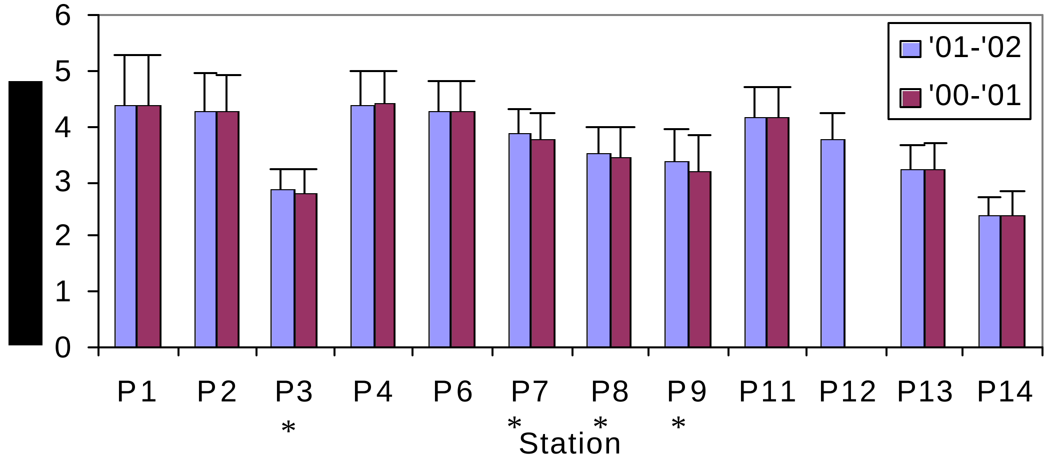


Figure 3.3-1. Mean tidal range for each station for monitoring years 2000-2001 and 2001-2002. All water levels are relative to NAVD88 with the exception of P4 (USACE yard), which is relative to MSL. Error bars show one standard deviation. Asterisks denote significant differences between yearly means ($p<0.05$). See Table 3.3-3 for additional statistics.

Tidal lags were determined by measuring the difference in time for high (or low) tide at 2 different stations as described in the Year 1 report. All tidal lags were calculated relative to station P1. Mean tidal range, flood duration, ebb duration, and tidal lags for each station are given in Table 3.3-2. The mean lag values indicate that the mean high tide lag decreased at all stations during this reporting period relative to the 2000-2001 reporting period. Similarly, the mean low tide lag between P1 and upriver stations appears to have increased at most stations. These results, however, have not yet been statistically examined. The next phase of data analysis will include the identification of significant differences in tidal lag between stations, constraining the chronology of the changes, and relating significant changes in lag time to specific events associated with the dredging and widening project.

Table 3.3-2. Summary of tidal data generated from data collection platforms (DCP) at eleven stations along the Cape Fear River and tributaries. Values in italicized parentheses are the percent change between the current monitoring interval and the previous reporting period. Positive values indicate an increase and negative values a decrease. ND indicates that a change was not measurable. N/A indicates that data were insufficient to measure a reliable change. Mean lag times are also given in parentheses for both high and low tide.

Station Number	**Mean Tidal Range (ft)**	**Mean Flood Duration (hr)** ***(% change)***	**Mean Ebb Duration (hr)** ***(%change)***	**Mean High Tide Lag From P1 (hr) ('00-'01 lag time)**	**Mean Low Tide Lag From P1 (hr) ('00-'01 lag time)**
P1	4.38 ± 20.3%	6.2 *(-1.1)*	6.08 *(-1.1)*	------	------
P2	4.27 ± 15.7%	5.77*(+2.5)*	6.63 *(-0.7)*	1.52 (2.11)	2.12 (1.42)
P3	2.84 ± 13.6%	6.25 (ND)	6.05 *(-1.3)*	2.85 (3.00)	2.82 (3.00)
P4	4.38 ± 13.7%	5.82 *(+2.8)*	6.3 *(-3.5)*	1.1 (2.39)	1.1 (1.78)
P6	4.29 ± 13.3%	5.85 *(+1.4)*	6.55 *(-0.6)*	2.37 (2.71)	2.73 (2.21)
P7	3.85 ± 12.4%	5.73 *(+0.2)*	6.66 (ND)	2.58 (3.07)	3.12 (2.62)
P8	3.54 ± 15.1%	5.83 *(+2.1)*	6.58 *(-0.9)*	3.13 (3.54)	3.47 (3.01)
P9	3.34 ± 18.2%	5.77*(+0.5)*	6.63 (ND)	3.13 (3.85)	3.75 (3.40)
P11	4.17 ± 12.9%	5.76 *(+0.9)*	6.63 *(-0.9)*	2.25 (2.84)	2.75 (2.24)
P12	3.76 ± 13.5%	5.82 (N/A)	6.58 (N/A)	2.63 (----)	3.07 (----)
P13	3.23 ± 13.5%	5.85 *(+1.2)*	6.55 *(-1.1)*	3.12 (3.51)	3.51 (3.08)
P14	2.38 ± 15.2%	5.88 *(+0.9)*	6.52 *(-0.5)*	4.2 (4.53)	4.53 (4.10)

Table 3.3-3. Summary of statistical tests for yearly data collected at the 11 DCP stations. Yearly means of tidal ranges were compared as were the means of the monthly maximum and minimum water levels (Table 3.3-1). Yearly differences in the slopes of the best fit lines generated by regressing each tidal range for each station on the corresponding tidal range for P1 were compared using analysis of covariance. NS indicates no significant difference at P <0.05. Asterisks denote significant differences between years and p values are given. N/A indicates insufficient data to complete analyses.

Station	Mean Tidal Range	Mean Monthly Maximum WL	Mean Monthly Minimum WL	P1 Versus Station Slope
P1	NS	NS	NS	---
P2	NS	NS	NS	*(<0.0001)
P3	*(0.0025)	NS	NS	* (<0.0001)
P4	NS	NS	NS	NS
P6	NS	NS	NS	NS
P7	*(<0.0001)	NS	*(0.0006)	* (0.0247)
P8	*(<0.0001)	NS	NS	NS
P9	*(<0.0001)	NS	NS	NS
P11	NS	NS	*(0.0425)	NS
P12	N/A	N/A	N/A	N/A
P13	NS	NS	NS	NS
P14	NS	NS	NS	* (0.0088)

3.4 Upstream Tidal Effects

Stations upstream of Point Peter are increasingly influenced by river flow in both branches of the Cape Fear Estuary and are considered separately from estuarine stations P1, P2, and P4, and from each other.

3.41 Ft Caswell (P1) and Outer Town Creek (P2)

The tidal ranges observed at the Ft Caswell base station show good agreement with the predicted tides (Figure 3.41-1). When observed tidal ranges were regressed against the predicted tidal ranges, the slope and correlation coefficient are similar to those reported last year report [measured = 1.08 (predicted) - 0.225; $R^2 = 0.94$]. The mean tidal range at P1 has not changed significantly since the last reporting period (Table 3.3-2, Figure 3.3-1). The same was true for the Outer Town Creek (P2) site. As seen in Figure 3.41-2, the tidal range at P2 is strongly and positively correlated with observed tidal ranges at P1. The slope of the P1 versus P2 regression for this monitoring period was significantly lower ($p<0.0001$) than the slope reported in 2000-2001 (Table 3.3-3), even though the magnitudes were similar (0.69 and 0.61 for years 1 and 2, respectively). One possible explanation for the statistical significance may be the greater variability in tidal ranges at P2 during this reporting period ($R^2 = 0.66$) compared to the previous reporting period ($R^2 = 0.96$). Deviations of tidal range at either extreme, high or low, has a greater impact of slope than values close to the mean where linear functions are determined by the least square fitting procedures employed in regression analysis. While the observed deviations from the predicted tides at P2 (and P1 for that matter) may be associated with wind events, upland run-off events, and to a lesser degree, periods of increased river discharge; the overall impact of these events on water level is minimal relative to other up river sites. Instead, reports of increased wave activity and shoaling combined with documented increases in boat traffic associated with the dredging project and monitoring surveys may be the primary factor contributing to the increased scatter in the tidal range data at P2 this year.

As expected, the water level curve at P1 is symmetrical and shows little evidence of the time-velocity asymmetries (Table 3.3-2) measured at other stations.

Tidal asymmetries, as evidenced by the unequal flood and ebb durations shown in Table 3.3-2, begin at site P2 and continue up river to all monitoring sites. As mentioned above, the duration of flooding tide at P2 increased slightly during this reporting period as did the mean high tide lag. This suggests that the tidal curve is moving toward greater asymmetry. In the coming year, we will evaluate the asymmetry on a monthly basis (including past data) and undertake analyses to identify significant changes in tidal propagation that coincide with specific dredging activity in the river.

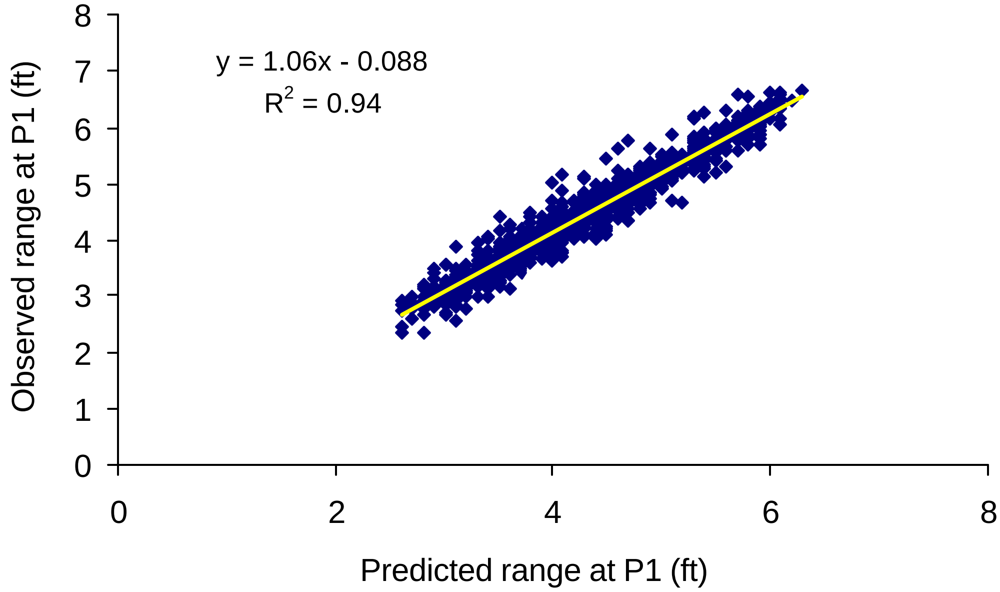


Figure 3.41-1. Plot of predicted tidal range at P1 relative to measured tidal range at P1 for June 2001 to May 2002.

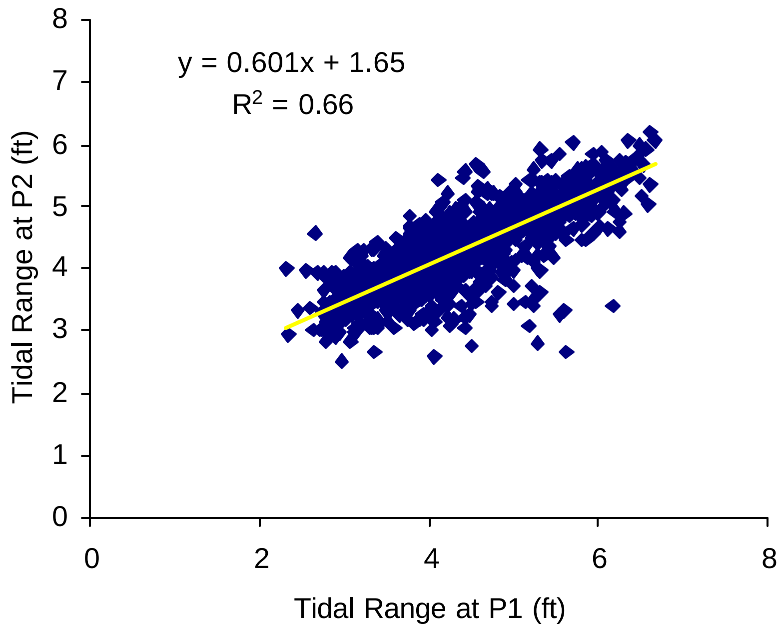


Figure 3.41-2. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Outer Town Creek (P2).

3.42 Inner Town Creek (P3)

The mean tidal range observed at this site is approximately 1.5 feet less than the tidal range observed at the creek mouth (approximately 4.3 feet). The mean tidal range from June 2001 to May 2002 was significantly greater (+0.08 ft) than the mean tidal range reported from October 2000 to May 2001. This difference may be associated with a decrease in upland runoff at P3 this year due to reduced rainfall in this relatively small watershed. As shown in last year's report, large runoff events often cause a decrease in the magnitude of the tidal range, thereby lowering the mean when they occur. Water level curves generated for this station and computed tidal ranges continue to exhibit a wide range of variability (Figure 3.42-1) and to depend on flow conditions in the creek. The correlation between tides at P3 and P1 this year (R^2=0.32) was comparable to last year (R^2=0.39).

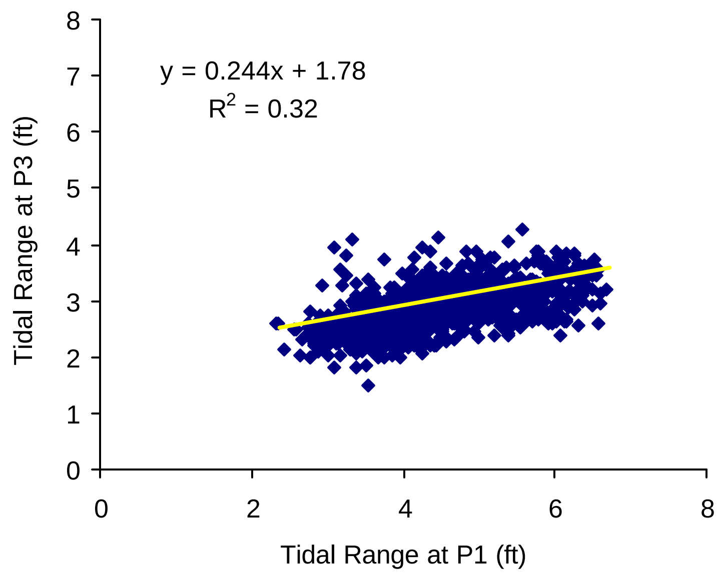


Figure 3.42-1 Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Inner Town Creek (P3).

3.43 Corps Yard (P4)

The tidal range observed at P4 continues to approximate the range observed at the P1 base station (Figure 3.43-1). The slope (0.66) of the P1/P4 regression was not significantly different from the 2000-2001 slope (0.65). The mean tidal range for this station was identical to that calculated for Ft Caswell (Table 3.3-2). However, the range of tides measured at this station showed less variability than those measured at P1. This variability might be associated with the different methods used to measure water level at each of these stations or the fact that tidal data available for this station and generated by the USGS are smoothed by various statistical procedures. The mean tidal range at the Corps yard for this reporting period was not significantly different from the previous year's value (Figure 3.3-1). Water level curves generated for P4 continue to show a slight time asymmetry that does not occur at P1; mean ebb and flood durations of 6.3 and 5.82 hours, respectively. Both the mean high and low tide lags at this station, relative to P1, have decreased relative to last year's reporting period (Table 3.3-2). Water levels at the Corps yard appear to be only minimally impacted by changes in river discharge. Water levels observed at P4 do not appear to be impacted by non-tidal forcing mechanisms any more or any less than those observed at sites P1 and P2.

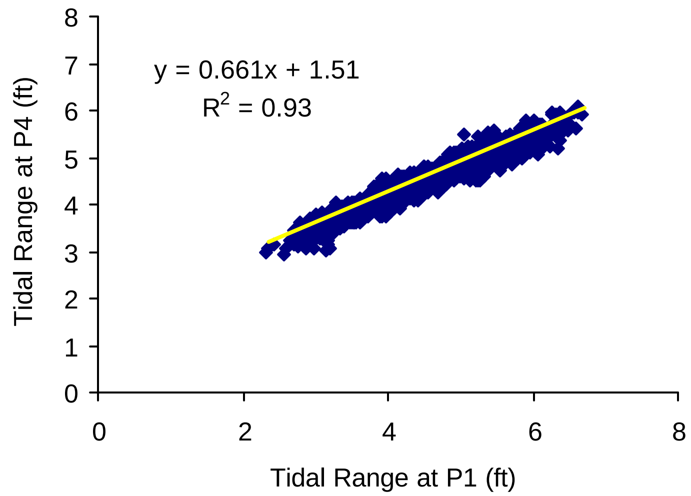


Figure 3.43-1. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and the Corps Yard station (P4).

3.44 Cape Fear River Stations: Eagle Island (P6), Indian Creek (P7), Dollisons Landing (P8), and Black River (P9)

Mean tidal ranges computed for these sites were lower than the mean determined for P1. In general, tidal range decreased with distance upriver (Table 3.3-2) with P9 exhibiting the lowest tidal range. Figures 3.44-1, 3.44-2, 3.44-3, and 3.44-4 illustrate the relationship between tidal range at these Cape Fear River sites and tidal range at Ft. Caswell. In general, tidal range at each upriver site is positively correlated with tidal range at the mouth, however, the degree of correlation decreases upriver. Water levels at all of these stations continue to be impacted somewhat by run-off events, but to a much lesser extent than last year as evidenced by the higher R^2 values at these sites this year. This difference can be attributed to a reduction in periods of high precipitation and greater consistency in upriver discharge; two factors recognized to control water level at these sites. In contrast to stations located in the estuary, mean tidal ranges measured over this reporting period, were significantly different from those measured during the first year of monitoring for the three upstream stations (Figure 3.3-1). No significant difference in mean monthly maximum or minimum water levels was noted between years, with the exception of P7, which showed a significant increase in the mean minimum water level. Further, comparisons of the regression slopes between years yielded no significant differences with the exception of P7 (Table 3.3-3) where the difference in the magnitude of the slope was less than 0.03 and is likely not meaningful given the variability in the tidal range data. Even though a significant increase in tidal range was measured at all of the upstream mainstem Cape Fear River stations, it is likely not likely caused by dredging in the estuary, as the relationship between tides at the river's mouth (P1) versus P6, P8, and P9 did not change. The statistically significant difference in slope between last year at P7 and this year was extremely small. Instead, differences in tidal range are likely related to the regional drought and reduced flow in the river. Reduced discharge could result in a change in the local cross-sectional area of the channel interacting with the tide and cause tidal amplification if convergence exceeds frictional effects.

The mainstem upriver sites continue to exhibit pronounced time asymmetries as shown in the 2000-2001 report. The duration of flooding and ebbing tide at these stations has changed little (~2% or less) since the last reporting period (Table 3.3-2). The mean high tide lag from P1 decreased during this reporting period whereas the mean low tide lag increased. These results, however, have not been statistically examined. Although the high tide lag data suggest that at least some parts of the tide are propagating upriver more quickly than in the past, the apparent increase in low tide lags indicates that not all parts of the tide are equally affected. Typically when long tidal channels are enlarged or straightened by dredging, all parts of the tide propagate more quickly.

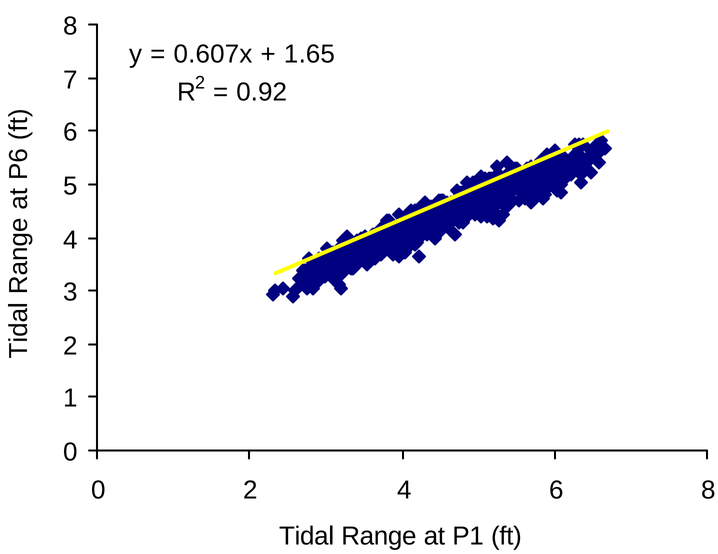


Figure 3.44-1. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Eagle Island (P6).

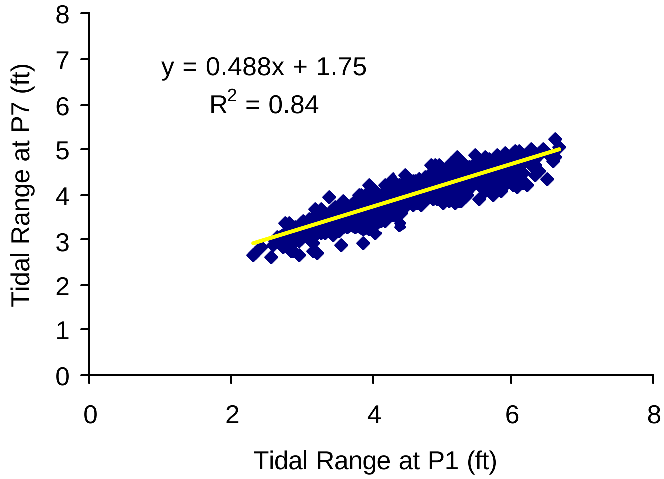


Figure 3.44-2. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Indian Creek (P7).

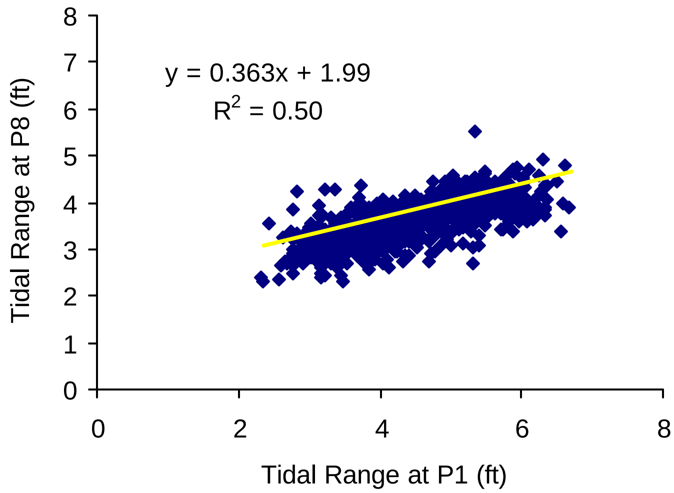


Figure 3.44-3. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Dollisons Landing (P8).

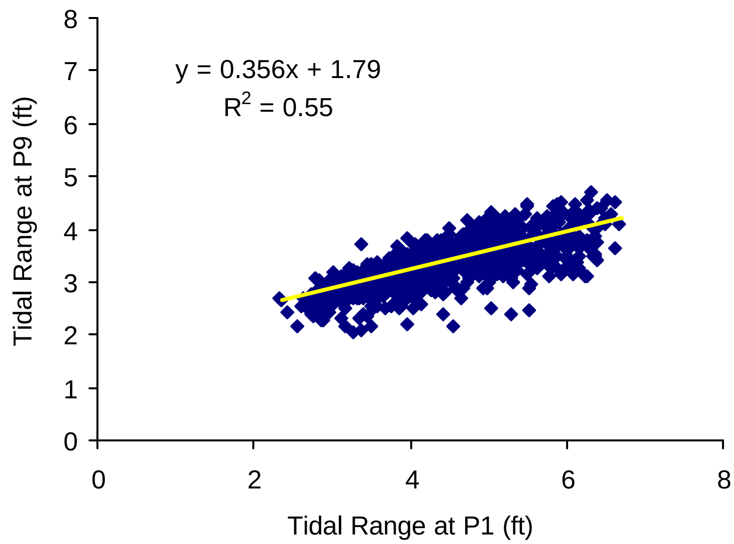


Figure 3.44-4. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Black River (P9).

3.45 Northeast Cape Fear: Smith Creek (P11), Rat Island (P12), Fishing Creek (P13), and Prince George Creek (P14)

Mean tidal ranges computed for P11, P13 and P14 over the current reporting period are not statistically different from those reported in 2000-2001 (Figure 3.3-1). Data were not available for P12 in 2000-2001 to make reliable comparisons. Mean tidal range computed for these stations since June 2001 are lower than the mean determined for P1 (Table 3.3-2). In general, tidal range decreased with distance upriver and were positively correlated with the tidal range at P1 (Figure 3.45-1, Figure 3.45-2, Figure 3.45-3, and Figure 3.45-4). The mean tidal range at P14 on the Northeast Cape Fear River (16 mi from convergence of the Cape Fear and Northeast Cape Fear Rivers near Wilmington) is less than the mean range measured at P9, 12 mi from convergence on the Cape Fear River. At P11 and P12, tidal range variability was similar to that observed at P1; thus suggesting that astronomical forcing mechanisms continue to exert primary control over water level at these stations. Tidal ranges at P13 and P14 were more weakly correlated with P1, indicating that water levels at these upriver stations were impacted by other types of events. The influence of these other events (i.e. rainfall, wind, and upriver discharge) on tidal range this year, however, was less than in 2000-2001 and most likely due to reduced rainfall in the upper watershed.

Comparisons of the regression slopes between years yielded no significant differences with the exception of P14 (Table 3.3-3) where the slope was reduced by 0.04 from the previous year. This too, may be related to both distance from tidal source combined with very low freshwater flow. No significant difference in mean monthly maximum or minimum water levels was noted between years for these stations with the exception of P11 where the mean monthly minimum level was higher than during the last reporting period.

All of the sites in the Northeast Cape Fear River continue to exhibit pronounced time asymmetries typical of estuarine systems with virtually no change in flood and ebb durations compared to last reporting period (Table 3.3-3). The mean high tide lag from P1 decreased and the mean low tide lag increased for all of these upriver stations during this reporting period. These data suggest that the propagation of the tidal wave has changed during this reporting period. As described above, however, these patterns are inconsistent with the expected effects of dredging and may be complicated by the lower, drought-induced water levels in the system.

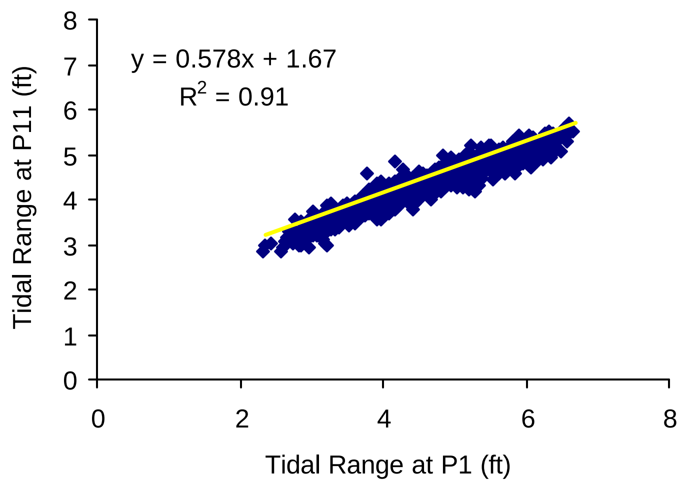


Figure 3.45-1. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Smith Creek (P11).

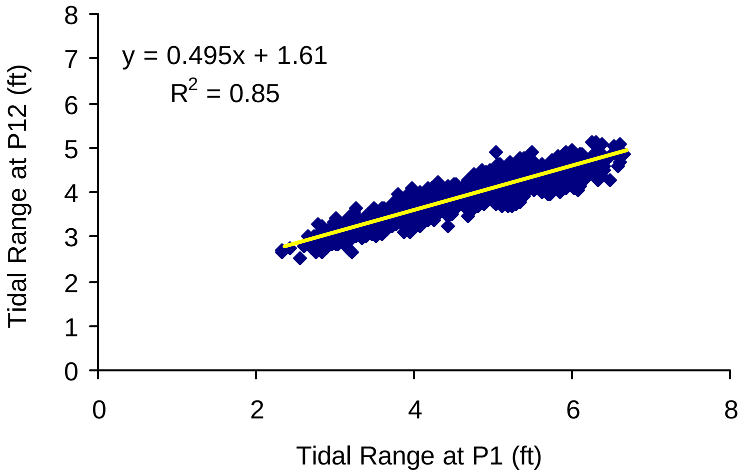


Figure 3.45-2. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Rat Island (P12).

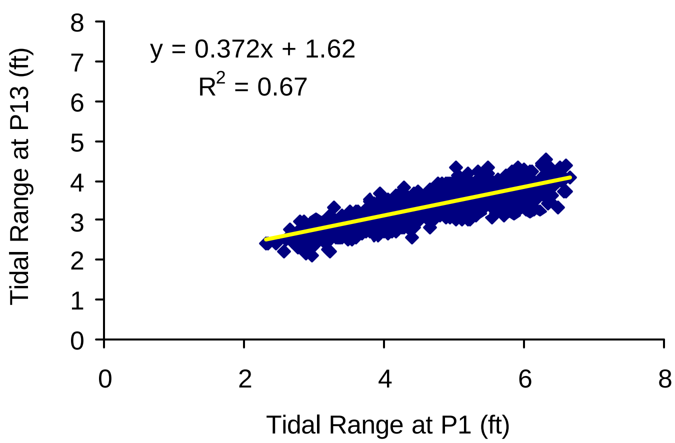


Figure 3.45-3. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Fishing Creek (P13).

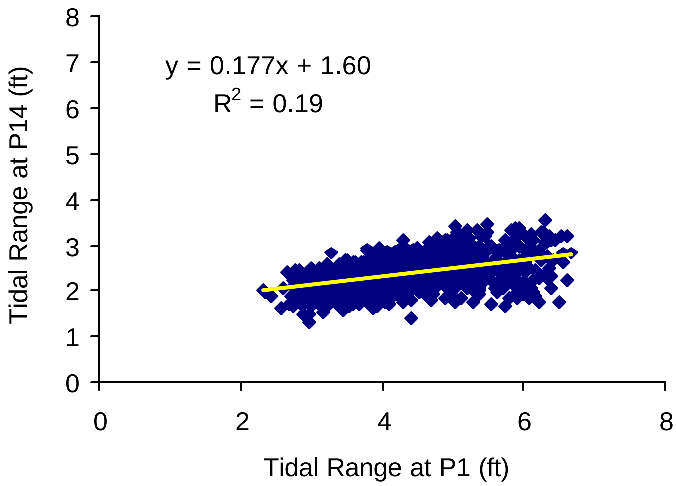


Figure 3.45-4. Plot showing relationship between tidal ranges observed at Ft. Caswell (P1) and Prince George Creek (P14).

4.0 MARSH/SWAMP FLOOD AND SALINITY LEVELS

4.1 Summary

No significant differences with respect to flooding frequency were noted between 2000-2001 and 2001-2002 despite a regional drought. Trends between stations were essentially the same with Indian Creek (P7) substations flooding less than half the time. Smith Creek (P11) and Rat Island (P12) also had more than half of their substations covered by flooding water less than 50% of the tides studied.

Saline water (>1 ppt) flooded substations in the Northeast Cape Fear branch of the estuary more frequently Fall 2001 versus Fall 2000. The frequency of flood events containing saline water and the maximum salinity of water reaching substations was statistically higher Fall 2002, reflecting drought conditions. No statistical differences were found between years in spring. The Cape Fear branch of the estuary was affected, but continual flow of freshwater from Jordan Lake limits salt intrusion above the Eagle Island (P6) station.

4.2 Data Base

Water levels and salinity were measured at all 54 substations during Fall 2001 and Spring 2002. During each season water level and salinity measurements were made during a randomly assigned two-week period. Each station was monitored during a different two-week time span, i.e. data were not collected simultaneously at all substations during one two-week period. Few equipment problems were encountered.

Tables 4.2-1 and 4.2-2 summarize these data. Statistical comparisons were made between Fall 2000 versus Fall 2001 and Spring 2001 versus Spring 2002 for number of flood events per two-week period that exceeded 1 ppt and maximum salinity through a Paired t-test. Statistical comparisons were made using all stations, for only the Cape Fear River stations (P6-9), the Northeast Cape Fear River stations (P11-14), and for Inner Town Creek.

Table 4.2-1. Flooding frequency, duration and depth and actual water level of marsh/swamp substations during Fall 2001. Actual water level is calculated using the maximum depth and marsh/swamp surface elevation relative to NAVD88 datum.

Station Number	Substation Number	Season	Start Date	End Date	# Flood Events	Mean Flood Duration (hr)	Maximum Depth (ft)	Marsh/Swamp Elevation (ft)	Actual water level (ft)
P3	1	Fall 01	11/12/01	11/26/01	27/27	5.7	1.7	0.66	1.0
	2	Fall 01	11/12/01	11/26/01	22/27	5.3	1.6	0.83	0.8
	3	Fall 01	11/12/01	11/26/01	27/27	6.2	1.6	0.52	1.1
	4	Fall 01	11/12/01	11/26/01	27/27	6.0	1.6	1.49	0.1
	5	Fall 01	11/12/01	11/26/01	13/27	5.9	1.6	0.99	0.6
	6	Fall 01	11/12/01	11/26/01	7/27	7.5	3.8	3.31	0.5
P6	1	Fall 01	9/25/01	10/9/01	23/26	6.9	2.0	0.76	1.2
	2	Fall 01	9/25/01	10/9/01	20/26	6.5	2.9	1.56	1.3
	3	Fall 01	9/25/01	10/9/01	25/26	6.5	2.3	0.85	1.5
	4	Fall 01	9/25/01	10/9/01	25/26	6.4	2.3	1.13	1.2
	5	Fall 01	9/25/01	10/9/01	18/26	5.0	2.8	1.92	0.9
	6	Fall 01	9/25/01	10/9/01	14/26	4.4	2.8	1.74	1.1
P7	1	Fall 01	10/2/01	10/16/01	22/26	6.6	3.0	1.76	1.2
	2	Fall 01	10/2/01	10/16/01	6/26	5.9	3.0	2.23	0.8
	3	Fall 01	10/2/01	10/16/01	6/26	6.1	2.9	2.26	0.6
	4	Fall 01	10/2/01	10/16/01	6/26	6.1	3.0	2.43	0.6
	5	Fall 01	10/2/01	10/16/01	6/26	6.1	2.9	2.31	0.6
	6	Fall 01	10/2/01	10/16/01	3/26	6.0	2.8	2.37	0.4
P8	1	Fall 01	9/18/01	10/2/01	18/26	4.5	2.7	2.14	0.6
	2	Fall 01	9/18/01	10/2/01	23/26	4.9	2.8	1.54	1.3
	3	Fall 01	9/18/01	10/2/01	23/26	5.6	2.9	1.46	1.4
	4	Fall 01	9/18/01	10/2/01	16/26	4.2	2.8	1.98	0.8
	5	Fall 01	9/18/01	10/2/01	12/26	4.0	2.8	2.24	0.6
	6	Fall 01	9/18/01	10/2/01	5/26	3.4	2.8	2.38	0.4
P9	1	Fall 01	9/18/01	9/25/01	13/13	8.0	2.8	0.58	2.2
	2	Fall 01	9/11/01	9/25/01	27/27	7.1	3.0	2.21	0.8
	3	Fall 01	9/11/01	9/25/01	21/27	5.7	3.1	1.22	1.9
	4	Fall 01	9/11/01	9/25/01	16/27	6.1	3.0	2.06	0.9
	5	Fall 01	9/11/01	9/25/01	11/27	5.9	2.8	2.20	0.6

Table 4.2-1. concluded

Station Number	Substation Number	Season	Start Date	End Date	# Flood Events	Mean Flood Duration (hr)	Maximum Depth (ft)	Marsh/Swamp Elevation (ft)	Actual water level (ft)
	6	Fall 01	9/11/01	9/25/01	15/27	6.2	2.9	1.92	1.0
P11	1	Fall 01	10/16/01	10/30/01	15/27	6.0	3.0	1.44	1.6
	2	Fall 01	10/16/01	10/30/01	13/27	5.4	3.0	1.82	1.2
	3	Fall 01	10/16/01	10/30/01	13/27	6.0	3.0	1.76	1.2
	4	Fall 01	10/16/01	10/30/01	12/27	5.3	2.9	1.85	1.1
	5	Fall 01	10/16/01	10/30/01	12/27	5.3	2.9	1.91	1.0
	6	Fall 01	10/16/01	10/30/01	11/27	5.0	3.1	2.04	1.1
P12	1	Fall 01	10/9/01	10/23/01	24/27	7.0	2.9	0.90	2.0
	2	Fall 01	10/9/01	10/23/01	19/27	5.2	2.7	1.62	1.1
	3	Fall 01	10/9/01	10/23/01	7/27	5.6	2.7	2.00	0.7
	4	Fall 01	10/9/01	10/23/01	7/27	4.7	2.8	1.90	0.9
	5	Fall 01	10/9/01	10/23/01	6/27	6.3	2.7	2.08	0.6
	6	Fall 01	10/9/01	10/23/01	2/27	7.4	2.9	2.44	0.5
P13	1	Fall 01	11/13/01	11/27/01	16/27	7.4	2.0	1.43	0.6
	2	Fall 01	11/13/01	11/27/01	20/27	4.7	2.0	1.08	0.9
	3	Fall 01	11/13/01	11/27/01	26/27	5.3	2.1	0.75	1.4
	4	Fall 01	11/13/01	11/27/01	25/27	6.1	2.0	1.00	1.0
	5	Fall 01	11/13/01	11/27/01	25/27	5.6	2.0	1.21	0.8
	6	Fall 01	11/13/01	11/27/01	7/27	2.2	2.3	1.64	0.7
P14	1	Fall 01	11/29/01	12/13/01	26/27	6.5	1.9	0.70	1.2
	2	Fall 01	11/29/01	12/13/01	26/27	4.7	1.9	0.87	1.0
	3	Fall 01	11/29/01	12/13/01	26/27	6.3	1.8	1.08	0.7
	4	Fall 01	11/29/01	12/13/01	25/27	5.9	1.8	1.22	0.6
	5	Fall 01	11/29/01	12/13/01	16/27	5.5	1.9	1.28	0.6
	6	Fall 01	11/29/01	12/13/01	6/27	6.9	1.8	1.49	0.3

Table 4.2-2. Flooding frequency, duration and depth and actual water level of marsh/swamp substations during Spring 2002. Actual water level is calculated using the maximum depth and marsh/swamp surface elevation relative to NAVD88 datum.

Station Number	Substation Number	Season	Start Date	End Date	# Flood Events	Mean Flood Duration (hr)	Maximum Depth (ft)	Marsh/Swamp Elevation (ft)	Actual water level (ft)
P3	1	Spr 02	3/6/02	3/20/02	21/26	6.4	1.5	0.66	0.8
	2	Spr 02	3/6/02	3/20/02	17/26	5.3	1.4	0.83	0.6
	3	Spr 02	3/6/02	3/20/02	20/26	6.0	1.4	0.52	0.9
	4	Spr 02	3/6/02	3/20/02	20/26	5.1	1.3	1.49	-0.2
	5	Spr 02	3/6/02	3/20/02	6/26	4.8	1.4	0.99	0.4
	6	Spr 02	3/6/02	3/20/02	15/26	4.5	3.7	3.31	0.4
P6	1	Spr 02	4/8/02	4/22/02	27/27	6.4	2.5	0.76	1.7
	2	Spr 02	4/8/02	4/22/02	23/27	5.7	2.3	1.56	0.7
	3	Spr 02	4/8/02	4/22/02	27/27	5.6	2.4	0.85	1.6
	4	Spr 02	4/8/02	4/22/02	26/27	5.5	2.4	1.13	1.3
	5	Spr 02	4/8/02	4/22/02	17/27	4.9	2.6	1.92	0.7
	6	Spr 02	4/8/02	4/22/02	13/27	4.4	2.3	1.74	0.6
P7	1	Spr 02	4/10/02	4/24/02	23/27	5.6	2.6	1.76	0.8
	2	Spr 02	4/10/02	4/24/02	3/27	6.1	2.5	2.23	0.3
	3	Spr 02	4/10/02	4/24/02	2/27	6.0	2.5	2.26	0.2
	4	Spr 02	4/10/02	4/24/02	3/27	5.5	2.5	2.43	0.1
	5	Spr 02	4/10/02	4/24/02	4/27	4.4	2.4	2.31	0.1
	6	Spr 02	4/10/02	4/24/02	7/27	5.3	2.7	2.37	0.3
P8	1	Spr 02	4/24/02	5/8/02	11/27	5.1	2.7	2.14	0.6
	2	Spr 02	4/24/02	5/8/02	24/27	5.6	2.9	1.54	1.4
	3	Spr 02	4/24/02	5/8/02	25/27	4.8	2.9	1.46	1.4
	4	Spr 02	4/24/02	5/8/02	12/27	5.2	2.8	1.98	0.8
	5	Spr 02	4/24/02	5/8/02	10/27	5.4	2.8	2.24	0.6
	6	Spr 02	4/24/02	5/8/02	8/27	5.0	2.7	2.38	0.3
P9	1	Spr 02	5/8/02	5/22/02	27/27	6.3	2.5	0.58	1.9
	2	Spr 02	5/8/02	5/22/02	16/27	4.3	2.7	2.21	0.5
	3	Spr 02	5/8/02	5/22/02	8/27	5.9	2.3	1.22	1.1
	4	Spr 02	5/8/02	5/22/02	5/27	6.0	2.3	2.06	0.2
	5	Spr 02	5/8/02	5/22/02	3/27	4.3	2.4	2.20	0.2
	6	Spr 02	5/8/02	5/22/02	4/27	4.6	2.4	1.92	0.5
P11	1	Spr 02	3/27/02	4/10/02	19/26	5.1	3.6	1.44	2.2
	2	Spr 02	3/27/02	4/10/02	15/26	4.2	3.5	1.82	1.7
	3	Spr 02	3/27/02	4/10/02	17/26	5.1	3.2	1.76	1.4
	4	Spr 02	3/27/02	4/10/02	14/26	5.2	3.3	1.85	1.5
	5	Spr 02	3/27/02	4/10/02	15/26	4.9	3.1	1.91	1.2
	6	Spr 02	3/27/02	4/10/02	14/26	4.7	3.1	2.04	1.1

Table 4.2-2. concluded

Station Number	Substation Number	Season	Start Date	End Date	# Flood Events	Mean Flood Duration (hr)	Maximum Depth (ft)	Marsh/Swamp Elevation (ft)	Actual water level (ft)
P12	1	Spr 02	3/25/02	4/8/02	27/27	6.2	3.1	0.90	2.2
	2	Spr 02	3/25/02	4/8/02	20/27	4.7	3.1	1.62	1.5
	3	Spr 02	3/25/02	4/8/02	16/27	4.5	3.1	2.00	1.1
	4	Spr 02	3/25/02	4/8/02	14/27	5.0	2.9	1.90	1.0
	5	Spr 02	3/25/02	4/8/02	10/27	5.4	3.0	2.08	0.9
	6	Spr 02	3/25/02	4/8/02	6/27	4.8	3.2	2.44	0.8
P13	1	Spr 02	4/22/02	5/6/02	25/27	7.1	2.3	1.43	0.9
	2	Spr 02	4/22/02	5/6/02	25/27	5.0	2.3	1.08	1.2
	3	Spr 02	4/22/02	5/6/02	25/27	5.3	2.5	0.75	1.8
	4	Spr 02	4/22/02	5/6/02	25/27	6.8	2.4	1.00	1.4
	5	Spr 02	4/22/02	5/6/02	25/27	5.9	2.2	1.21	1.0
	6	Spr 02	4/22/02	5/6/02	11/27	4.3	2.2	1.64	0.6
P14	1	Spr 02	3/5/02	3/19/02	27/27	5.2	1.9	0.70	1.2
	2	Spr 02	3/5/02	3/19/02	24/27	5.1	1.7	0.87	0.8
	3	Spr 02	3/5/02	3/19/02	23/27	5.3	1.7	1.08	0.6
	4	Spr 02	3/5/02	3/19/02	23/27	4.8	1.7	1.22	0.5
	5	Spr 02	3/5/02	3/19/02	19/27	4.7	1.7	1.28	0.4
	6	Spr 02	3/5/02	3/19/02	9/27	5.6	1.6	1.49	0.1

4.3 Marsh/Swamp Flooding

Some of the same trends with respect to flooding frequency found for Spring 2000, Summer 2000, Fall 2000, and Spring 2001 (Hackney et al. 2001) were noted again. Most substations flooded regularly with some notable exceptions. Station 7 (Indian Creek), was flooded less than half of the tides measured during both seasons (Tables 4.2-1 and 4.2-2) at substations 2-6. Likewise, P11 (Smith Creek) and P12 (Rat Island) stations flooded less than half the tides at substations 2-6 and 3-6, respectively during Fall 2001, but with higher frequency Spring 2002. The Smith Creek transect on which substations are located is on an old dredge material deposit and the Rat Island transect (P12) encompasses both former rice fields (substations 1 and 2) and remnant pocosin (substations 3-6).

There are some notable differences between stations depending on both the underlying substrate and the basin in which they are found. The Cape Fear River substations are generally higher in elevation than substations in the Northeast Cape Fear River. This difference is greater further upstream. Stations P7, P8, and P9 receive flood water from the Cape Fear River that carries Piedmont silts and clays while the Northeast Cape Fear River is a Blackwater Coastal Plain tributary that has no source of similar sediments. This statement is supported by significant differences in the organic content of marsh/swamp soils in the Cape Fear River substations (45.9% organic material by combustion) compared to the Northeast Cape Fear River substations (65.8%) (Wicks 2002). Despite a regional drought, there were no obvious differences in the number of flooding events between years for either tributary.

Substations also continued to flood for significant portions of each tide (Tables 4.2-1 and 4.2-2), allowing ample time for replacement of porewater in soils (see section 5 of this report) and for the movement of aquatic species onto the swamp/marsh surface (see section 7 of this report).

4.4 Water Salinity In Marshes and Swamps

While few notable changes in flooding frequency and flooding duration were noted, there were obvious changes in salinity at some stations. These differences were reflected in both the maximum salinity measured at substations during each two-week period and by the number of flood events where floodwater exceeded 1 ppt (Tables 4.4-1 and 4.4-2).

Table 4.4-1. Summary of salinity data from nine stations collected along the Cape Fear River and its tributaries in Fall 2001.

Station Number	Station Name	Substation Number	Fall 2001 Salinity Range (ppt)	Proportion of flood events containing > 1 ppt salinity
P3	Town Creek	1	<1-19	27/27
		2	<1-19	23/27
		3	<1-19	27/27
		4	<1-17	27/27
		5	<1-14	16/27
		6	<1-14	8/27
P6	Eagle Island	1	<1-15	26/26
		2	<1-12	24/26
		3	<1-13	25/26
		4	<1-11	25/26
		5	<1-7	20/26
		6	<1-6	16/26
P7	Indian Creek	1	<1-5	8/26
		2	<1-1	0/26
		3	<1-1	0/26
		4	<1	0/26
		5	<1	0/26
		6	<1	0/26
P8	Dollisons Landing	1	ND	0/26
		2	<1	0/26
		3	<1	0/26
		4	<1	0/26
		5	<1	0/26
		6	<1	0/26
P9	Black River	1	<1	0/13
		2	<1	0/27
		3	<1	0/27
		4	<1	0/27
		5	<1	0/27
		6	<1	0/27
P11	Smith Creek	1	<1-14	13/27
		2	3-12	13/27

Table 4.4-1. concluded

Station Number	Station Name	Substation Number	Fall 2001 Salinity Range (ppt)	Proportion of flood events containing > 1 ppt salinity
		3	<1-15	13/27
		4	<1-15	14/27
		5	<1-14	12/27
		6	<1-13	11/27
P12	Rat Island	1	<1-11	27/27
		2	<1-13	21/27
		3	<1-12	17/27
		4	<1-11	11/27
		5	<1-10	3/27
		6	<1-2	3/27
P13	Fishing Creek	1	<1-9	8/27
		2	<1-11	19/27
		3	<1-9	27/27
		4	<1-8	27/27
		5	<1-7	13/27
		6	<1-1	1/27
P14	Prince George	1	<1-2	27/27
		2	<1-2	23/27
		3	<1-2	23/27
		4	<1-2	20/27
		5	<1-2	12/27
		6	<1-1	6/27

Table 4.4-2. Summary of salinity data from nine substations collected along the Cape Fear River and its tributaries in Spring 2002.

Station Number	Station Name	Substation Number	Spring 2002 Salinity Range (ppt)	Proportion of flood events containing > 1 ppt salinity
P3	Town Creek	1	<1	0/26
		2	<1	0/26
		3	<1	0/26
		4	<1	0/26
		5	<1-2	12/26
		6	<1-1	12/26
P6	Eagle Island	1	<1-5	11/27
		2	<1	0/27
		3	<1-4	8/27
		4	<1-2	3/27
		5	<1	0/27
		6	<1-2	10/27
P7	Indian Creek	1	<1	0/27
		2	<1-3	1/27
		3	<1	0/27
		4	<1	0/27
		5	<1	0/27
		6	<1	0/27
P8	Dollisons Landing	1	<1	0/27
		2	<1-2	1/27
		3	<1	0/27

Table 4.4-2. concluded

Station Number	Station Name	Substation Number	Spring 2002 Salinity Range (ppt)	Proportion of flood events containing > 1 ppt salinity
		4	<1	0/27
		5	<1	0/27
		6	<1	0/27
P9	Black River	1	<1	0/27
		2	<1	0/27
		3	<1	0/27
		4	<1	0/27
		5	<1	0/27
		6	<1	0/27
P11	Smith Creek	1	<1-3	14/26
		2	<1-3	14/26
		3	2-5	17/26
		4	<1-3	19/26
		5	<1-3	7/26
		6	<1-3	17/26
P12	Rat Island	1	<1-2	5/27
		2	<1-1	2/27
		3	<1-1	1/27
		4	<1-3	1/27
		5	<1-1	0/27
		6	<1-1	0/27
P13	Fishing Creek	1	<1	0/27
		2	<1	0/27
		3	<1	0/27
		4	<1	0/27
		5	<1	0/27
		6	<1	0/27
P14	Prince George	1	<1	0/27
		2	<1	0/27
		3	<1	0/27
		4	<1	0/27
		5	<1	0/27
		6	<1	0/27

During Fall 2001 there were no differences in the number of flood tides in which floodwater exceeded 1 ppt salinity for all stations combined or for the Cape Fear River stations. However, there was a significant (Pr< 0.0001) increase in the number of saline flood tides at substations along the Northeast Cape Fear River (P11-P14). In spring, the same relationship was found, i.e. more flooding events containing salt water, (P< 0.04) than in the previous spring. Note that there was no significance in the number of times substations flooded (Section 4.3), so the increased flooding was caused by an increase in salinity in the adjacent river, not additional flooding events.

Increased salinity in the upper reaches of the Northeast Cape Fear branch of the estuary was also evident through a comparison of the maximum salinity measured at each subsite during the two-week study period in Fall 2000 versus Fall 2002 (Pr< 0.0001). During Winter/Spring sampling, however, there were no statistically significant differences between 2001 and 2002. Note that the background site (P14) in the Northeast

Cape Fear River received water with measurable levels of salt, 2 ppt, while normally fresh sites P12 and P13 experienced 13 ppt and 11 ppt, respectively (Table 4.4-1). Note that these were concentrations of saline water that reached into the marsh and swamp, not just saline water in the river channel. Expectations are that salinity lower in the water column was higher.

More saline floodwater has the potential to alter fauna and flora in these wetlands. However, the importance of more saline water flooding wetlands is magnified if sea salts penetrate into wetland soils and modify the biogeochemistry of these sediments.

5.0 MARSH SWAMP BIOGEOCHEMISTRY

5.1 Summary

Geochemical data was collected at nine stations along the Cape Fear River Estuary beginning Winter 2000. Data from the winters of 2000, 2001 and the Summer of 2000 was presented in the previous annual report for this project (Hackney et al. 2001). The data presented in the current report includes Winter of 2002 and Summer 2001. The microbial modes of organic matter remineralization of the study sites range from sulfate reducing to methanogenic. Analysis of porewater chloride, sulfate, and methane was performed at six substations per station and at 6 depths per subsite. Samples were collected during the winter and summer at eight sites and monthly at P6 (Eagle Island). These data were used to classify the geochemical setting of each subsite at each station as methanogenic, sulfate reducing, methanogenic with evidence of past sulfate reduction, and sulfate reducing with a non-seawater source of sulfate. The classifications were compared to the previous data for these sites. Understanding the current and past geochemical conditions examined during the past 2 ½ years will be necessary to separate potential change caused by the dredging and widening of the Cape Fear River from natural fluctuations.

Station P6's (Eagle Island) geochemistry was analyzed monthly and was characterized by a mix of sulfate reduction and methane production. Sulfate reduction was the dominant microbial pathway for the breakdown of organic material during most of the year with the exception of early fall. During fall (September and October) the warmest temperatures of the year resulted in the maximum microbial rates of sulfate reduction. This coincided with a decrease in floodwater salinity as winter approached resulting in low porewater sulfate concentrations. Because of the depleted sulfate stocks from high rates of sulfate reduction in summer, the microbial community switched to methanogenesis and the highest rates of methane production occurred. Methane production rates were low during the remainder of the year due to competition with sulfate reducing bacteria. A major feature of the Eagle Island geochemical data was a pulse of high salinity floodwater that occurred in November and May in both the previous and current study periods. Originally it was thought that the high levels of sulfate that occurred during May 2001 reflected seasonal patterns associated with river flow while the event in November 2000 may have been an anomaly. However, the reoccurrence of the November peak in 2001 may indicate a pattern that is typical for this river system. Comparisons between geochemical classifications for the current and previous year show that 16% of the subsites at Eagle Island were fresher during the current year while 20%

were saltier. Therefore 64% of the substations were unchanged. These baseline data will be useful in comparing normal river variations with changes that could occur as a result of the dredging project.

The remaining eight stations were sampled twice each year, during summer and winter. In the previous report, three of these stations were primarily sulfate reducing year-round (P3 - Town Creek, P12 - Rat Island, and P11- Smith Creek) two were primarily methanogenic year round (P8 - Dollisons Landing, and P14 - Prince George) and four exhibited mixed conditions with sulfate reduction typically dominating the geochemistry during the summer and methanogenesis dominating during the winter (P7- Indian Creek , P9 - Black River, P12 - Rat Island, P13 - Fishing Creek) (Hackney et al. 2001). During 2001-2002, two Northeast Cape Fear River sites, Prince George (P14) and Fishing Creek (P13), displayed a dramatic change in winter classification from methanogenic in the winters of 2000 and 2001 to sulfate reducing in the Winter of 2002 resulting from an increase in salinity. The other two sites on the Northeast Cape Fear River, Rat Island (P12) and Smith Creek (P11), also showed signs of increased salinity although their general classification did not change. Rat Island (P12) had several methanogenic classifications converted to sulfate reducing. Smith Creek (P11), which is already a sulfate reducing system, recorded higher salinities in porewaters.

The summer classifications on the Cape Fear River showed the opposite trend with evidence of a slight freshening of the porewaters. Changes in classifications of the Cape Fear River sites were not as dramatic as those observed on the Northeast Cape Fear River. The general trend for Cape Fear River sites was a slight freshening of the porewaters in Winter 2002 and saltier conditions in Summer 2001 compared to the data contained in the previous report. Town Creek (P3), which is located below the confluence of the Northeast Cape Fear River and the Cape Fear River, displayed a similar trend as that of the Cape Fear River sites with slightly saltier conditions during the summer and slightly fresher conditions during the winter.

5.2 Geochemical Theory and Classification

Porewater sampling of the metabolic products of sulfate reducing and methanogenic bacteria help establish the frequency and duration of organic soil inundation by tidal water carrying ocean-derived salt versus inundation by fresh water. Changes in flooding frequency have a more significant impact if salts from seawater enter the pore space of wetland sediments. In the presence of sufficient seawater sulfate, organic matter is remineralized via sulfate reducing bacteria in anaerobic environments generating hydrogen sulfide. In freshwater environments, organic matter is usually remineralized via methanogens that generate methane as a byproduct. In the presence of high levels of sulfate from seawater, methanogens are replaced by sulfate reducing bacteria and methanogenesis is inhibited. Hydrogen sulfide is toxic and limits both plants and animal species that do not have a behavioral or physiological mechanism to tolerate this bacterial metabolite. Thus, a shift in remineralization pathway can lead to different communities of plants and animals.

Chloride concentrations are a direct measure of salinity as it occurs in a constant proportion in seawater and has no substantial sinks or sources in wetland sediments.

Therefore, the term salinity used in the biogeochemistry section of this report will refer to salinity based on measured chloride concentrations.

Chloride and sulfate concentrations are in a constant ratio in seawater (approximately 20:1). Unlike sulfate, which can decrease due to sulfate reduction, there are no common removal mechanisms (biotic or abiotic) for chloride from seawater. Therefore, chloride concentrations can be used as an indicator of the amount of sulfate originally supplied to a site by seawater. Changes in the ratio of chloride to sulfate are an indicator of sulfate reduction. In the presence of sulfate reduction, methanogenic bacteria are out competed and methane production is inhibited. Therefore, low concentrations of methane are another indicator of sulfate reduction. When sulfate concentrations decrease sufficiently, sulfate-reducing bacteria are no longer able to function and methane production dominates. Thus, a sulfate reducing threshold concentration can be identified in sulfate concentration versus depth profiles, where sulfate concentrations no longer decrease with increasing depth and methane concentrations increase. Data from all nine marsh/swamp stations of the present study place the level where the shift occurs at approximately 300 µM sulfate. This corresponds to sulfate being supplied by salinities of approximately 0.4 parts per thousand.

Using this sulfate reducing threshold (300 µM sulfate), stations and substations were classified as sulfate reducing or methanogenic. Methanogenic substations that had a chloride to sulfate ratio significantly greater than seawater (>30:1) were classified as methanogenic sites with evidence of past sulfate reduction. Sulfate reducing sites with ratios less than seawater (5:1) were classified as sulfate reducing with a non-seawater source of sulfate. The four main classifications are: 1) sulfate reducing (SR), 2) methanogenic (M), 3) methanogenic with evidence of past sulfate reduction (MPSR) and sulfate reducing with a non-seawater source of sulfate (SRNS). Changes in these classifications will be used to determine changes in biogeochemical setting associated with river dredging, drought, or other factors.

5.3 Geochemical Methodology

Biogeochemical monitoring was established in close proximity to shallow water well/conductivity/temperature substations. Six substations are distributed along the length of each of nine monitoring belt transects with number one near the river or channel and number 6 adjacent to uplands. Substations are roughly perpendicular to the segment of the stream along which they have been established. Sampling devices, peepers, are constructed of thick acrylic with wells (1-cm deep grooves) located at six different depths that sample 1, 6, 11, 16, 21, and 26 cm below the soil surface. Semipermeable membranes allow methane, sulfate, and chlorine to equilibrate with distilled water in wells. Peepers are inserted into the substrate and left for 1 week, which is ample time for equilibration. Peepers have been shown to be reliable collection devices for these types of dissolved substances (Hesslein 1976). The concentrations of all parameters are determined after removing samples from peeper cells with a syringe equipped with a needle. Sulfate and chloride concentrations are stable under oxic conditions and can be stored in serum vials until analysis. Sulfate and chloride concentrations are determined with an ion chromatograph (Hoehler et al. 1994). Salinity is calculated from the chloride concentrations of the equilibrated peeper chamber water based on the constant ratio of chloride to total dissolved salts in seawater. Samples for porewater methane analysis are prepared by extraction of porewater methane into an inert helium headspace within a gas-tight syringe. The headspace gas is then injected into a gas chromatograph equipped with a flame ionization detector (Kelley et al. 1995) for quantitative determination of methane concentration.

Porewater is collected and analyzed at all 54 substations in all nine transect stations during mid-summer and mid-winter, the coldest and warmest parts of the year. This provides data during periods of maximum and minimum bacterial metabolism. In addition, porewater is collected from the Eagle Island station (P6) every month using the same procedures. This station represents a transition between saline and fresh-dominated stations. In addition, the six substations represent the same transition along a different scale, well-flooded to less flooded.

5.4 Eagle Island (P6) Annual Cycles of Sulfate, Chloride, and Methane

Eagle Island has been classified an SR and MPSR classification because both methanogenesis and sulfate reduction occur at this station (Hackney et al. 2001). Although some minor changes have occurred, the general classifications and systematics of this site during the Winter of 2002 and the Summer of 2001 are similar to those previously reported (Hackney et al. 2001). Eagle Island's general classification is based on the following observations: 1) Methane is present at depth in all substations, but is often at very low concentrations at the surface during times of high sulfate input (Figure 5.4-1), 2) Sulfate concentrations range from below the sulfate reducing threshold of 300 µM indicating methane production, to as high as 6000 µM indicating sufficient sulfate to drive sulfate reduction (Figure 5.4-2) and, 3) The ratios of sulfate to chloride range from those found in seawater to ratios indicating a depletion of sulfate due to sulfate reduction (Figure 5.4-3).

Salinity input to Eagle Island varies during the year. Generally the salinity is higher during summer months when the flow rate of the river is lower, however, a massive input of salt was observed during November 2000 and May 2001 (Hackney et al. 2001). These events overshadowed seasonal trends and dominated geochemical conditions during the previous report period (January 2000-May 2001). Surprisingly, the exact same pattern of salinity variations was observed during the current study (Summer 2001, Winter 2002) with salinity peaks once again occurring during November and May (Figure 5.4-4). Even minor variations such as a July summer peak in salinity was observed during both summers. The low salinity values, which occurred between February and April of 2001, were also evident during the same time period in the Winter

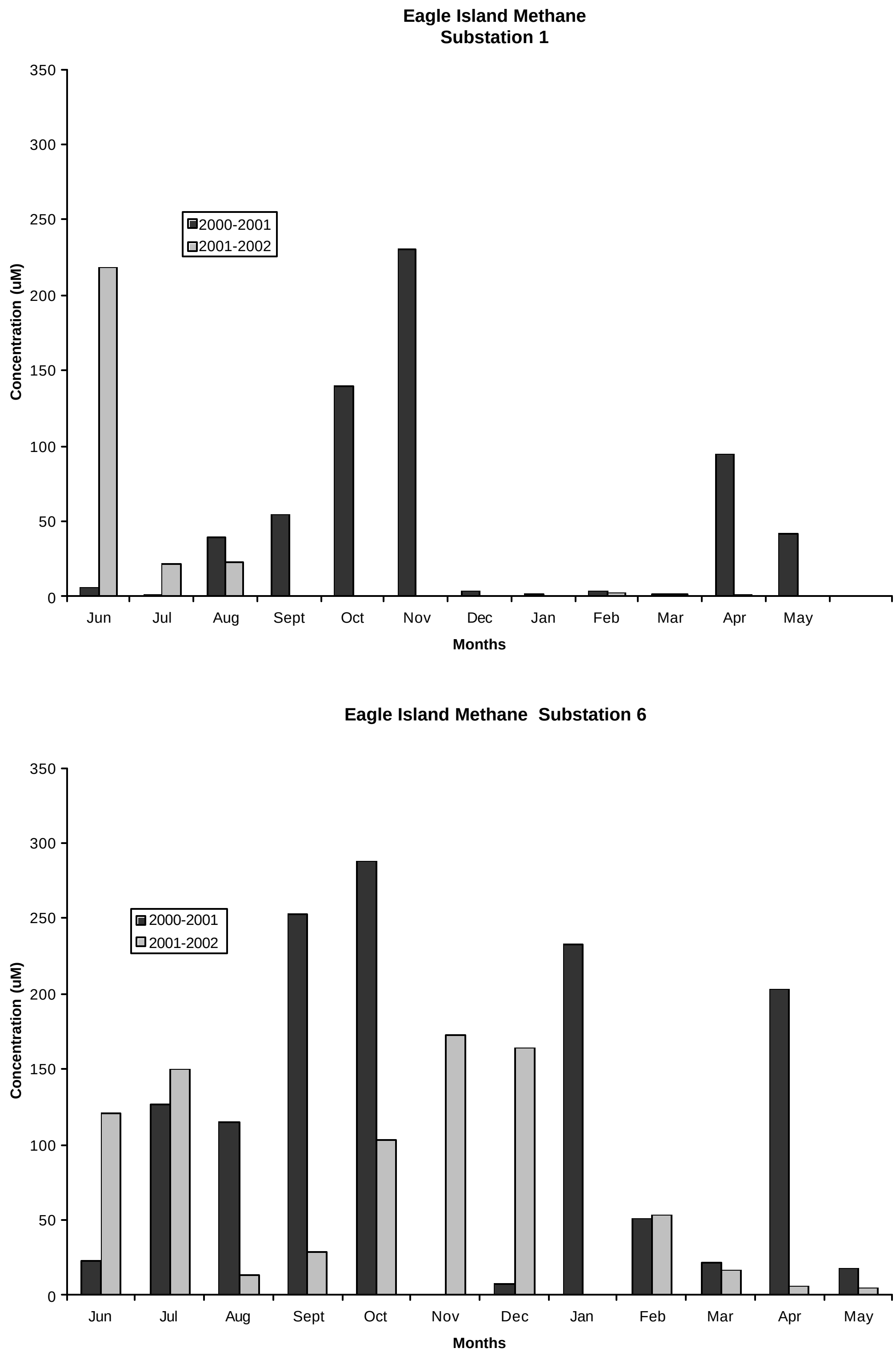


Figure 5.4-1. Methane concentrations of Eagle Island porewaters vs. month for 2000-2001 and 2001-2002. Top shows nearshore site (S1) and bottom shows most upland site (S6).

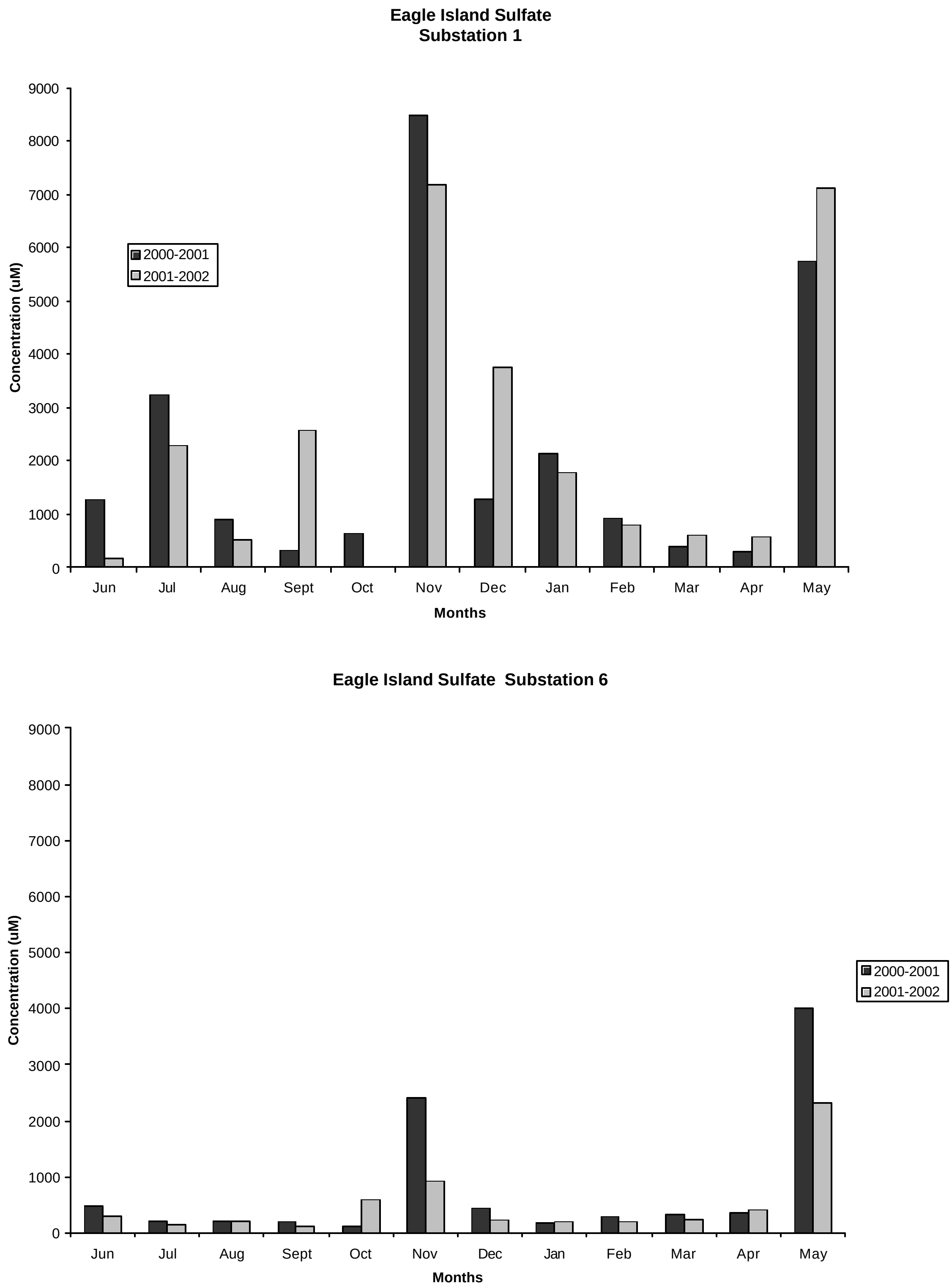
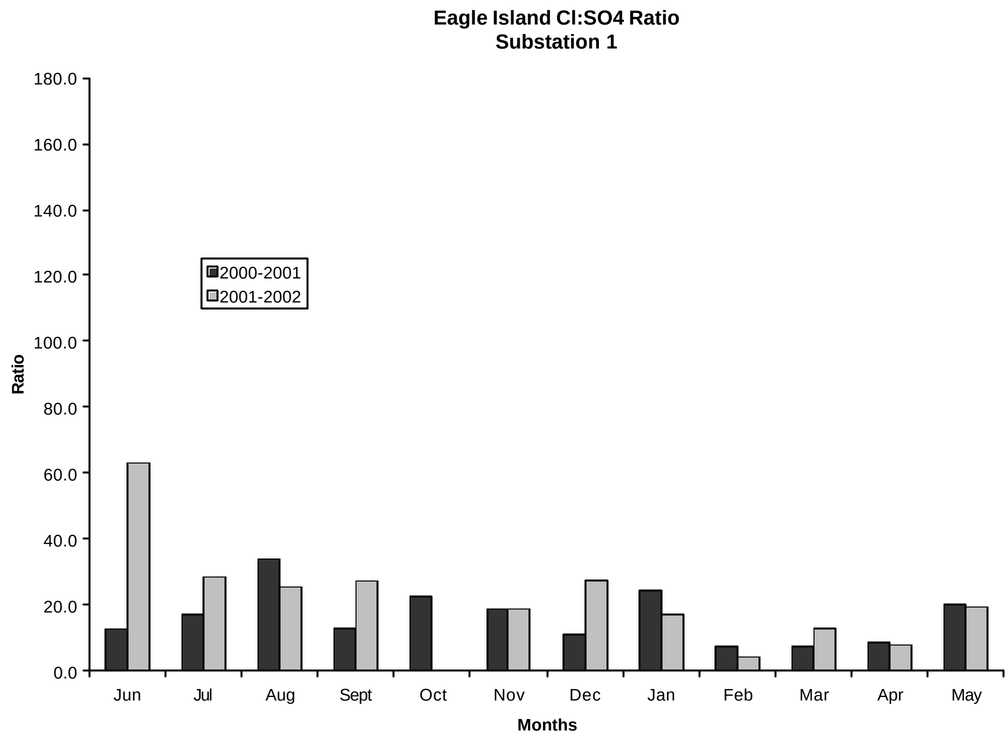


Figure 5.4-2. Sulfate concentrations of Eagle Island porewaters vs. month for 2000-2001 and 2001-2002. Top shows nearshore site (S1) and bottom shows most upland site (S6).



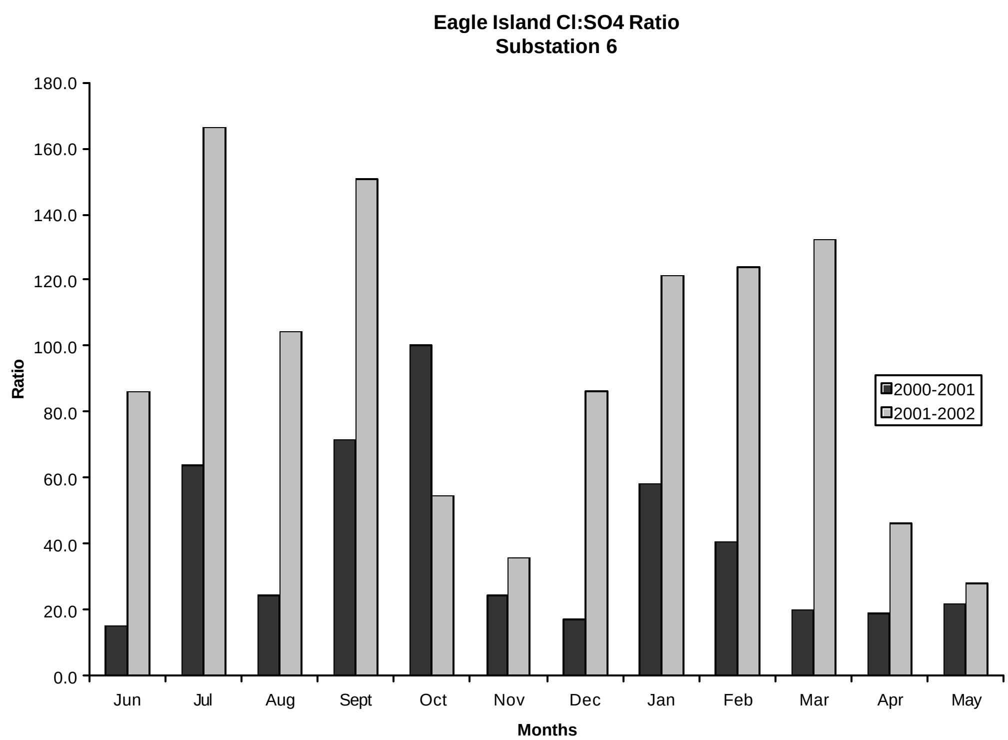
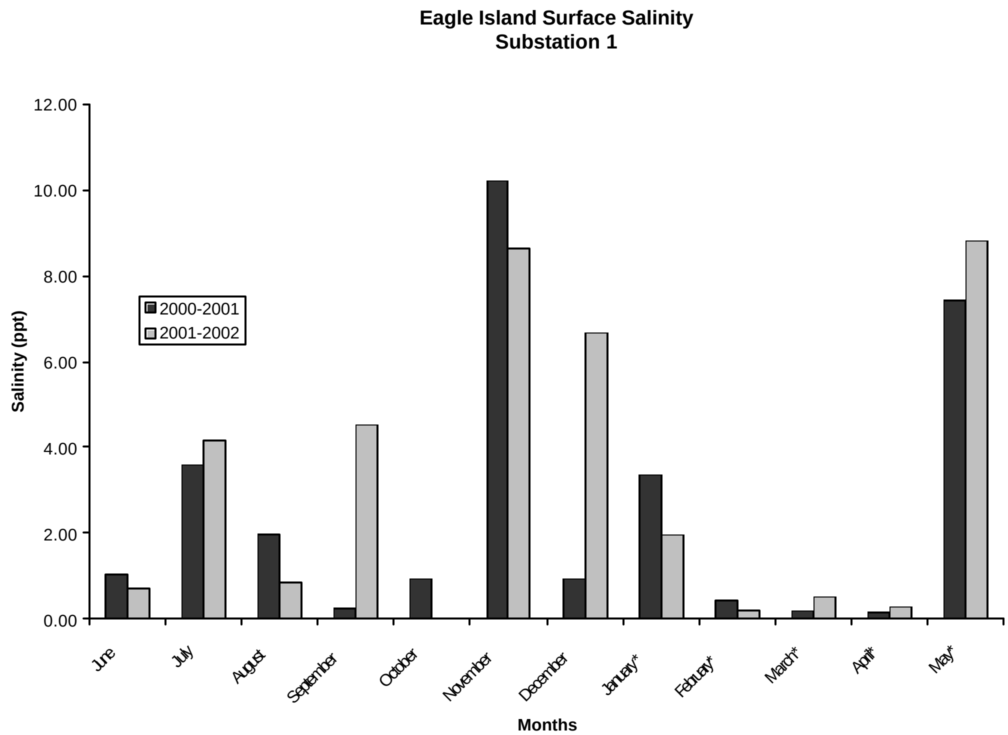


Figure 5.4-3. Chloride to sulfate ratios of Eagle Island porewaters vs. month for 2000-2001 and 2001-2002. Top shows nearshore site (S1) and bottom shows most upland site (S6).



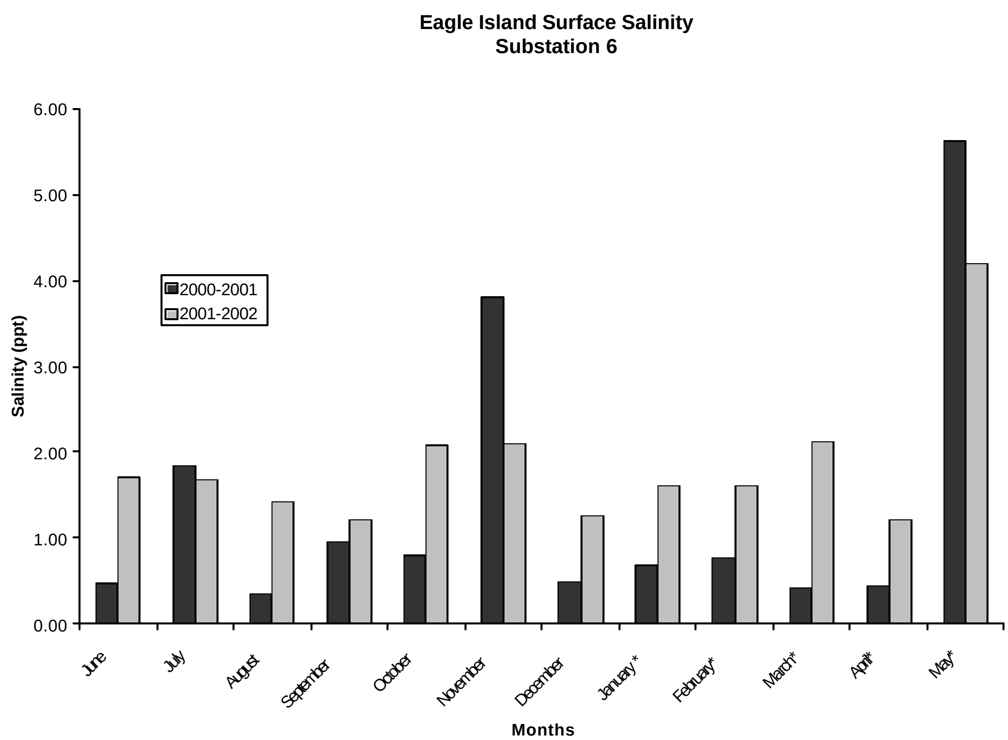


Figure 5.4-4. Salinities of Eagle Island porewaters vs. month for 2000-2001 and 2001-2002. Top shows nearshore site (S1) and bottom shows most upland site (S6).

of 2002. The only noticeable differences between 2000-2001 and 2001-2002 occurred during September and December 2001 when the salinity was highly elevated above the same period in 2000.

The same general trends of salinity peaks were observed at both the near-shore substation (S1) and the most upland site (S6) (Figure 5.4-4). However, the upland site had much less dramatic shifts in salinity during the year and appeared to be more buffered with respect to short-term variations. This is likely due to a lack of a daily flooding in the upland sites rendering them less susceptible to regular flushing and exchange of porewaters with floodwaters. The upland site was also noticeably saltier during the Winter of 2002 compared to the previous year, a pattern that was not as obvious in the near-shore location.

Sulfate concentrations at Eagle Island essentially paralleled salinity trends (Figure 5.4-2). Peaks in sulfate concentrations were observed during November and May at both substations S1 and S6. The secondary trends, such as low values during the winter and the July summer peak, were obvious at substation 1, near the river's edge, but not at the upland edge (S6). With the exception of the November and May peaks, the sulfate values at S6 remained fairly constant during the year. Most porewater sulfate values were close to the sulfate reducing threshold of 300 µM, indicating that the sulfate at S6 has been depleted and was not re-supplied by floodwater. This explanation is confirmed by the classifications of this site, which was essentially methanogenic or methanogenic with evidence of past sulfate reduction during the majority of the year (Table 5.4-1).

The chloride to sulfate ratios ($Cl^-:SO_4^{2-}$) support the idea of less frequent resupply of sulfate at station S6 compared to station S1. At station S1, the ($Cl^-:SO_4^{2-}$) was very similar to the 20:1 ratio of seawater indicating a resetting of the ratio by flushing of the sediments on a regular basis (Figure 5.4-3). At station S6, the ($Cl^-:SO_4^{2-}$) was generally much larger than that of seawater, indicating a depletion of sulfate due to bacterial consumption. The ratio at station S6 was different in 2001-2002 versus 2000-2001. Salinity values during 2001-2002 were higher at all subsites than the level required to support sulfate reduction (i.e., 300 µM sulfate, which corresponds to a salinity of 0.4 parts per thousand), while salinity values during 2000-2001 were generally lower than the value required for sulfate reduction (Figure 5.4-4). As a result, in 2000-2001, a lack of sulfate reduction resulted in no appreciable consumption of sulfate and therefore no change in the ($Cl^-:SO_4^{2-}$). During the current study, where sulfate concentrations were high enough for sulfate reduction, a shift in the ($Cl^-:SO_4^{2-}$) was observed.

Methane concentrations at Eagle Island provide important supporting data for the geochemical explanations presented above. Generally, methane concentrations were higher at S6 compared to S1 (Figure 5.4-1) indicating the predominance of methanogenesis over sulfate reduction at the upland edge where resupply of sulfate via seawater is lower. The methane data clearly show the inhibition of methanogens by sulfate reducers in the past November data of both the current and previous study. After the large pulse of salinity in November, methane concentrations at S6 remained extremely low for the following four months.

Table 5.4-1. Eagle Island (P6) Geochemical Classifications by month for 2000-2001 and 2001-2002. Site classifications are as follows: Methanogenic I, Sulfate Reducing II, Methanogenic with evideance of past sulfate reduction I*, Sulfate reducing non-seawater source of sulfate II*.

Sites	Jun '00	Jun '01	Jul'00	Jul '01	Aug'00	Aug '01	Sept'00	Sept'01
S1-1	II	I*	II	II	II	II	II	II
S1-2	II	I*	II	II	II	II	I	II
S1-3	II	I*	II	II	II	I*	I*	II
S1-4	II	I*		II	II	I*	I	II
S1-5	II	I*	II	II	I*	I*	I*	II
S1-6	II	I*	II	II	I*	I*	I*	II
S2-1	II	I*	II	II	II	II	I	I*
S2-2	II	I*	II	II	II	II	I	II
S2-3	II	I*	II	II	II	II	I	II
S2-4	II	I*	II	I*	I*	I*	I	II
S2-5	II	II	II	I*	I*	I*	I	II
S2-6	II	II	II	I*	I*	I*	II	II
S3-1	II	II	II	II	II	I*	I*	II
S3-2	II	I*	I*	I*	II	I*	II	II
S3-3	II	I*	I*	I*	II	I*	II	II
S3-4	I*	I*	I*	I*	I*	II	I*	I*
S3-5	I*	I*	I*	I*	I*	I*	I*	I*
S3-6	I*	I*	I*	I*	I*	I*	I*	I*
S4-1	II	I*	I*	II	II	I*	I	I*
S4-2	I*	I*	II	I*	I*	I*	I*	II
S4-3	I*	I*	II	I*	I*	I*	I*	II
S4-4	II	I*	II	I*	I*	I*	I*	II
S4-5	I*	I*	II	I*	I*	I*	I*	ns
S4-6	I*	II	II	I*	I*	I*	I*	I*
S5-1	I	I*	I*	I*	II	I*	I*	I*
S5-2	I*	I*	II	I*	I*	I*	I*	I*
S5-3	I	I*	I*	I*	I*	I*	I*	I*
S5-4	I*	I*	II	I*	I*	I*	I*	I*
S5-5	I	II	I*	I*	I*	I*	II	I*
S5-6	I	I*	I*	I*	I*	I*	I*	I*
S6-1	II	II	I*	I*	I	I*	I*	I*
S6-2	I	I*	II	I*	I*	I*	I*	II
S6-3	I*	I*	I*	I*	I*	I*	I*	I*
S6-4	I*	I*	II	I*	I*	I*	I*	I*
S6-5	I*	I*	I*	I*	I*	I*	I*	I*
S6-6	I	I*	I*	I*	I*	I*	I*	I*

Table 5.4-1. continued

Sites	Oct'00	Oct '01	Nov'00	Nov '01	Dec'00	Dec '01	Jan'01	Jan '02	Feb'01	Feb '02
S1-1	II	ns	II	II	II	II	II	II	II	II*
S1-2	II	ns	II	II	II	II	II	II	II	II*
S1-3	II	II	II	II	II	II	II	II	II	II
S1-4	II	II	II	II	II	II	II	II	II	II
S1-5	I*	II	II	II	II	II	II	II	II	II
S1-6	II	II	II	II	II	II	II	II	II	II
S2-1	II	II	II	II	II	II	II	II	II	II
S2-2	II	II	II	II	II	II	II	II	I*	II
S2-3	II	II	II	II	II	II	II	II	II	II
S2-4	II	II	II	II	II	II	II	II	II	II
S2-5	II	II	II	II	II	II	II	II	II	II
S2-6	I*	II	II	II	II	II	II	II	I	II
S3-1	I*	II	II	II	II	I*	II	II	II	II
S3-2	I*	II	II	II	II	I*	II	II	II	II
S3-3	I*	II	II	II	II	II	II	II	II	II
S3-4	I*	I*	II	II	II	II	I*	II	II	II
S3-5	I*	I*	II	II	II	I*	II	II	I*	II
S3-6	I*	I*	II	II	II	I*	II	II	II	II
S4-1	I	II	II	II	II	II	II	II	II	I*
S4-2	I*	II	II	II	II	II	II	II	II	I*
S4-3	I*	II	II	II	I*	II	II	II	II	II
S4-4	I*	II	II	II	I*	II	I*	II	II	II
S4-5	I*	I*	II	II	I*	II	II*	II	II	II
S4-6	II	I*	II	II	I*	II	II	II	II	II
S5-1	I*	II	II	I*	II	I*	II	II	II	II
S5-2	I*	II	II	II	I*	II	II	I*	II	I*
S5-3	I*	I*	II	II	I*	I*	II	I*	II	I*
S5-4	I*	I*	I*	II	I*	I*	II	I*	II	I*
S5-5	I*	I*	II	I*	I*	II	II	II	II	I*
S5-6	I*	I*	II	I*	I*	I*	II	I*	II	I*
S6-1	I*	II	II	II	II	I*	I*	I*	I*	I*
S6-2	I*	I*	II	I*	I*	II	I*	I*	II	I*
S6-3	I*	I*	II	II	I*	II	I*	I*	II	I*
S6-4		I*	II	I*	I*	I*	I*	I*	II	I*
S6-5		I*	II	I*	I*	I*	I*	I*	I*	I*
S6-6		I*	II	I*	I*	I*	I*	I*	I*	I*

Table 5.4-1. concluded

Sites	Mar'01	Mar '02	Apr'01	Apr '02	May'01	May '02	Jun '01	Jun '02
S1-1	II	II	II	II	II	II	I*	II
S1-2	I	II	II	II	II	II	I*	II
S1-3	II	II	I	II	II	II	I*	II
S1-4	I*	II	I	I	II	II	I*	II
S1-5	I*	II	I*	I*	II	II	I*	II
S1-6	I*	I*	II*	I*	II	II	I*	II
S2-1	II*	II	II*	II	II	II	I*	II
S2-2	II	II	I	II	II	II	I*	II
S2-3	II	II	II	I*	II	II	I*	II
S2-4	I	II	I	I*	II	II	I*	II
S2-5	I	II	II	I*	II	II	II	II
S2-6	I*	II	I	I*	II	II	II	II
S3-1	I*	II	I*	I*	II	II	II	II
S3-2	I*	II	I*	I*	II	II	I*	II
S3-3	I*	II	II	I*	II	II	I*	II
S3-4	I*	II	I*	I*	II	II	I*	II
S3-5	I*	II	I*	I*	I*	II	I*	II
S3-6	II	I*		I*	I*	II	I*	II
S4-1	II	I*	II	I*	II	II	I*	II
S4-2	I	I*	I*	I*	II	II	I*	I*
S4-3	I*	I*	I*	I*	I*	I*	I*	I*
S4-4	I*	I*		I*	I*	II	I*	I*
S4-5	I*	I*		I*	II	II	I*	I*
S4-6	I*	I*		I*	I*	I*	II	I*
S5-1	I*	I*	II	I*	II	II	I*	II
S5-2	I*	I*	I*	I*	II	I*	I*	II
S5-3	I*	I*	II*	I*	II	I*	I*	II
S5-4	I*	I*		I*	II	I*	I*	II
S5-5	I*	I*		I*	I*	II	II	II
S5-6	I*	I*		I*	I*	II	I*	I*
S6-1	II	I*	II	II	II	II	II	II
S6-2	I*	I*	II	I*	II	II	I*	I*
S6-3	I*	I*		I*	II	II	I*	I*
S6-4	I*	I*		I*	II	I*	I*	I*
S6-5	I*	I*		I*	II	I*	I*	I*
S6-6	I*	I*		I*	II	I*	I*	I*

Slight changes in geochemical classifications of some Eagle Island subsites can now be understood in terms of the geochemical variations described above. For example, the saltier conditions observed during September of this year compared to the previous year resulted in the conversion of several subsites from methanogenic or methanogenic with evidence of past sulfate reduction to sulfate reducing. Even subtle differences can be detected with this classification scheme. For example, during June 2001, S1 experienced slightly fresher conditions and S6 slightly saltier conditions compared to the previous year. These changes are reflected in the classification scheme where several creek-bank locations were converted from sulfate reducing classification (S) to methanogenic with evidence of past sulfate reduction (MPSR), while several upland locations were converted from methanogenic to MPSR or S classifications.

5.5 Marsh/Swamp Transect Stations Geochemistry, Annual Variability

The following section compares the geochemistry of substations from the previous year 2000-2001 (Hackney et al. 2001) to the current year. The initial report included three separate seasons including the winters of 2000 and 2001 and the Summer of 2000. The current report includes the Winter of 2002 and the Summer of 2001.

5.51 Town Creek (P3)

Town Creek is the most seaward station monitored for geochemistry. The salinities of the porewaters previously reported for this site ranged from 0.1 - 4 ppt during the winter and 2 - 8 ppt during summer (Hackney et al. 2001). Salinity at subsites during the Winter of 2002 (0.3 - 8 ppt) was approximately double levels reported for the previous two winters, while summer salinity (1 - 5 ppt) was lower (Table 5.51-1).

The station was previously classified as a sulfate reducing system (SR) during the summer with the exception of deep samples at substations 1 and 6 which were classified as methanogenic with evidence of past sulfate reduction (MPSR) (Table 5.51-2). This vertical zonation is typical of estuarine sediments that are often sulfate reducing at the surface and methanogenic at depth due to depletion of sulfate which cannot be easily re-supplied at depth. The classification of the site during the Summer 2001 was essentially the same as the previous year with 95% of the classifications unchanged (Table 5.51-2).

During the winters of 2000 and 2001, the station was primarily classified as SR with a few MPSR classifications (Table 5.51-2), but by Winter of 2002, the site was strictly a sulfate reducing system reflecting the higher salinity conditions described above. Of the 36 substations sampled, 22% displayed a shift toward higher salinity classifications, while none of the subsites shifted toward fresher classifications. Porewater methane concentrations were generally low at this site during the Winter of 2001, with the exception of substations 4 and 6 which were slightly elevated reflecting methane production at depth below the zone of sulfate reduction (Hackney et al. 2001). During the Winter of 2002, methane concentrations were generally lower reflecting the dominance of sulfate reduction and the inhibition of methanogenesis caused by the increases in salinity (Table 5.51-3).

Table 5.51-1. Salinity of Sites. Salinity in parts per thousand calculated from chloride concentrations in porewaters. A --- indicates no data.

			Salinity	
Station	Substation	Depth (cm)	Summer 2001	Winter 2002
Town Creek	1	1	3.32	0.35
P3	1	6	4.69	0.47
	1	11	4.16	1.73
	1	16	3.65	3.08
	1	21	3.62	4.25
	1	26	3.71	4.94
	2	1	4.41	4.24
	2	6	4.51	4.91
	2	11	4.14	4.91
	2	16	4.65	5.18
	2	21	4.59	5.59
	2	26	4.69	6.34
	3	1	1.01	0.78
	3	6	2.77	1.97
	3	11	3.15	3.27
	3	16	3.92	5.83
	3	21	4.59	7.16
	3	26	4.98	8.04
	4	1	2.67	1.55
	4	6	2.68	2.15
	4	11	2.63	2.46
	4	16	2.79	2.81
	4	21	2.63	2.71
	4	26	2.81	2.49
	5	1	3.55	3.31
	5	6	3.07	3.63
	5	11	2.35	3.68
	5	16	2.51	3.86
	5	21	2.73	3.72
	5	26	3.03	3.82
	6	1	3.39	2.68
	6	6	3.80	8.34
	6	11	3.64	4.31
	6	16	3.20	4.28
	6	21	2.95	4.49
	6	26	2.99	4.37
Eagle Island	1	1	4.16	1.95
P6	1	6	4.54	2.27
	1	11	4.47	2.73
	1	16	4.29	2.82
	1	21	4.33	3.90

Table 5.51-1. continued

Station	Substation	Depth (cm)	Salinity	
			Summer 2001	Winter 2002
Eagle Island	1	26	3.17	4.82
(continued)	2	1	4.30	3.43
	2	6	3.58	4.28
	2	11	2.84	4.43
	2	16	2.13	4.62
	2	21	1.78	4.42
	2	26	1.40	4.22
	3	1	4.08	3.05
	3	6	1.80	3.51
	3	11	1.61	3.57
	3	16	1.73	3.51
	3	21	1.61	3.14
	3	26	1.74	2.80
	4	1	1.84	3.23
	4	6	1.81	3.60
	4	11	1.33	3.69
	4	16	1.40	3.95
	4	21	1.73	3.77
	4	26	1.50	4.09
	5	1	1.44	2.11
	5	6	1.31	1.90
	5	11	1.24	1.44
	5	16	1.24	1.57
	5	21	1.31	1.89
	5	26	1.23	1.50
	6	1	1.68	1.61
	6	6	1.69	1.45
	6	11	1.73	1.57
	6	16	1.63	1.47
	6	21	1.59	1.50
	6	26	1.62	1.57
Indian Creek	1	1	3.24	0.05
P7	1	6	3.31	0.03
	1	11	2.28	0.07
	1	16	1.65	0.12
	1	21	0.83	0.16
	1	26	0.51	0.20
	2	1	0.56	0.05
	2	6	0.26	0.05
	2	11	0.26	0.05
	2	16	0.45	0.08
	2	21	0.30	0.09
	2	26	0.20	0.09
	3	1	0.28	0.02

Table 5.51-1. continued

Station	Substation	Depth (cm)	Salinity Summer 2001	Salinity Winter 2002
Indian Creek (continued)	3	6	0.44	0.01
	3	11	0.42	0.01
	3	16	0.25	0.01
	3	21	0.11	0.02
	3	26	0.17	0.01
	4	1	0.14	0.02
	4	6	0.26	0.01
	4	11	0.17	0.01
	4	16	0.12	0.02
	4	21	0.17	0.01
	4	26	0.10	0.01
	5	1	0.12	0.01
	5	6	0.11	0.00
	5	11	0.13	0.00
	5	16	---	0.00
	5	21	0.61	0.00
	5	26	0.21	0.00
	6	1	---	0.02
	6	6	---	0.01
	6	11	0.16	0.00
	6	16	0.53	0.01
	6	21	---	0.01
	6	26	0.17	0.01
Dollisons Landing P8	1	1	---	0.06
	1	6	0.24	0.04
	1	11	0.20	0.06
	1	16	0.30	0.07
	1	21	0.23	0.06
	1	26	0.26	0.06
	2	1	0.32	0.04
	2	6	0.30	0.03
	2	11	0.44	0.05
	2	16	0.57	0.04
	2	21	1.11	0.04
	2	26	0.27	0.04
	3	1	0.16	0.04
	3	6	---	0.05
	3	11	0.18	0.04
	3	16	0.20	0.04
	3	21	0.28	0.03
	3	26	0.24	0.04
	4	1	0.18	0.04
	4	6	0.27	0.04
	4	11	0.45	0.03

Table 5.51-1. continued

Station	Substation	Depth (cm)	Salinity Summer 2001	Salinity Winter 2002
Dollisons Landing (continued)	4	16	0.22	0.04
	4	21	0.31	0.02
	4	26	0.21	0.04
	5	1	0.14	0.03
	5	6	0.12	0.03
	5	11	0.25	0.02
	5	16	0.78	0.05
	5	21	0.62	0.03
	5	26	0.27	0.02
	6	1	0.38	0.03
	6	6	0.49	0.04
	6	11	0.36	0.04
	6	16	0.89	0.04
	6	21	0.29	0.04
	6	26	0.54	0.03
Black River P9	1	1	---	0.07
	1	6	---	0.03
	1	11	---	0.04
	1	16	---	0.04
	1	21	---	0.04
	1	26	0.90	0.04
	2	1	0.71	0.03
	2	6	0.50	0.03
	2	11	0.27	0.04
	2	16	0.26	0.04
	2	21	0.27	0.04
	2	26	0.38	0.04
	3	1	0.25	0.03
	3	6	0.11	0.04
	3	11	0.18	0.05
	3	16	0.38	0.04
	3	21	0.12	0.03
	3	26	0.16	0.04
	4	1	0.23	0.04
	4	6	0.13	0.05
	4	11	0.33	0.04
	4	16	0.29	0.03
	4	21	0.21	0.03
	4	26	0.20	0.03
	5	1	0.16	0.05
	5	6	0.16	0.04
	5	11	0.43	0.05
	5	16	0.35	0.04
	5	21	0.16	0.04

Table 5.51-1. continued

Station	Substation	Depth (cm)	Salinity	
			Summer 2001	Winter 2002
Black River (continued)	5	26	0.22	0.05
	6	1	---	0.05
	6	6	0.37	0.04
	6	11	0.25	0.04
	6	16	0.26	0.04
	6	21	0.16	0.03
	6	26	0.18	0.04
Smith Creek P11	1	1	2.59	7.44
	1	6	0.16	8.96
	1	11	4.15	8.96
	1	16	4.81	8.42
	1	21	5.16	7.65
	1	26	5.44	6.98
	2	1	5.35	0.00
	2	6	4.57	6.00
	2	11	5.17	6.18
	2	16	5.28	6.85
	2	21	4.86	6.82
	2	26	4.63	6.62
	3	1	2.11	6.02
	3	6	3.00	7.85
	3	11	3.51	8.50
	3	16	4.74	9.33
	3	21	4.63	9.57
	3	26	4.50	9.91
	4	1	2.59	6.89
	4	6	3.95	9.18
	4	11	4.97	9.88
	4	16	5.79	9.81
	4	21	5.90	9.67
	4	26	5.60	9.77
	5	1	2.50	5.62
	5	6	3.23	5.09
	5	11	3.40	4.12
	5	16	3.31	3.90
	5	21	3.50	4.04
	5	26	3.61	4.32
	6	1	1.17	1.92
	6	6	1.39	4.89
	6	11	1.08	7.01
	6	16	1.14	7.72
	6	21	---	8.59
	6	26	2.11	9.09

Table 5.51-1. continued

Station	Substation	Depth (cm)	Salinity Summer 2001	Salinity Winter 2002
Rat Island	1	1	0.93	3.40
P12	1	6	1.19	2.70
	1	11	1.11	2.77
	1	16	1.22	4.15
	1	21	1.11	5.21
	1	26	1.16	5.70
	2	1	0.58	1.06
	2	6	0.99	3.25
	2	11	1.41	4.44
	2	16	1.63	4.81
	2	21	1.54	5.14
	2	26	---	5.21
	3	1	0.55	0.79
	3	6	0.39	3.73
	3	11	0.48	4.84
	3	16	0.43	4.62
	3	21	0.40	4.20
	3	26	0.52	3.82
	4	1	0.49	0.29
	4	6	1.28	0.91
	4	11	0.49	1.54
	4	16	0.54	1.55
	4	21	0.67	1.42
	4	26	0.69	1.64
	5	1	0.34	0.21
	5	6	0.25	0.53
	5	11	0.31	2.09
	5	16	0.29	2.56
	5	21	0.32	2.53
	5	26	0.26	2.56
	6	1	---	---
	6	6	0.08	---
	6	11	0.13	0.22
	6	16	0.30	0.16
	6	21	0.27	0.17
	6	26	0.09	0.18
Fishing Creek	1	1	---	0.02
P13	1	6	---	0.38
	1	11	0.49	1.04
	1	16	0.45	1.94
	1	21	0.39	2.61
	1	26	0.66	2.80
	2	1	0.29	0.32
	2	6	0.23	0.49

Table 5.51-1. continued

Station	Substation	Depth (cm)	Salinity	
			Summer 2001	Winter 2002
Fishing Creek	2	11	0.26	0.85
(continued)	2	16	0.42	1.39
	2	21	1.98	1.62
	2	26	0.30	1.63
	3	1	0.71	1.09
	3	6	0.57	1.14
	3	11	0.36	1.20
	3	16	0.45	1.24
	3	21	0.52	1.18
	3	26	0.53	1.09
	4	1	0.37	0.57
	4	6	0.58	0.83
	4	11	0.21	1.07
	4	16	0.55	1.21
	4	21	0.24	1.23
	4	26	0.32	1.27
	5	1	0.28	---
	5	6	0.19	0.69
	5	11	0.40	0.75
	5	16	0.30	0.81
	5	21	0.44	0.79
	5	26	0.42	---
	6	1	0.39	0.05
	6	6	0.36	0.46
	6	11	0.27	0.02
	6	16	0.45	0.02
	6	21	0.39	0.02
	6	26	0.16	0.02
Prince George	1	1	0.21	0.13
P14	1	6	0.16	0.14
	1	11	0.62	0.17
	1	16	0.27	0.15
	1	21	0.20	0.14
	1	26	0.33	0.16
	2	1	0.13	0.12
	2	6	0.20	0.15
	2	11	0.34	0.18
	2	16	0.22	0.19
	2	21	0.51	0.21
	2	26	0.30	0.24
	3	1	0.28	0.11
	3	6	0.33	0.20
	3	11	0.20	0.31
	3	16	0.34	0.42

Table 5.51-1. continued

Station	Substation	Depth (cm)	Salinity	
			Summer 2001	Winter 2002
Prince George (continued)	3	21	0.22	0.44
	3	26	0.16	0.47
	4	1	0.21	0.14
	4	6	0.18	0.29
	4	11	0.31	0.38
	4	16	0.16	0.52
	4	21	0.14	0.51
	4	26	0.25	0.53
	5	1	0.55	0.15
	5	6	0.26	0.43
	5	11	0.20	0.53
	5	16	0.30	0.57
	5	21	0.26	0.50
	5	26	0.41	0.47
	6	1	0.29	0.19
	6	6	0.30	0.22
	6	11	0.16	0.23
	6	16	0.25	0.20
	6	21	0.14	0.17
	6	26	0.52	0.13

Table 5.51-2. Classification of Sites. Site classifications are as follows: Methanogenic I, Sulfate Reducing II, Methanogenic with evidence of past sulfate reduction I*, Sulfate reducing non-seawater source of sulfate II*.

Station	Substation	Depth (cm)	Classification Winter 2000	Winter 2001	Winter 2002	Summer 2000	Summer 2001
Town Creek P3	1	1	---	II	II	II	II
	1	6	---	II	II	II	II
	1	11	---	II	II	II	II
	1	16	---	I*	II	II	II
	1	21	---	I*	II	II	II
	1	26	I*	I*	II	I*	II
	2	1	II	II	II	II	II
	2	6	II	II	II	II	II
	2	11	I*	II	II	II	II
	2	16	I	II	II	II	II
	2	21	I*	II	II	II	II
	2	26	I*	II	II	II	II
	3	1	II	I	II	II	II
	3	6	I	II	II	II	II
	3	11	I	II	II	II	II
	3	16	I*	I*	II	II	II
	3	21	I*	II	II	II	II
	3	26	I*	II	II	II	II
	4	1	I	II	II	II	II
	4	6	I*	I*	II	II	II
	4	11	II	I*	II	II	II
	4	16	II	I*	II	II	II
	4	21	II	II	II	II	II
	4	26	II	II	II	II	II
	5	1	---	II	II	II	II
	5	6	I	II	II	II	II
	5	11	I	II	II	II	II
	5	16	II	II	II	II	II
	5	21	---	II	II	II	II
	5	26	II	II	II	II	II
	6	1	II	II	II	II	II
	6	6	II	II	II	II	II
	6	11	II	II	II	II	II
	6	16	II	II	II	II	II
	6	21	II	II	II	II	II
	6	26	II	II	II	I*	II

Table 5.51-2. continued

Station	Substation	Depth (cm)	Classification				
			Winter 2000	Winter 2001	Winter 2002	Summer 2000	Summer 2001
Eagle Island	1	1	---	II	II	II	II
P6	1	6	---	II	II	II	II
	1	11	---	II	II	II	II
	1	16	I	II	II	II	II
	1	21	I	II	II	II	II
	1	26	I*	II	II	II	II
	2	1	I	II	II	II	II
	2	6	I	II	II	II	II
	2	11	---	II	II	II	II
	2	16	---	II	II	II	I*
	2	21	I	II	II	II	I*
	2	26	I	II	II	II	I*
	3	1	I	II	II	I*	II
	3	6	---	II	II	I*	I*
	3	11	I*	II	II	I*	I*
	3	16	I*	I*	II	I*	I*
	3	21	I*	II	II	I*	I*
	3	26	II	II	II	I*	I*
	4	1	I	II	II	II	II
	4	6	I*	II	II	II	I*
	4	11	I*	II	II	II	I*
	4	16	II	I*	II	II	I*
	4	21	I*	II*	II	II	I*
	4	26	I*	II	II	I*	I*
	5	1	I	II	II	II	I*
	5	6	I*	II	I*	I*	I*
	5	11	I	II	I*	II	I*
	5	16	I*	II	I*	I*	I*
	5	21	I*	II	II	I*	I*
	5	26	I*	II	I*	I*	I*
	6	1	I	I*	I*	II	I*
	6	6	I*	I*	I*	I*	I*
	6	11	I	I*	I*	---	I*
	6	16	I	I*	I*	II	I*
	6	21	I	I*	I*	I*	I*
	6	26	I	I*	I*	I*	I*
Indian Creek	1	1	I	I	I	II	II
P7	1	6	I	I	I	II	II
	1	11	I	I	I	II	II
	1	16	---	I	I	II	II
	1	21	I	I	I	II	II
	1	26	I	I	I	I	I*

Table 5.51-2. continued

Station	Substation	Depth (cm)	Classification Winter 2000	Winter 2001	Winter 2002	Summer 2000	Summer 2001
Indian Creek (continued)	2	1	I	I	I*	I	II
	2	6	I	I	I*	I	I
	2	11	I	I	I*	I	I
	2	16	I	I	I*	I	I*
	2	21	I*	I	I*	I	I*
	2	26	I*	I	I*	I	I
	3	1	I	I	I	II	II
	3	6	I*	I	I	II	I
	3	11	I*	I	I*	I	I*
	3	16	I	I	I*	I	I
	3	21	I*	I	I*	II	I
	3	26	I	I	I*	I	II
	4	1	I	I	I	I	I
	4	6	I	I	I	II	I
	4	11	I	I	I	II	I
	4	16	I*	I	I	I	I
	4	21	I*	I	I	I	I
	4	26	I	I	I	I	I
	5	1	I	I	I	II	I
	5	6	I	I	I	I	I
	5	11	I	I	I	II	I
	5	16	I*	I	I	II	---
	5	21	I	I	I	I	I*
	5	26	I*	I	I	I	I
	6	1	I	I	I	II	---
	6	6	I	I	I	I	---
	6	11	I	I	I	I	I
	6	16	I	I	I	I	I
	6	21	I	I	I	I	---
	6	26	II*	I	I	II	I
Dollisons Landing P8	1	1	---	II*	I	I	
	1	6	I	II*	II*	II*	II
	1	11	II	II*	II*	II*	II
	1	16	I	II*	II*	II*	II
	1	21	I*	II	II*	II	I
	1	26	II*	II*	I	II	I
	2	1	---	I	I	II*	II
	2	6	---	I	I	II	I
	2	11	II	I	I	I	II
	2	16	II	I	I	I	I*
	2	21	I	I	I	I	II
	2	26	I	I	I	I	I

Table 5.51-2. continued

Station	Substation	Depth (cm)	Classification Winter 2000	Winter 2001	Winter 2002	Summer 2000	Summer 2001
Dollisons Landing (continued)	3	1	II	I	I	II	I
	3	6	I	I	I	I	
	3	11	II*	II*	I	I	I
	3	16	I	II*	I	I	I
	3	21	II	I	I	I	I
	3	26	I	I	I	I	II
	4	1	II	I	I	I	I
	4	6	I	I	I	I	I
	4	11	I*	I	I	I	II
	4	16	---	I	I	I	I
	4	21	---	I	I	I	II
	4	26	I	I	I	I	II
	5	1	I	I	I	I	I
	5	6	II	I	I	I	I
	5	11	---	I	I	I	I
	5	16	II	I	I	I	I*
	5	21	I	II*	I	I	II
	5	26	II	I	I	I	II
	6	1	I*	I	I	I	I
	6	6	I	I	I	I	I*
	6	11	II*	I	I*	I	I*
	6	16	II	I	I	I	I*
	6	21	---	I	I	I	I
	6	26	I	I	I	I	I
Black River P9	1	1	---	I	I	I	---
	1	6	I	I	I	---	---
	1	11	I	I	I	I	---
	1	16	I	I	I	I	---
	1	21	I	II	I	II	---
	1	26	I*	II	I	I	II
	2	1	I	II*	I	I	I*
	2	6	I	II*	I	I	I*
	2	11	I	I	I	I	I
	2	16	I*	I	I	I	I
	2	21	I	II	I	I	I
	2	26	I	I	I	I	I*
	3	1	I	II*	I	I	II
	3	6	I	II*	I	I	II*
	3	11	I	II*	I	I	I
	3	16	I	I	I	I	I
	3	21	I	II	I	I	I
	3	26	I	II*	I	I	I

Table 5.51-2. continued

Station	Substation	Depth (cm)	Classification				
			Winter 2000	Winter 2001	Winter 2002	Summer 2000	Summer 2001
Black River (continued)	4	1	I	II*	I	I	II
	4	6	I*	I	I	II	II*
	4	11	I*	II*	I	I	II
	4	16	I*	II*	I	I	I
	4	21	I*	II*	I	I	I
	4	26	I*	II*	I	I	I
	5	1	I*	II*	I	II*	II*
	5	6	I	II*	I	II	II
	5	11	I	II*	I	I	II
	5	16	I*	II*	I	I	I
	5	21	I*	II*	I*	II	I
	5	26	I*	II*	I	II	I
	6	1	I	I	I	II*	---
	6	6	I	I	I	II*	II
	6	11	I*	I	I	II*	I
	6	16	I*	I	I	I	I*
	6	21	I	II*	I	I	I
	6	26	I	II*	I	I	I
Smith Creek P11	1	1	I	II	II	II	II
	1	6	I*	I*	II	II	I*
	1	11	---	II	II	---	II
	1	16	I*	II	II	II	II
	1	21	I*	II	II	---	II
	1	26	---	II	II	---	II
	2	1	II	II	---	II	II
	2	6	I*	II	II	---	I*
	2	11	I*	II	II	II	II
	2	16	I*	II	II	II	II
	2	21	I*	II	II	II	II
	2	26	---	II	II	II	II
	3	1	---	II	II	II	II
	3	6	I*	II	II	II	II
	3	11	I*	II	II	II	II
	3	16	I*	II	II	II	II
	3	21	I*	II	II	II	II
	3	26	I*	II	II	II	II
	4	1	I	II	II	II	II
	4	6	II	I	II	II	II
	4	11	II	II	II	II	II
	4	16	II	II	II	II	II
	4	21	II	II	II	II	II
	4	26	II	II	II	II	II

Table 5.51-2. continued

Station	Substation	Depth (cm)	Classification				
			Winter 2000	Winter 2001	Winter 2002	Summer 2000	Summer 2001
Smith Creek	5	1	II	II	II	II	I*
(continued)	5	6	II	II	II	II	II
	5	11	I*	II	II	II	II
	5	16	I*	II	II	II	II
	5	21	I*	II	II	II	II
	5	26	---	II	II	II	II
	6	1	---	II	II	II	II
	6	6	---	II	II	II	I*
	6	11	---	II	II	II	I*
	6	16	---	II	II	II	I*
	6	21	---	II	II	II	---
	6	26	---	II	II	II	II
Rat Island	1	1	---	II	II	II	II
P12	1	6	---	II	II	II	II
	1	11	I*	II	II	II	II
	1	16	I*	II	II	II	II
	1	21	I*	II	II	II	II
	1	26	I*	II	II	I	II
	2	1	I*	II	II	II	I*
	2	6	I*	I	II	II	I*
	2	11	I*	II	II	II	I*
	2	16	I*	II	II	II	II
	2	21	I*	II	II	II	II
	2	26	I*	II	II	I*	---
	3	1	II	II	II	II	II
	3	6	I	II	II	II	I
	3	11	I*	II	II	II	I
	3	16	I	II	II	II	I
	3	21	I	II	II	II	I*
	3	26	I	II	II	II	I*
	4	1	I*	II	II	II	I*
	4	6	I*	I*	II	I*	II
	4	11	I*	I*	II	I*	I*
	4	16	I*	I*	II	II	I*
	4	21	I*	I*	II	II	I*
	4	26	I*	I*	II	I*	I*
	5	1	I	II	II	II	I
	5	6	I	I*	I	II	I
	5	11	I	I*	II	I	I*
	5	16	I	I*	II	II	I*
	5	21	I	I*	I*	II	I*
	5	26	I	I*	I*	I*	I*

Table 5.51-2. continued

Station	Substation	Depth (cm)	Classification Winter 2000	Winter 2001	Winter 2002	Summer 2000	Summer 2001
Rat Island (continued)	6	1	I	I	---	I	---
	6	6	I	I	---	I	I
	6	11	I	I	II	I	I
	6	16	I	II	II	I	I*
	6	21	I	I	II	I	I
	6	26	I	I	II	I	I
Fishing Creek P13	1	1	II	II	I	II	---
	1	6	II	II	I	II	---
	1	11	I	II	II	II	I*
	1	16	I	II	II	II	II
	1	21	I	II	II	II	I*
	1	26	I	II	II	I*	II
	2	1	---	II	I	II	I
	2	6	I	II	II	II	I
	2	11	I	II	II	II	I
	2	16	I	I	II	II	II
	2	21	I*	I	II	II	II
	2	26	I*	I	II	I*	II
	3	1	I	I	II	II	II
	3	6	I	I	II	I	I*
	3	11	I*	I	II	II	I*
	3	16	I	I	II	II	I*
	3	21	I*	I	II	II	II
	3	26	I	II	II	I	I*
	4	1	II*	II	II	I	I
	4	6	I	II	II	I	II
	4	11	I	II	II	I	I
	4	16	I	II	II	I	I
	4	21	I	I	II	I	I
	4	26	I	I	II	I	I
	5	1	I	I	---	II	I
	5	6	I	I	II	II	I
	5	11	I	I	II	II	I
	5	16	I	I	II	II	I
	5	21	I	I	I*	II	II
	5	26	I	I	---	II	I
	6	1	II	I	I	I	II
	6	6	I*	I	I*	II*	I
	6	11	II	I	I	I	I
	6	16	---	I	I	II	II
	6	21	II	I	I	I	I*
	6	26	I	I	I	I	I

Table 5.51-2. continued

Station	Substation	Depth (cm)	Classification				
			Winter 2000	Winter 2001	Winter 2002	Summer 2000	Summer 2001
Prince George	1	1	I	II*	II*	I	I
P14	1	6	I	I	II*	I	I
	1	11	I	I	II	I	I*
	1	16	I	I	II	I	I
	1	21	I	I	II	I	I
	1	26	I	I	II*	I	I*
	2	1	I	I	II*	I	I
	2	6	I	I	II*	I	I
	2	11	I	I	II*	I	I
	2	16	I	II	II*	I	I
	2	21	I	I*	II*	I	I*
	2	26	I*	I	II	I	I*
	3	1	II	I	II*	I	I
	3	6	II	I	II*	I	II*
	3	11	I	I	II	I	I
	3	16	I	I	II*	I	I*
	3	21	I	I	II	I	I
	3	26	I	I	II	I	I
	4	1	I	I	II*	I	I
	4	6	I	II*	II*	I	I
	4	11	I	I	II	I*	I
	4	16	I	I	II*	I	I
	4	21	I	I	II	I	I
	4	26	I	I	II	I	I
	5	1	I	I	II	I	II
	5	6	I	I	II*	II	II
	5	11	I	I	II	I	I
	5	16	I	II	II	I	I
	5	21	I	I	II	I	I
	5	26	I	I	II	I	I*
	6	1	II*	II	II*	I	I
	6	6	I	I	II	I	I
	6	11	I	I	II	I	I
	6	16	I	I	II	I	I
	6	21	I	I	I	I	I
	6	26	I	I	I	I	II

Table 5.51-3. Methane Concentrations of Sites. Porewater methane concentrations are µM.

Station	Substation	Depth (cm)	Methane	
			Summer 2001	Winter 2002
Town Creek P3	1	1	13	0
	1	6	54	1
	1	11	90	6
	1	16	102	9
	1	21	125	5
	1	26	151	6
	2	1	53	2
	2	6	136	10
	2	11	24	17
	2	16	17	36
	2	21	17	34
	2	26	30	NC
	3	1	4	1
	3	6	34	32
	3	11	55	75
	3	16	78	123
	3	21	73	219
	3	26	77	213
	4	1	137	9
	4	6	184	44
	4	11	207	200
	4	16	193	329
	4	21	204	298
	4	26	213	280
	5	1	110	81
	5	6	242	125
	5	11	247	123
	5	16	160	121
	5	21	193	165
	5	26	239	114
	6	1	78	NC
	6	6	131	NC
	6	11	156	145
	6	16	169	167
	6	21	169	181
	6	26	102	116

Table 5.51-3. continued

Station	Substation	Depth (cm)	Methane	
			Summer 2001	Winter 2002
Eagle Island P6	1	1	22	1
	1	6	137	1
	1	11	211	2
	1	16	234	7
	1	21	250	33
	1	26	203	53
	2	1	124	1
	2	6	108	2
	2	11	126	3
	2	16	117	31
	2	21	162	27
	2	26	180	54
	3	1	153	1
	3	6	155	8
	3	11	143	31
	3	16	121	35
	3	21	182	62
	3	26	179	131
	4	1	37	11
	4	6	205	26
	4	11	189	19
	4	16	187	25
	4	21	139	27
	4	26	146	32
	5	1	95	78
	5	6	109	157
	5	11	101	198
	5	16	115	256
	5	21	157	179
	5	26	140	200
	6	1	150	NC
	6	6	196	185
	6	11	176	405
	6	16	191	556
	6	21	143	5297
	6	26	166	370

Table 5.51-3. continued

Station	Substation	Depth (cm)	Methane	
			Summer 2001	Winter 2002
Indian Creek P7	1	1	1	0
	1	6	1	0
	1	11	2	1
	1	16	8	3
	1	21	38	6
	1	26	81	11
	2	1	63	14
	2	6	127	107
	2	11	199	202
	2	16	291	344
	2	21	334	373
	2	26	211	340
	3	1	17	51
	3	6	28	151
	3	11	220	188
	3	16	422	225
	3	21	403	218
	3	26	302	248
	4	1	107	16
	4	6	185	85
	4	11	112	88
	4	16	113	104
	4	21	122	101
	4	26	179	149
	5	1	52	7
	5	6	36	23
	5	11	40	23
	5	16	70	34
	5	21	118	50
	5	26	213	103
	6	1	0	8
	6	6	3	14
	6	11	12	19
	6	16	22	36
	6	21	46	56
	6	26	86	95

Table 5.51-3. continued

Station	Substation	Depth (cm)	Methane	
			Summer 2001	Winter 2002
Dollisons Landing P8	1	1	0	1
	1	6	1	4
	1	11	11	17
	1	16	44	14
	1	21	109	14
	1	26	116	10
	2	1	1	83
	2	6	90	113
	2	11	106	147
	2	16	174	129
	2	21	113	143
	2	26	93	121
	3	1	38	77
	3	6	94	102
	3	11	130	105
	3	16	126	106
	3	21	144	60
	3	26	NC	81
	4	1	7	132
	4	6	169	150
	4	11	204	151
	4	16	145	177
	4	21	250	197
	4	26	96	206
	5	1	82	80
	5	6	140	80
	5	11	185	87
	5	16	130	91
	5	21	180	96
	5	26	NC	96
	6	1	3	19
	6	6	72	51
	6	11	136	67
	6	16	225	67
	6	21	250	93
	6	26	115	116

Table 5.51-3. continued

			Methane	
Station	Substation	Depth (cm)	Summer 2001	Winter 2002
Black River	1	1	1	5
P9	1	6	124	27
	1	11	330	103
	1	16	321	183
	1	21	277	244
	1	26	231	279
	2	1	21	3
	2	6	160	8
	2	11	197	31
	2	16	148	63
	2	21	183	64
	2	26	100	122
	3	1	1	5
	3	6	25	21
	3	11	123	51
	3	16	172	72
	3	21	225	64
	3	26	254	69
	4	1	1	19
	4	6	1	141
	4	11	9	136
	4	16	130	289
	4	21	174	379
	4	26	215	361
	5	1	1	4
	5	6	1	30
	5	11	2	45
	5	16	69	76
	5	21	218	122
	5	26	211	87
	6	1	NC	2
	6	6	4	16
	6	11	159	54
	6	16	278	160
	6	21	342	211
	6	26	265	272

Table 5.51-3. continued

Station	Substation	Depth (cm)	Methane	
			Summer 2001	Winter 2002
Smith Creek	1	1	3	3
P11	1	6	7	9
	1	11	14	23
	1	16	22	24
	1	21	26	92
	1	26	30	104
	2	1	79	NC
	2	6	61	NC
	2	11	85	81
	2	16	97	175
	2	21	92	200
	2	26	140	6
	3	1	36	3
	3	6	90	18
	3	11	118	56
	3	16	187	107
	3	21	129	211
	3	26	174	199
	4	1	130	7
	4	6	196	NC
	4	11	262	290
	4	16	191	385
	4	21	233	408
	4	26	188	312
	5	1	183	19
	5	6	210	46
	5	11	NC	92
	5	16	123	69
	5	21	151	63
	5	26	71	52
	6	1	114	1
	6	6	228	3
	6	11	366	15
	6	16	235	NC
	6	21	NC	1
	6	26	220	18

Table 5.51-3. continued

Station	Substation	Depth (cm)	Methane	
			Summer 2001	Winter 2002
Rat Island	1	1	160	1
P12	1	6	168	0
	1	11	121	10
	1	16	122	10
	1	21	158	8
	1	26	142	7
	2	1	196	1
	2	6	199	12
	2	11	210	55
	2	16	209	61
	2	21	205	101
	2	26	83	135
	3	1	4	2
	3	6	25	32
	3	11	45	161
	3	16	61	231
	3	21	112	195
	3	26	126	269
	4	1	NC	1
	4	6	210	5
	4	11	216	276
	4	16	78	313
	4	21	194	182
	4	26	212	248
	5	1	97	1
	5	6	164	1
	5	11	160	76
	5	16	157	168
	5	21	343	218
	5	26	194	249
	6	1	47	NC
	6	6	86	NC
	6	11	124	0
	6	16	143	1
	6	21	108	1
	6	26	75	1

Table 5.51-3. continued

Station	Substation	Depth (cm)	Methane	
			Summer 2001	Winter 2002
Fishing Creek P13	1	1	NC	1
	1	6	0	2
	1	11	2	2
	1	16	14	2
	1	21	80	3
	1	26	207	7
	2	1	70	2
	2	6	94	2
	2	11	130	21
	2	16	160	127
	2	21	157	246
	2	26	181	261
	3	1	131	5
	3	6	149	23
	3	11	140	52
	3	16	149	91
	3	21	NC	138
	3	26	NC	183
	4	1	1	1
	4	6	8	2
	4	11	16	2
	4	16	25	2
	4	21	41	8
	4	26	72	10
	5	1	36	1
	5	6	57	4
	5	11	60	9
	5	16	64	14
	5	21	75	18
	5	26	84	NC
	6	1	21	NC
	6	6	31	2
	6	11	40	2
	6	16	50	2
	6	21	54	3
	6	26	44	3

Table 5.51-3. continued

Station	Substation	Depth (cm)	Methane	
			Summer 2001	Winter 2002
Prince George P14	1	1	57	1
	1	6	137	0
	1	11	142	0
	1	16	163	2
	1	21	182	3
	1	26	195	1
	2	1	90	0
	2	6	130	1
	2	11	139	3
	2	16	79	48
	2	21	205	57
	2	26	118	77
	3	1	16	0
	3	6	67	0
	3	11	89	0
	3	16	154	5
	3	21	255	28
	3	26	220	30
	4	1	87	0
	4	6	185	1
	4	11	172	1
	4	16	206	39
	4	21	175	92
	4	26	195	108
	5	1	14	0
	5	6	122	4
	5	11	132	25
	5	16	150	77
	5	21	206	84
	5	26	170	187
	6	1	241	NC
	6	6	284	151
	6	11	239	126
	6	16	236	278
	6	21	239	311
	6	26	277	362

5.52 Indian Creek (P7)

Porewaters of Indian Creek were essentially fresh in Winter 2000 and 2001, with salinities ranging from 0.04 – 0.2 ppt and 0.1 – 0.4 ppt during Summer of 2000 (Hackney et al. 2001). During the Summer of 2001 and the Winter of 2002 there were no obvious changes (Table 5.51-1). The previous winter classifications were exclusively methanogenic due to the low salinities, with the late Winter sampling of 2000 showing some evidence of past sulfate reduction (Table 5.51-2). Sampling during Winter of 2002 also found some evidence of past sulfate reduction indicating that salinities may have been higher during the fall. Some substations salinity levels were sufficient for sulfate reduction in Summer 2000 (Hackney et al. 2001). During Summer of 2001, sulfate reduction was less prevalent (Table 5.52-1), with more sites showing evidence of past sulfate reduction. This was particularly evident at sites close to the upland edge. This suggests slightly fresher conditions and a lower supply of sulfate during the Spring of 2001 compared with the Spring of 2000. This type of analysis displays the strength of the geochemical classification scheme, which provides a sensitive method to detect geochemical conditions at a site even if sampling did not occur during the specific time that sulfate was being consumed.

Table 5.52-1. Sulfate Concentrations of Sites. Porewater sulfate concentrations are µM. A --- indicates no data.

Station	Substation	Depth (cm)	Sulfate Summer 2001	Sulfate Winter 2002
Town Creek	1	1	892	350
P3	1	6	837	421
	1	11	354	685
	1	16	106	1075
	1	21	55	1443
	1	26	110	1664
	2	1	863	1106
	2	6	737	1282
	2	11	644	1282
	2	16	639	1046
	2	21	480	1349
	2	26	429	2352
	3	1	507	795
	3	6	898	1117
	3	11	639	1766
	3	16	577	3789
	3	21	999	4338
	3	26	1097	4988
	4	1	355	879
	4	6	305	850
	4	11	212	542
	4	16	333	451

Table 5.52-1. continued

Station	Substation	Depth (cm)	Sulfate Summer 2001	Sulfate Winter 2002
Town Creek (continued)	4	21	403	412
	4	26	444	396
	5	1	644	1468
	5	6	308	1430
	5	11	270	1615
	5	16	286	1313
	5	21	271	1180
	5	26	684	1201
	6	1	781	1302
	6	6	438	3339
	6	11	350	870
	6	16	322	972
	6	21	1285	1084
	6	26	330	1196
Eagle Island P6	1	1	2283	1776
	1	6	849	1968
	1	11	668	2203
	1	16	634	2066
	1	21	741	1873
	1	26	407	2157
	2	1	991	2390
	2	6	547	3283
	2	11	460	3409
	2	16	151	3439
	2	21	231	3154
	2	26	143	2726
	3	1	427	1745
	3	6	165	1710
	3	11	149	1316
	3	16	111	1038
	3	21	229	646
	3	26	121	359
	4	1	871	1291
	4	6	279	1188
	4	11	130	1231
	4	16	119	1658
	4	21	112	1731
	4	26	122	1846
	5	1	163	447
	5	6	83	292
	5	11	82	117
	5	16	60	79
	5	21	92	448
	5	26	114	116

Table 5.52-1. continued

Station	Substation	Depth (cm)	Sulfate	
			Summer 2001	Winter 2002
Eagle Island (continued)	6	1	158	208
	6	6	156	84
	6	11	87	61
	6	16	221	36
	6	21	94	49
	6	26	98	39
Indian Creek P7	1	1	1745	107
	1	6	1087	72
	1	11	1490	98
	1	16	1283	108
	1	21	408	115
	1	26	236	128
	2	1	441	23
	2	6	298	16
	2	11	247	8
	2	16	224	22
	2	21	143	10
	2	26	252	13
	3	1	335	12
	3	6	232	9
	3	11	205	4
	3	16	168	4
	3	21	88	7
	3	26	371	5
	4	1	169	19
	4	6	245	9
	4	11	219	17
	4	16	171	15
	4	21	148	7
	4	26	170	9
	5	1	247	12
	5	6	151	2
	5	11	145	4
	5	16	---	4
	5	21	285	3
	5	26	209	5
	6	1	---	20
	6	6	---	13
	6	11	216	10
	6	16	294	10
	6	21	---	5
	6	26	134	6

Table 5.52-1. continued

Station	Substation	Depth (cm)	Sulfate	
			Summer 2001	Winter 2002
Dollisons	1	1	550	286
Landing P8	1	6	398	443
	1	11	372	417
	1	16	174	495
	1	21	222	360
	1	26	357	275
	2	1	261	43
	2	6	478	25
	2	11	223	57
	2	16	735	34
	2	21	207	25
	2	26	181	37
	3	1	---	50
	3	6	150	61
	3	11	153	124
	3	16	225	30
	3	21	426	18
	3	26	195	57
	4	1	210	56
	4	6	474	41
	4	11	257	20
	4	16	359	26
	4	21	369	17
	4	26	159	35
	5	1	221	31
	5	6	266	50
	5	11	230	15
	5	16	345	158
	5	21	339	20
	5	26	268	14
	6	1	244	37
	6	6	170	45
	6	11	268	21
	6	16	363	58
	6	21	323	31
	6	26	---	25
Black River	1	1	---	247
P9	1	6	---	158
	1	11	---	107
	1	16	---	95
	1	21	---	64
	1	26	305	57
	2	1	236	134
	2	6	136	127

Table 5.52-1. continued

Station	Substation	Depth (cm)	Sulfate	
			Summer 2001	Winter 2002
Black River	2	11	234	85
(continued)	2	16	184	44
	2	21	170	37
	2	26	184	382
	3	1	492	137
	3	6	392	85
	3	11	237	117
	3	16	248	63
	3	21	194	36
	3	26	150	43
	4	1	574	106
	4	6	508	102
	4	11	331	74
	4	16	295	35
	4	21	151	28
	4	26	124	26
	5	1	1278	219
	5	6	493	210
	5	11	354	132
	5	16	259	31
	5	21	156	20
	5	26	144	30
	6	1	---	241
	6	6	471	247
	6	11	174	95
	6	16	135	114
	6	21	128	97
	6	26	137	37
Smith Creek	1	1	827	6049
P11	1	6	67	7705
	1	11	1227	7006
	1	16	1910	5951
	1	21	1999	4412
	1	26	2194	3300
	2	1	815	---
	2	6	209	3777
	2	11	385	2868
	2	16	458	2972
	2	21	568	2928
	2	26	691	2660
	3	1	868	5167
	3	6	377	6893
	3	11	319	6288
	3	16	450	6178

Table 5.52-1. continued

Station	Substation	Depth (cm)	Sulfate	
			Summer 2001	Winter 2002
Smith Creek	3	21	672	6063
(continued)	3	26	550	6058
	4	1	415	4841
	4	6	406	6446
	4	11	437	5865
	4	16	413	5258
	4	21	611	5025
	4	26	902	5278
	5	1	166	3225
	5	6	322	2297
	5	11	526	1759
	5	16	734	1779
	5	21	665	2103
	5	26	553	2396
	6	1	418	1218
	6	6	229	3774
	6	11	288	4391
	6	16	201	5298
	6	21	---	6371
	6	26	309	6733
Rat Island	1	1	422	1095
P12	1	6	634	2493
	1	11	383	1905
	1	16	418	2613
	1	21	378	2925
	1	26	368	2478
	2	1	204	825
	2	6	175	2036
	2	11	217	2431
	2	16	355	2519
	2	21	354	2452
	2	26	---	2218
	3	1	486	672
	3	6	297	2600
	3	11	287	3043
	3	16	242	2830
	3	21	198	2448
	3	26	211	2187
	4	1	219	471
	4	6	856	502
	4	11	166	488
	4	16	281	427
	4	21	291	368
	4	26	272	959

Table 5.52-1. continued

Station	Substation	Depth (cm)	Sulfate	
			Summer 2001	Winter 2002
Rat Island	5	1	204	442
(continued)	5	6	187	287
	5	11	147	341
	5	16	146	319
	5	21	142	189
	5	26	110	147
	6	1	---	---
	6	6	87	---
	6	11	113	360
	6	16	104	300
	6	21	296	359
	6	26	84	523
Fishing Creek	1	1	---	54
P13	1	6	---	229
	1	11	226	515
	1	16	397	1072
	1	21	171	1697
	1	26	413	1886
	2	1	266	294
	2	6	214	376
	2	11	205	477
	2	16	378	512
	2	21	578	408
	2	26	331	302
	3	1	337	673
	3	6	251	632
	3	11	172	659
	3	16	193	603
	3	21	305	510
	3	26	223	432
	4	1	224	493
	4	6	521	500
	4	11	196	546
	4	16	294	557
	4	21	241	515
	4	26	257	512
	5	1	277	---
	5	6	161	361
	5	11	244	368
	5	16	159	339
	5	21	338	288
	5	26	279	---
	6	1	347	151
	6	6	244	119

Table 5.52-1. continued

Station	Substation	Depth (cm)	Sulfate	
			Summer 2001	Winter 2002
Fishing Creek (continued)	6	11	275	101
	6	16	322	96
	6	21	204	95
	6	26	189	119
Prince George P14	1	1	167	453
	1	6	113	635
	1	11	189	480
	1	16	141	459
	1	21	120	405
	1	26	142	514
	2	1	179	683
	2	6	268	922
	2	11	253	1279
	2	16	160	836
	2	21	186	782
	2	26	123	677
	3	1	287	566
	3	6	1957	880
	3	11	208	925
	3	16	153	1371
	3	21	138	559
	3	26	97	579
	4	1	201	636
	4	6	147	1027
	4	11	195	1011
	4	16	135	1961
	4	21	174	432
	4	26	175	503
	5	1	318	390
	5	6	339	1369
	5	11	243	851
	5	16	198	669
	5	21	172	439
	5	26	151	395
	6	1	158	599
	6	6	189	368
	6	11	211	348
	6	16	224	330
	6	21	139	171
	6	26	421	118

5.53 Dollisons Landing (P8)

Porewater of subsites at Dollisons Landing during the winters of 2000 and 2001, and the Summer of 2000 averaged around 0.1 ppt and with no obvious seasonal variation (Hackney et al. 2001). Salinity during the Winter of 2002 was lower (0.01-0.05), while markedly higher (0.1-1.0 ppt) during the Summer of 2001 (Table 5.51-1). During the winters of 2000 and 2001, small pockets of porewater sulfate concentrations approaching those required for sulfate reduction were observed at the creek-bank location (S1) and randomly distributed at the upland substations (Table 5.52-1). Winter 2002 classifications at this site show methanogenic conditions in all but the creek-bank locations reflecting fresher winter conditions and a lower salt supply to the uplands (Table 5.51-2).

Higher salinity during the Summer 2001 resulted in changed classifications of subsites compared to the previous summer. In Summer 2000, all subsites adjacent to uplands were essentially methanogenic (Table 5.51-2), but by Summer 2001, several upland substations were classified as sulfate reducing or methanogenic with evidence of past sulfate reduction. Higher salinity influenced the geochemistry of this site. Of the 36 Dollisons Landing's subsites sampled during the Summer 2001, 36% shifted to a higher salinity classification.

5.54 Black River (P9)

Porewaters of the Black River station during the previous years averaged 0.1 ppt salinity with no obvious seasonal variations. During Winter of 2002, there appears to be a slight freshening of the porewaters (0.02-0.06 ppt) and during the Summer of 2001, a slight increase in salinity (0.1-0.9 ppt) (Table 5.51-1). The geochemistry of this site, however, shows no obvious changes due to these small changes in salinity. During the summers, a mixture of methanogenic and sulfate reducing conditions were observed and during the winters the site was methanogenic (Table 5.51-2). The high seasonal variability in classifications previously observed at this site has not changed.

5.55 Smith Creek (P11)

Porewater salinity ranged from 0.5 – 5 ppt during winters of 2000 and 2001 to 2 – 8 ppt during Summer of 2000 (Hackney et al. 2001). While Summer 2001 salinities remain essentially the same (1-6 ppt), Winter 2002 salinities showed an increase (2-9 ppt) (Table 5.51-1) compared to the previous winters. Because of the high salinity at this station, it was previously classified as SR year round. Since the site is already classified as sulfate reducing, the increased salinity did not change the geochemical classification of this site even though a significant increase in winter salinity was observed (Table 5.51-2).

5.56 Rat Island (P12)

Vegetation along this transect is strongly transitional, from saline tolerant species near the river to salt intolerant species toward the upland boundary. Porewater salinity reflected the gradient in Summer of 2000 and the winters of 2000 and with higher salinity at substations near the river and almost freshwater conditions toward the uplands. Salinities ranged from 0.1 - 1 ppt during winters of 2000 and 2001 and 0.2 - 2 ppt during Summer of 2000 (Table 5.51-1). Because of the strong salinity gradient along the belt transect, this station contained both SR and M classifications during both summer and winter (Table 5.51-2). Salinity during Summer 2001 (0.1-1.5) was lower than the previous summer. Some sulfate reducing classifications in the near shore subsites were converted to methanogenic (11% of sites) with evidence of past sulfate reduction classification due to the lower sulfate supply while 42% of the Summer 2001 classifications displayed a shift towards a higher salinity classification. The opposite was true for changes observed in Winter 2002. Winter 2002 salinities (0.15-5 ppt) were higher than previous winters resulting in the conversion of many MPSR to SR systems. Of the 36 substations sampled during the Winter 2002, 28% displayed a shift towards a higher salinity classification while only 3% shifted towards fresher classifications.

5.57 Fishing Creek (P13)

Porewater salinities ranged from 0.1 - 0.2 ppt during winters of 2000 and 2001 to 0.2 - 5 ppt during Summer 2000. Because of the seasonal variations in salinity, the site was essentially a SR classification during summer with the exception of substation 4. Substation 4 is located in an ephemeral creek that acts as a conduit for both rain and riverwater (Table 5.51-2). Typically during winter, all substations are essentially an M classification with the exception of subsites near the river edge that receive the highest salinity floodwaters. Summer 2001 salinities (0.15-2 ppt) were slightly lower than the previous summer (Table 5.51-1) resulting in more methanogenesis and less sulfate reduction in the upland locations. Winter 2002 salinities, however, were an order of magnitude higher than those from the previous two winters resulting in a dramatic conversion of this site from a predominantly methanogenic system to a sulfate reducing one. Of the 36 substations sampled, 42% displayed a shift towards a higher salinity classification while 8% (mainly creek-bank locations) shifted towards fresher classifications.

5.58 Prince George Creek (P14)

All Prince George substations were classified as methanogenic in 2000-2001 due to its low year round chloride (Table 5.58-1) and salinities levels (0.1-0.2 ppt) (Table 5.51-1). Sulfate levels were well below those required for sulfate reduction (5.52-1). Slight seasonal variations were observed at this station with higher salinities during the summer; but the values were still too low to support sulfate reduction. Summer 2001 salinities (0.1-0.5 ppt) were very similar to the Summer of 2000 (Table 5.51-1) and therefore the geochemical classifications were essentially the same (Table 5.51-2). During the Winter of 2002, however, salinity almost doubled that previously reported for Winter in 2000 and 2001 (0.1-0.4 ppt). This resulted in a dramatic conversion of the site to a sulfate reducing system when 47% of the Prince George Creek substations displayed a shift towards a higher salinity classification.

Table 5.58-1. Chloride Concentrations of Sites. Chloride concentrations of porewaters in μM.

			Chloride	
Station	Substation	Depth (cm)	Summer 2001	Winter 2002
Town Creek	1	1	51877	5449
P3	1	6	73252	7275
	1	11	65029	27007
	1	16	57090	48052
	1	21	56598	66369
	1	26	57931	77135
	2	1	68952	66269
	2	6	70449	76683
	2	11	64737	76683
	2	16	72728	80928
	2	21	71744	87400
	2	26	73301	99082
	3	1	15708	12183
	3	6	43259	30805
	3	11	49256	51120
	3	16	61269	91050
	3	21	71719	111837
	3	26	77760	125695
	4	1	41697	24289
	4	6	41872	33667
	4	11	41061	38507
	4	16	43652	43870
	4	21	41144	42327
	4	26	43880	38897
	5	1	55507	51653
	5	6	47913	56730
	5	11	36720	57537
	5	16	39178	60333
	5	21	42703	58158
	5	26	47297	59624
	6	1	52957	41926
	6	6	59410	130247
	6	11	56842	67381
	6	16	49954	66822
	6	21	46064	70125
	6	26	46673	68208

Table 5.58-1. continued

Station	Substation	Depth (cm)	Chloride	
			Summer 2001	Winter 2002
Eagle Island	1	1	65060	30515
P6	1	6	70954	35513
	1	11	69907	42722
	1	16	67104	44088
	1	21	67628	60989
	1	26	49560	75330
	2	1	67213	53545
	2	6	55990	66879
	2	11	44308	69289
	2	16	33324	72236
	2	21	27857	69019
	2	26	21803	65890
	3	1	63755	47586
	3	6	28051	54790
	3	11	25152	55825
	3	16	27061	54828
	3	21	25227	49021
	3	26	27155	43758
	4	1	28680	50498
	4	6	28342	56196
	4	11	20778	57601
	4	16	21928	61764
	4	21	27011	58874
	4	26	23431	63906
	5	1	22552	33036
	5	6	20433	29690
	5	11	19344	22446
	5	16	19416	24587
	5	21	20536	29482
	5	26	19280	23416
	6	1	26264	25228
	6	6	26362	22645
	6	11	26992	24561
	6	16	25480	22944
	6	21	24809	23509
	6	26	25316	24475

Table 5.58-1. continued

Station	Substation	Depth (cm)	Chloride Summer 2001	Chloride Winter 2002
Indian Creek	1	1	50592	740
P7	1	6	51789	508
	1	11	35599	1018
	1	16	25809	1865
	1	21	12891	2475
	1	26	7940	3152
	2	1	8789	797
	2	6	4043	778
	2	11	4088	842
	2	16	7107	1239
	2	21	4632	1356
	2	26	3118	1424
	3	1	4368	244
	3	6	6918	226
	3	11	6491	214
	3	16	3983	140
	3	21	1735	249
	3	26	2685	206
	4	1	2110	241
	4	6	4056	163
	4	11	2620	191
	4	16	1909	314
	4	21	2643	133
	4	26	1556	123
	5	1	1900	155
	5	6	1703	52
	5	11	2064	53
	5	16	---	66
	5	21	9494	51
	5	26	3263	45
	6	1	---	334
	6	6	---	97
	6	11	2568	70
	6	16	8338	165
	6	21	---	121
	6	26	2675	86

Table 5.58-1. continued

Station	Substation	Depth (cm)	Chloride Summer 2001	Chloride Winter 2002
Dollisons	1	1	---	923
Landing P8	1	6	3678	701
	1	11	3139	947
	1	16	4647	1026
	1	21	3609	963
	1	26	4017	919
	2	1	4996	660
	2	6	4671	542
	2	11	6890	725
	2	16	8839	586
	2	21	17391	597
	2	26	4145	592
	3	1	2531	575
	3	6	---	723
	3	11	2787	702
	3	16	3099	555
	3	21	4304	534
	3	26	3759	616
	4	1	2798	572
	4	6	4173	572
	4	11	7083	453
	4	16	3386	591
	4	21	4877	388
	4	26	3313	572
	5	1	2116	459
	5	6	1904	402
	5	11	3967	337
	5	16	12163	780
	5	21	9622	430
	5	26	4238	344
	6	1	5909	520
	6	6	7593	680
	6	11	5644	674
	6	16	13933	612
	6	21	4565	627
	6	26	8417	527

Table 5.58-1. continued

Station	Substation	Depth (cm)	Chloride	
			Summer 2001	Winter 2002
Black River	1	1	---	1021
P9	1	6	---	541
	1	11	---	679
	1	16	---	643
	1	21	---	613
	1	26	14136	622
	2	1	11130	489
	2	6	7747	531
	2	11	4286	593
	2	16	4063	580
	2	21	4261	549
	2	26	5954	672
	3	1	3932	518
	3	6	1720	611
	3	11	2825	761
	3	16	5907	645
	3	21	1838	547
	3	26	2439	601
	4	1	3647	578
	4	6	2066	809
	4	11	5160	582
	4	16	4553	482
	4	21	3225	499
	4	26	3106	472
	5	1	2445	752
	5	6	2570	684
	5	11	6657	767
	5	16	5401	566
	5	21	2496	634
	5	26	3374	765
	6	1	---	795
	6	6	5818	664
	6	11	3948	602
	6	16	4066	667
	6	21	2428	538
	6	26	2809	577

Table 5.58-1. continued

Station	Substation	Depth (cm)	Chloride Summer 2001	Chloride Winter 2002
Smith Creek	1	1	40509	116226
P11	1	6	2541	140072
	1	11	64908	139938
	1	16	75216	131515
	1	21	80589	119522
	1	26	85064	109095
	2	1	83589	---
	2	6	71366	93741
	2	11	80760	96624
	2	16	82558	107030
	2	21	75957	106633
	2	26	72305	103461
	3	1	33030	93987
	3	6	46797	122638
	3	11	54913	132805
	3	16	74054	145740
	3	21	72368	149519
	3	26	70377	154830
	4	1	40405	107690
	4	6	61694	143431
	4	11	77666	154383
	4	16	90524	153319
	4	21	92212	151089
	4	26	87557	152636
	5	1	39018	87848
	5	6	50464	79548
	5	11	53048	64410
	5	16	51703	60906
	5	21	54707	63050
	5	26	56480	67471
	6	1	18352	29980
	6	6	21768	76388
	6	11	16949	109595
	6	16	17820	120630
	6	21	---	134186
	6	26	32894	141994

Table 5.58-1. continued

Station	Substation	Depth (cm)	Chloride	
			Summer 2001	Winter 2002
Rat Island	1	1	14563	53089
P12	1	6	18569	42181
	1	11	17374	43273
	1	16	19009	64854
	1	21	17362	81359
	1	26	18078	89075
	2	1	9136	16593
	2	6	15400	50859
	2	11	21999	69359
	2	16	25502	75188
	2	21	24098	80271
	2	26	---	81364
	3	1	8533	12371
	3	6	6082	58340
	3	11	7517	75577
	3	16	6762	72182
	3	21	6204	65667
	3	26	8155	59753
	4	1	7669	4482
	4	6	19945	14251
	4	11	7604	24088
	4	16	8466	24194
	4	21	10540	22215
	4	26	10764	25548
	5	1	5299	3257
	5	6	3934	8207
	5	11	4899	32728
	5	16	4484	40006
	5	21	4977	39509
	5	26	4087	40071
	6	1	---	---
	6	6	1296	---
	6	11	2057	3395
	6	16	4650	2575
	6	21	4212	2709
	6	26	1475	2792

Table 5.58-1. continued

Station	Substation	Depth (cm)	Chloride Summer 2001	Chloride Winter 2002
Fishing Creek	1	1	---	312
P13	1	6	---	6003
	1	11	7602	16185
	1	16	7006	30281
	1	21	6091	40799
	1	26	10353	43780
	2	1	4454	5057
	2	6	3659	7685
	2	11	4022	13321
	2	16	6511	21661
	2	21	30979	25250
	2	26	4663	25428
	3	1	11097	17071
	3	6	8924	17787
	3	11	5674	18809
	3	16	6972	19399
	3	21	8105	18435
	3	26	8226	16993
	4	1	5713	8957
	4	6	8994	12958
	4	11	3304	16684
	4	16	8540	18852
	4	21	3781	19146
	4	26	4968	19773
	5	1	4333	---
	5	6	2899	10735
	5	11	6245	11748
	5	16	4757	12633
	5	21	6805	12313
	5	26	6575	---
	6	1	6092	775
	6	6	5582	7119
	6	11	4284	380
	6	16	7042	338
	6	21	6151	258
	6	26	2488	385

Table 5.58-1. continued

Station	Substation	Depth (cm)	Chloride	
			Summer 2001	Winter 2002
Prince George	1	1	3253	2020
P14	1	6	2505	2123
	1	11	9756	2631
	1	16	4156	2317
	1	21	3102	2140
	1	26	5192	2548
	2	1	2029	1915
	2	6	3170	2411
	2	11	5304	2888
	2	16	3386	2913
	2	21	7902	3335
	2	26	4711	3783
	3	1	4416	1713
	3	6	5120	3156
	3	11	3063	4767
	3	16	5241	6544
	3	21	3483	6877
	3	26	2480	7327
	4	1	3308	2206
	4	6	2812	4467
	4	11	4807	5972
	4	16	2496	8094
	4	21	2227	7944
	4	26	3878	8317
	5	1	8525	2376
	5	6	3995	6690
	5	11	3197	8282
	5	16	4762	8841
	5	21	4102	7776
	5	26	6444	7360
	6	1	4564	2923
	6	6	4634	3420
	6	11	2544	3586
	6	16	3961	3170
	6	21	2185	2607
	6	26	8126	2108

6.0 BENTHIC INFAUNAL COMMUNITIES

6.1 Summary

A total of 134 recognizable taxa (including some higher groupings) have been collected during sampling in 1999, 2000, and 2001. The number has steadily decreased from 99 in 1999 to 60 in 2000 and 54 in 2001 likely related to a regional drought and increased river salinity. Species were representative of those found in mid-sized, river-dominated estuaries impacted by human activities. The six most common and widespread species were analyzed for patterns in space and time. In addition, 18 taxa were placed into six functional groups and examined for changes in time and space. Stations in Town Creek (P2, P3A, and P3B), Cape Fear River mainstem (P6, P7, and P8), and Northeast Cape Fear river stations (P11, P12, and P13) were analyzed separately.

Oligochaetes decreased in Town Creek from levels present during the initial survey in 1999, while tube dwelling functional groups (motile and sessile) increased. In the mainstem of the Cape Fear River some taxa, such as oligochaetes, varied in their abundance response among sampling periods with decreases at P8 (Dollisons Landing), and increases at P6 (Eagle Island) during the three years of the study. Tube dwelling functional groups generally increased in this part of the estuary. Few time-related changes in functional groups or species were found in the Northeast Cape Fear River. Impacts from the harbor and river widening project, if any, are not apparent yet. A regional drought and larval life histories complicate the few patterns observed.

6.2 Background

As part of the U.S Army Corps of Engineers project to deepen and widen the Cape Fear River from the mouth of the river to Wilmington Harbor, benthic infaunal communities have been monitored at stations predicted to have the greatest potential impacts. The focus has been on the fringing wetlands that border the river and represent critical habitat and nursery areas for a number of commercially and ecologically important taxa. Changes in the composition and abundance of the organisms living directly on or within the sediments of the fringing marsh (infauna) may accompany any change in salinity and or tidal currents. Because of limited dispersal and mobility of the organisms comprising this community, possible impacts to this faunal group may show longer response times than would be expected from other more motile groups. Infauna (as a group) have a relatively sedentary nature (with movement patterns on the order of meters following settlement) and occupy an intermediate trophic position (with many groups being primary consumers or facultative detritivores) that is key to supporting juveniles of many fish species. The infaunal community also includes a variety of taxa that represent different life history strategies that may respond differently to channel modifications.

While many benthic species are resilient to short-term disturbances, long-term change associated with fluctuations in water quality, changes in tidal inundation or amplitude, changes in current flow or local hydrology, changes in salinity regime, or other physical factors may alter species composition and abundance. The monitoring effort reported here is focused on evaluating long-term trends in benthic community composition and abundance with a long range goal of separating natural variation, due primarily to inter-annual variability (normal fluctuations in community composition and abundance across years and seasons), from potential effects due to deepening and widening the Cape Fear River up to Wilmington harbor. Current working hypotheses are: 1) Changes in salinity and /or tidal amplitude and/or inundation period will lead to changes in intertidal and shallow subtidal benthic community composition and abundance patterns. If changes in tidal amplitude or salinity occur, there will be a shift in faunal dominance patterns that reflect environmental changes. 2) If alterations of the Cape Fear River shipping channel change estuarine flow characteristics, a change in community composition and function reflecting altered recruitment patterns may follow.

Polychaetes, oligochaetes, amphipods, and insect larvae are the dominant taxonomic groups of the Cape Fear estuary with a characteristic subset of each of these groups consistently present along the estuarine gradient (with the exception of insects that are freshwater to oligohaline). Bivalves and gastropods, though common in other estuaries, are not abundant in the Cape Fear system and are only represented by juveniles (1-2 mm) when found at all. Polychaetes (segmented worms bearing specialized appendages) are common throughout the marine and estuarine environments and are the numerically dominant taxa at mesohaline to euhaline sites. Polychaetes have a variety of living modes including free-living, burrowing, and sedentary forms. Burrowing and tube-dwelling species dominate in most of the intertidal and shallow-subtidal areas and are common prey items for many fish. Oligochaetes are another group of annelids mainly lacking specialized appendages with a deep-burrowing habit. This group has direct development and may be locally dense with potentially rapid responses to local conditions. However, they are generally less available as a prey resource because of their deep burrowing habit. Amphipods are a diverse group of brooding crustaceans. This group of organisms demonstrates explosive population growth at times, and serves as a critical food source for many juvenile fish that utilize fringing wetlands and marshes. Although many are free-living or pelagic, a large proportion of estuarine amphipods are tube builders that can be highly motile and quickly able to re-colonize or immigrate to adjacent disturbed habitats. Insect larvae are among the most numerous and diverse groups that inhabit the upper mesohaline and oligohaline regions of the estuary, but are generally absent from more saline areas. Insect larvae exploit virtually every habitat type available within the estuarine system and are distinct from other dominant groups by having aerial dispersal.

6.3 Methodology

In order to evaluate infaunal communities in the high intertidal and low intertidal/ shallow subtidal regions of the Cape Fear River that may be impacted by the widening and deepening project, benthic core samples were collected from nine stations along the Cape Fear River from the mouth of Town Creek to eight miles above Wilmington on both the main stem and North East Cape Fear River. These stations represent mesohaline, oligohaline and tidal freshwater wetland habitats. Sampling has been conducted annually since June 1999. Here we summarize infaunal patterns from June 1999- June 2001.

Samples were collected at replicate upper and lower intertidal sub-sites at each station to allow observations of potential differential responses that may occur with changes in tidal inundations regimes or with changes in larval availability. During the 1999 and 2000 sampling periods baselines were established for comparison of potential impacts. The sampling conducted during June 2001 represents the first year of sampling that may be impacted by the actual dredging activity, though construction is ongoing and the project has not been completed.

Infaunal core samples were collected at eight stations along the Cape Fear River estuarine gradient. Note that the availability of sampling sites necessitated collecting samples from two subsites (P3A and P3B) at the Inner Town Creek Station. These subsites are considered separately in this section, but as one station for purposes of the overall study. Three benthic stations are located in Town Creek (P2 at the mouth of Town Creek, P3A and P3B inner Town Creek), three stations in the main stem Cape Fear above the city of Wilmington (P6- Eagle Island, P7- Indian Creek, and P8- Dollisons Landing), and three stations in the North East Cape Fear River (P11- Smith Creek, P12- Rat Island, and P13- Fishing Creek).

Infaunal cores (10 cm diameter x 15 cm deep) were collected at two upper intertidal sub-sites and two lower intertidal sub-sites at each station. These sub-sites are fixed stations (CZR 2000). Three replicate core samples were collected within a one-meter area around these points. Core samples are collected at all stations in June of each year. All samples are fixed in a 10% formalin solution (~4% formaldehyde), with rose Bengal dye added, and later sieved through a 500 micron screen to remove excess sediment and preserved in 50% isopropanol. All organisms are separated from the remaining sediment by sorting under a dissecting microscope and identified to lowest reasonable taxon, in most cases this is genus or species.

Changes in faunal abundance, at each site, among years was calculated based on common taxa (those species that comprised 3% or more of the total number of individuals collected during any sampling period) and on functional guilds (cumulative effect on species groupings by living position and availability to predators). Only species comprising 1% or more of the total number of individuals collected during any sampling period were included in the functional guild analysis. A two-way analysis of variance was used to evaluate year (1999, 2000, 2001), position (high intertidal vs. low intertidal), and interactive effects. There were 15 instances of interactive effects, but in most instances these effects were weak and based on the absence of a particular taxa from one position or the other during two of the three years. *Marrenzellaria virdis* is the only taxa that showed strong interactions relative to main effects for both P6 and P11. The source of this interaction was based on the absence of *M. virdis* from the high intertidal habitat and an increasing year effect with increasing abundances from 1999 to 2001.

6.4 Faunal patterns

Because 1999 and 2000 represent baseline sampling periods prior to the initiation of deepening and widening activity and 2001 represents the first year of construction, the 2001 sampling period is the first possible window of potential impacts on the benthos.

Construction activities may alter salinity regime (effecting potential settlement habitats), hydrology (and subsequent dispersal) or inundation period (increase potential availability to predators). However, potential large-scale impacts may not be realized until the construction phase nears completion.

To date 134 taxa have been identified from infaunal core samples taken in 1999, 2000, and 2001 (Table 6.4-1 to 6.4-9). Ninety-nine taxa were collected in the 1999 sampling season, while 60 taxa were collected in 2000 and 54 taxa in 2001. Some of these taxa represent higher taxonomic groupings so total numbers of species may increase as further verification and clarifications are made. While there was a decrease in the number of taxa present through time, the species composition overall tends to be representative of communities found in other mid size estuaries experiencing anthropogenic impacts, although there were differences among the three tributary systems.

Table 6.4-1 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected on the Town Creek mouth site (P2) during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-sites for both high and low intertidal areas.

Town Creek mouth (P2)

High Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0.2(0.4)	0(0)	0(0)
Bezzia/palpomia	0.5(1.2)	0(0)	0(0)
juv. Bivalve	1(0.9)	0.5(0.6)	0(0)
Boccardiella sp.	0(0)	26.5(37.2)	0(0)
Cassidimidea lunifrons	0.2(0.4)	0.5(1)	0(0)
Collembola sp.	0(0)	0(0)	0(0)
Corophium acherasi	0(0)	0(0)	12.5(17.4)
Corophium acutum	0(0)	0(0)	7.8(15.5)
Corophium lacustre	0(0)	0(0)	0(0)
Corophium sp.	0.2(0.4)	4.3(1.7)	11.8(15.6)
Corophium volutator	0(0)	0(0)	0(0)
Cyathura polita	0(0)	0.8(1.5)	0(0)
Dicrotendipes sp.	2(2.3)	1(2)	0.3(0.5)
Dolichopodid larvae	0(0)	0(0)	0(0)
Dolichopus sp.	0(0)	0(0)	0(0)
Elasmopus sp.	0(0)	0(0)	0(0)
Eteone heteropoda	0(0)	1(0.8)	0(0)
Eteone sp.	0(0)	0.3(0.5)	0(0)
Eukiefferiella sp.	0(0)	0(0)	0(0)
Gammarus sp.	0(0)	0.8(1)	0(0)
Gammarus tigrinus	0(0)	2.3(4.5)	0(0)
Hemipodus roseus	0(0)	0(0)	0(0)

Table 6.4-1. continued

Town Creek mouth (P2)

High Intertidal	Spring 99	Spring 00	Spring 01
Hobsonia florida	2(2.3)	3(5.4)	0.5(1)
insect larvae c	0(0)	0(0)	0(0)
insect pupae	0(0)	0.25(0.5)	0(0)
insect sp.	0.2(0.4)	0(0)	0(0)
insect sp.b	0(0)	0(0)	0(0)
insect sp. e	0(0)	0(0)	0.3(.5)
insect sp. g	0(0)	0(0)	0(0)
juv. Nereid	0.2(0.4)	0(0)	0(0)
Marenzellaria virdis	1.7(4.1)	0(0)	0(0)
Mite	0(0)	0(0)	0(0)
Munna sp.	0(0)	0(0)	0(0)
Nereid sp.	0(0)	0(0)	0(0)
Nereis falsa	0(0)	1.25(2.5)	0(0)
Nereis riisei	0.7(1.2)	0(0)	0(0)
Nereis succinea	0(0)	0.3(0.5)	1.5(1.9)
Oligochaete	36.5(28.3)	8.8(13.6)	2.3(2.6)
Orchestia sp.	0(0)	0(0)	0(0)
Orchestia uhleri	0(0)	0(0)	0(0)
Owenia sp.	0.2(0.4)	0(0)	0(0)
Palaemonetes pugio	0.2(0.4)	0(0)	0(0)
Parandalia sp.	1(1.5)	0(0)	0.5(0.6)
Polydora ligni	12.2(26.5)	0.25(0.5)	0.3(0.5)
Polydora socialis	5.5(10)	0(0)	3.3(6.5)
Polypedilum sp.	1.5(1.8)	0(0)	0(0)
Procladius sp.	0(0)	0(0)	0(0)
Streblospio benedicti	0.8(0.8)	0.75(0.5)	0.3(0.5)
Tanais sp.	0.3(0.8)	0(0)	16.8(18.9)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0(0)	0(0)	0(0)
Uca pugnax	0(0)	0(0)	0(0)
Uca sp.	0(0)	0(0)	0(0)

Town Creek mouth (P2)

Low Intertidal	Spring 99	Spring 00	Spring 01
Ampharetidae sp.	0(0)	0(0)	0(0)
Amphipoda sp.	0.2(0.4)	0.3(0.5)	0(0)
Bezzia/palpomia	0.2(0.4)	0(0)	0(0)
juv. Bivalve	0.2(0.4)	0.3(0.5)	0(0)
Boccardiella sp.	0(0)	16.5(10.3)	0(0)
Capitella capitata	0(0)	0(0)	0.3(0.6)
Cassidisca lunifrons	0(0)	0(0)	0(0)
Chironomus sp.	0.2(0.4)	0(0)	0(0)
Corophium acutum	0(0)	0(0)	0(0)

Table 6.4-1. continued

Town Creek mouth (P2)

Low Intertidal	Spring 99	Spring 00	Spring 01
Corophium sp.	0(0)	0.3(0.5)	0.3(0.6)
Corophium lacustre	0(0)	2.5(2.4)	0(0)
crab megalopae	0.2(0.4)	0(0)	0(0)
Cyathura madelinae	0.2(0.4)	0(0)	0(0)
Cyathura polita	0(0)	0(0)	0(0)
Dicrotendipes sp.	0(0)	0.5(1)	0(0)
Dolichopodid larvae	0(0)	0(0)	0(0)
Dolichopus sp.	0(0)	0(0)	0(0)
Gammarus plumosa	0(0)	0(0)	0(0)
Gammarus tigrinus	0(0)	0(0)	0.3(0.6)
Edotea (*muntosa*)	0.2(0.4)	0(0)	0(0)
Elasmopus sp.	0(0)	0(0)	0(0)
E*ukiefferiella* sp.	0(0)	0(0)	0(0)
Gammarus lawrencianus	0(0)	0(0)	0(0)
Gammarus tigrinus	0.5(0.8)	0(0)	0(0)
Gammarus sp.	0(0)	0.3(0.5)	0(0)
gastropod juv.	1.8(4.5)	0(0)	0(0)
Hemipodus roseus	0(0)	0(0)	0(0)
Heteromastus filiformis	0(0)	0(0)	0(0)
Hobsonia florida	0.8(2)	4(5.5)	0(0)
Hydrophilidae larvae	0(0)	0(0)	0(0)
insect larva b	0(0)	0(0)	0(0)
insect pupae	0(0)	0(0)	0(0)
insecta sp.	0(0)	0(0)	0(0)
insect sp.b	0(0)	0(0)	0(0)
juv. Nereid	0(0)	0(0)	0(0)
Laeonereis culveri	0.2(0.4)	0(0)	0(0)
Marenzellaria virdis	0(0)	0(0)	0(0)
Marinogammarus sp.	0(0)	0(0)	0(0)
Mediomastus ambiseta	1.2(2)	0(0)	0(0)
Mediomastus califoriensis	0(0)	0(0)	0(0)
Mediomastus sp.	0.3(0.8)	0(0)	0(0)
Mite	0(0)	0(0)	0(0)
Munna sp.	0(0)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0(0)
Nemertean	0.2(0.4)	0(0)	0(0)
Nereis acuminata	0(0)	0.3(0.5)	0(0)
Nereis succinea	0(0)	1.3(1.9)	0(0)
Oligochaete	7(8.6)	2.5(2.4)	0.3(0.6)
Orchestia sp.	0(0)	0(0)	0(0)
Parandalia sp.	2.5(2)	1(1.4)	1(1)
Paraprionospio pinnata	0.2(0.4)	0(0)	0(0)
Polydora ligni	0.8(2)	1.5(3)	0(0)
Polydora sp.	0(0)	0(0)	0(0)
Polypedilum sp.	0.8(2)	0(0)	0(0)

Table 6.4-1. continued

Town Creek mouth (P2)

Low Intertidal	Spring 99	Spring 00	Spring 01
Procladius sp.	0(0)	0(0)	0(0)
Streblospio benedicti	3(4.1)	0(0)	0(0)
Syllidae sp.	0.2(0.4)	0(0)	0(0)
Tanais sp.	0(0)	0.3(0.5)	0(0)
Tanytarsus sp.	0(0)	0(0)	0(0)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0(0)	0(0)	0(0)
Uca pugnax	0(0)	0(0)	0(0)
Uca sp.	0(0)	0(0)	0(0)

Table 6.4-2 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected at P3A upper Town Creek sites during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-sites for both high and low intertidal areas.

Town Creek inner a (P3A)

High Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0(0)
Bezzia/palpomia	0(0)	0(0)	0.5(0.6)
juv. Bivalve	0.2(0.4)	0(0)	0(0)
Boccardiella sp.	0(0)	0(0)	0(0)
Cassidimidea lunifrons	0(0)	0(0)	0.8(1)
Collembola sp.	0.5(0.8)	0(0)	0(0)
Corophium acherasi	0(0)	0(0)	0(0)
Corophium acutum	0(0)	0(0)	0(0)
Corophium lacustre	0(0)	0(0)	0(0)
Corophium sp.	0(0)	0(0)	0(0)
Corophium volutator	0(0)	0(0)	0(0)
Cyathura polita	0(0)	0(0)	0(0)
Dicrotendipes sp.	0(0)	0(0)	0(0)
Dolichopodid larvae	0(0)	3.8(2.8)	0.8(1)
Dolichopus sp.	2.2(1.5)	0(0)	0(0)
Elasmopus sp.	0(0)	0.25(0.5)	0(0)
Eteone heteropoda	0(0)	0(0)	0(0)
Eteone sp.	0(0)	0(0)	0(0)
Eukiefferiella sp.	0(0)	0(0)	2(4)
Gammarus sp.	0(0)	0(0)	0(0)
Gammarus tigrinus	0.3(0.8)	0(0)	0(0)
Hemipodus roseus	0(0)	0(0)	0.5(0.6)
Hobsonia florida	0(0)	0(0)	0(0)
insect larva c	0(0)	0(0)	0(0)
insect pupae	0.2(0.4)	0(0)	0(0)

Table 6.4-2. continued

Town Creek inner a (P3A)

High Intertidal	Spring 99	Spring 00	Spring 01
insect sp.	0.2(0.4)	0(0)	0(0)
insect sp.b	0.2(0.4)	0(0)	0(0)
insect sp. e	0(0)	0(0)	0(0)
insect sp. g	0.3(0.8)	0(0)	0(0)
juv. Nereid	0(0)	0.3(0.5)	0(0)
Laeonereis culveri	07(1.6)	0.5(1)	0(0)
Marenzellaria virdis	0(0)	0(0)	0(0)
Mite	0.2(0.4)	0(0)	0(0)
Munna sp.	0(0)	0(0)	0(0)
Nereid sp.	0(0)	0(0)	0(0)
Nereis falsa	0(0)	0(0)	0(0)
Nereis riisei	0(0)	0(0)	0(0)
Nereis succinea	0(0)	0(0)	0(0)
Oligochaete	42.7(25.6)	42(25.6)	12(8.2)
Orchestia sp.	0(0)	0(0)	1(1.4)
Orchestia uhleri	0(0)	0(0)	0(0)
Owenia sp.	0(0)	0(0)	0(0)
Palaemonetes pugio	0(0)	0(0)	0(0)
Parandalia sp.	0(0)	0(0)	0(0)
Polydora ligni	0(0)	0(0)	0(0)
Polydora socialis	0(0)	0(0)	0(0)
Polypedilum sp.	0(0)	0.3(0.5)	0(0)
Procladius sp.	0(0)	0.3(0.5)	0(0)
Streblospio benedicti	0(0)	0(0)	0(0)
Tanais sp.	0(0)	0(0)	0(0)
Uca minax	0.2(0.4)	0(0)	0(0)
Uca pugilator	0.5(0.8)	0(0)	0(0)
Uca sp.	0(0)	0.3(0.5)	0(0)
Uca pugnax	0.2(0.4)	0(0)	0(0)

Town Creek inner a (P3A)

Low Intertidal	Spring 99	Spring 00	Spring 01
Ampharetidae sp.	0.2(0.4)	0(0)	0(0)
Amphipoda sp.	0.7(0.8)	0.3(0.5)	0(0)
Bezzia/palpomia	0(0)	0(0)	0.3(0.5)
juv. Bivalve	0.2(0.4)	0(0)	0(0)
Boccardiella sp.	0(0)	0(0)	0(0)
Capitella capitata	0(0)	0(0)	0(0)
Cassidisca lunifrons	0.2(0.4)	0(0)	0.3(0.5)
Chironomus sp.	0(0)	0(0)	0(0)
Corophium acutum	0(0)	0(0)	0(0)
Corophium sp.	0(0)	0(0)	0(0
Corophium lacustre	0(0)	0(0)	0(0)

Table 6.4-2. continued

Town Creek inner a (P3A)

Low Intertidal	Spring 99	Spring 00	Spring 01
crab megalopae	0(0)	0(0)	0(0)
Cyathura madelinae	0(0)	0(0)	0(0)
Cyathura polita	0(0)	0(0)	0.5(1)
Dicrotendipes sp.	0(0)	0(0)	0(0)
Dolichopodid larvae	0(0)	0.3(0.5)	0(0)
Dolichopus sp.	0(0)	0(0)	0(0)
Gammarus plumosa	0.2(0.4)	0(0)	0(0)
Gammarus tigrinus	0(0)	0(0)	0(0)
Edotea (muntosa)	0(0)	0(0)	0(0)
Elasmopus sp.	0(0)	0(0)	0(0)
Eukiefferiella sp.	0(0)	0(0)	0.5(1)
Gammarus lawrencianus	0(0)	0(0)	0(0)
Gammarus tigrinus	2.7(5.2)	0(0)	0(0)
Gammarus sp.	0(0)	0(0)	0(0)
gastropod juv.	0.2(0.4)	0(0)	0(0)
Hemipodus roseus	0(0)	0(0)	0(0)
Heteromastus filiformis	0(0)	0(0)	0(0)
Hobsonia florida	3.2(3.3)	0(0)	0.8(1)
Hydrophilidae larvae	0(0)	0.3(0.5)	0(0)
insect larva b	0(0)	0.3(0.5)	0(0)
insect pupae	0(0)	0(0)	0(0)
insecta sp.	0(0)	0(0)	0(0)
insect sp.b	0(0)	0(0)	0(0)
juv. Nereid	0(0)	0(0)	0(0)
Laeonereis culveri	0(0)	0(0)	0(0)
Marenzellaria virdis	0.3(0.8)	0(0)	0(0)
Marinogammarus sp.	0(0)	0(0)	0(0)
Mediomastus ambiseta	0.2(0.4)	0(0)	0(0)
Mediomastus califoriensis	0.2(0.4)	0(0)	0(0)
Mediomastus sp.	0(0)	0(0)	0(0)
Mite	0(0)	0(0)	0(0)
Munna sp.	0.2(0.4)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0(0)
Nemertean	0(0)	0(0)	0(0)
Nereis acuminata	0(0)	0(0)	0(0)

Town Creek inner a (P3A)

Low Intertidal	Spring 99	Spring 00	Spring 01
Nereis succinea	0(0)	0(0)	0(0)
Oligochaete	5(9.4)	83(71.3)	14.3(8.9)
Orchestia sp.	0(0)	0(0)	0.3(0.5)
Parandalia sp.	0(0)	0(0)	0(0
Paraprionospio pinnata	0(0)	0(0)	0(0)

Table 6.4-2. continued

Polydora ligni	0.2(0.4)	0(0)	0(0)
Polydora sp.	0.2(0.4)	0(0)	0(0)
Polypedilum sp.	1(0.9)	0(0)	0(0)
Procladius sp.	0(0)	0(0)	0(0)
Streblospio benedicti	0.2(0.4)	0(0)	0.3(0.5)
Syllidae sp.	0(0)	0(0)	0(0)
Tanais sp.	0(0)	0(0)	0(0)
Tanytarsus sp.	0.3(0.5)	0(0)	0(0)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0.2(0.4)	0(0)	0(0)
Uca pugnax	0(0)	0(0)	0(0)
Uca sp.	0.2(0.4)	0(0)	0(0)

Table 6.4-3 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected at P3B upper Town Creek sites during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-sites for both high and low intertidal areas.

Town Creek inner b (P3B)

High Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0(0)
Boccardiella sp.	0(0)	0(0)	0(0)
Bezzia/palpomia	0(0)	0(0)	0(0)
juv. Bivalve	0.5(0.6)	0(0)	0(0)
Cassidimidea lunifrons	0(0)	0(0)	0.5(0.6)
Collembola sp.	0.3(0.5)	0(0)	0(0)
Corophium acherasi	0(0)	0(0)	0(0)
Corophium acutum	0(0)	0(0)	0(0)
Corophium lacustre	0(0)	0(0)	0(0)
Corophium sp.	0(0)	0(0)	0(0)
Corophium volutator	0(0)	0(0)	0.3(0.5)
Cyathura polita	0(0)	0(0)	0(0)
Dicrotendipes sp.	0(0)	0(0)	0(0)
Dolichopodid larvae	0(0)	0.5(1)	0.5(0.6)
Dolichopus sp.	0(0)	0(0)	0(0)
Elasmopus sp.	0(0)	0(0)	0(0)
Eteone heteropoda	0(0)	0(0)	0(0)
Eteone sp.	0(0)	0(0)	0(0)
Eukiefferiella sp.	0(0)	0(0)	0.3(0.5)
Gammarus sp.	0(0)	0(0)	0(0)
Gammarus tigrinus	0(0)	0(0)	0(0)
Hemipodus roseus	0(0)	0(0)	0(0)

Table 6.4-3. continued

Town Creek inner b (P3B)

High Intertidal	Spring 99	Spring 00	Spring 01
Hobsonia florida	0(0)	0(0)	1(2)
insect larva c	0.5(0.6)	0(0)	0(0)
insect pupae	0(0)	0(0)	0(0)
insect sp.	0(0)	0(0)	0(0)
insect sp.b	0(0)	0(0)	0(0)
insect sp. e	0(0)	0(0)	0(0)
insect sp. g	0(0)	0(0)	0(0)
juv. Nereid	0(0)	0.3(0.5)	0(0)
Laeonereis culveri	0(0)	0.3(0.5)	0(0)
Marenzellaria virdis	0.3(0.5)	0(0)	0(0)
Mite	0(0)	0(0)	0(0)
Munna sp.	0.3(0.5)	0(0)	0(0)
Nereid sp.	0(0)	0.8(1.5)	0(0)
Nereis falsa	0(0)	0(0)	0(0)
Nereis riisei	0(0)	0(0)	0(0)
Nereis succinea	(0)	0(0)	0(0)
Oligochaete	11.5(10)	27.3(13.6)	3.8(4.4)
Orchestia sp.	0.3(0.5)	0.3(0.5)	7.5(14.3)
Orchestia uhleri	0(0)	0.8(1)	0(0)
Owenia sp.	0(0)	0(0)	0(0)
Palaemonetes pugio	0(0)	0(0)	0(0)
Parandalia sp.	0(0)	0(0)	0(0)
Polydora ligni	0(0)	0(0)	0(0)
Polydora socialis	0(0)	0(0)	0(0)
Polypedilum sp.	0(0)	0.3(0.5)	0(0)
Procladius sp.	0(0)	0(0)	0(0)
Streblospio benedicti	0(0)	0(0)	0.3(0.5)
Tanais sp.	0(0)	0(0)	0(0)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0(0)	0(0)	0(0)
Uca pugnax	0(0)	0(0)	0(0)
Uca sp.	0.3(0.5)	0(0)	0(0)

Town Creek inner b (P3B)

Low Intertidal	Spring 99	Spring 00	Spring 01
Ampharetidae sp.	0(0)	0(0)	0(0)
Amphipoda sp.	0.3(0.5)	0(0)	0(0)
Bezzia/palpomia	0(0)	0(0)	0(0)
juv. Bivalve	0(0)	0(0)	0(0)
Boccardiella sp.	0(0)	0(0)	0(0)
Capitella capitata	0(0)	0(0)	0(0)
Cassidisca lunifrons	0.2(0.4)	0(0)	0(0)
Chironomus sp.	0(0)	0(0)	0(0)
Corophium acutum	0(0)	0(0)	0.3(0.5)

Table 6.4-3. continued

Town Creek inner b (P3B)

Low Intertidal	Spring 99	Spring 00	Spring 01
Corophium sp.	0(0)	0(0)	0(0)
Corophium lacustre	0(0)	0(0)	0.5(1)
crab megalopae	0(0)	0(0)	0(0)
Cyathura madelinae	0(0)	0(0)	0(0)
Cyathura polita	0(0)	0.5(0.6)	0(0)
Dicrotendipes sp.	0.2(0.4)	0(0)	0(0)
Dolichopodid larvae	0(0)	0.3(0.5)	0.3(0.5)
Dolichopus sp.	0(0)	0(0)	0(0)
Gammarus plumosa	(0)	0(0)	0(0)
Gammarus tigrinus	0(0)	0(0)	0(0)
Dicrotendipes sp.	0(0)	0(0)	0(0)
Edotea (muntosa)	0(0)	0(0)	0(0)
Elasmopus sp.	0(0)	0(0)	0(0)
Eukiefferiella sp.	0(0)	0(0)	0(0)
Gammarus lawrencianus	0.8(2)	0(0)	0(0)
Gammarus tigrinus	1.8(4.5)	0(0)	0(0)
Gammarus sp.	0.2(0.4)	0(0)	0(0)
gastropod juv.	0(0)	0(0)	0(0)
Hemipodus roseus	0(0)	0(0)	0(0)
Heteromastus filiformis	0(0)	0(0)	0(0)
Hobsonia florida	2.5(2.2)	0(0)	0.3(0.5)
Hydrophilidae larvae	0(0)	0(0)	0(0)
insect larva b	0(0)	0(0)	0(0)
insecta sp.	0(0)	0.25(0.5)	0(0)
insect sp.b	0(0)	0(0)	0(0)
insect pupae	0(0)	0(0)	0.3(0.5)
juv. Nereid	0(0)	0(0)	0(0)
Laeonereis culveri	0(0)	0.3(0.5)	0(0)
Marenzellaria virdis	0.2(0.4)	0(0)	0(0)
Marinogammarus sp.	0.2(0.4)	0(0)	0(0)
Mediomastus ambiseta	0(0)	0(0)	0(0)
Mediomastus califoriensis	0(0)	0(0)	0(0)
Mediomastus sp.	0(0)	0(0)	0(0)
Mite	0(0)	0(0)	0.3(0.5)
Munna sp.	0.5(1.2)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0.3(0.5)
Nematoda sp.	1.5(2.3)	0(0)	0(0)
Nemertean	0(0)	0(0)	0(0)
Nereis acuminata	0(0)	0(0)	0(0)
Nereis succinea	0(0)	0(0)	0(0)
Oligochaete	4.8(5.8)	39.3(27.9)	10.5(6.5)
Orchestia sp.	0(0)	0(0)	0(0)

Table 6.4-3. continued

Town Creek inner b (P3B)

Low Intertidal	Spring 99	Spring 00	Spring 01
Parandalia sp.	0(0)	0(0)	0(0)
Paraprionospio pinnata	0(0)	0(0)	0(0)
Polydora sp.	0.3(0.8)	0(0)	0(0)
Polydora ligni	0(0)	0(0)	0.3(0.5)
Polypedilum sp.	0.7(1.2)	0(0)	0(0)
Procladius sp.	0.5(0.8)	0(0)	0(0)
Streblospio benedicti	0(0)	0(0)	0(0)
Syllidae sp.	0(0)	0(0)	0(0)
Tanais sp.	0(0)	0(0)	0(0)
Tanytarsus sp.	0(0)	0(0)	0(0)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0(0)	0(0)	0(0)
Uca pugnax	0(0)	0(0)	0(0)
Uca sp.	0(0)	0(0)	0(0)

Table 6.4-4 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected at Eagle Island (P6) during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-sites for both high and low intertidal areas.

Eagle Island (P6)

High Intertidal	Spring 99	Spring 00	Spring 01
Bezzia/palpomia	0.6(0.5)	0.3 (0.5)	0(0)
juv. Bivalve	0.2(0.4)	0(0)	0(0)
Cassidisca lunifrons	1(2.2)	0(0)	0(0)
Celina sp.	0(0)	0(0)	0(0)
Chironomus sp.	0(0)	0(0)	0(0)
Chrysops sp.	0(0)	0(0)	0(0)
Coleoptera larvae	0(0)	0(0)	0(0)
Collembola sp.	1.6(1.7)	0(0)	0(0)
Corophium acherasicum	0(0)	0(0)	0(0)
Corophium sp.	0(0)	0(0)	0(0)
Cryptochironomus sp.	0(0)	0(0)	0(0)
Curculionidae sp.	0.4(0.9)	0(0)	0(0)
Cyathura (madelinae)	0.4(0.9)	0(0)	0(0)
Cyathura polita	0.8(1.3)	0(0)	0(0)
Dolichopodid larvae	0(0)	0(0)	1(0.8)
Dolichopus sp.	0.8(1.8)	0(0)	0(0)
Eukiefferiella (claripennis)	0.2(0.4)	0(0)	0(0)
Gammarus diaberi	0(0)	0(0)	0(0)
Gammarus tigrinus	0(0)	0(0)	0(0)
gastropod juv.	0.2(0.4)	0(0)	0(0)
Hemipodus roseus	0.8(1.8)	0(0)	1.8(1.7)
Hobsonia florida	0(0)	0(0)	0(0)
Hydaticus larvae	0(0)	0(0)	0(0)

Table 6.4-4. continued

Eagle Island (P6) High Intertidal	Spring 99	Spring 00	Spring 01
Hydropbia sp.	0(0)	0(0)	0(0)
Hydrophilidae larvae	0(0)	0(0)	0(0)
insect larva c	0.2(0.4)	0(0)	0(0)
insect larvae	0(0)	0(0)	0(0)
insect pupae	0(0)	0(0)	0(0)
insect sp. a	0(0)	0(0)	0(0)
insect sp. b	0(0)	0(0)	0(0)
insect sp h	1(2.2)	0(0)	0(0)
insect sp I	0.4(0.9)	0(0)	0(0)
insecta sp.	0(0)	0(0)	0(0
Isopod sp.	0(0)	0(0)	0(0)
Laeonereis culveri	3.2(4.5)	2.5(3.3)	0(0)
Lirceus sp.	0(0)	0(0)	0(0)
Lumbriculidae sp.	0(0)	0(0)	0(0)
Micropsectra sp.	0(0)	0(0)	0(0)
Mite	0(0)	0(0)	0(0)
Namalycastis abiuma	0(0)	1(0.8)	0(0)
Nemertea	0(0)	0(0)	0(0)
Notomierus capricornis	0(0)	0(0)	0(0)
Oligochaete	9.6(10.8)	9.5(5.8)	6(8.1)
Orchestia (platensis)	0(0)	0(0)	0(0)
Orchestia uhleri	1(1.2)	0(0)	0(0)
Orchestia sp.	1.2(2.2)	0(0)	0(0)
Ostracoda	0(0)	0(0)	0(0)
Paratendipes sp.	0(0)	0(0)	0(0)
Polypedilum sp.	0(0)	0(0)	0(0)
Pristinella sp.	0(0)	0(0)	0(0)
Procladius sp.	0.2(0.4)	0(0)	0(0)
Rheotanytarsus sp.	0(0)	0(0)	0(0)
Stratiomya	0(0)	0(0)	0(0)
Syphidae	0(0)	0(0)	0.3(0.5)
Tabanus sp.	0(0)	0(0)	0(0)
Tanais sp.	0(0)	0(0)	0(0)
Tanytarsus sp.	0(0)	0(0)	0(0)
Tubificoides heterochaetus	0(0)	0(0)	0(0)
Uca minax	0(0)	0(0)	0.3(0.5)
Uca pugilator	0.4(0.9)	0(0)	0(0)
Uca pugnax	0(0)	0(0)	0.3(0.5)
Uca sp.	0.2(0.4)	0(0)	0(0)

Eagle Island (P6) Low Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0.8(1.3)	0(0)	0.5(1)
Bezzia/palpomia	0.6(0.9)	0(0)	0.3(0.5)

Table 6.4-4. continued

Eagle Island (P6)

Low Intertidal	Spring 99	Spring 00	Spring 01
juv. Bivalve	0.6(0.9)	0(0)	0(0)
Cassidisca lunifrons	1(1.7)	0(0)	0(0)
Collembola sp.	0.2(0.4)	0(0)	0(0)
Corophium acherasicum	0(0)	0(0)	0(0)
Corophium sp.	0(0)	0(0)	0(0)
crab megalopae	0(0)	0(0)	0(0)
Cryptochironomous sp.	0(0)	0(0)	0(0)
Cyathura polita	5(11.2)	0(0)	0(0)
Cyathura (madelinae)	0(0)	0(0)	0(0)
Dispia unicata	0(0)	0(0)	0(0)
Dolichopodid larvae	0(0)	0(0)	0(0)
Dolichopus sp.	0.2(0.4)	0(0)	0(0)
Eukiefferiella (claripennis)	0.4(0.9)	0(0)	0(0)
Gammarus daiberi	0.2(0.4)	0(0)	0.3(0.5)
Gammarus tigrinus	0(0)	0(0)	0(0)
gastropod juv.	0.4(0.5)	0(0)	0(0)
Hobsonia florida	0.2(0.4)	0(0)	0(0)
insect pupae	1.8(2.5)	0(0)	0(0)
insect sp. a	0(0)	0(0)	0(0)
insect sp.b	0(0)	0(0)	0(0)
insect sp. f	0(0)	0(0)	0(0)
insect sp. g	0(0)	0(0)	0(0)
insect sp.	0.2(0.4)	0(0)	0(0
Isopoda (unknown)	0(0)	0(0)	0(0)
Laeonereis culveri	0(0)	0(0)	0(0)
Lumbriculidae sp.	0(0)	0(0)	0(0)
Maranzellaria virdis	0(0)	0.8(0.5)	4.5(2.4)
Melita sp.	1(2.2)	0(0)	0(0)
Micropsectra sp.	0(0)	0(0)	0(0)
Mite	0.2(0.4)	0(0)	0(0)
Munna sp.	1(2.2)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0(0)
Oligochaete	49.6(42.2)	0.8(0.5)	1.3(1.3)
Orchestia sp.	0(0)	0(0)	0(0)
Orchestia uhleri	0(0)	0(0)	0(0)
Paratendipes sp.	0(0)	0(0)	0(0)
Polydora socialis	2.6(5.8)	0(0)	0(0)
Polypedilum haterale group	0(0)	0(0)	0(0)
Polypedilum sp.	0.4(0.9)	0(0)	0(0)
Pristinella sp.	0(0)	0(0)	0(0)
Procladius sp.	0.6(1.3)	0(0)	0(0)
Rheotanytarsus sp.	0(0)	0(0)	0(0)
Spionidae sp.	0(0)	0(0)	0(0)
Tanytarsus sp.	0(0)	0(0)	0(0)

Table 6.4-4. continued

Eagle Island (P6) Low Intertidal	Spring 99	Spring 00	Spring 01
Tribelos sp.	0(0)	0(0)	0(0)
Uca sp.	0.4(0.9)	0(0)	0(0)

Table 6.4-5 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected at Indian Creek (P7) during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-sites for both high and low intertidal areas.

Indian Creek (P7) High Intertidal	Spring 99	Spring 00	Spring 01
Bezzia/palpomia	0.2(0.4)	0(0)	0(0)
juv. Bivalve	0(0)	0.2(0.4)	0.3(0.5)
Cassidisca lunifrons	0(0)	0(0)	0.8(1.5)
Celina sp.	0.2(0.4)	0(0)	0(0)
Chironomus sp.	0(0)	0(0)	0.3(0.5)
Chrysops sp.	0.2(0.4)	0(0)	0(0)
Coleoptera larvae	0(0)	0(0)	0(0)
Collembola sp.	0.4(0.5)	1.2(1.8)	0(0)
Corophium acherasicum	0(0)	0(0)	0.3(0.5)
Corophium sp.	0(0)	0(0)	0.8(1.5)
Cryptochironomus sp.	0.2(0.4)	0(0)	0(0)
Curculionidae sp.	0(0)	0(0)	0(0)
Cyathura (madelinae)	0.4(0.9)	0.2(0.4)	0(0)
Cyathura polita	0(0)	0.2(0.4)	3.8(3)
Dolichopodid larvae	1.6(0.5)	0(0)	0.8(1.5)
Dolichopus sp.	1.6(1.1)	0(0)	0(0)
Eukiefferiella (claripennis)	0(0)	0(0)	0(0)
Gammarus diaberi	0(0)	0(0)	6(12)
Gammarus tigrinus	0(0)	0(0)	0(0)
gastropod juv.	0.2(0.4)	0(0)	0(0)
Hobsonia florida	0(0)	0(0)	0.3(0.5)
Hydaticus larvae	0(0)	0(0)	0(0)
Hydropbia sp.	0(0)	0(0)	0(0)
Hydrophilidae larvae	0(0)	0(0)	0(0)
insect larvae	0(0)	0.4(0.9)	0(0)
insect larva c	0(0)	0(0)	0(0)
insect pupae	0.2(0.4)	0(0)	0(0)
insect sp. a	0(0)	0(0)	0(0)
insect sp. b	0(0)	0(0)	1(1.4)
insect sp h	0(0)	0(0)	0(0)
insect sp I	0(0)	0(0)	0(0)
insect sp.	0(0)	0(0)	0(0)
Isopod sp.	0(0)	0(0)	0.3(0.5)
Laeonereis culveri	0(0)	0(0)	0(0)

Table 6.4-5. continued

Indian Creek (P7)

High Intertidal	Spring 99	Spring 00	Spring 01
Lirceus sp.	1.4(2.6)	0(0)	0(0)
Lumbriculidae sp.	7.4(7.4)	0(0)	0(0)
Micropsectra sp.	0.8(0.8)	0(0)	0(0)
Mite	0(0)	0.2(0.4)	0(0)
Namalycastis abiuma	0(0)	0(0)	0(0)
Nemertea	0(0)	0(0)	0(0)
Notomierus capricornis	0(0)	0(0)	0(0)
Oligochaete	52.2(34.6)	64.2(53)	30.3(25.6)
Orchestia (platensis)	0(0)	0(0)	0(0)
Orchestia sp.	0.2(0.4)	0(0)	0.3(0.5)
Orchestia uhleri	0.6(1.3)	0(0)	0(0)
Ostracoda	0(0)	0(0)	0(0)
Paratendipes sp.	0(0)	0(0)	2.8(4.9)
Polypedilum sp.	0(0)	0(0)	0.3(0.5)
Pristinella sp.	0.4(0.9)	0(0)	0(0)
Procladius sp.	0(0)	0(0)	0(0)
Rheotanytarsus sp.	0(0)	0(0)	0(0)
Stratiomya	0(0)	0(0)	0(0)
Syphidae	0(0)	0(0)	0(0)
Tabanus sp.	0.2(0.4)	0(0)	0(0)
Tanais sp.	0(0)	0(0)	0(0)
Tanytarsus sp.	0(0)	0(0)	0(0)
Tubificoides heterochaetus	0.2(0.4)	0(0)	0(0)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0.4(0.9)	0(0)	0(0)
Uca pugnax	0(0)	0(0)	0(0)
Uca sp.	0(0)	0(0)	0.5(1)

Indian Creek (P7)

Low Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0(0)
Bezzia/palpomia	0(0)	0(0)	0(0)
juv. Bivalve	0.3(0.5)	0.3(0.5)	0(0)
Cassidisca lunifrons	0.8(0.5)	0(0)	0(0)
Collembola sp.	0(0)	0(0)	0(0)
Corophium acherasicum	0(0)	0(0)	0(0)
Corophium sp.	0(0)	0(0)	0(0)
crab megalopae	0(0)	0(0)	0(0)
Cryptochironomous sp.	0.8(1.5)	0(0)	0(0)
Cyathura polita	0(0)	0.5(0.6)	0.8(1.5)
Cyathura (madelinae)	0.3(0.5)	0(0)	0(0)
Dispia unicata	0(0)	0.3(0.5)	0(0)
Dolichopodid larvae	0(0)	0.3(0.5)	1(2)
Dolichopus sp.	0.3(0.5)	0(0)	0(0)
Eukiefferiella (claripennis)	0(0)	0(0)	0(0)

Table 6.4-5. continued

Indian Creek (P7)

Low Intertidal	Spring 99	Spring 00	Spring 01
Gammarus daiberi	0.3(0.5)	0(0)	0(0)
Gammarus tigrinus	0.5(1)	0(0)	0(0)
gastropod juv.	0.8(1)	0(0)	0(0)
Hobsonia florida	0(0)	0(0)	0(0)
insect pupae	0.5(0.6)	0(0)	0(0)
insect sp. a	0.5(0.6)	0(0)	0(0)
insect sp.b	0(0)	0(0)	0.5(1)
insect sp. f	0(0)	0(0)	0.3(0.5)
insect sp. g	0(0)	0(0)	0.3(0.5)
insect sp.	0(0)	0(0)	0(0)
Isopoda (unknown)	0(0)	0.3(0.5)	0(0)
Laeonereis culveri	0(0)	0.3(0.5)	0(0)
Lumbriculidae sp.	0(0)	0(0)	0(0)
Maranzellaria virdis	0(0)	0(0)	0(0)
Melita sp.	0(0)	0(0)	0(0)
Micropsectra sp.	0(0)	0(0)	0(0)
Mite	0(0)	0(0)	0(0)
Munna sp.	0 (7.7)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0(0)
Oligochaete	19(11.3)	64(39.3)	70.3(64.6)
Orchestia sp.	0(0)	0(0)	0.3(0.5)
Orchestia uhleri	0(0)	0(0)	0(0)
Paratendipes sp.	0.25(0.5)	0(0)	0(0)
Polydora socialis	0(0)	0(0)	0(0)
Polypedilum haterale group	0(0)	0(0)	0(0)
Polypedilum sp.	0(0)	1.25(1)	0.5(1)
Pristinella sp.	0(0)	0(0)	0(0)
Procladius sp.	0.3(0.5)	0(0)	0(0)
Rheotanytarsus sp.	0(0)	0(0)	0(0)
Spionidae sp.	0(0)	0.3(0.5)	0(0)
Tanytarsus sp.	0(0)	0(0)	0(0)
Tribelos sp.	0(0)	0(0)	0(0)
Uca sp.	0(0)	0(0)	0(0)

Table 6.4-6 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected at Dollisons Landing (P8) during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-sites for both high and low intertidal areas.

Dollison Landing (P8)

High Intertidal	Spring 99	Spring 00	Spring 01
Bezzia/palpomia	0.3(0.8)	0.8 (0.5)	0.5(0.6)
juv. Bivalve	11.2(10.6)	23.5(17.0)	4.5(4.8)
Cassidisca lunifrons	0(0)	0(0)	0(0)

Table 6.4-6. continued

Dollison Landing (P8)

High Intertidal	Spring 99	Spring 00	Spring 01
Celina sp.	0(0)	0(0)	0(0)
Chironomus sp.	0(0)	0(0)	0(0)
Chrysops sp.	0(0)	0(0)	0(0)
Coleoptera larvae	0.3(0.8)	0(0)	0(0)
Collembola sp.	1.5(1)	6.5(5)	0.3(0.5)
Corophium acherasicum	0(0)	0(0)	0(0)
Corophium sp.	0(0)	0(0)	0(0)
Cryptochironomus sp.	0(0)	0(0)	0(0)
Curculionidae sp.	0(0)	0(0)	0(0)
Cyathura (madelinae)	0(0)	0(0)	0(0)
Cyathura polita	0(0)	0(0)	0(0)
Dolichopodid larvae	0(0)	6.5(4.7)	0.8(1.5)
Dolichopus sp.	2.2(1.8)	0(0)	0(0)
Eukiefferiella (claripennis)	0(0)	0(0)	0(0)
Gammarus diaberi	0(0)	0(0)	0(0)
Gammarus tigrinus	1.3(3.3)	0(0)	0(0)
gastropod juv.	1.3(3.3)	0(0)	0(0)
Hemipodus roseus	0(0)	0(0)	0(0)
Hobsonia florida	0(0)	0(0)	0(0)
Hydaticus larvae	0.3(0.5)	0(0)	0(0)
Hydropbia sp.	0(0)	0(0)	0.3(0.5)
Hydrophilidae larvae	0(0)	0.3(0.5)	0(0)
insect larvae	0(0)	0(0)	0(0)
insect larva c	0(0)	0(0)	0(0)
insect pupae	0(0)	0(0)	1(0.8)
insect sp. a	0(0)	0(0)	0.3(0)
insect sp. b	0(0)	0(0)	0.8(1.5)
insect sp h	0(0)	0(0)	0(0)
insect sp I	0(0)	0(0)	0(0)
insecta sp.	0.2(0.4)	0(0)	0(0)
Isopod sp.	0(0)	0(0)	0(0)
Laeonereis culveri	0(0)	0(0)	0(0)
Lirceus sp.	0(0)	0(0)	0(0)
Lumbriculidae sp.	5(7)	2(4)	0(0)
Micropsectra sp.	3.2(7.8)	0(0)	0(0)
Mite	0.2(0.4)	0(0)	0(0)
Namalycastis abiuma	0(0)	0(0)	0(0)
Nemertea	0(0)	0(0)	0.3(0.5)
Notomierus capricornis	0.2(0.4)	0(0)	0(0)
Oligochaete	73.5(34.5)	180.3(74.3)	33.5(25.8)
Orchestia (platensis)	0(0)	0(0)	0(0)
Orchestia sp.	0(0)	0(0)	4(3.4)
Orchestia uhleri	3.5(3.6)	2.5(3)	0(0)
Ostracoda	0.2(0.4)	0(0)	0(0)

Table 6.4-6. continued

Dollison Landing (P8)

High Intertidal	Spring 99	Spring 00	Spring 01
Paratendipes sp.	0(0)	5.8(5.4)	0(0)
Polypedilum sp.	0.2(0.4)	2.8(4.9)	0(0)
Pristinella sp.	0(0)	0(0)	0(0)
Procladius sp.	0(0)	0(0)	0(0)
Rheotanytarsus sp.	0.3(0.8)	0.5(1)	0(0)
Stratiomya	0.2(0.4)	0(0)	0(0)
Syphidae	0(0)	0(0)	0(0)
Tabanus sp.	0(0)	0(0)	0(0)
Tanais sp.	0(0)	0(0)	0.3(0.5)
Tanytarsus sp.	1(2.4)	0.5(1)	0(0)
Tubificoides heterochaetus	0.2(0.4)	0(0)	0(0)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0.2(0.4)	0.5(1)	0(0)
Uca pugnax	0(0)	0(0)	0.3(0.5)
Uca sp.	0(0)	0(0)	0(0)

Dollison Landing (P8)

Low Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0(0)
Bezzia/palpomia	0.3(0.8)	0(0)	0.5(0.6)
juv. Bivalve	1.7(1.4)	5.8(8.9)	1.8(0.5)
Cassidisca lunifrons	0.8(2)	0(0)	0(0)
Collembola sp.	0.8(2)	0.3(0.5)	1.5(3)
Corophium acherasicum	0(0)	0(0)	3(2.6)
Corophium sp.	0(0)	0(0)	0.3(0.5)
crab megalopae	0.8(2)	0(0)	0(0)
Cryptochironomous sp.	0.3(0.8)	0(0)	0(0)
Cyathura polita	0(0)	0(0)	2.3(1)
Cyathura (madelinae)	0.7(1.6)	0.8(1.5)	0(0)
Dispia unicata	0(0)	0(0)	0(0)
Dolichopodid larvae	0(0)	0.75(0.5)	0.8(1)
Dolichopus sp.	1(2)	0(0)	0(0)
Eukiefferiella (claripennis)	0(0)	0(0)	0(0)
Gammarus daiberi	0(0)	0(0)	0(0)
Gammarus tigrinus	0.3(0.8)	0(0)	0(0)
gastropod juv.	0.2(0.4)	0.5(1)	1(2)
Hobsonia florida	0(0)	0(0)	0(0)
insect pupae	0(0)	0.25(0.5)	0(0)
insect sp. a	0(0)	0(0)	0(0)
insect sp.b	0.2(0.4)	0(0)	0.3(0.5)
insect sp. f	0(0)	0(0)	0(0)
insect sp. g	0(0)	0(0)	0(0)
insect sp.	0(0)	0(0)	0(0)
Isopoda (unknown)	0(0)	0(0)	1(2)

Table 6.4-6. continued

Dollisons Landing (P8)

Low Intertidal	Spring 99	Spring 00	Spring 01
Laeonereis culveri	0(0)	0(0)	0(0)
Lumbriculidae sp.	3(3.9)	1.5(2.4)	0(0)
Maranzellaria virdis	0(0)	0(0)	0(0)
Micropsectra sp.	0.2(0.4)	0(0)	0(0)
Mite	0(0)	0(0)	0(0)
Munna sp.	8.3(10.6)	23.5(33)	0(0)
Namalycastis sp.	0(0)	0(0)	0.8(1)
Oligochaete	122.8(76.8)	103(33.8)	63(67.6)
Orchestia sp.	0(0)	0(0)	1.3(2.5)
Orchestia uhleri	0(0)	0.8(1)	0(0)
Paratendipes sp.	0.2(0.4)	1(1.2)	0(0)
Polydora socialis	0(0)	0(0)	0(0)
Polypedilum haterale group	2.3(5.7)	0(0)	0(0)
Polypedilum sp.	1.3(1.4)	3(3.2)	2.5(2.4)
Pristinella sp.	2.3(5.7)	0(0)	0(0)
Procladius sp.	0(0)	0(0)	0.3(0.5)
Rheotanytarsus sp.	0.2(0.4)	0(0)	0(0)
Spionidae sp.	0(0)	0(0)	0(0)
Tanytarsus sp.	0.3(0.8)	1(2)	0(0)
Tribelos sp.	0.3(0.8)	0(0)	0(0)
Uca sp.	0(0)	0(0)	0(0)

Table 6.4-7 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected at Smith Creek (P11) during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-site for both high and low intertidal areas at each station.

Smith Creek (P11)

High Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0.3(0.5)
Bezzia/palpomia	0(0)	0(0)	0.5(1)
juv. Bivalve	0.3(0.5)	0(0)	0(0)
Boccardiolla sp.	0(0)	1.3(2.5)	0(0)
Cassidisca lunifrons	1(1.4)	0.3(0.5)	1.3(1)
Collembola sp.	0(0)	0(0)	0(0)
Corophium (lacustre)	0(0)	0(0)	0(0)
Cricotopus sp.	0(0)	0(0)	0(0)
Curculionidae sp.	0.8(1.5)	0(0)	0(0)
Cyathura madelinae	0(0)	0.3(0.5)	0(0)
Cyathura polita	(0)	0(0)	0(0)
Dicrotendipes lobus	1(2)	0(0)	0(0)
Dicrotendipes nirvosus	0.5(1)	0(0)	0(0)
Dicrotendipes sp.	0(0)	1(1.4)	0.5(0.6)
Dispia unicata	0(0)	0(0)	0(0)

Table 6.4-7. continued

Smith Creek (P11)

High Intertidal	Spring 99	Spring 00	Spring 01
Dolichopodid larvae	0(0)	0(0)	0(0)
Dolichopus sp.	0(0)	0(0)	0(0)
Donacia sp.	0(0)	0(0)	0(0)
Edotea triloba	0(0)	0(0)	0.3(0.5)
Gammarus diaberi	0(0)	0(0)	0.3(0.5)
Gammarus tigrinus	0(0)	0.3(0.5)	0(0)
Gammarus mucronatus	0.3(0.5)	0(0)	0(0)
gastropod juv.	0(0)	0(0)	0(0)
Halipldae sp.	0(0)	0(0)	0(0)
Heterothissocladius sp.	0(0)	0(0)	0(0)
Hobsonia florida	7.5(8.7)	0(0)	3.3(2.2)
Hydrobia sp.	0(0)	0(0)	0(0)
Insect larvae (Elimidae)	0(0)	0.3(0.5)	0(0)
insect larvae g	0(0)	0(0)	0(0)
insect larvae h	0(0)	0(0)	0(0)
Insect larvae/pupae	1.3(2.5)	0(0)	0(0)
insect pupae	1(2)	0.3(0.5)	0(0)
insect sp. f	0(0)	0(0)	0(0)
Laeonereis culveri	0(0)	0(0)	0(0)
Lumbriculid sp.	0(0)	0(0)	0(0)
Mediomastus sp.	0(0)	0(0)	0(0)
Megalopae (Uca)	0(0)	0(0)	0.3(0.5)
Mite	0(0)	0(0)	0(0)
Monopylephorus irroratus	0(0)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0(0)
juv. Nereidae sp.	0(0)	0(0)	1(1.4)
Nereidae sp.	0(0)	0(0)	0(0)
Ocypode quadrata	0(0)	0(0)	0(0)
Oligochaete	10.5(7.4)	14.3(15.4)	1.8(1.7)
Orchestia sp.	0(0)	0(0)	0(0)
Orchestia uhleri	0(0)	0(0)	0(0)
Ostracoda	0(0)	0(0)	0(0)
Paratendipes sp.	0(0)	0.3(0.5)	0(0)
Polydora ligni	0.3(0.5)	0(0)	0(0)
Polydora socialis	0.3(0.5)	0(0)	0(0)
Polydora sp.	0(0)	0(0)	0.3(0.5)
Polypedilium sp.	0.5(1)	0.3(0.5)	0.5(1)
Pristinella sp	0(0)	0(0)	0(0)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0(0)	0(0)	0(0)

Table 6.4-7. continued

Smith Creek (P11)

Low Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0.2(0.4)	0(0)	0(0)
amphipod sp. B	0(0)	0(0)	0(0)
Bezzia/palpomia	0(0)	0(0)	0(0)
Boccardiella sp.	0(0)	0(0)	0.3(0.5)
Chirodotea caeca	0(0)	0(0)	0(0)
Collembola sp.	0(0)	0(0)	0(0)
Corophium acherasicum	0(0)	0(0)	0.5(1)
Corophium sp.	0(0)	0(0)	0.5(1)
crab megalopae	0.2(0.4)	0(0)	0(0)
Cryptochironomous (fulvens)	0.2(0.4)	0(0)	0(0)
Dolichopodid larvae	0(0)	0(0)	0(0)
Gammarus tigrinus	0.6(0.9)	0(0)	0(0)
juv. Gastropoda	0(0)	0(0)	0(0)
Hobsonia florida	0.6(0.5)	0(0)	0.5(0.6)
insect	0(0)	0(0)	0(0)
insect larvae	0(0)	0(0)	0(0)
insect pupae	0(0)	0(0)	0(0)
insect sp.d	0(0)	0(0)	0(0)
insect sp. E	0(0)	0(0)	0(0)
larval fish	0(0)	0(0)	0(0)
Lumbriculid sp.	0(0)	0(0)	0(0)
Marenzellaria virdis	1.7(3.8)	3.9(0)	20(14.4)
Megalopa (Uca)	0(0)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0(0)
nemertean	0.2(0.4)	0(0)	0.5(0.6)
juv. Nereidae	0(0)	0(0)	10.5(3.7)
Oligochaete	3.6(4.2)	0.3(0.5)	11.3(12.6)
Ostracoda	0(0)	0(0)	0(0)
Paracladopelma sp.	0(0)	0(0)	0(0)
Polydora ligni	0(0)	0(0)	0(0)
Polydora sp.	0(0)	0(0)	0(0)
Polypedilum sp.	0.4(0.9)	0.5(1)	2.3(1.5)
Procladius sp.	0(0)	0(0)	0(0)
Tubificoides heterochaetus	6.2(13.9)	0(0)	0(0)

Table 6.4-8 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected at Rat Island (P12) during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-site for both high and low intertidal areas at each station.

Rat Island (P12)

High Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0(0)
Bezzia/palpomia	1.8(0.8)	0(0)	0.3(0.5)
juv. Bivalve	0(0)	0(0)	0(0)

Table 6.4-8. continued

Rat Island (P12) High Intertidal	Spring 99	Spring 00	Spring 01
Boccardiolla sp.	0(0)	0(0)	0(0)
Cassidisca lunifrons	0.2(0.4)	0.3(0.5)	0.3(0.5)
Collembola sp.	0.2(0.4)	1(0.8)	0(0)
Corophium (lacustre)	0.2(0.4)	0(0)	0(0)
Cricotopus sp.	0.2(0.4)	0(0)	0(0)
Curculionidae sp.	0(0)	0(0)	0(0)
Cyathura madelinae	0(0)	0(0)	0(0)
Cyathura polita	0(0)	0(0)	0(0)
Dicrotendipes lobus	0(0)	0(0)	0(0)
Dicrotendipes nirvosus	0(0)	0(0)	0(0)
Dicrotendipes sp.	0(0)	0(0)	0.3(0.5)
Dispia unicata	0(0)	0.3(0.5)	0(0)
Dolichopodid larvae	0(0)	0.3(0.5)	0.8(1.5)
Dolichopus sp.	0.6(0.9)	0(0)	0(0)
Donacia sp.	0.2(0.4)	0(0)	0(0)
Edotea triloba	0(0)	0(0)	0(0)
Gammarus diaberi	0(0)	0(0)	0(0)
Gammarus mucronatus	0(0)	0(0)	0(0)
Gammarus tigrinus	0(0)	0(0)	0(0)
gastropod juv.	0.2(0.4)	0(0)	0(0)
Halipldae sp.	0(0)	0(0)	0(0)
Heterothissocladius sp.	0(0)	0.3(0.5)	0(0)
Hobsonia florida	0(0)	0(0)	0(0)
Hydrobia sp.	0(0)	0.25(0.5)	0(0)
Insect larvae (Elimidae)	0(0)	0(0)	0(0)
insect larvae g	0.4(0.9)	0(0)	0(0)
insect larvae h	1.2(2.7)	0(0)	0(0)
Insect larvae/pupae	0(0)	0(0)	0(0)
insect pupae	0(0)	0(0)	0(0)
insect sp. f	0(0)	0(0)	0.8(1)
Laeonereis culveri	1(1.2)	0.3(0.5)	0(0)
Lumbriculid sp.	0(0)	0.3(0.5)	0(0)
Mediomastus sp.	0(0)	0(0)	0(0)
Megalopae (Uca)	0(0)	0(0)	0(0)
Mite	0(0)	0(0)	0.3(0.5)
Monopylephorus irroratus	1(2.2)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0.3(0.5)
Nematoda sp.	24(35.6)	17.5(13.8)	0(0)
juv. Nereidae sp.	0(0)	0(0)	0.3(0.5)
Nereidae sp.	0(0)	17.5(13.8)	0(0)
Ocypode quadrata	0.2(0.4)	0(0)	0(0)
Oligochaete	47.8(21.5)	30(19.6)	13.3(14.2)
Orchestia sp.	0(0)	0(0)	0.5(1)
Orchestia uhleri	0.2(0.4)	0.5(0.6)	0(0)

Table 6.4-8. continued

Rat Island (P12) High Intertidal	Spring 99	Spring 00	Spring 01
Ostracoda	0.2(0.4)	0(0)	0(0)
Paratendipes sp.	0(0)	0(0)	0(0)
Polydora ligni	0(0)	0(0)	0(0)
Polydora socialis	0(0)	0(0)	0(0)
Polydora sp.	0(0)	0(0)	0(0)
Polypedilium sp.	0(0)	0(0)	0.5(1)
Pristinella sp	0.2(0.4)	0(0)	0(0)
Uca minax	0.2(0.4)	0(0)	0(0)
Uca pugilator	0.2(0.4)	0(0)	0(0)

Rat Island (P12) Low Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0(0)
amphipod sp. B	0.2(0.4)	0(0)	0(0)
Bezzia/palpomia	0.2(0.4)	0(0)	0(0)
Boccardiella sp.	0(0)	0(0)	12.5(25)
Chirodotea caeca	0(0)	0(0)	0(0)
Collembola sp.	0(0)	0(0)	0.5(1)
Corophium acherasicum	0(0)	0(0)	1(2)
Corophium sp.	0(0)	0(0)	0(0)
crab megalopae	0(0)	0(0)	0(0)
Cryptochironomous (fulvens)	0(0)	0(0)	0(0)
Dolichopodid larvae	0(0)	0(0)	0(0)
Gammarus tigrinus	0.2(0.4)	0(0)	0(0)
juv. Gastropoda	0(0)	0(0)	0.3(0.5)
Hobsonia florida	0(0)	0(0)	0(0)
insect	0(0)	0.3(0.5)	0(0)
insect larvae	0(0)	0.3(0.5)	0(0)
insect pupae	0(0)	0(0)	0(0)
insect sp.d	0(0)	0(0)	0(0)
insect sp. E	0(0)	0(0)	0(0)
larval fish	0(0)	0(0)	0(0)
Lumbriculid sp.	0(0)	1.8(2.9)	0(0)
Marenzellaria virdis	0(0)	0(0)	0(0)
Megalopa (Uca)	0(0)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0.5(1)
nemertean	0(0)	0(0)	0(0)
juv. Nereidae	0(0)	0(0)	0(0)
Oligochaete	1.6(1.1)	7.3(8.8)	2.8(3)
Ostracoda	0(0)	0(0)	0(0)
Paracladopelma sp.	0.2(0.4)	0(0)	0(0)
Polydora ligni	0.2(0.4)	0(0)	0(0)
Polydora sp.	0.2(0.4)	0(0)	0(0)
Polypedilum sp.	0.2(0.4)	0(0)	0(0)
Procladius sp.	0(0)	0(0)	0(0)

Table 6.4-8. continued

Rat Island (P12)

Low Intertidal	Spring 99	Spring 00	Spring 01
Tubificoides heterochaetus	0(0)	0(0)	0(0)

Table 6.4-9 Mean (no. per 0.01 m^2) and standard deviation for all taxa collected at Fishing Creek (P13) during June 1999, June 2000, and June 2001. The means presented here represent the combination of two sub-site for both high and low intertidal areas at each station.

Fishing Creek (P13)

High Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0(0)
Bezzia/palpomia	0(0)	0(0)	0(0)
juv. Bivalve	0(0)	0.8(1)	0(0)
Boccardiolla sp.	0(0)	0(0)	0(0)
Cassidisca lunifrons	0(0)	0(0)	0(0)
Collembola sp.	0.2(0.4)	0(0)	0(0)
Corophium (lacustre)	0(0)	0(0)	0(0)
Cricotopus sp.	0(0)	0(0)	0(0)
Curculionidae sp.	0(0)	0(0)	0(0)
Cyathura madelina	0(0)	0(0)	0(0)
Cyathura polita	0.2(0.4)	0(0)	0(0)
Dicrotendipes lobus	0(0)	0(0)	0(0)
Dicrotendipes nirvosus	0(0)	0(0)	0(0)
Dicrotendipes sp.	0(0)	0(0)	0(0)
Dispia unicata	0(0)	0(0)	0(0)
Dolichopodid larvae	0(0)	1.3(1.5)	0.3(0.5)
Dolichopus sp.	0.4(0.5)	0(0)	0(0)
Donacia sp.	0(0)	0(0)	0(0)
Edotea triloba	0(0)	0(0)	0(0)
Gammarus diaberi	0(0)	0(0)	0(0)
Gammarus mucronatus	0(0)	0(0)	0(0)
Gammarus tigrinus	0(0)	0(0)	0(0)
gastropod juv.	0(0)	0(0)	0(0)
Halipldae sp.	0.2(0.4)	0(0)	0(0)
Heterothissocladius sp.	0(0)	0(0)	0(0)
Hobsonia florida	0(0)	0(0)	0(0)
Hydrobia sp.	0(0)	0.3(0.5)	0(0)
Insect larvae (Elimidae)	0(0)	0(0)	0(0)
insect larvae g	0(0)	0(0)	0(0)
insect larvae h	0(0)	0(0)	0(0)
Insect larvae/pupae	0(0)	0(0)	0(0)
insect pupae	0.2(0.4)	0(0)	0.3(0.5)
insect sp. f	0(0)	0(0)	0(0)
Laeonereis culveri	0.4(0.5)	2(2.2)	0(0)
Lumbriculid sp.	1.4(3.1)	0.5(0.6)	0(0)

Table 6.4-9. continued

Fishing Creek (P13) High Intertidal	Spring 99	Spring 00	Spring 01
Mediomastus sp.	0.2(0.4)	0(0)	0(0)
Megalopae (Uca)	0(0)	0(0)	0.3(0.5)
Mite	0(0)	0(0)	0(0)
Monopylephorus irroratus	0(0)	0(0)	0(0)
Namalycastis sp.	0(0)	0(0)	0.3(0.5)
juv. Nereidae sp.	0(0)	0(0)	0(0)
Nereidae sp.	0(0)	0(0)	0(0)
Ocypode quadrata	0(0)	0(0)	0(0)
Oligochaete	29.4(15.4)	11(7.4)	46.5(27.1)
Orchestia sp.	0(0)	0(0)	0.5(0.6)
Orchestia uhleri	0(0)	0(0)	0(0)
Ostracoda	0(0)	0(0)	0(0)
Paratendipes sp.	0(0)	0.5(1)	0.8(1)
Polydora ligni	0(0)	0(0)	0(0)
Polydora socialis	0(0)	0(0)	0(0)
Polydora sp.	0(0)	0(0)	0(0)
Polypedilium sp.	0.2(0.4)	0(0)	0.3(0.5)
Pristinella sp	0(0)	0(0)	0(0)
Uca minax	0(0)	0(0)	0(0)
Uca pugilator	0(0)	0(0)	0(0)

Fishing Creek (P13) Low Intertidal	Spring 99	Spring 00	Spring 01
amphipod sp.	0(0)	0(0)	0(0)
amphipod sp. B	0(0)	0(0)	0(0)
Bezzia/palpomia	0(0)	0(0)	0.3(0.5)
Boccardiella sp.	0(0)	0(0)	0(0)
Chirodotea caeca	0.3(0.5)	0(0)	0(0)
Collembola sp.	0(0)	0(0)	0(0)
Corophium acherasicum	0(0)	0(0)	0(0)
Corophium sp.	0(0)	0(0)	0(0)
crab megalopae	0(0)	0(0)	0(0)
Cryptochironomous (fulvens	0.5(1)	0(0)	0(0)
Dolichopodid larvae	0(0)	0.3(0.5)	0(0)
Gammarus tigrinus	0(0)	0(0)	0(0)
juv. Gastropoda	0(0)	0(0)	0(0)
Hobsonia florida	0(0)	0(0)	0.3(0.5)
insect	0(0)	0(0)	0(0)
insect larvae	0(0)	0(0)	0(0)
insect pupae	0.3(0.5)	0(0)	0(0)
insect sp.d	0.3(0.5)	0(0)	0(0)
insect sp. E	0(0)	0(0)	0(0)
larval fish	0.3(0.5)	0(0)	0(0)
Lumbriculid sp.	0(0)	0(0)	0(0)

Table 6.4-9. continued

Fishing Creek (P13)

Low Intertidal	Spring 99	Spring 00	Spring 01
Marenzellaria virdis	0(0)	0(0)	0(0)
Megalopa (Uca)	0(0)	0(0)	0.3(0.5)
Namalycastis sp.	0(0)	0.3(0.5)	0(0)
nemertean	0(0)	0(0)	0(0)
juv. Nereidae	0(0)	0(0)	0(0)
Oligochaete	34.3(22.3)	29.3(30.7)	8.3(1)
Ostracoda	0.3(0.5)	0(0)	0(0)
Paracladopelma sp.	0(0)	0(0)	0(0)
Polydora ligni	0(0)	0(0)	0(0)
Polydora sp.	0(0)	0(0)	0(0)
Polypedilum sp.	0.3(0.5)	1(1.4)	1.3(1.9)
Procladius sp.	0.8(1)	0(0)	0(0)
Tubificoides heterochaetus	0(0)	0(0)	0(0)

There were six common taxa abundant enough to use in date and position analysis; oligochaetes, juvenile bivalves (<2 mm), *Boccardiella* and *Marrenzellaria* (spionid polychaetes), *Corophium* (amphipod), and *Tanais* (tanaid). As mentioned above, these taxa represent 3% or more of the total number of individuals in any sampling period. In addition to common taxa, we also conducted analysis using functional groupings based on all taxa greater than 1% of the total number of individuals present. These grouping were based primarily on living position and living habit or behavior that may affect their availability to predators, as recorded in the literature or personal observation. Eighteen total taxa were combined into five functional groups (guilds) for the analysis presented here. The functional groups include deep burrowing (taxa that burrow deeper than 3 cm), surface burrowing (taxa that are surface oriented either living directly on the surface or in the flocculent layer or burrow in the top 1 cm of sediment), sedentary (this includes taxa that build tubes, but have limited mobility), surface motile (taxa that tend to be associated with the substrate surface and are highly motile), and motile tube dwelling (taxa that build ephemeral tubes but are highly motile and often not associated with their tube). These functional grouping represent the various living habits and important aspects of prey susceptibility and ability to respond to disturbances. We will present the results of the analyses separately for each of the three tributary systems.

There are three Town Creek stations, P2 located at the mouth of the creek and two upper stations, P3A and P3B, located adjacent to one another in the mesohaline region of the creek. There were 11 total date effects (Table 6.4-10) among the three stations (most of which were relatively weak) including oligochaetes that showing a distinctly higher abundance in 1999 compared to 2001 (2000 samples were intermediate) at P2 but a higher abundance in 2000 at both of the upper stations. Other date effects include the motile tube dwelling functional group at P2 that had higher abundances in 2001 compared to the previous years and sedentary/tube dwellers at P3A and P3B that show a decline in abundance from a 1999 peak.

Table 6.4-10 Analysis of Variance results based on comparison among years and between positions for all common taxa and functional groups, (Town Creek stations P2=Mouth of Town Creek, P3A and P3B= Upper Town Creek.). Common taxa are those species that comprise 3% or more of the total population during any sampling period. Functional grouping are based on all taxa greater than 1% of the total abundance during any sampling period.

Site	Taxa	Date	Position	Date*position
P2	Oligochaete	.007	.02	ns ’99 > ‘01
	Bivalve (juv)	ns	ns	ns
	Boccardiella	.0001	ns	ns only present ‘00
	Corophium	ns	ns	ns
	Marrenzellaria	ns	ns	ns
	Tanais	-	-	-
	Sedentary/tube dwelling	ns	ns	ns
	Deep Burrowers	.02	.05	ns
	Surface Burrowers	ns	ns	ns
	Motile Tube dwelling	.01	.02	.01 ’01 > ’00 > ‘99
	Surface Motile	ns	ns	ns
P3A	Oligochaete	.04	ns	ns ‘00 > ‘99
	Bivalve (juv)	ns	ns	ns
	Boccardiella	-	-	-
	Corophium	-	-	-
	Marrenzellaria	ns	ns	ns
	Tanais	-	-	-
	Sedentary/tube dwelling	.01	.01	.01 ’99 > ’00, ‘01
	Deep Burrowers	.04	ns	ns ’00 > ’99 > ‘01
	Surface Burrowers	ns	ns	ns
	Motile Tube dwelling ns	ns	ns	
	Surface Motile	ns	ns	ns
P3B	Oligochaete	.0008	ns	ns ’00 > ’01, ‘99
	Bivalve (juv)	.04	ns	.04 only present ‘99
	Boccardiella	-	-	-
	Corophium	-	-	-
	Marrenzellaria	ns	ns	ns
	Tanais	-	-	-
	Sedentary/tube dwelling	.03	ns	ns ’99 > ‘00
	Deep Burrowers	.0009	ns	ns ’00 > ’01, ‘99
	Surface Burrowers	ns	ns	ns
	Motile Tube dwelling	ns	.04	ns low > high
	Surface Motile	ns	ns	ns

The main-stem Cape Fear stations also showed several mixed patterns with 10 comparisons showing date effects (6.4-11). Oligochaetes show differences at P6 (the lowest downstream station in this tributary) and at P8 (the highest upstream station) with highest abundances in 1999 and lowest abundances in 2001, respectively. The deep burrowing functional group also followed this pattern. The spionid *Marrenzellaria* showed lowest abundances in 1999, but no difference between 2000 or 2001 at P6. It was not present at either of the other stations. The motile tube dwelling functional group showed a consistent pattern of higher abundances in 2001 compared to 1999 or 2000 at both P7 and P8.

Table 6.4-11 Analysis of Variance results based on comparison among years and between positions for all common taxa and functional groups, (Cape Fear stations P6=Eagle Island, P7= Indian Creek., and P8= Dollisons Landing). Common taxa are those species that comprise 3% or more of the total population during any sampling period. Functional grouping are based on all taxa greater than 1% of the total abundance during any sampling period.

Site	Taxa	Date	Position	Date*position	
P6	Oligochaete	.0006	ns	.002	’99 > ’00, ‘01
	Bivalve (juv)	ns	ns	ns	
	Boccardiella	-	-	-	
	Corophium	-	-	-	
	Marrenzellaria	.002	.0001	.0003	’99 < ’00, ‘01
	Tanais	-	-	-	
	Sedentary/tube dwelling	ns	ns	ns	
	Deep Burrowers	.02	ns	.03	’99 > ’00, ‘01
	Surface Burrowers	-	-	-	
	Motile Tube dwelling	ns	ns	ns	
	Surface Motile	ns	ns	ns	
P7	Oligochaete	ns	ns	ns	
	Bivalve (juv)	ns	ns	ns	
	Boccardiella	-	-	-	
	Corophium	ns	ns	ns	
	Marrenzellaria	-	-	-	
	Tanais	-	-	-	
	Sedentary/tube dwelling	ns	ns	ns	
	Deep Burrowers	ns	ns	ns	
	Surface Burrowers	-	-	-	
	Motile Tube dwelling	.002	.03	.009	’01 > ’99, ‘00
	Surface Motile	ns	ns	ns	

Table 6.4-11. continued

Site	Taxa	Date	Position	Date*position	
P8	Oligochaete	.001	ns	ns	’01 < ’00, ‘99
	Bivalve (juv)	ns	.006	ns	
	Boccardiella	-	-	-	
	Corophium	.0009	.004	.009	’01 > ’99, ‘00
	Marrenzellaria	-	-	-	
	Tanais	-	-	-	
	Sedentary/tube dwelling	.04	ns	ns	’00 > ‘01
	Deep Burrowers	.01	ns	ns	’00 > ‘01
	Surface Burrowers	-	-	-	
	Motile Tube dwelling	.0008	.0003	.002	’01 > ’00, ‘99
	Surface Motile	ns	ns	ns	

Unlike the other two tributary systems the NE Cape Fear tributary showed only 3 date effects (Table 6.4-12). All three date effects were from samples collected at P11 and potentially consistent with construction effects. Note, however, that increased salinity found in this branch of the estuary was presumably caused by a regional drought (see Sections 3, 4, & 5 of this report) and may just as likely explain this effect. *Marenzellaria* showed a distinct stepwise increase in abundance since 1999. Likewise the sedentary/tube dwelling functional group also showed higher abundance in 2001 but no difference between 1999 and 2000. The only other effect was from the surface burrowing functional group that was only present during 2001 at that station.

Table 6.4-12 Analysis of Variance results based on comparison among years and between positions for all common taxa and functional groups, (NE Cape Fear stations P11=Smith Creek., P12= Rat Island., and P13= Fishing Creek). Common taxa are those species that comprise 3% or more of the total population during any sampling period. Functional grouping are based on all taxa greater than 1% of the total abundance during any sampling period.

Site	Taxa	Date	Position	Date*position	
P11	Oligochaete	ns	ns	.001	
	Bivalve (juv)	ns	ns	ns	
	Boccardiella	ns	ns	ns	
	Corophium	ns	ns	ns	
	Marrenzellaria	.0016	.0001	.0016	’01 > ’00 > ’99
	Tanais	-	-	-	
	Sedentary/tube dwelling	.03	ns	.007	
	Deep Burrowers	ns	ns	.03	
	Surface Burrowers	.0001	.0001	.001	only present ‘01
	Motile Tube dwelling	ns	ns	ns	
	Surface Motile	ns	ns	ns	

Table 6.4-12. continued

Site	Taxa	Date	Position	Date*position
P12	Oligochaete	ns	.0003	ns high > low
	Bivalve (juv)	-	-	-
	Boccardiella	ns	ns	ns
	Corophium	ns	ns	ns
	Marrenzellaria	-	-	-
	Tanais	-	-	-
	Sedentary/tube dwelling	ns	ns	ns
	Deep Burrowers	ns	.0002	.03 high > low
	Surface Burrowers	ns	ns	ns
	Motile Tube dwelling	ns	ns	ns
	Surface Motile	ns	ns	ns
P13	Oligochaete	ns	ns	.01
	Bivalve (juv)	ns	ns	ns
	Boccardiella	-	-	-
	Corophium	-	-	-
	Marrenzellaria	-	-	-
	Tanais	-	-	-
	Sedentary/tube dwelling	ns	ns	ns
	Deep Burrowers	ns	ns	.03
	Surface Burrowers	-	-	-
	Motile Tube dwelling	ns	ns	ns
	Surface Motile	ns	ns	ns

Although there were 22 total date effects (for both common taxa and functional groups) detected by our analysis only four were consistent with predictions of potential construction impacts. If current construction activities were having large-scale impacts on the infaunal community within the fringing marshes we would expect a more general pattern of change. Many of the obvious effects were weak and functional responses driven by patterns in the common taxa. These responses may be artifacts of yearly variation, especially the occurrence of drought conditions in 2001. As the project nears completion patterns of change will become more pronounced and occur a larger area if the cause is project related.

7.0 EPIBENTHIC STUDIES: DECAPODS AND EPIBENTHIC FISH

7.1 Summary of Monitoring Efforts

Three years of epibenthic sampling are summarized in this report. Breder traps target fauna in vegetated areas and drop traps more motile fauna in the shallow subtidal. Two years (1999 and 2000) of spring and fall collections prior to channel deepening represent the background condition, while 2001/2002 represents a period after construction has begun. Multiple years are critical in comparisons to control for inter-annual differences in recruitment and environmental effects. However, we have preliminarily compared the Fall 2001 and Spring 2002 samples to the previous two years.

Preliminary results from Breder traps do not indicate strong 2001/2002 differences relative to previous years. Fall drop traps also do not indicate strong 2001 differences compared to other years. However, grass shrimp, blue crabs, spot, croaker, and menhaden did exhibit significant differences between Spring 2002 and other years, with higher abundances in most cases during 2002. Effects were most apparent at the lower Cape Fear and Northeast Cape Fear sites and the two Town Creek sites. Further sampling is needed to determine if these patterns are just annual variations due to the recent drought or longer-term patterns.

7.2 Background

As part of the Cape Fear River Widening and Deepening Project, the epibenthic decapod and fish community located along the intertidal and shallow subtidal wetland fringe is being monitored. Aside from resident fish and decapods, epibenthos include juveniles of transient fish, crabs and shrimp as well as larger snails, amphipods, and isopods. These organisms tend to be highly motile, are often able to utilize a variety of habitats, and may respond rapidly to environmental cues. Many species have non-resident larval stages that recruit into the upper estuary, making recruitment, and subsequent impacts on population levels, potentially responsive to changes in river hydrology. Examples of epibenthos in the Cape Fear system include important fisheries species such as the blue crab, *Callinectes sapidus*, the spot, *Leiostomus xanthurus*, and commercial shrimp, *Panaeus* spp. Epibenthos also include species that occupy critical intermediate trophic roles, being predators on benthos or plankton and prey for larger fish (e.g. grass shrimp, *Palaemonetes* spp., killifish, *Fundulus* spp., and bay anchovy, *Anchoa* sp.). Evaluation of epibenthos provides direct information on possible year class strength of target fishery and indicator species as well as indications of resource and ecosystem responses. Epibenthos may respond quickly to changing conditions because of their ability to move from unfavorable conditions as well as their dependence on annual recruitment events.

In this study, the focus is on the epibenthic community utilizing fringing marsh habitats across the estuarine gradient during both spring and fall periods. This timing represents periods of recruitment into the estuary. The primary period of recruitment is in the spring with a smaller pulse in the fall of the year. Differences in species composition between seasons usually occur. Habitats sampled are the most prominent structural habitats within the upper Cape Fear estuarine system and provide both refuge and forage for epifaunal organisms, specifically juveniles of many fish and decapods.

Epibenthic taxa may represent indicators of ecosystem level changes for three reasons: 1) their motile lifestyles allows them to quickly respond to physical changes in the environment, 2) many of the species have juveniles that represent the critical "bottleneck" in year class strength and are sensitive to hydrodynamic factors affecting larval ingress, and 3) the intermediate trophic role of many epibenthos may lead to both changes in primary consumer abundances (e.g. benthos) and higher predator abundances. Changes in tidal amplitude or salinity regimes may be first detected as a change in the distribution of certain epifaunal organism, including shifts in dominance at a site or along the upstream/ downstream gradient. Epifauna are sensitive to changes in many physical conditions and may show behavioral avoidance depending on the factor (i.e. rapid shift in dissolved oxygen, temperature or salinity), with relatively small changes affecting dispersal and movement patterns. Despite variability in small-scale distribution, epibenthos may show consistency on the large scale (i.e. timing of ingress/egressing into the estuary and dominance patterns). For many epifauna, especially the juveniles of transient fish, a critical factor may be resource limitation. The presence of a consistent and abundant food resources (including benthic fauna) and refuge (structural habitat within the marsh system) are important for determining population levels and survivorship.

The objective of this section is to evaluate long-term trends in abundance, species composition and habitat utilization of epibenthos and to detect shifts (if any) in these patterns concordant with river deepening activities and any associated physical changes. The primary objective of the first 2 years of sampling (Fall 1999-Spring 2001) was to establish a reliable baseline data set on composition and abundance patterns. By the third year of monitoring (Fall 2001-Spring 2002 – the period covered in this report), initial effects of actual deepening activities may begin to be observed if construction progresses sufficiently to change hydrology in the upper estuary. Any potential long-term impacts of the river deepening project would be detected by comparison of patterns over multiple years after channel deepening has been completed to pre-construction and during construction patterns.

The current working hypotheses are: 1) Changes in salinity, tidal inundation, or tidal amplitude may cause shifts in the epibenthic community (composition and /or abundance) that utilizes the intertidal and shallow subtidal regions of the estuary. If these changes do occur they should be evident as shifts in faunal abundance over time at a site and possibly as shifts among sites. 2) If possible impacts due to the deepening and widening of the river channel significantly alter the benthic community they may cause a trophic cascading effect that will change the dominance patterns and possibly the distribution of some epibenthic species. 3) At the most severe extreme, hydrologic alterations may affect recruitment strength for transient species at some stations.

7.3 Methodology

The most important structural habitats within the upper Cape Fear River estuary are the fringing marshes. In order to evaluate possible impacts of deepening and widening the Cape Fear River shipping channel on ecosystem function and on the species that are dependent on these habitats we sampled epibenthic fish and crustaceans using Breder traps and drop traps. Breder traps are used to sample organisms moving into the fringing marsh as it becomes flooded on the rising tides. Drop traps target those organisms that primarily utilize the lower marsh edge in the shallow subtidal areas. Drop traps provide quantitative estimates of abundance while Breder traps compare relative abundance. However, Breder traps estimate cumulative abundance over several hours while drop traps provide only instantaneous measures of abundance. These methods sample different subsets of the epibenthos, but both are highly effective within their respective application.

Nine stations were selected across the estuarine gradient to monitor epibenthic communities, corresponding to the benthic monitoring stations and representing a subset of the 12 stations monitored for physical factors. Epibenthic samples have been collected in Fall (September-October) since 1999 and Spring (March-April) since 2000. These sampling periods reflect the major recruitment pulses for many estuarine dependent species. As with the benthic monitoring, these stations cover the mesohaline to oligohaline regions within Town Creek, the mainstem Cape Fear River and the Northeast Cape Fear River.

Breder traps are used to sample small fish and crustaceans utilizing areas within the vegetated marsh or wooded swamp. The traps are constructed of clear acrylic (31 cm length X 16 cm height X 15 cm width). When submerged, these traps are transparent and catch epibenthic fish and crustaceans passively. At each station, traps are placed at three tidal heights; lower intertidal (near mean low water), mid intertidal (submerged ~1m depth at mean high water), and upper intertidal (submerged ~ 0.5m at mean high water). Two sets of five traps are set at each tidal height with the opening oriented toward the channel or down stream. The orientation of the traps is based on preliminary data that indicates this positioning is optimal for obtaining highest catches. Each trap is secured to the substrate to ensure it maintains proper orientation. All traps are set on the rising tide and traps are allowed to “fish” for two hours. This time period is based on previous work and represents a compromise between obtaining higher catches and reducing possible loss due to escape or to predation or cannibalism among organisms within the traps. All organisms caught are identified to lowest possible taxon and representative specimens are preserved for verification. All organisms caught are measured for total length. Breder trap sampling is conducted at 9 sites: P11 (Smith Creek), P12 (Rat Island) and P13 (Fishing Creek) in the mainstem Cape Fear, P6 (Eagle Island), P7 (Indian Creek) and P8 (Dollisons Landing) in the Northeast Cape Fear, and P2 mouth of Town Creek) and 2 sites at P3 in upper Town Creek.

Drop traps are used to sample those epibenthos utilizing the lower marsh edge or shallow subtidal regions of the marsh. The drop trap is an aluminum square that is 1m on a side and 1m high with mesh netting and floats attached to the top edge to prevent organisms from escaping. The trap is deployed from a boat using a large boom that suspends the trap 6-8 feet above the water surface. When the trap is released its weight drives it into the substrate and seals the bottom to prevent organisms from escaping beneath the trap (each drop is checked for an adequate bottom seal upon deployment to ensure that organisms cannot escape). Eighteen replicate drops are made in the shallow subtidal areas at each station. Replicate samples are taken at least 10m apart and at least 20 minutes is allowed between each sample. Once the trap is secured, the contents are removed using a steel frame sweep net with a 2mm mesh. The trap is considered empty when five consecutive sweeps of the entire trap yield no organisms. All organisms caught are identified, enumerated, and measured (total length). Representatives of each species caught are preserved for verification. Drop sampling is conducted at the same sites as Breder trap sampling, except that the two P3 subsites are sampled as one site.

Drop trap and Breder trap sampling are conducted during the same time window for all stations. However, a minimum of two days is allowed between sampling methods for any station. This time period reduces possible interference between sampling methods and reduces possible impacts at the sampling stations.

For this report, we present mean abundance of epibenthos for each station by year and season (reflecting seasonal variation in faunal abundances). To begin examination of potential deepening activity effects, we compare abundances of dominant fauna among years for each station. Dominant fauna are defined here as those comprising greater than 5% of the individuals caught and these were the taxa used in initial statistical analyses because their higher mean abundance increases the likelihood of detecting patterns based on the limited among year data base. Abundances of all fauna were log transformed before analyses to meet assumptions of non-heterogeneity of variances. For drop traps, a 1-way Analysis of Variance was used to compare abundances among the 3 years for each taxa at each site within a season type. Where significant year affects were found, an SNK test was used to distinguish among the 3 years. If initial deepening is affecting abundances, we predict this should be apparent as Fall 2001 or Spring 2002 differences relative to the other 2 years of sampling. However, the nature of the epibenthic data set requires that multiple post-deepening years be compared to multiple pre-deepening years in order to filter out interannual variability. Additionally, full affects of channel deepening may not become apparent until the project is complete with all alterations finished. This is particularly true for the 2002 data where potential effects of a recent drought may alter distributions over the short term. The analysis for Breder traps was similar, except a 2-way ANOVA was used to also allow examination of interactions between elevation effects and among year effects.

7.4 Faunal Patterns

As expected, the faunal community described by Breder and drop trap sampling differed. Breder trap catches were dominated by benthic-oriented taxa such as grass shrimp, *Palaemonetes pugio*, gobiid fish (e.g. *Gobionellus*), mummichogs, *Fundulus heteroclitus*, and fiddler crabs, *Uca* spp. Several of these taxa are strongly associated with vegetation or structure (some being permanent marsh residents) and are underrepresented in drop trap catches (Tables 7.1-7.18). However, more motile and open water taxa are captured at high relative abundances in the drop trap catches relative to Breder traps (Tables 7.19-7.26). These include blue crabs, *Callinectes sapidus*, spot, *Leiostomus*, anchovy, *Anchoa*, flatfish, e.g. *Trinectes*, and silversides, *Menidia*. Because of these catch differences, results for Breder traps and drop traps are dealt with separately in the following discussion.

Intertidal position of Breder traps (high, mid or low tidal within the vegetated marsh or wooded swamp) had little significant effect on faunal abundances (Table 7.4-27). Comparisons of position effects were significant for only 8 instances out of 68 and were marginally significant ($0.05<p<0.01$) for 6 of these (Table 7.29). Grass shrimp at P12 in spring were the only taxa to have strong position effects and this was observed only during one year (as reflected by significant interactive effects). Interactions between year and position were only significant in 4 instances and were small relative to year effects.

Year effects were more frequent than position effects for Breder trap catches. *Panaeus*, *Palaemonetes*, *Gobionellus*, *Leiostomus*, *Uca*, *Fundulus*, and *Gambusia* all exhibited among year differences during at least one season*site combination (Table 7.4-27). During fall there were 16 significant among year effects (Table 7.29). However, these did not correspond to our *a priori* predictions for detecting effects of initial river deepening impacts, i.e. greater abundances in Fall 2001 relative to the other 2 years. Only 4 of the 16 among year differences involved significant differences between Fall 2001 and the previous 2 periods. Among year effects were much more frequent during spring, with 21 comparisons indicating significant among-year differences. Once again, these did not correspond to *a priori* expectations for initial deepening effects, with only 6 instances where Spring 2002 differed from the other years (2 of these occurring in the upper Town Creek areas).

Faunal composition and dominance patterns had a much stronger seasonal component for drop traps compared to Breder traps, reflecting this technique's targeting of transient as well as resident fauna. Fall drop trap sampling was qualitatively similar to Breder trap results for among-year patterns. Differences among years were apparent for a variety of taxa (17 of 68 comparisons), but few of these (3 of 17) were consistent with predictions for detection of initial channel deepening impacts (Table 7.4-26 ;7.4-28). Two of the 3 instances where Fall 2001 differed from the other 2 years occurred in station P3 (upper Town Creek) (7.4-28). However, year effects were much more apparent during Spring 2002, with 21 instances of significant among year effects and 14 of these representing cases where Spring 2002 differed from both Spring 2001 and Spring 2000. *Palaemonetes*, *Leiostomus*, and *Callinectes* exhibited differences between Spring 2002 and other years at the lower Northeast Cape Fear site. In 3 of these comparisons, 2002 abundances were higher than in the previous 2 years. Both *Palaemonetes* and *Callinectes* also exhibited higher abundances at P6 (lower mainstem Cape Fear station) in Spring 2002 compared to other years. Strong 2002 effects also were observed for the Town Creek stations, with *Callinectes*, *Panaeus*, *Micropogonias*, *Menidia* and *Brevoortia* all being more common in Spring 2002 relative to other years in stations P2 and/or P3. Only *Leiostomus* at P2 was less common in 2002 relative to other years.

Table 7.4-1 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P2.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0.20 (0.20)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculates	0 (0)	0 (0)	0.03 (0.03)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0.05 (0.05)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0.05 (0.05)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.10 (0.10)	0.05 (0.05)	0.03 (0.03)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboids	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0.05 (0.05)	0.03 (0.03)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0.03 (0.03)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0.15 (0.08)	0.03 (0.03)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.30 (0.21)	0.40 (0.22)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0.70 (0.33)	0.90 (0.28)	0.60 (0.27)	0.10 (0.10)	0.10 (0.10)	0.10 (0.10)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-1. continued

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)
Trinectes maculatus	0 (0)	0.05 (0.05)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0.05 (0.05)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0.03 (0.03)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0.10 (0.07)	2.90 (1.53)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-2 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P3A.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0.20 (.20)	0.10 (0.10)	0.10 (0.10)	0.10 (0.10)	0.20 (0.13)	0.40 (0.16)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0.20 (0.20)	0 (0)	0.50 (0.31)	1.10 (0.41)	0.50 (0.31)
Gobionellus shufeldti	0 (0)	0.10 (0.10)	0.10 (0.10)	0 (0)	0.80 (0.47)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0.10 (0.10)	0.10 (0.10)	0.20 (0.20)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-2. continued

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0.70 (0.52)	0.40 (0.31)	0.50 (0.31)	0.30 (0.15)	0.40 (0.22)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.20 (0.20)	0.40 (0.22)	0.80 (0.25)	0 (0)	0.20 (0.20)	0.30 (0.21)	0.20 (0.20)	0.10 (0.10)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-3 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P3B.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0.10 (0.10)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	1.00 (0.56)	0.20 (0.13)	1.00 (0.49)	0 (0)	0.30 (0.15)	0 (0)
Gobionellus shufeldti	0 (0)	0.10 (0.10)	0.10 (0.10)	0.10 (0.10)	0.10 (0.10)	0.50 (0.22)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	1.60 (0.40)	1.50 (0.76)	1.20 (0.59)	0.20 (0.13)	0.10 (0.10)	0.10 (0.10)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-3. continued

	Fall 1999			Fall 1999			Fall 1999		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.50 (0.22)	0.20 (0.13)	0.40 (0.16)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-4 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P6.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0.10 (0.10)	0.11 (0.11)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0.10 (0.10)	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)	0 (0)	0.10 (0.10)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-4. continued

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	1.00 (0.60)	0.80 (0.44)	0.20 (0.13)	1.90 (1.49)	1.40 (0.45)	2.89 (1.74)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-5 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P7.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)

Table 7.4-5. continued

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0.20 (0.13)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.60 (0.34)	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-6 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P8.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	1.0 (1.0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0.20 (0.13)	0.20 (0.20)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-6. continued

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-7 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P11.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.20 (0.13)	0 (0)	0.30 (0.21)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.10 (0.10)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0.10 (0.10)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-7. continued

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.80 (0.80)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.60 (0.27)	0.50 (0.22)	0.20 (0.13)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.10 (0.10)	0.20 (0.13)	8.50 (4.17)	0 (0)	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-8 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P12.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0.60 (0.34)	0 (0)	0.40 (0.22)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-8. continued

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0 (0)	0 (0)	0 (0)	0.20 (0.20)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0.20 (0.13)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0.10 (0.10)	0 (0)	0 (0)	0.40 (0.31)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.11 (0.11)	0 (0)	0.10 (0.10)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0.20 (0.13)	0.10 (0.10)	0.10 (0.10)	0.30 (0.15)	1.70 (0.52)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-9 Mean abundance (SE) for epibenthic fauna collected during fall breder trap samples at station P13.

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0.10 (0.10)	0.20 (0.20)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0.60 (0.60)	0.30 (0.30)	0 (0)	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-9. continued

	Fall 1999			Fall 2000			Fall 2001		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0.40 (0.31)	0.40 (0.31)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-10 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P2.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.20 (0.13)	0.10 (0.10)	0.10 (0.10)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0.10 (0.10)	0.09 (0.09)	0 (0)	0.20 (0.13)	0.20 (0.13)	0.10 (0.10)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.10 (0.10)	0.18 (0.12)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0.09 (0.09)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	9.90 (2.66)	5.00 (1.46)	5.30 (2.33)	0 (0)	0 (0)	0.50 (0.22)	1.10 (0.62)	0.80 (0.36)	0.30 (0.21)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)

Table 7.4-10. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)
Palaemonetes pugio	1.50 (0.43)	1.36 (0.47)	2.30 (1.04)	2.00 (0.82)	1.10 (0.53)	1.30 (0.68)	1.00 (0.45)	1.00 (0.47)	0.10 (0.10)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-11 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P3A.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0.10 (0.10)	1.00 (0.54)	1.00 (0.89)	1.50 (0.82)	0.10 (0.10)	0.30 (0.15)	0.80 (0.51)

Table 7.4-11. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0.10 (0.10)	0.50 (0.27)	0.50 (0.31)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0.10 (0.10)	0.30 (0.21)	0.40 (0.40)	0.90 (0.69)
Gobionellus shufeldti	0 (0)	0.10 (0.10)	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	1.50 (0.62)	2.10 (0.57)	2.00 (0.67)	0.10 (0.10)	1.40 (0.56)	1.80 (0.53)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.20 (0.13)	1.20 (0.36)	1.10 (0.48)

Table 7.4-12 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P3B.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0.10 (0.10)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0.10 (0.10)	0.20 (0.13)	0.30 (0.15)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0.40 (0.31)	1.10 (0.67)	0.60 (0.40)	2.30 (0.83)	2.30 (1.04)	0.60 (0.34)
Gobionellus shufeldti	0.10 (0.10)	0.10 (0.10)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0.20 (0.13)	0.10 (0.10)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0.20 (0.20)	0.10 (0.10)	0.10 (0.10)	1.20 (0.53)	0.30 (0.15)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-12. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.70 (0.26)	1.20 (0.49)	0.60 (0.34)	0.20 (0.13)	0.60 (0.40)	0.90 (0.50)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.40 (0.22)	0.30 (0.15)	2.60 (0.73)

Table 7.4-13 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P6.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0.10 (0.10)	0.10 (0.10)	0 (0)	0.10 (0.10)	0 (0)	0.20 (0.13)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.90 (0.59)	1.00 (0.89)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Gobionellus shufeldti	0 (0)	0.10 (0.10)	0.10 (0.10)	0.20 (0.13)	0.30 (0.21)	0.10 (0.10)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0.10 (0.10)	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0.20 (0.13)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)	0.10 (0.10)	0.20 (0.20)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0.30 (0.30)	0.10 (0.10)	0.20 (0.20)	0 (0)	0 (0)	0.20 (0.20)

Table 7.4-13. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)	0.10 (0.10)
Paralichthys dentatus	0.30 (0.30)	0.40 (0.22)	0.10 (0.10)	0.10 (0.10)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Uca pugnax	0 (0)	0 (0)	0 (0)	0.30 (0.21)	0 (0)	0.60 (0.31)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-14 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P7.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.50 (0.31)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-14. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.40 (0.16)	1.10 (0.28)	4.33 (3.85)	0.40 (0.22)	0.60 (0.22)	0.30 (0.21)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	6.60 (2.35)	8.20 (3.57)	2.80 (0.66)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0.40 (0.22)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0.10 (0.10)
Paralichthys lethostigma	0 (0)	0.30 (0.15)	0.67 (0.44)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)

Table 7.4-15 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P8.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0 (0)	0 (0)	0 (0)	0.60 (0.31)	0.30 (0.15)	0.30 (0.21)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0.10 (0.10)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.20 (0.13)	1.00 (0.80)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-15. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-16 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P11.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0.30 (0.15)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.20 (0.20)	0 (0)	0.10 (0.10)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0 (0)	0 (0)	0 (0)	0.60 (0.31)	0.20 (0.13)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	1.30 (0.76)	0.30 (0.21)	1.0 (0.39)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.80 (0.61)	0.50 (0.22)	1.70 (0.84)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.20 (0.20)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.40 (0.16)	0.40 (0.31)	1.20 (0.63)

Table 7.4-16. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0.20 (0.13)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-17 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P12.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0.30 (0.15)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0.20 (0.20)	0.80 (0.49)	0 (0)	0 (0)	0.30 (0.21)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-17. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Gobionellus shufeldti	0.60 (0.31)	0.60 (0.31)	0.10 (0.10)	0 (0)	0.20 (0.20)	0.10 (0.10)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.20 (0.13)	0.20 (0.13)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)
Leiostomas xanthurus	0.20 (0.20)	0.20 (0.13)	0.10 (0.10)	0.50 (0.31)	0.60 (0.27)	0.80 (0.49)	0 (0)	0.20 (0.13)	0 (0)
Lepomis macrochirus	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0.20 (0.20)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0.20 (0.20)	0.30 (0.21)	0.50 (0.22)	0 (0)	1.00 (0.39)	0.50 (0.27)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0.30 (0.21)	0.30 (0.15)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.20 (0.20)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.10 (0.10)	0 (0)	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-18 Mean abundance (SE) for epibenthic fauna collected during spring breder trap samples at station P13.

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
Amphipods	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Diving beetle	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dormitator maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinostomus argenteus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0.10 (0.10)	0.80 (0.42)	0.40 (0.22)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia affinis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hirudinea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomas xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.30 (1.10)	0.60 (0.34)	0.20 (0.13)
Lepomis macrochirus	0.10 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropterus salmoides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.30 (0.30)	0.10 (0.10)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys albigutta	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Symphorus plagiusa	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-18. continued

	Spring 2000			Spring 2001			Spring 2002		
	Low	Mid	Upper	Low	Mid	Upper	Low	Mid	Upper
U/I fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I insect	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I larval fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0.10 (0.10)	0.20 (0.13)	0.60 (0.43)	0.80 (0.33)	0 (0)	0 (0)	0 (0)
Uca sp	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-19. Mean abundance (SE) for epibenthic fauna collected in drop trap sampling at station P2.

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Anchoa mitchelli	0.44 (0.44)	0 (0)	1.39 (1.33)	0 (0)	0 (0)	2.00 (1.94)
Anchoa sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anguila rostrata	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)	0.28 (0.14)
Bivalve	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)	0 (0)
Brevoortia tyrannus	0 (0)	0 (0)	0.17 (0.17)	0 (0)	0 (0)	21.67 (20.80)
Callinectes sapidus	0.33 (0.14)	0.67 (0.23)	0.78 (0.42)	0.06 (0.06)	0.06 (0.06)	0.50 (0.15)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Clupeidae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Corbicula fluminea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dorosoma pretense	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox americanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox lucius	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinotomus argentus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gerres cinereus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.44 (0.20)	0 (0)	0.06 (0.06)	0.17 (0.09)	0.06 (0.06)	0.11 (0.08)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0.06 (0.06)	0 (0)	0.44 (0.23)	0 (0)	0 (0)
Leiostomus xanthurus	0 (0)	0 (0)	0 (0)	7.0 (2.41)	62.89 (40.60)	0.22 (0.17)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lutjanus griseus	0 (0)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0.39 (0.24)	5.61 (3.20)	1.28 (0.75)	1.39 (1.13)
Menidia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menticirrhus saxatilis	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0.44 (0.27)	0 (0)	0 (0)	9.06 (1.89)
Mugil cephalus	0 (0)	0 (0)	0.06 (0.06)	0 (0)	1.39 (0.78)	0.89 (0.35)
Notropis chalybaeus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis petersoni	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	1.39 (0.88)	0.78 (0.61)	2.11 (0.81)	5.56 (1.35)	20.22 (10.05)	37.94 (16.39)
Panopeus herbstii	0.06 (0.06)	0.50 (0.31)	0 (0)	0.06 (0.06)	0 (0)	0 (0)
Panopeus sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0.06 (0.06)	0 (0)	0.11 (0.08)	0 (0)	0.11 (0.08)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeid	0 (0)	0.17 (0.12)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0.17 (0.09)	0.17 (0.12)	0 (0)	0 (0)	3.06 (2.37)
Penaeus setiferus	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)
Procambarus robostus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia cuneata	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-19. continued

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Rhithropanopeus harrisii	0.06 (0.06)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0.22 (0.10)
Sesarma cinereum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma reticulatum	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
U/I juvenile fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.06 (0.06)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Uca sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-20 Mean abundance (SE) for epibenthic fauna collected in drop trap sampling at Station P3.

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Anchoa mitchelli	1.36 (0.63)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anchoa sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anguila rostrata	0.06 (0.04)	0 (0)	0 (0)	0.09 (0.07)	0.28 (0.16)	0 (0)
Bivalve	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brevoortia tyrannus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.00 (2.50)
Callinectes sapidus	0.11 (0.10)	0 (0)	0.11 (0.08)	0.20 (0.11)	0.28 (0.16)	0.56 (0.27)
Cambarus robustus	(0.03) (0.03)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Clupeidae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Corbicula fluminea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dorosoma pretense	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox americanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox lucius	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinotomus argentus	0 (0)	0 (0)	0.11 (0.08)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0.12 (.08)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0.81 (0.72)	1.83 (0.62)	3.39 (1.72)	2.00 (1.28)	0.06 (0.06)	0.22 (0.13)
Gerres cinereus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.53 (0.34)	0.33 (0.16)	0.17 (0.09)	0.28 (0.12)	0.73 (0.39)	0.22 (0.17)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0.34 (0.19)	0 (0)	0.22 (0.10)
Leiostomus xanthurus	0 (0)	0 (0)	0.28 (0.14)	0 (0)	0.28 (0.17)	0 (0)
Lepomis macrochirus	0.09 (0.07)	0.06 (0.06)	0 (0)	1.59 (1.70)	0 (0)	0 (0)
Lutjanus griseus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0.06 (0.04)	0 (0)	0.06 (0.06)	0.06 (0.06)	0 (0)	4.33 (2.22)
Menidia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menticirrhus saxatilis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0.11 (0.08)	0 (0)	0 (0)	0 (0)	0 (0)	50.44 (21.43)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	2.89 (1.19)
Notropis chalybaeus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-20. continued

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Notropis petersoni	0 (0)	0 (0)	0 (0)	0 (0)	0.22 (0.22)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	1.39 (0.83)	0 (0)	0.17 (0.09)	7.17 (3.23)
Panopeus herbstii	0.06 (0.06)	0.17 (0.12)	0.06 (0.06)	0.06 (0.04)	0 (0)	0 (0)
Panopeus sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0.06 (0.06)	0.45 (0.16)	1.17 (0.59)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus setiferus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Procambarus robostus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia cuneata	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Sesarma cinereum	0 (0)	0.28 (0.11)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma reticulatum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	2.14 (1.05)	0.06 (0.06)	0 (0)	0.31 (0.17)	0.39 (0.22)	0 (0)
U/I juvenile fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.92 (0.47)	5.06 (0.96)	0 (0)	0.03 (0.03)	0 (0)	0 (0)
Uca sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.78 (0.46)

Table 7.4-21 Mean abundance (SE) for epibenthic fauna collected in drop trap sampling at station P6.

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Anchoa mitchelli	0 (0)	1.00 (0.37)	0 (0)	0 (0)	0 (0)	0 (0)
Anchoa sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anguila rostrata	0 (0)	0 (0)	0 (0)	0 (0)	0.11 (0.08)	0.05 (0.05)
Bivalve	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brevoortia tyrannus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0.22 (0.10)	0.06 (0.06)	0 (0)	0 (0)	0.06 (0.06)	0.53 (0.18)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Clupeidae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.21 (0.21)
Corbicula fluminea	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dorosoma pretense	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox americanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox lucius	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinotomus argentus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.32 (0.27)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gerres cinereus	0 (0)	0.28 (0.16)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-21. continued

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Gobionellus shufeldti	0.06 (0.06)	0.22 (0.15)	0 (0)	0.11 (0.11)	0.11 (0.08)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomus xanthurus	0 (0)	0 (0)	0.22 (0.13)	0 (0)	1.72 (0.72)	1.00 (0.52)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lutjanus griseus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0.11 (0.08)	0 (0)	0.17 (0.09)	0 (0)	20.83 (10.04)	0 (0)
Menidia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menticirrhus saxatilis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.32 (0.32)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0.22 (0.17)	0.16 (0.16)
Notropis chalybaeus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis petersoni	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	5.44 (3.28)	1.00 (1.00)	0 (0)	1.78 (0.60)	8.21 (2.52)
Panopeus herbstii	0 (0)	0.11 (0.08)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0.17 (0.12)	1.17 (0.56)	0.11 (0.11)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.26 (0.13)
Penaeid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus setiferus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Procambarus robostus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia cuneata	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.05 (0.05)
Sesarma cinereum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma reticulatum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.05 (0.05)
Trinectes maculatus	0.44 (0.20)	0.11 (0.08)	0 (0)	0 (0)	0 (0)	0 (0)
U/I juvenile fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-22 Mean abundance (SE) for epibenthic fauna collected in drop trap sampling at station P7.

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Anchoa mitchelli	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anchoa sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anguila rostrata	0 (0)	0 (0)	0 (0)	0.71 (0.34)	0.11 (0.11)	0 (0)
Bivalve	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brevoortia tyrannus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-22. continued

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Callinectes sapidus	0.06 (0.06)	0 (0)	0.17 (0.09)	0 (0)	0 (0)	0 (0)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Clupeidae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Corbicula fluminea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dorosoma pretense	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox americanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox lucius	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinotomus argentus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0.06 (0.06)	0.17 (0.17)	0 (0)	0 (0)	0 (0)	0 (0)
Gerres cinereus	0 (0)	0.22 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.06 (0.06)	0.28 (0.18)	0.22 (0.10)	0.29 (0.14)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0.35 (0.35)	0 (0)	0 (0)
Leiostomus xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lutjanus griseus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0 (0)	0.28 (0.18)	0 (0)
Menidia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)
Menticirrhus saxatilis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.28 (0.28)
Notropis chalybaeus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis petersoni	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0.28 (0.23)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0.06 (0.06)	0.47 (0.29)	1.56 (0.56)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.11 (0.08)
Penaeid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus setiferus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Procambarus robostus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia cuneata	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia sp.	0 (0)	0 (0)	0 (0)	0.06 (0.06)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma cinereum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma reticulatum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0.06 (0.06)	0.44 (0.15)	0 (0)	0 (0)	0 (0)
U/I juvenile fish	0 (0)	0.39 (0.33)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.06 (0.06)	0.11 (0.11)	0 (0)	0.06 (0.06)	0 (0)	0 (0)
Uca sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-23 Mean abundance (SE) for epibenthic fauna collected in drop trap sampling at station P8.

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Anchoa mitchelli	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anchoa sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anguila rostrata	0 (0)	0 (0)	0 (0)	0 (0)	0.33 (0.18)	0.39 (0.14)
Bivalve	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brevoortia tyrannus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.22 (0.10)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Clupeidae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Corbicula fluminea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dorosoma pretense	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox americanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox lucius	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinotomus argentus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0.22 (0.22)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gerres cinereus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.11 (0.08)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomus xanthurus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lepomis macrochirus	0.06 (0.06)	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)
Lutjanus griseus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0 (0)	0.61 (0.39)	0 (0)	0 (0)
Menidia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menticirrhus saxatilis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis chalybaeus	2.94 (1.98)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis petersoni	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0.06 (0.06)	0.11 (0.11)	0.06 (0.06)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.22 (0.13)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus setiferus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Procambarus robostus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia cuneata	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-23. continued

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma cinereum	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0.11 (0.11)
Sesarma reticulatum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0.17 (0.12)	0 (0)	0.11 (0.11)	0 (0)	0 (0)	0.06 (0.06)
U/I juvenile fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0.17 (0.12)	0.17 (0.09)	0.06 (0.06)	0 (0)	0 (0)
Uca sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-24 Mean abundance (SE) for epibenthic fauna collected in drop trap sampling at station P11.

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Anchoa mitchelli	0 (0)	0 (0)	0.11 (0.11)	0 (0)	0 (0)	0.06 (0.06)
Anchoa sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anguila rostrata	0 (0)	0 (0)	0 (0)	0.33 (0.16)	0 (0)	0.06 (0.06)
Bivalve	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brevoortia tyrannus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Callinectes sapidus	0 (0)	0.06 (0.06)	0.50 (0.25)	0.11 (0.08)	0 (0)	1.17 (0.56)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Clupeidae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Corbicula fluminea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dorosoma pretense	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox americanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox lucius	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinotomus argentus	0 (0)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Gerres cinereus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.22 (0.13)	0 (0)	0.06 (0.06)	0.17 (0.12)	0 (0)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.33 (0.20)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0.72 (0.50)	0 (0)	0.11 (0.08)
Leiostomus xanthurus	0 (0)	0 (0)	0.11 (0.08)	14.83 (9.79)	9.56 (2.30)	1.94 (0.60)
Lepomis macrochirus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lutjanus griseus	0 (0)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	1.89 (0.64)	0.83 (0.61)	0.22 (0.17)	1.0 (0.76)	0.06 (0.06)
Menidia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menticirrhus saxatilis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0.28 (0.28)	0 (0)	0.94 (0.79)	0.17 (0.12)
Notropis chalybaeus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-24. continued

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Notropis petersoni	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	1.56 (0.41)	0.17 (0.17)	0.06 (0.06)	0.17 (0.09)	5.20 (2.38)
Panopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	1.17 (0.44)	0.06 (0.06)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.28 (0.14)
Penaeid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0.83 (0.49)	6.28 (4.30)	0 (0)	0 (0)	0.28 (0.18)
Penaeus setiferus	0 (0)	1.89 (0.85)	0 (0)	0 (0)	0 (0)	0 (0)
Procambarus robostus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia cuneata	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia sp.	0 (0)	0 (0)	0 (0)	0.17 (0.12)	0 (0)	0 (0)
Rhithropanopeus harrisii	0.06 (0.06)	0.06 (0.06)	0.17 (0.12)	0 (0)	0 (0)	0 (0)
Sesarma cinereum	0 (0)	0.72 (0.38)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma reticulatum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0.22 (0.17)	0.06 (0.06)	0 (0)	0 (0)	0 (0)	0 (0)
U/I juvenile fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)

Table 7.4-25 Mean abundance (SE) for epibenthic fauna collected in drop trap sampling at station P12.

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Anchoa mitchelli	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anchoa sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anguila rostrata	0 (0)	0 (0)	0 (0)	0 (0)	0.33 (0.28)	0 (0)
Bivalve	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brevoortia tyrannus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)
Callinectes sapidus	0 (0)	0.11 (0.08)	0.56 (0.27)	0 (0)	0 (0)	0.78 (0.26)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Clupeidae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Corbicula fluminea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dorosoma pretense	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox americanus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox lucius	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinotomus argentus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-25. continued

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Gerres cinereus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0.11 (0.08)	0.06 (0.06)	0.06 (0.06)	0.06 (0.06)	0.56 (0.23)	0 (0)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.22 (0.10)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomus xanthurus	0 (0)	0 (0)	0.28 (0.23)	0.11 (0.08)	0 (0)	17.56 (15.35)
Lepomis macrochirus	0.11 (0.08)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lutjanus griseus	0 (0)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0.33 (0.23)	0.17 (0.12)	0.39 (0.39)	0 (0)
Menidia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menticirrhus saxatilis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis chalybaeus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis petersoni	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	1.22 (0.66)	1.56 (0.89)	0.06 (0.06)	1.61 (0.93)	1.50 (0.41)
Panopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0.17 (0.12)	0.33 (0.16)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0.06 (0.06)	0 (0)	0 (0)	0 (0)
Penaeus setiferus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Procambarus robostus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia cuneata	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)
Sesarma cinereum	0 (0)	0.17 (0.09)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma reticulatum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.11 (0.08)
U/I juvenile fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.06 (0.06)	1.11 (0.54)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-26 Mean abundance (SE) for epibenthic fauna collected in drop trap sampling at station P13.

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Anchoa mitchelli	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anchoa sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Anguila rostrata	0 (0)	0 (0)	0 (0)	0.17 (0.17)	0.28 (0.14)	0 (0)
Bivalve	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Brevoortia tyrannus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-26. continued

	Fall			Spring		
	1999	2000	2001	2000	2001	2002
Callinectes sapidus	0 (0)	0 (0)	0 (0)	0 (0)	0.17 (0.12)	0.06 (0.06)
Cambarus robustus	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)	0 (0)
Clupeidae	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Corbicula fluminea	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Dorosoma pretense	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Esox americanus	0 (0)	0 (0)	0 (0)	0 (0)	0.11 (0.11)	0 (0)
Esox lucius	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Eucinotomus argentus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus heteroclitus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Fundulus majalis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gambusia holbrooki	0 (0)	0.33 (0.18)	0 (0)	0 (0)	0 (0)	0 (0)
Gerres cinereus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Gobionellus shufeldti	0 (0)	0 (0)	0 (0)	0.22 (0.15)	0.17 (0.09)	0.11 (0.08)
Gobiosoma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Lagodon rhomboides	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Leiostomus xanthurus	0 (0)	0 (0)	0.39 (0.27)	0 (0)	0 (0)	0.11 (0.11)
Lepomis macrochirus	0.06 (0.06)	0 (0)	0 (0)	0.11 (0.11)	0 (0)	0 (0)
Lutjanus griseus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menidia beryllina	0 (0)	0 (0)	0.72 (0.46)	1.39 (0.97)	0.22 (0.22)	6.89 (6.54)
Menidia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Menticirrhus saxatilis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Micropogonias undulatus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Mugil cephalus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis chalybaeus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Notropis petersoni	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Palaemonetes pugio	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus herbstii	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Panopeus sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys dentatus	0 (0)	0 (0)	0 (0)	0.33 (0.16)	0.56 (0.23)	0 (0)
Paralichthys lethostigma	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Paralichthys sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeid	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus aztecus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Penaeus setiferus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Procambarus robostus	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.06 (0.06)
Rangia cuneata	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rangia sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Rhithropanopeus harrisii	0 (0)	0.22 (0.10)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma cinereum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Sesarma reticulatum	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Trinectes maculatus	0 (0)	0 (0)	0 (0)	0.33 (0.20)	0 (0)	0 (0)
U/I juvenile fish	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugilator	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca pugnax	0.11 (0.11)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Uca sp.	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

Table 7.4-27 Year and position (high, mid, low) effects for epibenthos in Breder traps. F-values are from a 2-way Analysis of Variance (only significant F-values are shown). Ns: not significant (p>0.05). Where year effects are significant, years are listed from highest abundance to lowest and years with the same superscript do not differ significantly (SNK test).

Site	Season	Species	Year	Position	Position*year
P2	Fall	Palaemonetes pugio	F=5.02, p<0.009; 2001^{1} 1999^{2} 2000^{2}	ns	ns
		Gobionellus shufeldti	ns	ns	ns
		Panaeus aztecus	F=26.59, p<0.0001; 2000^{1} 2001^{2} 1999^{2}	ns	ns
		Uca pugnax	ns	ns	ns
		Fundulus heteroclitus	ns	ns	ns
	spring	Palaemonetes pugio	ns	ns	ns
		Gobionellus shufeldti	ns	ns	ns
		Fundulus heteroclitus	ns	ns	ns
		Leiostomus xanthurus	F=41.30, p<0.0001; 2000^{1} 2002^{2} 2001^{2}	ns	ns
P3A	Fall	Gambusia holbrooki	F=12.95, p<0.0001; 2001^{1} 2000^{2} 1999^{2}	ns	ns
		Palaemonetes pugio	F=4.00, p<0.03; 2000^{1} 2001^{12} 1999^{2}	ns	ns
		Gobionellus shufeldti	ns	F=3.33, p<0.05	F=2.56, p<0.05
		Uca pugnax	F=4.20, p<0.02; 1999^{1} 2000^{2} 2001^{2}	ns	ns
		Fundulus heteroclitus	F=3.69, p<0.03; 2001^{1} 2000^{12} 1999^{2}	ns	ns
	Spring	Gambusia holbrooki	F=4.12, p<0.02; 2002^{1} 2001^{2} 2000^{2}	ns	ns
		Gobionellus shufeldti	F=3.24, p<0.05; 2000^{1} 2001^{1} 2002^{1}	ns	ns
		Uca pugnax	F=20.13, p<0.0001; 2000^{1} 2001^{2} 2002^{2}	F=3.60, p<0.04	ns
		Fundulus heteroclitus	F=5.57, p<0.006; 2001^{1} 2002^{12} 2000^{2}	ns	ns
		Palaemonetes pugio	ns	ns	ns
P3B	Fall	Gambusia holbrooki	F=8.86, p<0.0003; 2000^{1} 2001^{2} 1999^{2}	ns	ns
		Palaemonetes pugio	F=20.86, p<.0001; 2000^{1} 2001^{2} 1999^{2}	ns	ns
		Gobionellus shufeldti	F=4.39, p<0.02	ns	ns
		Uca pugnax	F=11.10, p<0.0001; 1999^{1} 2000^{2} 2001^{2}	ns	ns
		Fundulus heteroclitus	ns	ns	ns
	Spring	Gambusia holbrooki	F=10.60, p<0.0001; 2002^{1} 2001^{2} 2000^{3}	ns	ns

Table 7.4-27. continued

Site	Season	Species	Year	Position	Position*year
		Palaemonetes pugio	ns	F=3.69, p<0.04	ns
		Gobionellus shufeldti	ns	ns	ns
		Uca pugnax	F=8.30, p<0.0005; 2000^{1} 2001^{2} 2002^{2}	ns	ns
		Fundulus heteroclitus	ns	ns	ns
		Leiostomus xanthurus	F=3.24, p<0.05; 2001^{1} 2000^{1} 2002^{1}	ns	ns
P6	Fall	Palaemonetes pugio	F=8.48, p<0.0005; 2001^{1} 2000^{2} 1999^{2}	ns	ns
		Gobionellus shufeldti	ns	ns	ns
		Panaeus aztecus	ns	ns	ns
P6	spring	Palaemonetes pugio	ns	ns	ns
		Gobionellus shufeldti	ns	ns	ns
		Uca pugnax	F=7.05, p<0.002; 2001^{1} 2000^{2} 2002^{2}	ns	ns
		Leiostomus xanthurus	ns	ns	ns
		Fundulus heteroclitus	F=5.22, p<0.008; 2002^{1} 2001^{2} 2000^{2}	ns	ns
		Gambusia holbrooki	ns	ns	ns
P7	Fall	Uca pugnax	F=5.57, p<0.006; 1999^{1} 2000^{2} 2001^{2}	ns	ns
	Spring	Gobionellus shufeldti	F=8.13, p<0.0006; 2000^{1} 2001^{2} 2002^{2}	ns	ns
		Fundulus heteroclitus	F=3.21, p<0.05; 2001^{1} 2000^{1} 2002^{1}	F=3.15, p<0.05	F=3.19, p<0.02
		Leiostomus xanthurus	F=64.46, p<0.0001; 2001^{1} 2000^{2} 2002^{2}	ns	ns
P8	Fall	Gobionellus shufeldti	ns	ns	ns
	Spring	Gobionellus shufeldti	F=10.68, p<0.0001; 2001^{1} 2000^{2} 2002^{2}	ns	ns
P11	Fall	Palaemonetes pugio	ns	ns	ns
		Gobionellus shufeldti	ns	ns	ns
		Panaeus aztecus	F=13.28, p<0.0001; 2001^{1} 2000^{2} 1999^{2}	ns	ns
		Uca pugnax	F=6.47, p<0.003; 1999^{1} 2000^{2} 2001^{2}	F=3.85, p<0.03	F=4.60, p<0.003

Table 7.4-27. continued

Site	Season	Species	Year	Position	Position*year
		Fundulus heteroclitus	ns	ns	ns
	Spring	Palaemonetes pugio	F=11.35, p<0.0001; 2002[1] 2001[2] 2000[2]	ns	ns
		Gobionellus shufeldti	F=5.97 p<0.004; 2001[1] 2000[2] 2002[2]	ns	ns
		Fundulus heteroclitus	ns	ns	ns
		Leiostomus xanthurus	F=11.97, p<0.0001; 2000[1] 2001[2] 2002[2]	ns	ns
P12	Fall	Palaemonetes pugio	ns	ns	ns
		Gobionellus shufeldti	ns	ns	ns
		Panaeus aztecus	ns	ns	ns
		Uca pugnax	F=13.80, p<0.0001; 2000[1] 1999[2] 2001[2]	F=7.02, p<0.002	F=6.47, P<0.001
	Spring	Palaemonetes pugio	F=5.70, p<0.0056; 2002[1] 2001[1] 2000[2]	F=3.26, p<0.05	ns
		Gobionellus shufeldti	F=6.84, p<0.002; 2000[1] 2001[2] 2002[2]	ns	ns
		Uca pugnax	ns	ns	ns
		Fundulus heteroclitus	ns	F=5.16, p<0.01	ns
		Leiostomus xanthurus	F=5.66, p<0.005; 2001[1] 2000[2] 2002[2]	ns	ns
P13	Fall	Gambusia holbrooki	ns	ns	ns
		Uca pugnax	F=3.95, p<0.03; 1999[1] 2000[2] 2000[2]	ns	ns
	Spring	Uca pugnax	F=9.26, p<0.0002; 2001[1] 2000[2] 2002[2]	ns	ns
		Fundulus heteroclitus	F=8.08, p<0.0006; 2001[1] 2000[2] 2002[2]	ns	ns
		Leiostomus xanthurus	F=6.31, p<0.003; 2002[1] 2001[2] 2000[2]	ns	ns

Table 7.4-28 Among year differences by site and season for epibenthos in drop traps. F- and p-values are given for significant effects. "-" indicates species was absent. For significant year effects, differences among years are indicated (SNK test). Years are listed from highest to lowest abundance and those with the same superscript do not differ significantly.

Site	Species	Fall	Spring
P2	Anchoa mitchelli	ns	ns
	Callinectes sapidus	ns	F=7.44, p<0.002; 2002^{1} 2001^{2} 2000^{2}
	Gobionellus shufeldti	F=4.43, p<0.02; 1999^{1} 2001^{2} 2000^{2}	ns
	Menidia beryllina	ns	ns
	Palaemonetes pugio	ns	ns
	Panaeus aztecus	ns	F=5.34, p<0.008; 2002^{1} 2001^{2} 2000^{2}
	Uca pugnax	ns	-
	Brevoortia tyrannus	ns	ns
	Leiostomus xanthurus	-	F=13.63, p<0.0001; 2001^{1} 2000^{2} 2002^{3}
	Micropogonias undulatus	ns	F=78.15, p<0.0001; 2002^{1} 2001^{2} 2000^{2}
P3	Anchoa mitchelli	ns	-
	Callinectes sapidus	ns	ns
	Gambusia holbrooki	F=4.91, p<0.02; 2000^{1} 2001^{1} 1999^{2}	ns
	Gobionellus shufeldti	ns	ns
	Menidia beryllina	ns	F=17.78, p<0.0001; 2002^{1} 2000^{2} 2001^{2}
	Palaemonetes pugio	F=7.25, p<0.002; 2001^{1} 2000^{2} 1999^{2}	F=31.79, p<0001; 2002^{1} 2001^{1} 2000^{2}
	Trinectes maculatus	F=7.40, p<0.002; 1999^{1} 2000^{2} 2001^{2}	ns
	Uca pugnax	F=33.18, p<0.0001; 2000^{1} 1999^{2} 2001^{2}	ns
	Brevoortia tyrannus	-	F=7.15, p<0.002; 2002^{1} 2001^{2} 2000^{2}
	Leiostomus xanthurus	F=6.96, p<0.002; 2001^{1} 2000^{2} 1999^{2}	ns
	Micropogonias undulatus	ns	F=81.12, p<0.0001; 2002^{1} 2001^{2} 2000^{2}
P6	Anchoa mitchelli	F=9.19, p<0.0004; 2000^{1} 1999^{2} 2001^{2}	-
	Callinectes sapidus	ns	F=7.26, p<0.002; 2002^{1} 2001^{2} 2000^{2}
	Gobionellus shufeldti	ns	ns
	Menidia beryllina	ns	F=12.79, p<0.0001; 2001^{1} 2000^{2} 2002^{2}

Table 7.4-28. continued

Site	Species	Fall	Spring
	Palaemonetes pugio	F=6.56, p<0.003; 2000^{1}, 2001^{2} 1999^{2}	F=9.67, p<0.0003; 2002^{1} 2001^{2} 2000^{2}
	Trinectes maculatus	F=3.64, p<0.04; 1999^{1} 2000^{12}, 2001^{2}	-
	Leiostomus xanthurus	F=3.20, p<0.05; 2001^{1} 2000^{1} 1999^{1}	F=3.68, p<0.04; 2001^{1} 2002^{12} 2000^{2}
	Micropogonias undulatus	-	ns
P7	Callinectes sapidus	ns	-
	Gambusia holbrooki	ns	-
	Gobionellus shufeldti	ns	F=4.91, p<0.02; 2000^{1} 2001^{2} 2002^{2}
	Menidia beryllina	-	ns
	Palaemonetes pugio	ns	-
	Trinectes maculatus	F=7.69, p<0.002; 2001^{1} 2000^{2} 1999^{2}	-
	Uca pugnax	ns	ns
P8	Gambusia holbrooki	ns	-
	Gobionellus shufeldti	ns	-
	Menidia beryllina	ns	ns
	Trinectes maculatus	ns	-
	Uca pugnax	ns	ns
	Callinectes sapidus	-	F=4.86, p<0.02; 2002^{1} 2001^{2} 2000^{2}
P11	Anchoa mitchelli	ns	ns
	Callinectes sapidus	F=3.55, p<0.04; 2000^{1} 2001^{2} 1999^{2}	F=7.29, p<0.002 2002^{1} 2002^{2} 2001^{2}
	Gambusia holbrooki	ns	-
	Gobionellus shufeldti	ns	ns
	Menidia beryllina	F=5.28, p<0.009; 2000^{1} 2001^{2} 1999^{2}	ns
	Palaemonetes pugio	F=13.45, p<0.000^{1}; 2000^{1} 2001^{2} 1999^{2}	F=12.84, p<0.0001; 2002^{1} 2001^{2} 2000^{2}
	Panaeus aztecus	ns	ns
	Rhithropanopeus hartisii	ns	ns
	Leiostomus xanthurus ns	F=7.99, p<0.001; 2001^{1} 2000^{2} 2002^{3}	ns

Table 7.4-28. continued

Site	Species	Fall	Spring
P12	Callinectes sapidus	F=3.63, p<0.04; 2001^{1} 2000^{12} 1999^{2}	F=11.46, p<0.0001; 2002^{1} 2001^{2} 2000^{2}
	Gobionellus shufeldti	ns	F=5.73, p<0.006; 2001^{1} 2000^{2} 2002^{2}
	Menidia beryllina	ns	ns
	Palaemonetes pugio	ns	F=5.28, p<0.009; 2002^{1} 2001^{1} 2000^{2}
	Panaeus aztecus	ns	-
	Uca pugnax	F=5.45, p<0.008; 2000^{1} 1999^{2} 2001^{2}	-
	Leiostomus xanthurus ns	F=9.76, p<0.0003; 2002^{1} 2000^{2} 2001^{2}	-
	Trinectes maculates	-	ns
	Brevoortia tyrannus	-	ns
P13	Gambusia holbrooki	F=4.21, p<0.03; 2000^{1} 1999^{2} 2001^{2}	-
	Gobiosoma sp.	-	ns
	Menidia beryllina	ns	ns
	Trinectes maculatus	-	ns
	Uca pugnax	ns	-
	Leiostomus xanthurus ns	ns	-
	Callinectes sapidus	-	ns
	Gambusia holbrooki	-	ns

8.0 SALT SENSITIVE VEGETATION SURVEY

8.1 Summary

All stations previously surveyed were resurveyed in August 2002. Canopy density presented a problem obtaining accurate GPS positions during Summer 2001 (See Hackney et al. 2001). As a result, the extent of sensitive vegetation was delineated with pvc markers that will be used to obtain the extent of stands of sensitive vegetation after leaves have fallen in January 2003. The results of the Summer 2002 survey will be included in the annual report for 2002-2003.

9.0 LITERATURE CITED

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APPENDIX A

LIST OF TIDAL RANGES AT TWELVE STATIONS IN THE CAPE FEAR, NORTHEAST CAPE FEAR RIVER AND TOWN CREEK COLLECTED FROM JUNE 1, 2001 THROUGH MAY 31, 2002

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1	4.75	4.5	2.68	4.42	4.28	3.89	3.55	3.34	xxx	3.66	3.13	2.25
2	5.11	4.93	2.79	4.86	4.69	4.25	3.89	3.65	xxx	3.99	3.43	2.47
3	4.89	4.38	2.97	4.63	4.46	3.91	3.46	3.11	xxx	3.72	3.05	1.83
4	3.88	3.49	2.65	3.76	3.68	3.22	2.89	2.65	xxx	3.1	2.58	1.63
5	4.67	4.45	2.32	4.43	4.32	3.95	3.61	3.4	xxx	3.69	3.23	2.3
6	5.42	5.08	2.93	5.04	4.86	4.48	4.08	3.82	xxx	4.13	3.56	2.47
7	5.21	4.86	3.12	4.85	4.68	4.17	3.63	3.24	xxx	3.9	3.26	2.08
8	4.26	4.12	2.94	4.15	4.06	3.63	3.18	2.83	xxx	3.37	2.82	1.81
9	4.56	4.42	2.6	4.42	4.31	3.88	3.42	3.06	xxx	3.68	3.22	2.27
10	5.51	5.13	2.98	5.14	5.01	4.52	4.02	3.62	xxx	4.24	3.69	2.57
11	xxx	4.93	3.27	4.97	4.85	4.17	3.52	2.98	xxx	3.97	3.3	2.06
12	xxx	4	3.02	4.08	4.02	3.38	2.78	2.27	xxx	3.29	2.7	1.63
13	4.44	4.35	2.58	4.52	4.45	3.96	3.41	3.29	4.31	3.85	3.36	2.47
14	5.69	5.39	3.05	5.48	5.32	4.78	4.23	3.82	5.17	4.55	3.95	2.87
15	5.2	4.9	3.49	4.89	4.75	4.15	3.57	3.1	4.5	3.9	3.24	2.03
16	4.04	4.03	3	4.07	4.01	3.47	2.95	2.51	3.78	3.3	2.77	1.74
17	4.34	4.37	2.66	4.46	4.38	3.97	3.46	3.19	4.23	3.72	3.25	2.35
18	5.25	5.13	3.04	5.16	5.02	4.55	4.05	3.68	4.85	4.26	3.69	2.64
19	5.22	5.02	3.36	5.06	4.91	4.33	3.74	3.27	4.73	4.06	3.41	2.21
20	4.04	4.13	3.16	4.24	4.14	3.63	3.11	2.68	3.99	3.42	2.87	1.84
21	3.99	4.12	2.77	4.21	4.14	3.76	3.39	3.08	4.01	3.54	3.13	2.32
22	5.34	5.11	2.91	5.11	4.98	4.51	4.06	3.71	4.81	4.22	3.7	2.68
23	5.07	4.87	3.32	4.93	4.79	4.2	3.67	3.24	4.6	3.94	3.32	2.13
24	3.67	3.83	3.04	3.92	3.85	3.34	2.88	2.49	3.71	3.18	2.66	1.71
25	3.76	4.12	2.58	4.10	4.03	3.67	3.34	3.06	3.91	3.45	3.02	2.3
26	xxx	4.95	2.82	4.89	4.75	4.33	3.95	3.64	4.6	4.04	3.51	2.62
27	4.69	4.68	3.21	4.65	4.54	4.05	3.62	3.28	4.38	3.77	3.2	2.19
28	3.66	3.9	2.95	3.95	3.88	3.44	3.05	2.74	3.74	3.22	2.74	1.87
29	3.53	3.79	2.62	3.94	3.89	3.6	3.32	3.11	3.77	3.34	2.97	2.23
30	4.91	4.85	2.73	4.88	4.75	4.36	3.99	3.73	4.62	4.06	3.58	2.63
31	4.9	4.79	3.17	4.79	4.66	4.17	3.75	3.45	4.51	3.84	3.25	2.16

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
32	3.82	4	2.91	4.07	3.99	3.54	3.15	2.89	3.87	3.31	2.8	1.85
33	3.33	3.62	2.61	3.66	3.61	3.34	3.08	2.95	3.49	3.05	2.66	1.97
34	4.17	4.28	2.45	4.28	4.19	3.87	3.57	3.39	4.07	3.57	3.11	2.29
35	4.29	4.38	2.77	4.40	4.28	3.89	3.55	3.33	4.15	3.58	3.02	1.99
36	3.22	3.52	2.71	3.60	3.53	3.18	2.9	2.73	3.43	2.95	2.5	1.65
37	2.84	3.38	2.34	3.49	3.45	3.2	2.97	2.87	3.35	2.93	2.57	1.91
38	3.55	3.94	2.37	4.00	3.93	3.66	3.38	3.24	3.8	3.34	2.91	2.14
39	4.06	4.18	2.62	4.23	4.13	3.81	3.5	3.33	3.98	3.47	2.98	2.08
40	3.22	3.54	2.7	3.68	3.6	3.31	3.04	2.9	3.48	3.03	2.59	1.8
41	2.8	3.16	2.4	3.29	3.26	3.06	2.89	2.82	3.18	2.84	2.51	1.94
42	xxx	3.72	2.29	3.77	3.71	3.49	3.28	3.18	3.62	3.22	2.83	2.14
43	xxx	4.08	2.53	4.18	4.04	3.74	3.46	3.3	3.94	3.44	2.97	2.12
44	3.04	3.43	2.68	3.60	3.49	3.2	2.97	2.84	3.42	2.98	2.57	1.82
45	2.71	3.01	2.38	3.16	3.12	2.92	2.77	2.71	3.08	2.75	2.44	1.88
46	xxx	3.61	2.21	3.71	3.63	3.42	3.22	3.13	3.55	3.16	2.8	2.13
47	xxx	3.76	2.49	3.77	3.64	3.4	3.17	3.04	3.55	3.12	2.74	2.01
48	xxx	3.56	2.51	3.67	3.56	3.35	3.13	3.04	3.5	3.09	2.73	2.07
49	xxx	2.8	2.5	2.95	2.89	2.7	2.5	2.42	2.85	2.47	2.11	1.47
50	xxx	2.8	1.88	2.85	2.82	2.62	2.45	2.37	2.77	2.42	2.07	1.48
51	xxx	3.9	1.87	3.94	3.88	3.61	3.32	3.16	3.77	3.33	2.9	2.04
52	xxx	3.6	2.66	3.66	3.6	3.35	3.12	2.99	3.51	3.1	2.7	1.89
53	xxx	3.37	2.51	3.42	3.39	3.13	2.94	2.84	3.31	2.96	2.63	2.01
54	xxx	3.25	2.44	3.30	3.29	3.05	2.88	2.76	3.17	2.8	2.48	1.87
55	xxx	3.82	2.31	3.91	3.86	3.51	3.22	3.03	3.74	3.26	2.89	2.17
56	xxx	4.1	2.68	4.19	4.16	3.82	3.53	3.34	4.02	3.52	3.13	2.33
57	3.4	3.71	2.87	3.79	3.74	3.34	2.97	2.71	3.58	3.1	2.64	1.7
58	2.74	3.29	2.58	3.41	3.38	3.02	2.7	2.4	3.23	2.81	2.42	1.64
59	3.42	3.86	2.33	4.02	3.95	3.51	3.11	2.76	3.82	3.32	2.89	2.05
60	4.29	4.41	2.76	4.54	4.45	4	3.57	3.2	4.29	3.75	3.25	2.3
61	3.86	4.1	3.07	4.21	4.13	3.65	3.19	2.78	3.98	3.46	2.96	2.03
62	3.49	3.78	2.67	3.90	3.84	3.37	2.93	2.54	3.71	3.2	2.71	1.82

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
63	3.8	4.17	2.5	4.35	4.28	3.79	3.33	2.91	4.17	3.65	3.21	2.34
64	4.49	4.66	2.87	4.79	4.69	4.18	3.7	3.26	4.54	3.96	3.48	2.51
65	4.15	4.29	3.08	4.35	4.27	3.75	3.23	2.79	4.13	3.58	3.08	2.13
66	3.52	3.89	2.79	3.99	3.93	3.42	2.91	2.49	3.8	3.29	2.81	1.93
67	4.16	4.41	2.59	4.59	4.46	3.92	3.41	2.98	4.34	3.82	3.34	2.49
68	4.99	5.02	3.02	5.14	4.98	4.41	3.87	3.42	4.84	4.25	3.71	2.73
69	4.56	4.65	3.27	4.71	4.59	4	3.44	2.97	4.44	3.84	3.3	2.28
70	3.76	4.05	2.98	4.16	4.07	3.51	2.99	2.53	3.94	3.41	2.92	2.01
71	4.35	4.53	2.71	4.67	4.54	4.04	3.55	3.15	4.41	3.89	3.43	2.55
72	5.47	5.34	3.14	5.41	5.23	4.63	4.1	3.68	5.06	4.45	3.9	2.87
73	4.97	4.93	3.47	4.98	4.83	4.23	3.68	3.24	4.67	4.02	3.44	2.36
74	3.93	4.17	3.12	4.27	4.18	3.64	3.14	2.74	4.07	3.5	2.99	2.05
75	4.57	4.64	2.81	4.77	4.64	4.17	3.72	3.38	4.51	3.94	3.47	2.56
76	5.81	5.61	2.81	5.64	5.43	4.85	4.33	3.94	5.28	4.69	4.04	2.93
77	5.4	5.21	2.53	5.20	5.04	4.4	3.83	3.4	4.88	4.26	3.53	2.31
78	4.36	4.44	3.59	4.48	4.37	3.82	3.31	2.93	4.24	3.71	3.07	2.01
79	4.74	4.79	3.19	4.81	4.69	4.22	3.77	3.44	4.56	4.07	3.5	2.56
80	6.04	5.88	2.88	5.75	5.55	4.96	4.43	4.03	5.4	4.79	4.09	2.94
81	5.68	5.43	3.23	5.32	5.1	4.4	3.8	3.34	4.96	4.3	3.53	2.23
82	4.58	4.47	3.65	4.54	4.4	3.82	3.29	2.88	4.27	3.73	3.08	1.95
83	4.83	4.58	3.17	4.56	4.43	3.96	3.52	3.2	4.28	3.79	3.22	2.26
84	6.25	5.74	2.83	5.59	5.35	4.72	4.17	3.78	5.18	4.54	3.83	2.64
85	5.86	5.47	2.99	5.42	5.16	4.42	3.78	3.31	5	4.31	3.5	2.11
86	4.42	4.35	3.44	4.43	4.27	3.68	3.15	2.76	4.14	3.61	2.95	1.79
87	4.88	4.65	3.07	4.69	4.54	4.02	3.55	3.19	4.41	3.91	3.31	2.26
88	6.05	5.56	2.69	5.49	5.27	4.65	4.09	3.66	5.13	4.5	3.77	2.54
89	5.8	5.51	3	5.43	5.2	4.47	3.85	3.36	5.06	4.39	3.6	2.25
90	4.62	4.54	3.34	4.56	4.41	3.79	3.25	2.82	4.26	3.73	3.06	1.91
91	4.69	4.69	3.15	4.75	4.63	4.16	3.7	3.38	4.48	4	3.42	2.39
92	5.94	5.68	2.77	5.56	5.35	4.76	4.22	3.84	5.2	4.58	3.88	2.65
93	5.69	5.41	3.06	5.33	5.11	4.4	3.82	3.37	4.96	4.31	3.54	2.28

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
94	4.74	4.54	3.39	4.62	4.48	3.88	3.38	2.99	xxx	3.79	3.13	2.03
95	4.74	4.64	3.08	4.62	4.5	4.02	3.56	3.24	4.35	3.87	3.3	2.31
96	5.58	5.33	4.26	5.24	5.07	4.51	3.98	3.6	4.91	4.33	3.66	2.52
97	5.44	5.28	3.06	5.22	5.04	4.39	3.84	3.41	4.89	4.27	3.57	2.37
98	4.54	4.62	2.82	4.63	4.53	3.95	3.46	3.09	4.37	3.84	3.23	2.14
99	4.52	4.56	2.91	4.60	4.51	4.05	3.6	3.3	4.34	3.86	3.29	2.3
100	4.79	4.74	2.98	4.76	4.62	4.14	3.67	3.35	4.48	3.96	3.37	2.35
101	5.21	5.08	3.21	5.18	4.98	4.44	4	3.69	4.83	4.27	3.57	2.59
102	4.66	4.66	3.01	4.79	4.63	4.11	3.69	3.42	4.48	3.96	3.39	2.39
103	4.32	4.42	2.95	4.49	4.42	4.01	3.64	3.41	4.28	3.82	3.31	2.43
104	4.56	4.56	2.98	4.63	4.52	4.1	3.72	3.48	4.38	3.91	3.36	2.45
105	4.73	4.77	3.18	4.89	4.74	4.32	3.92	3.69	4.61	4.14	3.6	2.71
106	4.84	4.94	3.25	5.04	4.89	4.45	4.05	3.8	4.76	4.26	3.71	2.77
107	4.36	4.47	2.88	4.53	4.42	3.97	3.58	3.32	4.29	3.8	3.24	2.3
108	4.04	4.16	2.78	4.26	4.18	3.75	3.38	3.13	4.05	3.6	3.08	2.22
109	4.37	4.49	3.02	4.63	4.53	4.11	3.79	3.56	4.39	3.93	3.45	2.6
110	4.86	4.98	3.21	5.07	4.92	4.46	4.1	3.84	4.78	4.27	3.72	2.75
111	4.3	4.46	2.78	4.49	4.37	3.93	3.55	3.29	4.24	3.74	3.18	2.22
112	3.73	3.91	2.6	3.99	3.91	3.52	3.16	2.94	3.8	3.36	2.88	2.06
113	4.27	4.38	2.97	4.47	4.38	4.02	3.7	3.53	4.26	3.82	3.34	2.54
114	4.98	5.03	3.2	5.10	4.95	4.52	4.14	3.92	4.83	4.3	3.73	2.76
115	4.7	4.54	2.36	4.72	4.07	4.09	2.73	xxx	4.44	3.9	3.29	2.25
116	3.71	xxx	2.01	3.89	3.8	3.37	3.01	2.79	3.68	3.24	2.74	1.9
117	4.28	4.35	3.04	4.47	4.39	4.06	3.76	3.62	4.27	3.86	3.42	2.66
118	5.16	4.64	3.35	5.24	5.1	4.71	4.35	4.16	4.97	4.47	3.93	2.97
119	4.71	4.13	2.91	4.72	4.9	4.14	3.75	3.51	4.45	3.93	3.34	2.34
120	3.6	3.73	2.47	3.78	4.02	3.32	2.98	2.77	3.61	3.19	2.7	1.91
121	4.11	4.22	3	4.39	4.27	3.89	3.64	3.53	4.18	3.76	3.32	2.47
122	5.32	4.94	3.35	5.07	4.93	4.51	4.24	4.11	4.82	4.34	3.84	2.87
123	4.58	4.42	2.89	4.48	4.37	3.98	3.67	3.49	4.26	3.79	3.26	2.36
124	3.9	3.99	2.72	4.08	4.01	3.63	3.33	3.17	3.9	3.47	2.97	2.14

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
125	4.08	4.19	2.89	4.28	4.19	3.84	3.56	3.42	4.09	3.67	3.21	2.47
126	5.06	5.02	3.22	5.04	4.89	4.48	4.13	3.93	4.78	4.26	3.71	2.79
127	5.01	4.86	2.91	4.85	4.7	4.23	3.79	3.53	4.58	4.01	3.38	2.35
128	3.68	3.86	2.5	3.89	3.82	3.43	3.06	2.86	3.73	3.27	2.76	1.94
129	4.08	4.21	2.89	4.23	4.18	3.85	3.55	3.39	4.07	3.67	3.23	2.5
130	5.2	5.14	3.29	5.13	5.03	4.63	4.27	4.05	4.89	4.39	3.83	2.9
131	4.87	4.76	2.9	4.77	4.64	4.18	3.77	3.52	4.52	3.97	3.35	2.34
132	3.87	3.78	2.47	3.87	3.78	3.39	3.03	2.83	3.68	3.24	2.73	1.88
133	4.33	4.14	2.91	4.22	4.17	3.88	3.6	3.46	4.07	3.7	3.3	2.56
134	5.28	4.97	3.24	4.96	4.87	4.52	4.21	4.03	4.74	4.28	3.79	2.9
135	4.97	4.76	2.99	4.77	4.65	4.17	3.78	3.53	4.52	4.02	3.47	2.52
136	3.64	3.68	2.49	3.79	3.73	3.36	3.09	2.91	3.62	3.21	2.76	2.01
137	3.54	3.63	1.51	3.72	3.7	3.38	3.14	2.98	3.61	3.31	2.96	2.35
138	4.49	4.38	0.87	4.42	4.38	4.06	3.8	3.62	4.24	3.89	3.48	2.75
139	4.68	4.62	2.84	4.61	4.54	4.06	3.67	3.38	4.41	3.95	3.44	2.58
140	4	4	2.92	4.05	4.01	3.56	3.21	2.94	3.9	3.46	3	2.23
141	3.49	3.66	2.61	3.83	3.77	3.48	3.22	3.05	3.68	3.32	2.96	2.36
142	4.53	4.62	2.61	4.72	4.6	4.24	3.9	3.68	4.5	4.07	3.61	2.85
143	4.54	4.54	3.02	4.53	4.43	3.97	3.56	3.26	4.3	3.8	3.25	2.34
144	3.46	3.72	2.8	3.78	3.75	3.34	2.98	2.74	3.65	3.23	2.77	2.03
145	3.4	3.69	2.46	3.81	3.79	3.5	3.25	3.1	3.7	3.33	2.94	2.28
146	4.13	4.28	2.55	4.35	4.27	3.94	3.66	3.48	4.18	3.76	3.32	2.55
147	4.25	4.38	2.82	4.42	4.34	3.95	3.63	3.4	4.24	3.75	3.25	2.37
148	3.59	3.78	2.78	3.86	3.79	3.42	3.11	2.89	3.69	3.26	2.82	2.04
149	3.05	3.32	2.49	3.43	3.39	3.13	2.94	2.83	3.3	2.98	2.64	2.07
150	3.95	4.05	2.32	4.09	4.02	3.72	3.5	3.36	3.93	3.55	3.14	2.45
151	4.06	4.18	2.64	4.22	4.1	3.71	3.4	3.2	4	3.53	3.01	2.15
152	3.37	3.72	2.59	3.82	3.74	3.37	3.09	2.94	3.63	3.23	2.78	2.01
153	2.97	3.3	2.44	3.37	3.33	3.06	2.85	2.75	3.23	2.88	2.5	1.86
154	3.58	3.75	2.09	3.78	3.7	3.42	3.17	3.02	3.62	3.21	2.78	2.07
155	3.9	4.03	2.35	4.08	3.98	3.65	3.34	3.15	3.89	3.43	2.93	2.1

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
156	3.36	3.67	2.42	3.76	3.68	3.34	3.05	2.89	3.59	3.16	2.56	1.92
157	3.03	3.34	2.25	3.40	3.36	3.06	2.84	2.72	3.29	2.83	2.53	1.86
158	3.17	3.32	2.01	3.38	3.33	3.05	2.82	2.7	3.26	2.91	2.52	1.85
159	3.76	3.92	2	4.04	3.97	3.66	3.4	3.27	3.88	3.47	3.02	2.27
160	3.56	3.73	2.56	3.85	3.78	3.47	3.22	3.1	3.69	3.29	2.87	2.14
161	2.95	3.24	2.43	3.31	3.26	3.05	2.87	2.81	3.21	2.91	2.58	2
162	3.15	3.37	2.23	3.44	3.35	3.13	2.95	2.87	3.31	3.01	2.66	2.06
163	3.47	3.7	2.27	3.80	3.71	3.46	3.26	3.15	3.66	3.31	2.94	2.28
164	3.62	3.67	2.5	3.71	3.64	3.38	3.18	3.07	3.59	3.23	2.87	2.24
165	3.18	3.32	2.48	3.35	3.28	3.03	2.85	2.78	3.25	2.9	2.56	2
166	2.84	3.22	2.25	3.28	3.22	2.98	2.8	2.72	3.2	2.87	2.53	1.97
167	3.57	3.85	2.19	3.95	3.86	3.61	3.42	3.33	3.82	3.46	3.09	2.44
168	3.82	4.06	2.68	4.16	4.05	3.78	3.56	3.45	4.01	3.61	3.2	2.49
169	3.26	3.54	2.75	3.56	3.5	3.25	3.05	2.95	3.48	3.12	2.74	2.13
170	2.82	3.2	2.38	3.28	3.23	2.99	2.79	2.69	3.21	2.88	2.54	1.98
171	3.59	3.94	2.22	4.08	3.97	3.72	3.49	3.38	3.93	3.57	3.2	2.55
172	4.05	4.39	2.78	4.49	4.35	4.09	3.84	3.72	4.3	3.89	3.47	2.74
173	3.65	3.98	2.95	4.03	3.95	3.67	3.42	3.3	3.92	3.49	3.08	2.38
174	2.95	3.3	2.65	3.41	3.36	3.1	2.88	2.76	3.34	2.98	2.64	2.05
175	3.74	3.96	2.34	4.14	4.05	3.8	3.57	3.44	3.99	3.64	3.29	2.63
176	4.5	4.71	2.88	4.81	4.69	4.43	4.16	4.02	4.62	4.2	3.76	2.96
177	3.91	4.17	3.19	4.18	4.1	3.81	3.54	3.4	4.05	3.64	3.19	2.42
178	3.2	3.46	2.74	3.56	3.51	3.22	2.96	2.84	3.46	3.1	2.73	2.08
179	3.92	4.14	2.43	4.29	4.21	3.95	3.69	3.58	4.09	3.7	3.41	2.74
180	4.98	5.02	2.99	5.09	4.97	4.67	4.37	4.22	4.89	4.45	3.97	3.13
181	4.59	4.63	3.39	4.66	4.57	4.21	3.88	3.7	4.48	4.01	3.5	2.62
182	3.55	3.81	3.04	3.87	3.81	3.46	3.19	3.02	3.75	3.34	2.92	2.21
183	4.19	4.39	2.63	4.53	4.41	4	3.86	3.7	4.35	3.94	3.55	2.83
184	5.49	5.41	3.11	5.48	5.31	4.86	4.64	4.45	5.22	4.73	4.22	3.29
185	5.13	4.92	3.59	4.94	4.77	4.37	4.02	3.8	4.69	4.17	3.61	2.65
186	4	3.95	3.12	4.04	3.96	3.63	3.35	3.16	3.9	3.48	3.04	2.27

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
187	4.66	4.47	2.72	4.60	4.51	4.11	3.89	3.73	4.44	4.03	3.58	2.8
188	6.1	5.64	3.16	5.65	5.47	4.98	4.69	4.49	5.37	4.85	4.26	3.28
189	5.63	5.26	3.65	5.26	5.07	4.58	4.18	3.92	4.96	4.4	3.74	2.66
190	4.8	4.49	3.2	4.55	4.42	4	3.65	3.43	4.31	3.84	3.28	2.36
191	4.89	4.7	2.92	4.78	4.64	4.26	3.93	3.74	4.53	4.08	3.57	2.72
192	6.61	6.18	3.12	6.08	5.82	5.25	4.81	4.52	5.71	5.07	4.38	3.23
193	5.8	5.36	3.68	5.22	4.98	4.34	3.86	3.52	4.86	4.2	3.44	2.2
194	4.71	4.51	2.89	4.49	4.35	3.86	3.48	3.22	4.24	3.73	3.1	2.06
195	5.11	4.88	2.65	4.89	4.69	4.23	3.85	3.6	4.59	4.08	3.44	2.37
196	6.49	5.98	2.92	5.88	5.56	4.93	4.43	4.09	5.46	4.79	3.99	2.7
197	6.04	5.42	3.35	5.31	5.04	4.32	3.79	3.4	4.92	4.22	3.37	1.98
198	5.04	4.55	2.72	4.54	4.4	3.83	3.4	3.09	4.28	3.72	3.01	1.81
199	5.37	4.83	2.44	4.74	4.57	4.01	3.61	3.32	4.46	3.9	3.19	2.03
200	6.16	5.58	2.67	5.43	5.17	4.49	4	3.64	5.06	4.39	3.57	2.26
201	6.12	5.41	2.97	5.32	5.07	4.33	3.78	3.36	4.94	4.23	3.36	1.89
202	5.02	4.61	2.64	4.63	4.47	3.89	3.44	3.08	4.34	3.78	3.03	1.75
203	5.38	4.84	2.38	4.77	4.6	4.09	3.67	3.36	4.49	3.95	3.22	2.01
204	6.01	5.31	2.64	5.19	4.95	4.32	3.83	3.5	4.83	4.21	3.41	2.07
205	6.03	5.35	2.78	5.09	4.87	4.23	3.74	3.41	4.74	4.11	3.32	2.03
206	5.12	4.6	2.67	4.52	4.38	3.86	3.43	3.14	4.26	3.7	3	1.83
207	5.21	4.6	2.4	4.61	4.47	4	3.6	3.34	4.38	3.84	3.17	2.04
208	5.33	4.63	2.59	4.58	4.43	3.96	3.56	3.3	4.33	3.79	3.12	2.01
209	5.39	4.98	2.43	4.96	4.8	4.34	3.94	3.68	4.69	4.13	3.46	2.37
210	5.01	4.7	2.86	4.74	4.59	4.15	3.76	3.52	4.49	3.94	3.28	2.2
211	4.83	4.54	2.7	4.60	4.47	4.07	3.71	3.5	4.38	3.87	3.27	2.27
212	4.72	4.44	2.72	4.47	4.35	3.95	3.61	3.4	4.26	3.76	3.18	2.22
213	4.79	4.69	2.68	4.72	4.58	4.2	3.87	3.67	4.49	4.01	3.45	2.54
214	4.8	4.71	2.91	4.69	4.53	4.17	3.83	3.62	4.46	3.97	3.4	2.47
215	4.62	4.48	2.84	4.47	4.36	4.02	3.71	3.52	4.29	3.83	3.31	2.43
216	4.28	4.17	2.81	4.22	4.13	3.79	3.5	3.33	4.05	3.63	3.14	2.31
217	4.39	4.44	2.69	4.49	4.39	4.06	3.79	3.64	4.32	3.91	3.44	2.65

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
218	4.62	4.59	2.96	4.61	4.51	4.17	3.88	3.72	4.44	4	3.5	2.68
219	4.32	4.37	3.01	4.44	4.33	4	3.71	3.55	4.26	3.83	3.35	2.53
220	4.12	4.2	2.84	4.21	4.12	3.78	3.49	3.34	4.05	3.63	3.16	2.38
221	3.77	3.98	2.72	4.01	3.9	3.62	3.37	3.24	3.86	3.51	3.12	2.48
222	4.66	4.69	2.66	4.73	4.58	4.28	4.02	3.87	4.53	4.1	3.64	2.84
223	4.26	4.23	3.01	4.24	4.11	3.67	3.33	3.1	4.04	3.55	3	2.12
224	3.18	3.41	2.49	3.51	3.45	3.08	2.8	2.63	3.39	3.01	2.57	1.88
225	3.91	4.04	2.2	4.09	4.01	3.71	3.43	3.28	3.96	3.58	3.15	2.43
226	4.69	4.78	2.68	4.77	4.65	4.32	4.02	3.84	4.6	4.15	3.64	2.77
227	4.34	4.19	2.96	4.19	4.07	3.65	3.31	3.07	4.01	3.54	2.97	2.03
228	3.18	3.1	2.48	3.17	3.11	2.71	2.41	2.18	3.04	2.68	2.23	1.54
229	3.86	4.11	2.02	4.27	4.22	3.92	3.69	3.53	4.14	3.81	3.43	2.76
230	4.89	4.86	2.92	4.93	4.82	4.52	4.25	4.09	4.75	4.33	3.85	3
231	4.18	4.16	3.2	4.19	4.1	3.74	3.43	3.26	4.05	3.6	3.09	2.26
232	3.47	3.61	2.64	3.73	3.66	3.29	3.02	2.87	3.62	3.22	2.79	2.09
233	3.6	3.78	2.43	3.88	3.79	3.53	3.31	3.19	3.76	3.42	3.03	2.39
234	4.78	4.79	2.65	4.80	4.65	4.33	4.03	3.85	4.6	4.16	3.63	2.76
235	4.32	4.97	3.04	4.33	4.23	3.77	2.75	xxx	4.13	3.64	3.08	2.12
236	3.17	3.97	2.58	3.47	3.42	3.05	3.43	2.6	3.37	2.98	2.55	1.81
237	3.71	3.97	2.24	4.06	3.98	3.68	3.99	3.31	3.93	3.56	3.14	2.42
238	4.72	4.75	2.73	4.76	4.61	4.28	3.54	3.82	4.56	4.1	3.58	2.69
239	4.36	4.39	3.02	4.36	4.23	3.86	2.88	3.34	4.2	3.71	3.15	2.21
240	3.27	3.49	2.68	3.54	3.49	3.14	3.35	2.71	3.45	3.07	2.62	1.88
241	3.74	3.87	2.31	3.97	3.89	3.58	3.88	3.21	3.82	3.47	3.06	2.38
242	4.62	4.6	2.72	4.64	4.48	4.16	3.68	3.71	4.42	3.99	3.49	2.65
243	4.77	4.51	2.99	4.49	4.36	4	2.97	3.48	4.31	3.83	3.29	2.37
244	3.64	3.6	2.87	3.65	3.61	3.26	3.35	2.81	3.57	3.16	2.72	1.97
245	3.7	3.86	2.46	3.94	3.91	3.6	4.1	3.23	3.81	3.46	3.09	2.41
246	4.82	4.85	2.79	4.84	4.73	4.38	3.66	3.93	4.63	4.18	3.69	2.84
247	4.52	4.55	3.21	4.50	4.41	4	3.05	3.45	4.34	3.82	3.23	2.28
248	3.5	3.68	2.86	3.73	3.71	3.34	3.39	2.88	3.64	3.22	2.75	1.97

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
249	3.9	3.89	2.52	3.97	3.91	3.64	3.89	3.27	3.84	3.47	3.07	2.37
250	4.75	4.59	2.76	4.60	4.48	4.19	3.75	3.74	4.4	3.97	3.48	2.63
251	4.53	4.53	3.05	4.52	4.44	4.08	3.12	3.53	4.34	3.87	3.34	2.4
252	3.56	3.69	2.93	3.76	3.74	3.41	3.46	2.93	3.65	3.25	2.82	2.02
253	3.77	3.93	2.55	4.05	3.98	3.7	3.9	3.33	3.9	3.56	3.16	2.48
254	4.46	4.5	2.82	4.58	4.46	4.17	3.74	3.74	4.39	3.99	3.51	2.72
255	4.45	4.39	3.08	4.43	4.37	4.05	3.29	3.56	4.3	3.86	3.36	2.52
256	3.79	3.84	2.97	3.95	3.91	3.58	3.2	3.13	3.84	3.44	3	2.25
257	3.54	3.66	2.69	3.80	3.74	3.44	3.73	3.07	3.68	3.33	2.96	2.31
258	4.24	4.29	2.65	4.35	4.28	3.99	3.63	3.58	4.2	3.81	3.38	2.62
259	4.35	4.33	2.97	4.38	4.31	3.94	3.16	3.44	4.22	3.76	3.25	2.38
260	3.63	3.74	2.83	3.83	3.79	3.43	3.17	3	3.74	3.32	2.88	2.13
261	3.48	3.39	2.57	3.67	3.61	3.38	3.58	3.05	3.6	3.25	2.88	2.23
262	4.04	xxx	2.57	4.15	4.1	3.83	3.58	3.45	4.04	3.65	3.22	2.49
263	4.08	xxx	2.83	4.27	4.2	3.86	3.24	3.42	4.12	3.69	3.22	2.39
264	3.56	3.78	2.81	3.88	3.81	3.48	3.05	3.08	3.73	3.5	2.94	2.18
265	3.22	3.47	2.61	3.54	3.49	3.25	3.32	2.95	3.45	3.13	2.76	2.15
266	3.66	3.81	2.46	3.84	3.79	3.54	3.47	3.21	3.75	3.4	3	2.32
267	3.89	4.04	2.63	4.11	4.04	3.73	3.34	3.31	3.97	3.57	3.13	2.35
268	3.6	3.88	2.75	3.98	3.9	3.6	3.12	3.2	3.84	3.44	3.01	2.27
269	3.36	3.6	2.65	3.69	3.62	3.36	3.11	3	3.56	3.21	2.81	2.17
270	3.41	3.59	2.49	3.68	3.61	3.35	3.43	2.97	3.57	3.21	2.81	2.15
271	3.84	3.96	2.49	4.05	3.98	3.69	3.41	3.28	3.91	3.53	3.12	2.42
272	3.73	3.92	2.74	4.06	3.98	3.68	3.02	3.26	3.91	3.51	3.09	2.38
273	3.34	3.42	2.7	3.55	3.5	3.25	2.89	2.9	3.46	3.11	2.75	2.1
274	3.12	3.28	2.43	3.35	3.32	3.09	3.27	2.79	3.29	2.96	2.65	2.05
275	3.68	3.81	2.35	3.87	3.83	3.52	3.41	3.13	3.77	3.37	2.99	2.41
276	3.83	3.92	2.66	4.06	4	3.68	3.05	3.25	3.94	3.52	3.09	2.46
277	xxx	3.43	2.72	3.57	3.52	3.28	2.71	2.93	3.49	3.14	2.78	2.18
278	2.83	3.07	2.44	3.18	3.15	2.91	3.35	2.6	3.11	2.8	2.48	1.96
279	3.56	3.72	2.23	3.85	3.78	3.55	3.75	3.23	3.74	3.43	3.12	2.55

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
280	4.07	4.14	2.75	4.29	4.2	3.97	3.01	3.66	4.16	3.79	3.42	2.75
281	3.32	3.55	2.97	3.59	3.54	3.26	2.81	2.91	3.56	3.18	2.84	2.24
282	2.92	3.18	2.5	3.22	3.22	2.98	3.29	2.73	3.2	2.86	2.56	2.03
283	3.58	3.79	2.3	3.92	3.87	3.87	3.88	3.09	3.81	3.47	3.12	2.52
284	xxx	4.39	2.78	4.52	4.47	4.16	3.05	3.68	4.39	4	3.6	2.89
285	xxx	3.67	3.11	3.76	3.71	3.35	xxx	2.81	3.67	3.28	2.88	2.17
286	3.14	3.05	2.52	3.00	xxx	xxx	xxx	xxx	xxx	xxx	xxx	1.88
287	xxx	3.82	xxx	3.84	xxx	xxx	3.93	1.96	xxx	xxx	xxx	2.62
288	4.52	4.54	2.68	4.63	4.56	4.23	3.36	3.7	4.48	4.09	3.68	2.89
289	3.86	4.01	3.07	4.08	4.02	3.67	2.86	3.15	3.94	3.54	3.12	2.38
290	3.13	3.38	2.64	3.50	3.47	3.14	3.5	2.66	3.39	3.05	2.72	2.12
291	3.74	3.94	2.37	4.08	4.08	3.75	4.35	3.3	3.96	3.61	3.23	2.53
292	5.15	5.15	2.74	5.16	5.09	4.69	3.52	4.11	4.97	4.49	3.96	3.02
293	4.72	xxx	3.25	4.49	4.4	3.93	3.21	3.21	4.31	3.79	3.21	2.22
294	4.07	xxx	2.63	4.05	3.99	3.57	3.61	2.93	3.91	3.46	2.96	2.1
295	4.35	xxx	2.48	4.48	4.4	3.98	4.14	3.34	4.3	3.83	3.31	2.43
296	5.35	5.27	2.79	5.22	5.09	4.59	3.68	3.82	4.97	4.4	3.77	2.72
297	5.16	4.94	3.1	4.92	4.77	4.18	3.13	3.29	4.66	4.05	3.37	2.21
298	4.08	4.09	2.77	4.13	4.06	3.55	3.9	2.79	3.96	3.47	2.91	1.95
299	4.93	4.79	2.45	4.85	4.75	4.29	4.43	3.6	4.63	4.14	3.57	2.62
300	6.1	5.74	3.04	5.70	5.51	4.92	3.89	4.08	5.39	4.75	4.04	2.88
301	5.75	5.29	3.35	5.22	xxx	4.43	3.42	3.51	4.94	4.28	3.54	2.33
302	4.76	4.49	2.98	4.53	xxx	3.89	3.97	3.08	4.33	3.79	3.15	2.11
303	5.47	4.9	2.68	4.91	xxx	4.37	4.35	3.68	4.73	4.19	3.57	2.51
304	6.34	5.51	3.06	5.45	5.31	4.79	3.87	4.02	5.19	4.58	3.9	2.74
305	xxx	5.13	3.33	5.08	4.94	4.37	3.61	3.51	4.81	4.2	3.51	2.34
306	xxx	4.72	2.98	4.70	4.59	4.07	4.08	3.28	4.46	3.91	3.26	2.15
307	xxx	5.34	2.76	5.27	5.12	4.57	4.49	3.73	4.97	4.4	3.71	2.56
308	6.67	6.04	3.21	5.91	5.69	5.04	3.89	4.1	5.53	4.86	4.09	2.81
309	6.15	5.52	3.5	5.43	5.21	4.49	3.64	3.47	5.05	4.36	3.56	2.24
310	5.58	5.02	3.04	4.98	4.82	4.17	3.82	3.25	4.67	4.07	3.36	2.16

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
311	6	5.21	2.89	5.13	4.98	4.37	3.93	3.44	4.82	4.19	3.45	2.19
312	6.36	5.44	3	5.34	5.17	4.51	4.05	3.53	5	4.34	3.56	2.32
313	6.29	5.56	3.08	5.52	5.34	4.62	3.84	3.64	5.16	4.48	3.68	2.33
314	5.97	5.2	3.18	5.19	5.04	4.37	3.91	3.45	4.84	4.21	3.47	2.15
315	5.66	5.16	3.01	5.16	5.01	4.4	4	3.55	4.82	4.25	3.57	2.38
316	5.86	5.35	3.1	5.32	5.13	4.51	3.95	3.64	4.97	4.35	3.64	2.43
317	5.66	5.29	3.15	5.28	5.1	4.46	3.92	3.57	4.94	4.33	3.6	2.39
318	5.53	5.18	3.13	5.20	5.04	4.41	3.74	3.53	4.87	4.28	3.57	2.37
319	5.24	4.92	3.1	4.93	4.78	4.21	3.79	3.36	4.61	4.04	3.37	2.19
320	5.31	5.02	2.95	5.03	4.88	4.28	3.82	3.41	4.71	4.13	3.44	2.25
321	5.29	5.05	2.99	5.06	4.91	4.31	3.78	3.45	4.74	4.13	3.43	2.22
322	5.19	4.97	3	5.01	4.86	4.26	3.67	3.42	4.69	4.1	3.41	2.21
323	5.01	4.79	2.97	4.82	4.68	4.12	3.38	3.33	4.51	3.94	3.26	2.09
324	4.41	4.37	2.88	4.44	4.32	3.8	3.74	3.08	4.17	3.66	3.04	1.98
325	4.55	4.62	2.74	4.68	4.59	4.13	3.86	3.49	4.42	3.93	3.34	2.33
326	4.85	4.85	2.98	4.87	4.74	4.27	3.67	3.57	4.57	4.04	3.42	2.37
327	4.7	4.63	3.05	4.64	4.52	4.05	3.17	3.39	4.37	3.84	3.24	2.22
328	4.03	4.05	2.88	4.08	4	3.54	3.62	2.91	3.87	3.37	2.84	1.93
329	4.03	4.23	2.61	4.35	4.29	3.93	4.06	3.41	4.17	3.73	3.26	2.45
330	4.93	4.83	2.87	4.89	4.79	4.4	3.17	3.83	4.65	4.17	3.62	2.67
331	3.99	3.98	3.12	3.98	3.88	3.48	2.96	2.95	3.74	3.29	2.76	1.91
332	3.49	3.6	2.43	3.67	3.6	3.24	3.32	2.77	3.49	3.1	2.62	1.85
333	3.82	3.94	2.34	4.03	3.94	3.6	3.68	3.14	3.82	3.4	2.93	2.09
334	4.4	4.51	2.57	4.50	4.4	4.01	3.18	3.45	4.27	3.78	3.24	2.28
335	3.93	4.06	2.78	4.02	3.92	3.53	2.8	2.96	3.8	3.33	2.77	1.83
336	3.13	3.44	2.42	3.51	3.43	3.09	3.18	2.62	3.33	2.95	2.47	1.65
337	3.45	3.74	2.21	3.84	3.75	3.44	3.67	3.01	3.65	3.26	2.79	1.99
338	4.21	4.43	2.47	4.51	4.38	4.02	3.3	3.45	4.27	3.77	3.2	2.25
339	4.12	4.22	2.74	4.25	4.13	3.71	2.63	3.03	4.02	3.49	2.86	1.82
340	2.97	3.3	2.49	3.37	3.31	2.95	3.19	2.43	3.22	2.82	2.31	1.46
341	3.46	3.72	2.11	3.78	3.76	3.45	3.56	3.06	3.66	3.29	2.87	2.12

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
342	4.1	4.21	2.57	4.23	4.17	3.84	3.39	3.39	4.05	3.61	3.14	2.29
343	4.03	4.16	2.74	4.17	4.09	3.72	2.7	3.17	3.97	3.51	2.96	2.07
344	3	3.3	2.66	3.36	3.32	2.99	3.47	2.53	3.22	2.84	2.36	1.65
345	3.46	3.87	2.23	4.02	3.99	3.7	xxx	3.33	3.88	3.56	3.16	2.51
346	4.4	4.52	2.82	4.65	4.56	4.23	xxx	3.79	4.43	4.03	3.56	2.74
347	3.91	3.99	3.1	4.06	3.98	3.64	xxx	3.15	3.87	3.46	2.98	2.17
348	3.26	3.51	2.68	3.58	3.55	3.24	xxx	2.84	3.44	3.09	2.67	1.99
349	xxx	3.7	2.47	3.73	3.72	3.4	xxx	3.05	3.6	3.25	2.84	2.18
350	xxx	xxx	2.56	4.48	4.43	4.05	xxx	3.57	4.29	3.84	3.35	2.5
351	4.26	4.51	3.11	4.09	4.02	3.62	xxx	3.09	3.89	3.43	2.92	2.04
352	3.49	4.2	2.32	3.75	3.7	3.34	xxx	2.87	3.58	3.18	2.7	1.91
353	3.78	3.79	2.2	4.13	4.05	3.71	xxx	3.22	3.93	3.51	3.04	2.25
354	4.48	4.02	2.36	4.55	xxx	4.03	xxx	3.46	4.32	3.5	3.3	2.44
355	4.32	4.53	2.57	4.34	xxx	3.77	xxx	2.8	4.1	xxx	3	2.04
356	3.46	3.71	2.23	3.76	xxx	3.3	xxx	xxx	3.59	xxx	2.65	1.78
357	3.96	3.78	2	4.23	xxx	3.81	xxx	3.38	xxx	xxx	3.2	2.4
358	5	3.97	2.33	4.88	xxx	4.35	xxx	3.81	xxx	xxx	3.57	2.62
359	4.56	3.69	2.6	4.52	xxx	3.9	xxx	3.23	4.27	xxx	3.16	2.15
360	3.8	3.47	2.31	4.01	xxx	3.47	xxx	2.9	3.8	xxx	2.84	1.97
361	3.9	3.5	2.08	4.12	xxx	3.63	xxx	3.12	3.93	xxx	3.01	2.17
362	4.57	3.48	2.29	4.65	xxx	4.12	xxx	3.52	4.42	xxx	3.39	2.42
363	4.12	3.67	2.52	4.27	xxx	3.7	xxx	3.07	4.03	xxx	2.95	1.93
364	3.9	3.8	2.27	4.05	xxx	3.5	xxx	2.92	3.83	xxx	2.82	1.87
365	4.07	3.89	2.17	4.18	xxx	3.66	xxx	3.14	3.96	xxx	2.96	2.05
366	4.57	3.66	2.34	4.56	xxx	3.97	xxx	3.36	4.31	xxx	3.2	2.18
367	4.51	3.44	2.47	4.46	xxx	3.81	xxx	3.13	4.19	xxx	3.02	1.94
368	3.72	3.25	2.37	3.92	xxx	3.38	xxx	2.83	3.71	xxx	2.72	1.8
369	3.93	3.17	2.16	3.99	xxx	3.44	xxx	2.85	3.75	xxx	2.68	1.67
370	4.26	3.07	2.06	4.28	xxx	3.68	xxx	3.03	4.03	xxx	2.88	1.81
371	4.28	3.1	2.21	4.38	xxx	3.81	xxx	3.18	4.16	xxx	3.04	2
372	4.03	3	2.29	4.13	xxx	3.6	xxx	3.01	3.92	xxx	2.86	1.86

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
373	4.06	3.14	2.2	4.20	xxx	3.72	xxx	3.21	3.98	xxx	3.01	2.1
374	4.04	3.41	2.28	4.21	xxx	3.7	3.02	3.17	3.97	xxx	2.98	2.06
375	4.03	3.66	2.28	4.26	xxx	3.77	3.25	3.28	4.04	xxx	3.09	2.21
376	4.21	3.67	2.28	4.24	xxx	3.74	3.47	3.24	4.02	xxx	3.05	2.15
377	3.83	3.43	2.28	3.97	xxx	3.51	3.17	3.07	3.74	xxx	2.86	2.06
378	3.94	3.24	2.14	4.13	xxx	3.65	2.93	3.17	3.9	xxx	2.97	2.14
379	4.05	3.2	2.22	4.16	xxx	3.66	3.26	3.15	3.94	xxx	2.94	2.04
380	4.15	3.37	2.21	4.24	xxx	3.73	3.49	3.21	4.01	xxx	3	2.08
381	3.86	3.65	2.23	3.98	xxx	3.51	2.93	3.02	3.76	xxx	2.8	1.93
382	3.46	4.22	2.15	3.74	xxx	3.3	2.43	2.85	3.53	xxx	2.65	1.86
383	3.72	4.45	2.03	3.93	xxx	3.5	3.26	3.06	3.74	xxx	2.83	2.02
384	4.14	4.06	2.22	4.21	xxx	3.75	3.65	3.25	4.01	xxx	3.03	2.12
385	3.78	3.48	2.32	3.92	xxx	3.46	3.26	2.97	3.72	xxx	2.76	1.89
386	3.3	3.2	2.16	3.64	xxx	3.2	2.69	2.75	3.45	xxx	2.57	1.77
387	3.68	3.3	2	3.94	xxx	3.52	3.33	3.1	3.76	xxx	2.86	2.03
388	3.95	3.74	2.3	4.20	xxx	3.77	3.8	3.31	4.01	xxx	3.04	2.16
389	3.52	3.94	2.4	3.77	xxx	3.26	3.23	2.73	3.58	xxx	2.54	1.73
390	2.87	3.92	2.09	3.18	xxx	2.72	2.94	2.26	3.03	xxx	2.13	1.46
391	3.37	4	1.82	3.76	xxx	3.46	3.25	3.16	3.62	xxx	2.9	2.25
392	3.96	4.34	2.44	4.27	xxx	3.9	3.9	3.52	4.08	xxx	3.21	2.41
393	3.65	4.03	2.61	3.96	xxx	3.55	3.26	3.1	3.78	xxx	2.85	2.04
394	2.83	3.85	2.39	3.29	xxx	2.93	2.88	2.56	3.16	xxx	2.38	1.73
395	3.39	3.67	2.07	3.89	xxx	3.53	3.35	3.21	3.75	xxx	3.02	2.35
396	4.18	3.52	2.6	4.41	xxx	4.03	3.93	3.66	4.23	xxx	3.37	2.56
397	3.62	3.38	2.81	3.87	xxx	3.49	3.48	3.07	3.72	xxx	2.86	2.11
398	3.18	3.27	2.41	3.55	xxx	3.19	3.05	2.8	3.42	xxx	2.64	1.96
399	3.41	3.1	2.26	3.87	xxx	3.49	3.62	3.12	3.71	xxx	2.94	2.23
400	4.52	2.75	2.5	4.67	xxx	4.21	3.91	3.73	4.47	xxx	3.48	2.6
401	4.07	2.59	2.88	4.12	xxx	3.61	3.96	3.04	3.95	xxx	2.87	1.94
402	3.35	2.65	2.4	3.60	xxx	3.15	3.54	2.7	3.46	xxx	2.57	1.79
403	3.84	3.11	2.19	4.08	xxx	3.62	3.9	3.17	3.9	xxx	2.98	2.15

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
404	4.74	3.46	2.53	4.91	xxx	4.3	4.45	3.68	4.65	xxx	3.48	2.45
405	4.51	3.53	2.89	4.60	xxx	3.9	3.72	3.19	4.35	xxx	3.08	1.94
406	3.78	3.32	2.54	3.94	xxx	3.39	3.69	2.82	3.77	xxx	2.72	1.76
407	4.47	3.25	2.29	4.47	xxx	3.94	3.61	3.4	4.26	xxx	3.2	2.21
408	5.24	3.39	2.69	4.98	xxx	4.32	4.08	3.63	4.68	xxx	3.45	2.32
409	5.21	3.71	2.89	5.09	xxx	4.41	3.59	3.66	4.82	xxx	3.51	2.34
410	4.9	3.84	2.84	4.53	xxx	3.92	3.37	3.28	4.3	xxx	3.14	2.1
411	5	3.73	2.61	4.76	xxx	4.23	3.68	3.69	4.53	xxx	3.49	2.55
412	6.18	3.4	2.87	5.62	xxx	4.89	3.69	4.16	5.28	xxx	3.97	2.81
413	5.59	3.31	3.2	5.02	xxx	4.2	3.79	3.4	4.68	xxx	3.33	2.12
414	5.3	4.89	2.67	4.90	xxx	4.14	3.64	3.37	4.61	xxx	3.33	2.16
415	5.62	4.9	2.64	4.90	xxx	4.08	3.76	3.25	4.58	xxx	3.22	1.95
416	6.32	5.69	2.57	5.64	xxx	4.65	3.73	3.65	5.25	xxx	3.67	2.25
417	6.23	5.4	2.9	5.23	xxx	4.22	3.93	3.12	4.87	xxx	3.24	1.74
418	5.55	4.86	2.53	4.74	xxx	3.91	3.84	2.96	4.46	xxx	3.06	1.7
419	6.08	5.24	2.38	5.13	xxx	4.22	3.86	3.27	4.78	xxx	3.29	1.87
420	6.16	5.32	2.63	5.22	xxx	4.25	3.76	3.27	4.85	xxx	3.31	1.87
421	6.13	5.38	2.64	5.26	xxx	4.36	3.91	3.38	4.94	xxx	3.38	1.94
422	5.79	5.11	2.68	4.99	xxx	4.18	3.98	3.26	4.7	xxx	3.22	1.84
423	5.96	5.26	2.58	5.13	xxx	4.31	3.6	xxx	4.8	xxx	3.34	1.99
424	5.89	5.18	2.71	5.09	xxx	4.24	3.38	xxx	4.74	xxx	3.28	1.93
425	5.95	5.28	2.66	5.21	xxx	4.41	3.68	xxx	4.9	xxx	3.46	2.15
426	5.87	5.16	2.79	5.07	xxx	4.32	3.95	xxx	4.78	xxx	3.36	2.07
427	5.81	5.14	2.73	5.09	xxx	4.33	3.48	xxx	4.78	xxx	3.4	2.17
428	5.4	4.92	2.75	4.95	xxx	4.22	3.08	xxx	4.65	xxx	3.3	2.11
429	5.49	5.01	2.67	5.03	xxx	4.36	3.49	xxx	4.74	xxx	3.44	2.27
430	5.79	5.2	2.81	5.17	xxx	4.45	3.77	xxx	4.86	xxx	3.5	2.28
431	5.29	4.79	2.85	4.77	xxx	4.07	3.36	xxx	4.48	xxx	3.17	2.01
432	4.72	4.37	2.61	4.40	xxx	3.8	2.9	xxx	4.16	xxx	2.99	1.92
433	4.8	4.6	2.47	4.63	xxx	4.06	3.32	xxx	4.4	xxx	3.25	2.21
434	5.33	5.07	2.7	5.04	xxx	4.37	3.68	xxx	4.76	xxx	3.5	2.39

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
435	4.95	4.66	2.85	4.62	xxx	3.93	3.22	xxx	4.33	xxx	3.05	1.89
436	4.1	3.96	2.53	4.00	xxx	3.45	2.79	xxx	3.8	xxx	2.7	1.69
437	4.21	4.23	2.28	4.30	xxx	3.81	2.95	xxx	4.11	xxx	3.06	2.13
438	4.77	4.69	2.59	4.72	xxx	4.15	3.65	xxx	4.49	xxx	3.29	2.24
439	4.32	4.28	2.76	4.29	xxx	3.74	3.17	xxx	4.09	xxx	2.94	1.9
440	3.47	3.58	2.45	3.63	xxx	3.2	2.31	xxx	3.5	xxx	2.55	1.68
441	3.69	3.87	2.18	3.96	xxx	3.56	2.94	xxx	3.8	xxx	2.94	2.16
442	4.38	4.42	2.51	4.46	xxx	3.99	3.29	xxx	4.26	xxx	3.23	2.34
443	3.87	3.97	2.69	4.01	xxx	3.54	3.33	xxx	3.85	xxx	2.84	1.94
444	3.16	3.38	2.37	3.46	xxx	3.05	2.5	xxx	3.34	xxx	2.48	1.72
445	3.3	3.48	2.13	3.56	xxx	3.18	2.87	xxx	3.42	xxx	2.62	1.91
446	4.32	4.41	2.26	4.45	xxx	3.94	3.56	xxx	4.26	xxx	3.24	2.34
447	4.29	4.15	2.66	4.14	xxx	3.54	3.24	xxx	3.95	xxx	2.79	1.75
448	2.97	2.5	2.29	3.06	xxx	2.62	2.8	xxx	2.94	xxx	2.09	1.31
449	3.08	2.82	1.82	3.44	xxx	3.14	2.86	xxx	3.33	xxx	2.69	2.13
450	3.76	3.81	2.28	3.85	xxx	3.52	3.48	xxx	3.72	xxx	2.9	2.2
451	3.86	3.94	2.43	3.99	xxx	3.6	3.28	xxx	3.86	xxx	2.99	2.23
452	2.86	2.97	2.52	3.04	xxx	2.72	2.8	xxx	2.96	xxx	2.29	1.71
453	3.01	3.19	2.02	3.29	xxx	3.05	3.12	xxx	3.22	xxx	2.68	2.2
454	3.71	3.95	2.38	4.05	xxx	3.77	3.48	xxx	3.94	xxx	3.23	2.6
455	3.62	3.8	2.74	3.86	xxx	3.5	3.51	xxx	3.77	xxx	2.93	2.22
456	2.95	3.25	2.52	3.36	xxx	3.02	3.09	xxx	3.29	xxx	2.57	1.97
457	2.84	3.19	2.27	3.31	xxx	3.03	3.25	xxx	3.24	xxx	2.65	2.14
458	3.67	3.94	2.33	3.99	xxx	3.68	3.71	xxx	3.9	xxx	3.17	2.51
459	3.74	3.93	2.69	3.96	xxx	3.56	3.45	xxx	3.86	xxx	2.96	2.15
460	3.12	3.4	2.54	3.47	xxx	3.08	3.22	xxx	3.38	xxx	2.58	1.9
461	3.19	3.55	2.3	3.65	xxx	3.35	3.11	xxx	3.6	xxx	2.89	2.29
462	4.02	4.05	2.49	4.08	xxx	3.73	3.61	xxx	3.99	xxx	3.16	2.45
463	4.24	4.22	2.7	4.28	xxx	3.81	xxx	xxx	4.13	xxx	3.19	2.38
464	3.64	3.67	2.74	3.79	xxx	3.37	xxx	xxx	3.67	xxx	2.84	2.14
465	3.49	3.63	2.49	3.80	xxx	3.47	xxx	xxx	3.7	xxx	3	2.39

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
466	4.23	4.23	2.56	4.36	xxx	3.96	xxx	xxx	4.21	xxx	3.38	2.63
467	4.22	4.16	2.81	4.24	xxx	3.75	xxx	xxx	4.08	xxx	3.16	2.33
468	3.9	3.89	2.68	3.95	xxx	3.5	xxx	xxx	3.8	xxx	2.99	2.25
469	3.68	3.64	2.6	3.72	xxx	3.35	xxx	xxx	3.58	xxx	2.85	2.16
470	4.27	4.29	2.43	4.36	xxx	3.89	xxx	xxx	4.19	xxx	3.28	2.45
471	4.15	xxx	2.7	4.05	xxx	3.53	xxx	xxx	3.88	xxx	2.87	1.94
472	3.97	4.04	2.4	3.94	xxx	3.49	3.18	xxx	3.81	xxx	2.88	2.01
473	3.8	3.93	2.43	3.86	xxx	3.38	3.07	xxx	3.69	xxx	2.73	1.8
474	4.25	3.81	2.28	4.25	xxx	3.7	3.34	xxx	4.04	xxx	2.99	1.98
475	4.13	4.21	2.45	3.98	xxx	3.44	3.07	xxx	3.79	xxx	2.7	xxx
476	4.02	4	2.2	3.91	xxx	3.42	3.07	xxx	3.75	xxx	2.71	xxx
477	4.09	3.93	2.23	4.01	xxx	3.45	3.08	xxx	3.8	xxx	2.7	xxx
478	4.21	3.98	2.18	4.11	xxx	3.51	3.13	xxx	3.88	xxx	2.76	xxx
479	4.43	4.07	2.22	4.20	xxx	3.59	3.21	xxx	3.99	xxx	2.81	xxx
480	4.19	4.21	2.28	3.98	xxx	3.45	3.09	xxx	3.81	xxx	2.69	xxx
481	4.35	4	2.2	4.10	xxx	3.58	3.23	xxx	3.9	xxx	2.79	xxx
482	4.07	4.13	2.33	3.90	3.78	3.39	3.05	xxx	3.7	3.23	2.63	xxx
483	4.4	3.88	2.21	4.32	4.17	3.8	3.47	xxx	4.13	3.64	3.02	xxx
484	4.2	4.27	2.53	4.17	4.04	3.69	3.36	xxx	4	3.52	2.9	xxx
485	4.32	4.13	2.45	4.21	4.1	3.77	3.44	xxx	4.04	3.58	3	xxx
486	3.93	4.19	2.56	3.94	3.84	3.5	3.18	xxx	3.76	3.32	2.78	xxx
487	4.13	3.89	2.4	4.23	4.14	3.84	3.54	xxx	4.08	3.66	3.15	xxx
488	4.56	4.16	2.71	4.48	4.37	4.05	3.72	xxx	4.32	3.85	3.28	xxx
489	4.34	4.43	xxx	4.24	4.13	3.79	3.45	xxx	4.06	3.59	3.03	xxx
490	3.7	4.19	xxx	3.81	3.73	3.4	3.1	xxx	3.66	3.24	2.75	xxx
491	3.87	3.75	xxx	4.05	3.96	3.66	3.4	xxx	3.9	3.5	3.04	xxx
492	4.47	3.96	xxx	4.54	4.43	4.1	3.82	xxx	4.37	3.92	3.39	xxx
493	4.31	4.49	xxx	4.33	4.24	3.85	3.53	xxx	4.17	3.69	3.12	xxx
494	3.21	4.23	xxx	3.08	3.04	2.7	2.44	xxx	2.98	2.63	2.22	xxx
495	3.12	2.96	xxx	3.31	3.29	3.12	2.98	xxx	3.26	3.04	2.8	xxx
496	4.42	3.23	xxx	4.42	4.33	4.12	3.92	xxx	4.29	3.93	3.53	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
497	4.02	4.38	xxx	3.95	3.85	3.5	3.21	xxx	3.79	3.36	2.87	xxx
498	2.9	3.92	xxx	3.29	3.23	2.94	2.72	xxx	3.19	2.86	2.48	xxx
499	3.4	3.17	xxx	3.81	3.73	3.48	3.29	xxx	3.7	3.38	3	xxx
500	4.28	3.62	xxx	4.31	4.2	3.93	3.68	xxx	4.15	3.77	3.31	xxx
501	3.6	4.2	xxx	3.73	3.65	3.41	3.15	xxx	3.61	3.26	2.83	xxx
502	3.07	3.67	xxx	3.29	3.25	3.03	2.8	xxx	3.22	2.92	2.55	xxx
503	3.75	3.2	xxx	3.85	3.82	3.58	3.36	xxx	3.79	3.46	3.08	xxx
504	4.29	3.78	xxx	4.29	4.25	3.98	3.75	xxx	4.2	3.82	3.38	xxx
505	3.83	4.27	xxx	3.96	3.87	3.63	3.42	xxx	3.84	3.51	3.1	xxx
506	3.08	3.92	xxx	3.45	3.38	3.15	2.94	xxx	3.36	3.07	2.72	xxx
507	3.49	3.34	xxx	3.78	3.73	3.47	3.25	xxx	3.69	3.38	3.01	xxx
508	4.24	3.67	xxx	4.38	4.3	4.02	3.6	xxx	4.26	3.89	3.44	xxx
509	3.95	xxx	xxx	4.02	3.95	3.64	3.19	xxx	3.88	3.51	3.07	xxx
510	3.17	xxx	xxx	3.52	3.48	3.2	2.96	xxx	3.41	3.1	2.74	xxx
511	3.58	xxx	2.79	3.93	3.84	3.58	3.35	xxx	3.79	3.45	3.08	xxx
512	4.45	xxx	3.02	4.55	4.42	4.13	3.87	xxx	4.38	3.96	3.5	xxx
513	4.26	4.45	2.97	4.33	4.23	3.91	3.62	xxx	4.19	3.76	3.28	xxx
514	3.68	4.31	2.81	3.91	3.83	3.52	3.24	xxx	3.77	3.39	2.97	xxx
515	4.07	3.83	2.6	4.25	4.12	3.82	4.04	xxx	4.06	3.67	3.22	xxx
516	4.82	4.11	2.82	4.84	4.67	4.33	3.66	xxx	4.6	4.16	3.63	xxx
517	4.64	4.75	3.11	4.49	4.39	4	3.54	xxx	4.3	3.83	3.25	xxx
518	4.44	4.47	2.82	4.33	4.24	3.88	3.65	xxx	4.17	3.71	3.17	xxx
519	4.47	4.3	2.77	4.42	4.33	3.96	4.04	xxx	4.27	3.79	3.24	xxx
520	5.28	4.4	2.82	5.02	4.87	4.4	3.68	xxx	4.79	4.23	3.59	xxx
521	5.18	5.06	3.08	4.77	4.6	4.09	3.66	xxx	4.51	3.94	3.24	xxx
522	4.95	4.82	2.78	4.68	4.54	4.06	3.44	xxx	4.45	3.92	3.25	xxx
523	5.25	4.68	2.77	4.51	4.36	3.86	3.65	xxx	4.24	3.69	3	xxx
524	5.7	4.64	2.64	4.85	4.67	4.09	3.88	xxx	4.56	3.95	3.21	xxx
525	5.71	5.03	2.79	5.14	4.94	4.31	3.42	xxx	4.84	4.19	3.41	xxx
526	5.2	5.17	2.81	4.50	4.34	3.81	3.84	xxx	4.23	3.67	2.99	xxx
527	5.3	4.51	2.54	4.86	4.69	4.22	4.17	xxx	4.6	4.05	3.38	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
528	5.85	4.83	2.86	5.39	5.16	4.6	3.84	xxx	5.07	4.44	3.67	xxx
529	5.77	5.38	3.05	5.11	4.91	4.31	3.99	xxx	4.8	4.17	3.39	xxx
530	5.98	5.13	2.81	5.29	5.09	4.47	3.65	xxx	4.98	4.33	3.53	xxx
531	6.08	5.33	2.93	5.07	4.84	4.17	3.58	xxx	4.7	4.05	3.22	xxx
532	5.86	5.14	2.65	4.99	4.73	4.09	4.22	xxx	4.6	3.98	3.17	xxx
533	6.58	5.01	2.6	5.62	5.39	4.75	3.96	xxx	5.29	4.59	3.73	xxx
534	6.34	5.7	3.06	5.21	5.03	4.46	3.89	xxx	4.93	4.27	3.47	xxx
535	5.79	5.34	2.91	5.06	4.87	4.33	3.69	xxx	4.76	4.17	3.43	xxx
536	5.15	5.1	2.86	4.79	4.62	4.12	4.13	xxx	4.51	3.96	3.25	xxx
537	5.41	4.71	2.7	5.13	4.95	4.53	4.33	xxx	4.88	4.35	3.68	xxx
538	6.14	5.05	3.08	5.48	5.26	4.77	3.96	xxx	5.17	4.57	3.84	xxx
539	5.83	5.51	3.2	5.13	4.94	4.42	3.59	xxx	4.83	4.24	3.51	xxx
540	4.95	5.19	2.97	4.57	4.44	3.99	3.8	xxx	4.36	3.85	3.2	xxx
541	4.72	4.53	2.74	4.63	4.49	4.12	4.22	xxx	4.44	3.97	3.41	xxx
542	5.58	4.56	2.91	5.23	5.04	4.59	3.76	3.98	4.96	4.41	3.76	xxx
543	5.41	5.24	3.15	4.87	4.71	4.18	3.28	3.47	4.6	4.03	3.32	xxx
544	4.26	4.9	2.83	4.17	4.06	3.63	3.65	3.06	3.99	3.52	2.93	xxx
545	4.43	4.12	2.54	4.43	4.31	3.96	4.03	3.47	4.26	3.82	3.29	xxx
546	5.13	4.37	2.83	4.93	4.79	4.39	3.67	3.8	4.71	4.21	3.59	xxx
547	4.87	4.91	3.05	4.63	4.5	4.06	3.06	3.42	4.4	3.89	3.24	xxx
548	3.77	4.62	2.78	3.86	3.76	3.38	3.4	2.86	3.68	3.26	2.73	xxx
549	3.75	3.73	2.42	3.99	3.9	3.63	3.92	3.25	3.85	3.5	3.07	xxx
550	4.7	3.86	2.68	4.65	4.52	4.21	3.52	3.74	4.45	4.03	3.5	xxx
551	4.42	4.6	2.96	4.36	4.25	3.86	2.86	3.32	4.16	3.7	3.12	xxx
552	3.33	4.32	2.68	3.53	3.47	3.14	3.15	2.69	3.41	3.03	2.57	xxx
553	3.32	3.43	2.31	3.65	3.6	3.36	3.69	3.02	3.57	3.24	2.86	xxx
554	4.18	3.53	2.51	4.32	4.22	3.94	3.18	xxx	4.83	3.78	3.31	xxx
555	3.72	4.31	2.81	3.83	3.75	3.47	2.78	xxx	3.69	3.28	2.8	xxx
556	2.99	3.85	2.41	3.30	3.26	3.02	2.89	2.64	3.2	2.87	2.47	xxx
557	2.95	3.2	2.19	3.34	3.3	3.09	3.35	2.79	3.25	2.95	2.59	xxx
558	3.66	3.25	2.27	3.89	3.83	3.58	3.13	3.24	3.77	3.4	2.97	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
559	3.54	3.85	2.53	3.70	3.64	3.39	2.69	3.01	3.58	3.19	2.74	xxx
560	2.88	3.68	2.34	3.19	3.15	2.92	2.79	2.58	3.09	2.77	2.38	xxx
561	2.87	3.13	2.1	3.24	3.21	2.98	3.23	2.68	3.15	2.85	2.5	xxx
562	3.35	3.14	2.18	3.73	3.67	3.44	2.98	3.11	3.62	3.28	2.87	xxx
563	3.38	3.64	2.42	3.51	3.45	3.22	2.62	2.82	3.38	3.01	2.56	xxx
564	2.83	3.48	2.19	3.10	3.05	2.84	2.75	2.48	2.99	2.65	2.28	xxx
565	2.77	3.02	2	3.17	3.11	2.92	3.01	2.65	3.06	2.76	2.44	xxx
566	3.37	3.06	2.11	3.53	3.43	3.21	3.33	2.88	3.37	3.03	2.64	xxx
567	3.84	3.52	2.27	3.94	3.86	3.59	2.55	3.17	3.8	3.4	2.93	xxx
568	2.75	3.93	2.53	3.10	3.04	2.8	2.78	2.41	3.01	2.66	2.28	xxx
569	2.64	3.01	2.04	3.14	3.09	2.95	3.27	2.71	3.08	2.84	2.6	xxx
570	3.39	3.03	2.22	3.68	3.63	3.45	3.49	3.18	3.59	3.31	3	xxx
571	3.97	3.59	2.52	4.01	3.99	3.75	3.12	3.32	3.93	3.55	3.13	xxx
572	xxx	3.95	2.7	3.61	3.59	3.37	2.8	2.96	3.55	3.19	2.81	xxx
573	xxx	3.5	2.45	3.18	3.18	2.98	3.14	2.71	3.15	2.87	2.59	xxx
574	3.34	3.06	2.24	3.52	3.51	3.32	3.65	3.05	3.46	3.19	2.87	xxx
575	4.22	3.48	2.48	4.24	4.19	3.92	3.08	3.5	4.12	3.75	3.28	xxx
576	3.49	4.17	2.87	3.63	3.59	3.32	3.15	2.94	3.55	3.2	2.8	xxx
577	3.15	3.35	2.52	3.49	3.49	3.32	3.73	3.06	3.47	3.2	2.91	xxx
578	3.89	3.19	2.52	4.17	4.12	3.94	3.48	3.61	4.08	3.78	3.39	xxx
579	4.01	4.08	2.85	4.09	4	3.74	3.52	3.31	3.96	3.59	3.14	xxx
580	3.91	4.04	2.75	4.10	4.03	3.77	3.44	3.36	3.98	3.6	3.18	xxx
581	3.78	4.05	2.79	4.01	3.92	3.68	3.54	3.29	3.86	3.49	3.1	xxx
582	3.93	3.95	2.68	4.14	4.06	3.8	3.57	3.38	3.99	3.61	3.18	xxx
583	4.16	4.05	2.72	4.20	4.15	3.86	3.61	3.4	4.07	3.67	3.2	xxx
584	4.22	4.16	2.78	4.23	4.18	3.89	3.63	3.44	4.1	3.69	3.23	xxx
585	4.24	4.22	2.81	4.30	4.18	3.9	3.56	3.45	4.11	3.71	3.23	xxx
586	4.17	4.24	2.8	4.23	4.12	3.84	3.66	3.37	4.04	3.65	3.17	xxx
587	4.34	4.15	2.75	4.31	4.24	3.94	3.75	3.47	4.15	3.75	3.26	xxx
588	4.57	4.24	2.83	4.42	4.33	4.03	3.74	3.56	4.25	3.83	3.33	xxx
589	4.49	4.39	2.9	4.43	4.31	4.02	3.61	3.55	4.23	3.82	3.32	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
590	4.24	4.38	2.88	4.31	4.2	3.91	2.97	3.43	4.11	3.71	3.22	xxx
591	4.33	4.21	2.79	4.37	4.27	3.99	3.64	3.16	4.18	3.78	3.3	xxx
592	4.78	4.28	xxx	4.66	4.56	4.27	3.96	3.77	4.48	4.05	3.53	xxx
593	4.82	4.64	xxx	4.64	4.53	4.19	3.86	3.63	4.44	3.98	3.42	xxx
594	4.18	4.62	2.53	4.19	4.12	3.8	3.49	3.28	4.02	3.61	3.11	xxx
595	4.23	4.11	3.31	4.25	4.17	3.9	3.61	3.44	4.1	3.71	3.25	xxx
596	4.88	4.16	3.3	4.74	4.62	4.33	4.02	3.83	4.55	4.11	3.59	xxx
597	4.94	4.69	3.41	4.69	4.57	4.21	3.87	3.64	4.47	3.99	3.4	xxx
598	4.07	4.65	3.43	4.07	3.98	3.65	3.34	3.13	3.9	3.48	2.96	xxx
599	4.11	3.95	3.56	4.23	4.15	3.91	3.64	3.48	4.11	3.73	3.28	xxx
600	4.98	4.1	3.61	4.83	4.75	4.46	4.14	3.96	4.69	4.23	3.7	xxx
601	4.85	4.86	3.33	4.61	4.54	4.19	3.84	3.62	4.45	3.97	3.4	xxx
602	3.77	4.68	2.91	3.83	3.78	3.49	3.19	2.99	3.71	3.32	2.86	xxx
603	4.02	3.75	2.74	4.22	4.16	3.93	3.66	3.5	4.11	3.75	3.34	xxx
604	4.96	4.08	2.63	4.73	4.62	4.36	4.07	3.9	4.55	4.14	3.67	xxx
605	4.59	4.67	2.65	4.35	4.27	3.99	3.68	3.49	4.18	3.77	3.27	xxx
606	3.69	4.34	2.88	3.87	3.83	3.57	3.3	3.12	3.76	3.4	2.96	xxx
607	3.52	3.8	3.09	3.81	3.76	3.53	3.32	3.17	3.71	3.38	3	xxx
608	4.66	3.73	3.17	4.43	4.35	4.1	3.85	3.68	4.29	3.9	3.43	xxx
609	4.2	4.46	3.22	3.98	3.9	3.65	3.36	3.18	3.83	3.42	2.95	xxx
610	3.26	3.96	3.45	3.41	3.38	3.19	2.94	2.78	3.32	2.99	2.61	xxx
611	3.55	3.31	3.39	3.72	3.69	3.51	3.28	3.13	3.64	3.32	2.93	xxx
612	4.82	3.62	3.35	4.62	4.52	4.23	3.93	3.74	4.45	4.01	3.48	xxx
613	4.43	4.65	3.36	4.17	4.09	3.77	3.45	3.24	4	3.55	3.01	xxx
614	3.16	4.27	3.56	3.40	3.37	3.16	2.9	2.73	3.32	2.97	2.55	xxx
615	3.75	3.37	3.74	3.90	3.84	3.64	3.37	3.2	3.8	3.45	3	xxx
616	4.35	3.85	3.86	4.35	4.29	4.04	3.75	3.57	4.21	3.82	3.31	xxx
617	4.14	4.35	3.77	4.18	4.12	3.86	3.56	3.37	4.03	3.62	3.11	xxx
618	3.08	4.18	3.93	3.35	3.31	3.11	2.85	2.69	3.25	2.92	2.53	xxx
619	3.32	3.25	4.08	3.71	3.65	3.5	3.3	3.18	3.6	3.32	2.99	xxx
620	4.47	3.56	4.14	4.60	4.51	4.28	4.02	3.86	4.44	4.05	3.58	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
621	4.26	4.52	3.96	4.24	4.18	3.92	3.61	3.44	4.11	3.68	3.19	xxx
622	3.24	4.29	3.8	3.45	3.43	3.24	3	2.86	3.37	3.04	2.67	xxx
623	xxx	3.44	3.62	4.03	3.95	3.75	3.51	3.36	3.9	3.56	3.15	xxx
624	xxx	3.81	3.51	4.57	4.46	4.22	3.93	3.76	4.4	4	3.5	xxx
625	xxx	4.41	3.62	4.32	4.26	4.02	3.74	3.56	4.18	3.8	3.32	xxx
626	xxx	4.25	3.72	4.20	4.13	3.88	3.6	3.42	4.03	3.67	3.21	xxx
627	4.25	4.09	3.45	4.31	4.18	3.92	3.63	3.45	4.09	3.72	3.26	xxx
628	4.59	4.16	3.03	4.64	4.5	4.22	3.93	3.74	4.43	4.01	3.51	xxx
629	4.67	4.51	2.91	4.55	4.47	4.14	3.82	3.6	4.38	3.92	3.37	xxx
630	4.66	4.5	2.99	4.47	4.39	4.08	3.75	3.54	4.29	3.85	3.31	xxx
631	4.68	4.42	3.16	4.60	4.53	4.2	3.87	3.67	4.44	4	3.45	xxx
632	4.66	4.56	2.93	4.60	4.53	4.19	3.86	3.66	4.44	4	3.45	xxx
633	4.85	4.57	2.66	4.82	4.69	4.37	4.04	3.83	4.62	4.18	3.6	xxx
634	5.27	4.72	2.64	4.88	4.74	4.4	4.05	3.82	4.66	4.2	3.6	xxx
635	5.23	4.83	2.93	4.89	4.75	4.4	4.04	3.82	4.66	4.17	3.61	xxx
636	5.02	4.81	3.1	4.84	4.7	4.36	4.01	3.8	4.61	4.13	3.58	xxx
637	5.14	4.8	3.1	4.87	4.74	4.4	4.05	3.83	4.66	4.19	3.6	xxx
638	5.59	4.85	2.79	5.19	5.03	4.64	4.28	4.03	4.95	4.44	3.8	xxx
639	5.64	5.17	2.88	5.10	4.93	4.5	4.1	3.83	4.82	4.29	3.62	xxx
640	5.06	5.16	3.06	4.66	4.55	4.17	3.78	3.55	4.44	3.96	3.35	xxx
641	5.38	4.65	3.31	4.99	4.86	4.41	4.15	3.93	4.78	4.31	3.73	xxx
642	6.03	4.91	3.64	5.49	5.3	4.8	4.51	4.25	5.23	4.69	4.04	xxx
643	6.04	5.52	3.78	5.39	5.19	4.76	4.33	4.03	5.11	4.55	3.84	xxx
644	5.19	5.41	3.78	4.74	4.6	4.23	3.84	3.57	4.5	4.04	3.41	xxx
645	5.16	4.64	3.78	4.87	4.76	4.27	4.08	3.87	4.68	4.25	3.69	xxx
646	6.26	4.76	3.81	5.56	5.38	4.81	4.57	4.33	5.3	4.76	4.11	xxx
647	5.77	5.58	3.87	5.12	4.98	4.52	4.11	3.84	4.84	4.3	3.65	xxx
648	4.84	5.16	3.88	4.51	4.39	4.05	3.69	3.46	4.3	3.85	3.3	xxx
649	5.04	4.45	3.73	4.77	4.65	4.33	4	3.78	4.57	4.13	3.6	xxx
650	6.03	4.68	3.46	5.50	5.31	4.91	4.53	4.26	5.22	4.69	4.04	xxx
651	5.66	5.49	2.97	5.02	4.84	4.41	3.99	3.73	4.72	4.18	3.5	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
652	4.43	5.08	3.03	4.30	4.2	3.86	3.5	3.29	4.09	3.66	3.1	xxx
653	4.63	4.23	2.72	4.58	4.48	4.19	3.87	3.66	4.4	4	3.46	xxx
654	5.43	4.49	3.01	5.12	4.98	4.63	4.27	4.03	4.89	4.41	3.79	xxx
655	xxx	5.13	3.25	5.01	4.85	4.44	4.04	3.76	4.75	4.22	3.56	xxx
656	xxx	5.03	3.07	3.97	3.88	3.55	3.2	2.96	3.82	3.39	2.87	xxx
657	4.08	3.88	2.58	4.08	4.02	3.83	3.56	3.42	3.99	3.66	3.27	xxx
658	5.31	3.96	2.86	5.11	4.97	4.69	4.38	4.2	4.9	4.47	3.93	xxx
659	4.86	5.08	3.33	4.50	4.38	4.02	3.66	3.42	4.27	3.79	3.2	xxx
660	3.76	4.51	2.78	3.81	3.75	3.48	3.18	2.99	3.66	3.29	2.83	xxx
661	3.71	3.72	2.51	3.90	3.83	3.59	3.35	3.2	3.75	3.42	3	xxx
662	4.6	3.79	2.64	4.56	4.46	4.16	3.86	3.67	4.36	3.94	3.42	xxx
663	4.51	4.51	2.91	4.33	4.23	3.9	3.55	3.3	4.12	3.65	3.08	xxx
664	3.33	4.32	2.66	3.48	3.43	3.15	2.89	2.69	3.35	2.96	2.53	xxx
665	3.55	3.42	2.29	3.78	3.75	3.52	3.31	3.17	3.69	3.36	2.97	xxx
666	4.32	3.71	2.62	4.33	4.25	4	3.72	3.55	4.18	3.8	3.3	xxx
667	3.9	4.29	2.85	4.17	4.07	3.83	3.55	3.39	4.01	3.62	3.14	xxx
668	3.12	4.09	2.69	3.38	3.33	3.14	2.9	2.76	3.28	2.96	2.58	xxx
669	2.86	3.26	2.29	3.16	3.15	2.98	2.77	2.65	3.1	2.84	2.52	xxx
670	3.6	3.03	2.22	3.84	3.81	3.62	3.4	3.27	3.76	3.45	3.06	xxx
671	3.55	3.82	2.62	3.61	3.6	3.38	3.15	3.01	3.52	3.18	2.77	xxx
672	xxx	3.65	2.42	3.10	3.1	2.9	2.69	2.55	3.02	2.73	2.39	xxx
673	xxx	3	2.13	3.28	3.26	3.1	2.92	2.81	3.21	2.94	2.64	xxx
674	xxx	3.15	2.31	3.55	3.54	3.38	3.18	3.08	3.48	3.2	2.86	xxx
675	xxx	3.46	2.47	3.76	3.72	3.58	3.35	3.21	3.69	3.37	2.97	xxx
676	xxx	3.72	2.58	3.27	3.23	3.09	2.86	2.72	3.21	2.91	2.55	xxx
677	2.83	3.2	2.26	3.25	3.23	3.08	2.89	2.79	3.18	2.94	2.67	xxx
678	xxx	3.1	2.32	3.53	3.49	3.35	3.16	3.06	3.45	3.2	2.9	xxx
679	xxx	3.4	2.5	3.46	3.41	3.23	3.01	2.91	3.37	3.07	2.76	xxx
680	xxx	3.41	2.44	3.40	3.37	3.19	2.98	2.88	3.33	3.04	2.75	xxx
681	xxx	3.34	2.43	3.11	3.06	2.9	2.72	2.6	3.03	2.8	2.49	xxx
682	2.94	2.98	2.18	3.29	3.25	3.09	2.92	2.82	3.21	2.96	2.63	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
683	3.52	3.16	2.28	3.81	3.78	3.59	3.35	3.21	3.72	3.4	3	xxx
684	3.34	3.71	2.63	3.66	3.62	3.42	3.18	3.05	3.56	3.24	2.86	xxx
685	3	3.55	2.53	3.36	3.33	3.14	2.92	2.8	3.28	2.98	2.67	xxx
686	2.91	3.26	2.36	3.30	3.28	3.1	2.89	2.76	3.23	2.94	2.63	xxx
687	3.74	3.2	2.32	3.94	3.91	3.71	3.46	3.29	3.87	3.52	3.13	xxx
688	xxx	3.86	2.73	3.95	3.92	3.7	3.45	3.28	3.87	3.51	3.11	xxx
689	3.41	3.89	2.72	3.72	3.69	3.51	3.3	3.17	3.65	3.37	3.04	xxx
690	3.32	3.65	2.65	3.69	3.65	3.47	3.24	3.1	3.63	3.33	3	xxx
691	3.73	3.6	2.61	4.05	3.98	3.75	3.48	3.32	3.95	3.6	3.21	xxx
692	4.11	3.92	2.82	4.33	4.25	4.01	3.74	xxx	4.21	3.84	3.41	xxx
693	3.78	4.24	2.99	4.01	3.94	3.73	3.45	xxx	4.6	3.55	3.14	xxx
694	3.56	3.94	2.77	3.87	3.81	3.62	3.33	xxx	3.77	3.44	3.05	xxx
695	4.04	3.77	2.69	4.25	4.16	3.93	3.62	xxx	4.11	3.76	3.3	xxx
696	4.55	4.11	2.91	4.59	4.48	4.23	3.9	xxx	4.43	4.04	3.54	xxx
697	4.3	4.5	3.09	4.37	4.26	4	3.66	xxx	4.19	3.8	3.32	xxx
698	3.83	4.29	2.9	4.03	3.94	3.68	3.36	3.17	3.87	3.51	3.08	xxx
699	4.24	3.96	2.71	4.35	4.26	3.99	3.67	3.49	4.21	3.84	3.37	xxx
700	4.89	4.29	2.96	4.82	4.7	4.42	4.08	3.87	4.64	4.23	3.69	xxx
701	4.58	4.76	3.22	4.53	4.42	4.13	3.78	3.55	4.35	3.91	3.38	xxx
702	4.04	4.5	2.98	4.19	4.07	3.77	3.43	3.22	4.01	3.59	3.11	xxx
703	4.16	4.13	2.77	4.26	4.14	3.86	3.54	3.35	4.09	3.7	3.23	xxx
704	5.17	4.19	2.86	5.01	4.89	4.57	4.21	3.99	4.8	4.35	3.8	xxx
705	5.09	4.98	3.26	4.68	4.55	4.15	3.72	3.45	4.43	3.94	3.31	xxx
706	4.16	4.75	2.91	3.97	3.87	3.53	3.15	2.92	3.79	3.38	2.84	xxx
707	4.29	3.2	2.6	4.33	4.22	3.95	3.63		4.18	3.79	3.29	xxx
708	5.39	xxx	4.04	5.11	4.95	4.6	4.22	3.98	4.88	4.39	3.78	xxx
709	5.25	*4.11*	3.27	4.86	4.72	4.29	3.86	3.57	4.61	4.08	3.42	xxx
710	4.16	*3.66*	2.99	4.09	4	3.64	3.26	3.02	3.91	3.48	2.93	xxx
711	4.42	*3.05*	2.63	4.44	4.34	4.05	3.72	3.52	4.28	3.89	3.39	xxx
712	5.54	*3.24*	2.96	5.22	5.06	4.7	4.39	4.07	4.98	4.49	3.87	xxx
713	5.31	*3.62*	3.3	5.02	4.87	4.42	2.69	3.7	4.77	4.21	3.54	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
714	4.02	*3.63*	3.04	3.96	3.88	3.51	3.4	2.9	3.81	3.36	2.84	xxx
715	4.09	*3.28*	2.57	4.20	4.14	3.91	3.62	3.46	4.11	3.76	3.34	xxx
716	5.63	*2.66*	2.91	5.31	5.17	4.82	4.45	4.22	5.1	4.62	4.03	xxx
717	5.18	*3.09*	3.4	4.79	4.646	4.18	xxx	3.47	4.53	4.02	3.36	xxx
718	3.8	*3.68*	2.92	3.85	3.786	3.44	xxx	2.89	3.72	3.34	2.83	xxx
719	4.26	*3.44*	2.54	4.30	4.2	3.93	3.62	3.44	4.16	3.78	3.3	xxx
720	5.29	*2.81*	2.91	5.04	4.89	4.55	4.19	3.96	4.82	4.34	3.76	xxx
721	5.23	*3.49*	3.21	4.85	4.66	4.3	3.83	3.64	4.61	4.1	3.48	xxx
722	3.97	*3.58*	3.02	4.01	3.87	3.58	3.16	3.02	3.84	3.44	2.93	xxx
723	4.17	*3.52*	2.63	4.34	4.28	4.01	3.75	3.6	4.23	3.88	3.44	xxx
724	5.13	*3.46*	3.01	4.99	4.87	4.55	4.24	4.04	4.79	4.36	3.82	xxx
725	4.73	*3.4*	3.28	4.78	4.64	4.28	3.9	3.67	4.54	4.08	3.52	xxx
726	3.57	*4.11*	3.09	3.95	3.88	3.58	3.24	3.06	3.81	3.44	2.99	xxx
727	4.15	*3.84*	2.68	4.26	4.21	3.88	3.66	3.51	4.16	3.81	3.38	xxx
728	5.01	*3.44*	2.98	4.96	4.85	4.46	4.21	4.02	4.79	4.36	3.83	xxx
729	4.57	*3.6*	3.3	4.65	4.54	4.22	3.88	3.69	4.46	4.04	3.51	2.68
730	4.03	*4.05*	3.07	4.19	4.1	3.81	3.49	3.31	4.04	3.65	3.19	2.45
731	4.14	*4.2*	2.84	4.27	4.17	3.89	3.59	3.4	4.11	3.73	3.28	2.56
732	4.5	*4.09*	2.91	4.62	4.51	4.21	3.9	3.71	4.44	4.03	3.54	2.78
733	4.37	*3.89*	3.11	4.53	4.43	4.14	3.81	3.63	4.37	3.95	3.45	2.68
734	4.2	*4.27*	3.03	4.33	4.24	3.98	3.65	3.47	4.19	3.81	3.33	2.58
735	3.99	*4.55*	2.95	4.15	4.01	3.76	3.61	3.25	3.96	3.59	3.14	2.39
736	4.42	*4.31*	2.77	4.53	4.39	4.11	3.96	3.59	4.33	3.92	3.43	2.62
737	4.5	*3.96*	2.96	4.55	4.44	4.11	3.96	3.57	4.37	3.93	3.41	2.54
738	4.41	*4.71*	2.95	4.44	4.34	4.02	3.87	3.49	4.27	3.85	3.34	2.5
739	4.61	*4.92*	2.92	4.72	4.59	4.27	3.93	3.73	4.53	4.09	3.54	2.65
740	4.39	*4.74*	3.04	4.29	4.17	3.87	3.52	3.32	4.1	3.69	3.19	2.37
741	4.47	*4.62*	2.84	4.47	4.38	4.07	3.82	3.64	4.32	3.96	3.52	2.79
742	5.17	*4.64*	3.05	5.04	4.91	4.55	4.29	4.08	4.85	4.42	3.89	3.04
743	4.65	*5.57*	3.3	4.47	4.49	4.02	3.93	3.42	4.28	3.83	3.28	2.42
744	4.21	*5.2*	2.85	4.25	4.31	3.89	3.82	3.35	4.11	3.71	3.21	2.43

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
745	4.39	*4.59*	2.8	4.24	4.14	3.83	3.82	3.25	4.06	3.65	3.1	2.25
746	5.18	*4.9*	2.69	4.90	4.76	4.37	4.32	3.7	4.67	4.17	3.53	2.55
747	5.33	*5.72*	3.01	4.93	4.77	4.31	5.51	3.59	4.69	4.13	3.45	2.39
748	4.11	*5.43*	2.92	4.00	3.89	3.53	3.16	2.92	3.83	3.39	2.85	1.99
749	4.8	*4.56*	2.5	4.67	4.55	4.18	3.93	3.73	4.49	4.07	3.57	2.75
750	5.66	*4.84*	3.08	5.27	5.1	4.67	4.38	4.14	5.02	4.51	3.92	2.93
751	5.25	*5.58*	3.31	4.94	4.79	4.41	4.01	3.76	4.7	4.22	3.61	2.63
752	4.57	*5.66*	3.08	4.49	4.37	4.03	3.66	3.44	4.3	3.88	3.31	2.43
753	4.76	*4.06*	2.86	4.72	4.59	4.25	3.9	3.69	4.53	4.09	3.55	2.7
754	5.8	*4.47*	3.06	5.48	5.29	4.87	4.47	4.22	5.21	4.68	4.04	3.02
755	5.55	*5.83*	3.4	5.05	4.87	4.4	3.95	3.65	4.76	4.22	3.54	2.46
756	4.4	*5.44*	3.03	4.24	4.13	3.75	3.36	3.12	4.03	3.59	3.04	2.16
757	4.66	*4.66*	2.68	4.54	4.43	4.13	3.79	3.6	4.37	3.96	3.46	2.67
758	5.82	*4.7*	3.01	5.35	5.18	4.79	4.4	4.16	5.11	4.6	3.98	3
759	5.68	*5.36*	3.38	4.92	4.76	4.29	3.81	3.52	4.65	4.11	3.43	2.37
760	4.44	*5.54*	2.99	4.11	4.02	3.65	3.22	2.98	3.92	3.48	2.93	2.06
761	4.71	*4.2*	2.61	4.66	4.54	4.23	3.85	3.65	4.48	4.05	3.54	2.69
762	5.41	*4.36*	3.05	4.95	4.81	4.46	4.07	3.84	xxx	4.26	3.69	2.78
763	5.42	*4.92*	3.21	5.07	4.93	4.49	4.12	3.87	xxx	4.34	3.74	2.82
764	4.35	*4.73*	3.25	4.35	4.23	3.81	3.46	3.23	xxx	3.72	3.18	2.37
765	4.06	*4.71*	2.82	4.28	4.21	xxx	3.64	3.48	xxx	3.82	3.41	2.73
766	5.22	*4.5*	2.99	5.16	5.05	xxx	4.41	4.22	xxx	4.55	4.04	3.18
767	5.09	*5.15*	3.43	4.85	4.74	4.33	3.94	3.7	xxx	4.16	3.58	2.63
768	4.09	*4.91*	3.12	4.17	4.09	3.73	3.36	3.15	xxx	3.61	3.13	2.33
769	3.83	*4.55*	2.79	4.07	4	3.7	3.41	3.24	xxx	3.58	3.16	2.47
770	4.96	*4.01*	2.78	4.90	4.81	4.46	4.14	3.93	xxx	4.29	3.77	2.91
771	4.89	*3.82*	3.2	4.54	4.44	4.01	3.6	3.33	4.33	3.84	3.22	2.25
772	3.77	*4.84*	2.82	3.96	3.91	3.56	3.23	3.04	3.83	3.43	2.93	2.15
773	xxx	*4.16*	2.59	4.06	4.02	3.81	3.55	3.45	3.96	3.63	3.22	2.46
774	xxx	*4.12*	2.73	3.73	3.63	3.4	3.13	2.98	3.6	3.27	2.87	2.14
775	xxx	*3.72*	2.54	4.01	3.93	3.66	3.37	3.2	3.89	3.53	3.11	2.43

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
776	xxx	*3.96*	2.79	3.83	3.79	3.54	3.25	3.1	3.72	3.4	3	2.33
777	2.96	*3.74*	2.65	3.32	3.32	3.12	2.9	2.81	3.26	3.01	2.71	2.19
778	4.22	*3.23*	2.39	4.33	4.3	4.04	3.75	3.62	4.22	3.85	3.42	2.7
779	4.01	*4.29*	2.91	4.02	3.92	3.56	3.21	2.98	3.83	3.39	2.87	2
780	2.56	*3.96*	2.49	2.96	2.88	2.61	2.35	2.18	2.84	2.53	2.18	1.6
781	2.78	*2.83*	2	3.64	3.61	3.4	3.19	3.09	3.56	3.27	2.95	2.42
782	3.4	*3.53*	2.58	3.89	3.81	3.55	3.29	3.14	3.76	3.42	3.02	2.37
783	3.82	*3.84*	2.68	3.95	3.87	3.62	3.33	3.17	3.82	3.49	3.08	2.45
784	3	*3.87*	2.75	3.42	3.4	3.18	2.91	2.77	3.34	3.05	2.7	2.14
785	2.78	*3.27*	2.33	3.28	3.28	3.11	2.89	2.8	3.24	2.99	2.71	2.25
786	3.37	*3.14*	2.34	3.71	3.68	3.48	3.26	3.15	3.64	3.36	3.03	2.48
787	3.43	*3.61*	2.66	3.76	3.73	3.53	3.32	3.21	3.69	3.42	3.1	2.55
788	3.26	*3.7*	2.72	3.66	3.62	3.43	3.2	3.09	3.59	3.32	3	2.44
789	2.75	*3.64*	2.6	3.26	3.21	3.02	2.82	2.72	3.2	2.96	2.68	2.2
790	2.95	*3.18*	2.29	3.39	3.37	3.21	3.03	2.92	3.35	3.12	2.84	2.37
791	3.28	*3.27*	2.43	3.60	3.63	3.44	3.22	3.09	3.57	3.31	2.99	2.43
792	3.05	*3.53*	2.58	3.46	3.48	3.27	3.04	2.92	3.4	3.17	2.85	2.33
793	2.6	*3.36*	2.48	3.07	3	2.84	2.66	2.55	2.95	2.78	2.51	2.04
794	2.89	*2.91*	2.15	3.37	3.31	3.16	2.99	2.89	3.27	3.07	2.8	2.29
795	xxx	*3.22*	2.36	3.33	3.3	3.12	2.9	2.76	3.24	2.98	2.65	2.05
796	xxx	*3.24*	2.3	3.37	3.35	3.17	2.96	2.83	3.3	3.03	2.71	2.13
797	3.27	*3.29*	2.36	3.62	3.57	3.34	3.08	2.95	3.49	3.16	2.8	2.23
798	2.78	*3.45*	2.4	3.21	3.15	2.93	2.67	2.51	3.08	2.78	2.44	1.94
799	3.3	*3.03*	2.13	3.62	3.62	3.42	3.17	3.04	3.57	3.28	2.93	2.38
800	3.86	*3.5*	2.55	3.99	3.98	3.74	3.48	3.35	3.92	3.59	3.19	2.55
801	3.14	*3.91*	2.78	3.50	3.46	3.27	3.05	2.94	3.43	3.14	2.82	2.25
802	3.14	*3.39*	2.41	3.51	3.49	3.3	3.09	2.98	3.45	3.16	2.85	2.26
803	xxx	*3.41*	2.43	3.80	3.78	3.55	3.31	3.16	3.71	3.41	3.02	2.35
804	xxx	*3.75*	2.61	4.40	4.32	4.06	3.79	3.62	4.25	3.89	3.43	2.66
805	3.84	*4.39*	2.91	3.88	3.82	3.56	3.28	3.08	3.77	3.38	2.92	2.11
806	3.2	*3.9*	2.49	3.44	3.42	3.22	2.98	2.8	3.37	3.04	2.66	1.96

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
807	4.22	*3.4*	2.29	4.24	4.18	3.92	3.64	3.46	4.11	3.73	3.28	2.5
808	4.57	*4.16*	2.84	4.52	4.42	4.13	3.81	3.61	4.34	3.93	3.42	2.58
809	xxx	*4.44*	2.94	3.75	3.68	3.48	3.19	3.03	3.6	3.25	2.85	2.19
810	xxx	*3.74*	2.47	3.37	3.35	3.17	2.88	2.73	3.27	2.95	2.6	2
811	4	*3.33*	2.28	4.08	4.03	3.79	3.47	3.29	3.96	3.59	3.14	2.41
812	4.7	*3.96*	2.76	4.63	4.55	4.27	3.95	3.76	4.47	4.05	3.53	2.7
813	4.44	*4.58*	3.05	4.19	4.2	3.81	3.47	3.24	3.97	3.55	3.05	2.19
814	3.92	*4.24*	2.71	3.86	3.89	3.53	3.21	2.99	3.68	3.29	2.85	2.06
815	4.27	*3.86*	2.55	4.58	4.48	4.15	3.82	3.61	4.42	3.97	3.44	2.58
816	4.69	*4.53*	3	4.80	4.68	4.33	3.97	3.76	4.6	4.13	3.56	2.65
817	4.99	*4.79*	3.1	4.67	4.54	4.22	3.84	3.66	4.47	4.02	3.47	2.55
818	4.41	*4.68*	3.05	4.27	4.15	3.83	3.46	3.25	4.09	3.66	3.14	2.26
819	5.1	*4.22*	2.81	5.24	5.12	xxx	4.43	4.2	4.91	4.61	4.08	3.17
820	5.92	*4.84*	3.47	5.55	5.38	xxx	4.62	4.37	5.15	4.8	4.21	3.21
821	5.37	*5.28*	3.6	5.00	4.87	xxx	4.13	3.9	4.77	4.32	3.78	2.87
822	4.37	*5*	3.31	4.44	4.36	xxx	3.68	3.46	4.29	3.88	3.4	2.57
823	4.84	*4.29*	2.98	4.80	4.73	xxx	4.06	3.85	4.63	4.26	3.78	2.95
824	5.93	4.56	3.31	5.59	5.48	xxx	4.74	4.52	5.35	4.91	4.35	3.4
825	5.82	5.48	3.74	5.32	5.17	xxx	4.32	4.05	5.06	4.54	3.9	2.88
826	4.58	5.3	3.42	4.32	4.22	xxx	4.06	3.22	4.15	3.73	3.2	2.36
827	4.73	4.2	2.9	4.74	xxx	xxx	3.47	4.16	4.48	4.23	3.78	3.02
828	5.89	5.3	3.29	5.53	5.39	xxx	4.69	4.46	5.19	4.85	4.3	3.39
829	5.72	5.28	3.71	5.23	5.11	xxx	4.3	4.04	5	4.51	3.93	2.96
830	4.28	4.62	3.45	4.21	4.14	xxx	3.42	3.21	4.06	3.67	3.2	2.42
831	4.81	4.29	2.84	4.82	4.5	xxx	4.11	3.92	4.28	4.31	3.86	3.12
832	6.31	5.49	3.33	5.86	5.47	xxx	4.94	4.7	5.21	5.13	4.55	3.55
833	5.75	5.19	3.88	5.45	5.3	xxx	4.49	4.23	5.17	4.72	4.15	3.14
834	xxx	3.73	3.54	4.77	4.64	xxx	3.98		4.56	4.18	3.72	2.9
835	xxx	4.35	3.29	4.36	4.24	xxx	3.68		4.21	3.83	3.44	2.71
836	5.83	4.91	3.06	5.53	5.37	xxx	4.64	4.42	5.3	4.81	4.27	3.33
837	5.87	4.46	3.61	5.17	4.98	4.5	4.07	3.77	4.88	4.32	3.68	2.65

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
838	4.03	4.51	3.2	3.83	3.72	3.36	3.01	2.77	3.66	3.25	2.8	2.08
839	4.66	4.47	2.58	4.64	4.56	xxx	4	3.84	4.47	4.2	3.78	3.07
840	5.39	4.45	3.28	5.17	5.04	xxx	4.4	4.2	4.94	4.61	4.09	3.2
841	4.76	4.7	3.5	4.50	4.39	4.13	3.76	3.55	4.35	3.96	3.5	2.72
842	4.65	4.48	3.1	4.60	4.53	4.29	3.96	3.77	4.47	4.11	3.67	2.9
843	4.71	3.95	3.18	4.56	4.47	4.17	3.81	3.58	4.4	4.01	3.52	2.68
844	4.6	4.54	3.08	4.55	4.47	4.18	3.82	3.59	4.4	4	3.52	2.69
845	4.69	5.26	3.08	4.79	4.69	4.34	4.09	3.88	4.64	4.25	3.78	2.97
846	4.62	4.56	3.28	4.56	4.47	4.11	3.84	3.62	4.41	4.03	3.55	2.75
847	4.17	4.24	3.11	3.96	3.86	3.61	3.27	3.04	3.81	3.45	3.02	2.33
848	4.66	3.81	2.77	4.59	4.44	4.18	3.85	3.65	4.39	3.99	3.54	2.81
849	xxx	4.18	3.13	5.34	5.17	xxx	4.46	xxx	5.09	4.63	4.09	3.09
850	xxx	4.33	3.42	4.64	4.52	xxx	3.84	xxx	4.46	4.04	3.55	2.64
851	4.24	4.26	3.06	4.40	4.27	4	3.65	3.47	4.22	3.86	3.46	2.73
852	3.78	3.85	3	3.95	3.83	3.57	3.24	3.05	3.82	3.45	3.07	2.41
853	4.87	3.93	2.67	4.79	4.56	xxx	4.06	3.83	4.39	4.31	3.86	3.08
854	5.08	4.79	3.35	4.97	4.73	xxx	4.23	4.02	4.53	4.46	3.99	3.12
855	4.3	4.6	3.41	4.47	4.35	xxx	3.71	3.5	4.32	3.96	3.54	2.76
856	3.62	3.84	3.12	4.08	3.98	xxx	3.39	3.21	3.95	3.63	3.26	2.59
857	4	4.03	2.84	4.32	4.27	xxx	3.68	3.51	4.14	3.91	3.52	2.83
858	5.06	4.64	3.08	5.12	5.04	xxx	4.4	4.21	4.9	4.61	4.13	3.31
859	4.78	4.64	3.63	4.58	4.49	4.17	3.78	3.56	4.43	4.03	3.55	2.73
860	3.82	3.97	3.23	3.90	3.86	3.56	3.19	2.98	3.81	3.47	3.07	2.38
861	4.3	3.97	2.76	4.49	4.41	xxx	3.8	3.61	4.29	4.02	3.6	2.89
862	5.11	4.81	3.16	5.05	4.92	xxx	4.26	4.06	4.81	4.48	4	3.16
863	4.95	4.81	3.54	4.90	4.73	xxx	3.99	3.76	4.67	4.26	3.76	2.87
864	4.12	3.66	3.37	4.29	4.17	xxx	3.47	3.24	4.1	3.74	3.29	2.52
865	4.44	3.66	2.91	4.65	4.45	xxx	3.88	3.66	4.25	4.14	3.68	2.9
866	5.35	4.83	3.21	5.38	5.15	xxx	4.52	4.3	4.97	4.76	4.23	3.33
867	5.11	4.81	3.72	5.13	5	xxx	4.19	4.07	4.91	4.47	3.93	3.01
868	3.98	4.48	3.49	4.09	4	xxx	3.26	3	3.89	3.56	3.1	2.33

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
869	4.2	4.5	2.73	4.39	4.16	xxx	3.73	3.53	xxx	3.97	3.54	2.84
870	5.49	4.56	3.08	5.45	5.16	xxx	4.67	4.46	xxx	4.88	4.37	3.5
871	4.96	4.56	3.87	4.94	4.8	xxx	4.02	3.8	4.73	4.27	3.75	2.86
872	4.5	4.22	3.39	4.64	4.5	xxx	3.73	3.51	4.43	4.02	3.51	2.69
873	xxx	4.22	3.19	4.87	4.75	xxx	3.95	xxx	4.57	4.25	3.73	2.83
874	xxx	5.01	3.28	4.90	4.82	xxx	4.06	xxx	4.65	4.34	3.85	2.99
875	4.74	4.75	3.39	4.82	4.71	xxx	3.98	3.75	4.62	4.24	3.73	2.89
876	4.41	4.01	3.32	4.56	4.44	xxx	3.65	3.41	4.34	3.96	3.46	2.59
877	4.32	4.28	3.06	4.55	4.48	xxx	3.81	3.62	4.39	4.08	3.65	2.9
878	5.21	4.81	3.21	5.24	5.15	xxx	4.46	4.26	5.05	4.67	4.18	3.34
879	4.87	4.59	3.68	4.79	4.65	4.26	3.81	3.56	4.59	4.1	3.55	2.65
880	3.88	3.77	3.22	4.13	4.03	3.65	3.22	3	3.98	3.56	3.09	2.33
881	4.18	3.99	2.86	4.56	4.51	3.74	3.8	3.62	4.4	4.07	3.64	2.88
882	4.92	4.62	3.19	5.04	4.93	4.15	4.21	4.01	4.83	4.47	3.97	3.11
883	4.7	4.47	3.47	4.72	4.57	4.14	3.82	3.61	4.51	4.11	3.61	2.78
884	3.62	3.86	3.22	3.95	3.88	3.46	3.14	2.93	3.81	3.45	3.02	2.3
885	3.8	3.72	2.67	4.34	4.33	3.47	3.7	3.52	4.2	3.94	3.54	2.87
886	4.77	4.49	3.07	4.92	4.84	3.97	4.2	4.01	4.71	4.42	3.96	3.17
887	4.51	4.42	3.46	4.61	4.48	3.97	3.75	3.53	4.42	4.03	3.56	2.73
888	3.59	3.68	3.2	4.04	3.96	3.47	3.3	3.14	3.9	3.57	3.19	2.53
889	3.38	3.53	2.83	3.87	3.83	3.47	3.28	3.15	3.76	3.47	3.13	2.56
890	4.23	4.12	2.75	4.55	4.48	4.11	3.87	3.69	4.42	4.08	3.65	2.92
891	4.37	3.39	3.23	4.50	4.38	4.05	3.66	3.45	4.32	3.94	3.45	2.63
892	3.37	3.5	3.1	3.83	3.76	3.44	3.11	2.94	3.69	3.37	2.97	2.32
893	2.99	3.26	2.67	3.65	3.63	3.4	3.17	3.06	3.58	3.32	3	2.47
894	3.49	4.32	2.65	4.05	3.97	3.73	3.46	3.32	3.93	3.63	3.26	2.64
895	3.81	3.96	2.89	4.39	4.27	3.83	3.64	3.45	4.22	3.88	3.46	2.71
896	3.2	3.08	3.27	3.63	3.58	3.18	3.07	2.91	3.53	3.25	2.92	2.31
897	2.93	3.82	3.26	3.38	3.36	3.17	3.02	2.92	3.32	3.09	2.82	2.35
898	3.97	4.09	2.12	4.53	4.44	4.23	3.97	3.82	4.41	4.08	3.69	2.97
899	3.71	3.49	2.57	4.09	3.97	3.71	3.35	3.2	3.94	3.57	3.16	2.42

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
900	2.76	3.9	2.82	3.13	3.11	2.84	2.49	2.35	3.09	2.78	2.43	1.86
901	xxx	3.51	2.22	3.97	4.02	xxx	3.58	xxx	3.97	3.76	3.46	2.93
902	xxx	3.4	2.91	4.29	4.26	xxx	3.71	xxx	xxx	3.91	3.5	2.86
903	xxx	3.85	2.98	3.63	3.55	3.29	2.96	xxx	xxx	3.25	2.85	2.24
904	xxx	3.74	2.54	3.95	3.88	3.66	3.44	xxx	3.88	3.63	3.31	2.71
905	3.18	3.79	2.93	3.56	3.48	3.19	2.9	2.72	3.48	3.18	2.82	2.2
906	2.88	3.24	2.52	3.42	3.36	3.12	2.92	2.77	3.34	3.08	2.78	2.28
907	xxx	3.06	2.53	3.90	3.81	3.48	3.14	xxx	3.76	3.45	3.07	2.5
908	xxx	4.07	2.76	3.89	3.85	3.55	3.2	xxx	3.76	3.45	3.03	2.42
909	3.49	3.66	2.69	3.88	3.88	3.5	3.14	2.84	3.81	3.51	3.1	2.46
910	2.91	2.97	2.73	3.36	3.39	3.04	2.71	2.42	3.31	3.01	2.68	2.06
911	2.66	4.58	2.31	3.22	3.23	3.02	2.75	2.53	3.17	2.99	2.77	2.38
912	3.79	4.56	2.38	4.17	4.13	3.89	3.57	3.33	4.08	3.82	3.48	2.91
913	3.43	3.59	3.03	3.72	3.66	3.33	2.97	xxx	3.62	3.3	2.91	2.27
914	2.34	2.94	2.61	3.04	3.01	2.68	2.33	2.66	2.96	2.7	2.41	1.94
915	3.27	3.97	2.2	4.04	4.02	3.71	3.37	2.04	3.92	3.66	3.36	2.82
916	4.31	4.56	2.94	4.70	4.66	4.33	3.97	3.12	4.57	4.23	3.84	3.11
917	3.38	4.44	3.32	3.61	3.52	3.23	2.84	3.72	3.46	3.16	2.83	2.23
918	2.32	4.01	2.59	2.98	2.92	2.65	2.4	2.69	2.86	2.65	2.42	2.02
919	3.51	3.97	2.2	4.04	4.02	3.6	3.15	2.16	3.89	3.59	3.2	2.55
920	4.44	4.92	2.87	4.64	4.6	4.19	3.72	2.79	4.46	4.1	3.65	2.89
921	4.22	4.68	3.31	4.60	4.53	4	3.47	3.35	4.45	4.11	3.65	2.89
922	3.88	4.16	3.23	4.17	4.13	3.61	3.1	2.98	4.03	3.69	3.24	2.51
923	3.9	4.66	2.88	4.14	4.1	3.53	2.98	2.63	4	3.64	3.22	2.51
924	5.03	5.36	2.91	5.02	4.94	4.33	3.73	2.49	4.83	4.42	3.92	3.11
925	4.7	5.19	3.48	4.77	4.65	3.9	3.19	3.19	4.52	4.06	3.48	2.55
926	3.86	4.47	3.13	4.33	4.23	3.49	2.8	2.52	4.12	3.69	3.17	2.33
927	4.54	4.73	2.88	4.82	4.7	3.94	3.16	2.16	4.6	4.16	3.62	2.73
928	5.51	5.39	3.25	5.44	5.31	4.53	3.73	2.48	5.18	4.67	4.05	3.02
929	5.31	5.39	3.56	5.29	5.09	4.19	3.05	3	4.96	4.42	3.74	2.67
930	4.15	4.8	3.34	4.62	4.44	3.55	xxx	2.57	4.32	3.85	3.25	2.32

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
931	5.01	4.81	2.97	5.20	5.05	4.15	xxx	xxx	4.84	4.44	3.86	2.89
932	6.01	5.52	3.45	5.80	5.62	4.72	xxx	xxx	5.39	4.93	4.29	3.21
933	5.78	5.51	3.8	5.51	5.29	4.45	xxx	3.12	5.15	4.59	3.91	2.8
934	4.99	4.92	3.54	4.99	4.78	3.95	3.1	2.87	4.66	4.15	3.52	2.5
935	5.29	4.92	3.24	5.29	5.16	4.34	3.72	2.4	4.9	4.56	3.97	3
936	6.27	5.51	3.57	5.90	5.74	4.89	4.24	3.11	5.47	5.06	4.39	3.29
937	6.01	5.51	3.87	5.54	5.36	4.62	3.89	3.61	5.21	4.61	3.91	2.75
938	5.18	5.03	3.53	5.02	4.86	4.15	3.46	3.28	4.73	4.2	3.57	2.53
939	5.53	5.03	3.29	5.41	5.26	xxx	3.99	2.88	4.99	4.65	4.03	3
940	6.37	5.63	3.6	5.94	5.75	xxx	4.38	3.47	5.46	5.06	4.37	3.21
941	6.15	5.62	3.84	5.63	5.44	4.72	4.01	3.85	5.28	4.7	3.98	2.79
942	5.47	4.17	3.59	5.19	5.04	4.36	3.69	3.45	4.89	4.36	3.71	2.63
943	5.5	5.1	3.4	5.40	5.25	xxx	3.99	3.15	5.05	4.59	3.96	2.91
944	6.33	5.6	3.56	5.93	5.73	xxx	4.37	3.5	5.53	5	4.29	3.12
945	6.08	5.22	3.8	5.65	5.44	4.7	4	3.85	5.29	4.67	3.93	2.73
946	5.31	4.73	3.53	5.20	4.89	4.31	3.49	3.46	4.87	4.33	3.67	2.59
947	5.29	5.12	2.56	5.27	5.09	4.49	3.91	3.44	4.95	4.45	3.84	2.8
948	5.9	5.03	3.62	5.78	5.57	4.91	4.28	3.8	5.43	4.85	4.16	2.98
949	5.55	4.63	xxx	5.24	5.05	4.39	3.77	3.29	4.89	4.31	3.6	2.43
950	4.93	5.13	xxx	4.73	4.57	3.97	3.38	2.9	4.43	3.95	3.33	2.32
951	5.38	4.8	xxx	5.55	5.4	4.55	4.24	3.79	5.16	4.75	4.1	2.99
952	5.63	4.47	xxx	5.44	5.28	4.42	4.12	3.69	5.03	4.6	3.95	2.81
953	4.68	4.54	3.16	4.75	4.63	4.17	3.77	3.46	4.51	4.07	3.54	2.66
954	5.2	4.84	3.38	5.21	5.06	4.54	4.09	3.76	4.96	4.47	3.88	2.91
955	4.88	5.02	3.04	4.89	4.73	4.18	3.34	3.36	4.61	4.08	3.44	2.39
956	4.38	4.23	2.94	4.59	4.47	3.94	xxx	3.16	4.36	3.88	3.28	2.32
957	4.41	4.71	3.01	4.61	4.5	4.07	xxx	3.4	4.38	3.93	3.38	2.48
958	4.76	4.33	3.13	4.88	4.76	4.29	xxx	3.57	4.65	4.16	3.57	2.59
959	5.14	xxx	3.15	5.09	4.93	4.38	xxx	3.6	4.79	4.26	3.62	2.52
960	4.2	xxx	2.8	4.35	4.18	3.69	3.28	2.97	4.08	3.63	3.05	2.15
961	5.04	xxx	3.68	5.49	5.15	xxx	4.59	4.33	xxx	4.89	4.33	3.44

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
962	5.46	xxx	3.61	5.57	5.16	xxx	4.55	4.27	xxx	4.86	4.27	3.21
963	4.37	xxx	3.04	4.48	4.39	3.98	3.61	3.39	4.29	3.88	3.41	2.59
964	4.08	xxx	3.04	4.41	4.39	4	3.65	3.44	4.3	3.92	3.47	2.71
965	3.8	xxx	2.88	4.09	4.08	3.75	3.45	3.26	4	3.64	3.21	2.53
966	4.43	xxx	3.19	4.65	4.58	4.23	3.92	3.72	4.49	4.09	3.62	2.86
967	4.19	xxx	2.89	4.38	4.27	3.89	3.55	3.35	4.18	3.75	3.26	2.44
968	xxx	xxx	2.58	3.75	3.68	3.33	3.01	2.83	3.61	3.25	2.83	2.12
969	xxx	xxx	2.72	3.93	3.89	3.56	3.28	3.12	3.82	3.47	3.06	2.39
970	4.85	xxx	3.37	5.12	5.05	4.65	4.29	4.07	4.97	4.49	3.96	3.1
971	5.18	xxx	2.95	5.17	5.01	4.4	3.86	3.48	4.89	4.26	3.53	2.3
972	3.46	xxx	2.28	3.72	3.6	3.09	2.68	2.36	3.49	3.07	2.51	1.58
973	xxx	xxx	2.73	4.04	4.01	3.7	3.41	3.21	3.9	3.62	3.24	2.61
974	xxx	xxx	3.02	4.61	4.55	4.23	3.91	3.73	4.42	4.05	3.6	2.84
975	4	xxx	2.74	4.19	4.12	3.75	3.42	3.22	4	3.63	3.15	2.38
976	3.49	xxx	2.62	4.01	3.96	3.6	3.28	3.09	3.85	3.49	3.04	2.32
977	3.82	xxx	2.8	4.25	4.18	3.83	3.48	3.27	4.08	3.7	3.22	2.44
978	4.6	xxx	3.05	4.74	4.65	4.29	3.92	3.67	4.54	4.11	3.57	2.69
979	4.71	xxx	3.03	4.83	4.69	4.22	3.79	3.48	4.57	4.1	3.49	2.54
980	3.75	xxx	2.63	4.09	4.02	3.6	3.21	2.93	3.9	3.5	2.97	2.16
981	3.79	xxx	2.92	4.24	4.2	3.86	3.51	3.26	4.1	3.74	3.31	2.57
982	4.92	xxx	3.32	5.12	5.03	4.64	4.25	3.96	4.9	4.44	3.91	2.99
983	4.82	xxx	2.96	4.74	4.61	4.09	3.61	3.21	4.48	3.99	3.37	2.36
984	3.93	xxx	2.67	4.14	4.05	3.58	3.16	2.79	3.93	3.51	2.96	2.09
985	4	xxx	2.97	4.37	4.31	3.91	3.52	3.21	4.18	3.81	3.33	2.54
986	4.34	xxx	3.04	4.48	4.38	3.97	3.56	3.23	4.25	3.86	3.35	2.57
987	xxx	xxx	3.26	4.95	4.85	4.33	3.88	3.51	4.69	4.24	3.66	2.77
988	xxx	xxx	2.86	4.41	4.36	3.85	3.44	3.09	4.23	3.8	3.26	2.44
989	3.73	xxx	2.94	4.20	4.18	3.82	3.48	3.2	4.1	3.72	3.26	2.57
990	4.95	xxx	3.46	5.11	5.04	4.63	4.22	3.92	4.92	4.48	3.94	3.06
991	4.73	xxx	3.04	4.67	4.54	4.05	3.59	3.23	4.41	3.92	3.33	2.36
992	4.26	xxx	2.92	4.39	4.27	3.81	3.38	3.03	4.15	3.7	3.16	2.27

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
993	4.34	xxx	3	4.56	xxx	4.03	3.6	3.26	4.34	3.9	3.34	2.45
994	4.65	xxx	3.05	4.55	xxx	4.04	3.6	3.25	4.34	3.9	3.36	2.49
995	4.72	xxx	3.1	4.70	xxx	4.1	3.67	3.33	4.45	3.99	3.44	2.54
996	4.01	xxx	2.91	4.45	xxx	3.86	3.43	3.13	4.19	3.75	3.21	2.33
997	3.93	xxx	3.08	4.55	xxx	4.05	3.66	3.39	4.34	3.95	3.48	2.71
998	4.63	xxx	3.2	4.77	4.66	4.24	3.84	3.56	4.54	4.12	3.62	2.79
999	4.58	xxx	3.08	4.64	4.52	4.06	xxx	3.31	4.38	3.95	3.4	2.52
1000	4.33	xxx	3.05	4.58	4.49	4.01	xxx	3.28	4.36	3.93	3.38	2.52
1001	3.95	xxx	2.85	4.24	4.18	3.76	xxx	3.13	4.04	3.64	3.16	2.36
1002	4.14	xxx	2.99	4.42	4.34	3.93	xxx	3.26	4.22	3.82	3.34	2.51
1003	4.26	xxx	2.92	4.47	4.36	3.91	xxx	3.21	4.22	3.77	3.23	2.35
1004	3.9	xxx	2.81	4.27	4.17	3.73	xxx	3.05	4.03	3.61	3.08	2.24
1005	3.73	xxx	2.81	4.15	4.09	3.75	xxx	3.18	3.96	3.58	3.12	2.36
1006	3.71	xxx	2.8	4.14	4.08	3.73	xxx	3.15	3.95	3.58	3.12	2.36
1007	xxx	xxx	2.86	4.26	4.19	3.82	xxx	3.22	4.06	3.66	3.15	2.33
1008	3.86	xxx	2.84	4.20	4.13	3.75	xxx	3.16	4.01	3.61	3.11	2.31
1009	xxx	xxx	3.07	4.50	4.47	4.1	xxx	3.56	4.35	3.95	3.44	2.62
1010	3.71	xxx	2.77	4.03	3.97	3.59	xxx	3.04	3.89	3.47	2.99	2.25
1011	3.82	3.61	3.03	4.25	4.18	3.75	xxx	3.47	4.11	3.75	3.36	2.7
1012	3.63	3.92	2.77	4.01	3.93	3.49	xxx	3.18	3.86	3.51	3.12	2.43
1013	3.12	3.58	2.65	3.69	3.64	3.42	xxx	3.11	3.59	3.29	2.99	2.49
1014	3.5	3.4	3.13	3.93	3.88	3.66	xxx	3.32	3.82	3.52	3.21	2.65
1015	3.45	3.67	2.63	3.69	3.63	3.36	xxx	2.93	3.57	3.24	2.85	2.21
1016	3.59	4.09	2.91	4.01	3.96	3.71	xxx	3.34	3.92	3.62	3.23	2.59
1017	3.25	3.68	2.58	3.68	3.62	3.37	xxx	3.03	3.58	3.26	2.89	2.25
1018	2.9	3.29	2.49	3.55	3.53	3.27	3.12	2.91	3.45	3.15	2.79	2.17
1019	3.17	3.6	2.68	3.81	3.8	3.53	3.76	3.14	3.7	3.41	3.01	2.38
1020	3.76	3.96	2.88	4.13	4.08	3.78	xxx	3.36	4	3.65	3.22	2.53
1021	3.3	3.95	2.55	3.73	3.63	3.36	2.86	2.99	3.6	3.24	2.85	2.22
1022	2.73	3	2.37	3.45	3.37	3.12	3.37	2.77	3.34	3.02	2.66	2.08
1023	3.13	3.42	2.61	3.66	3.59	3.36	3.92	3.02	3.53	3.23	2.91	2.31

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1024	3.71	4.18	2.81	3.95	3.88	3.65	3.39	3.29	3.82	3.5	3.14	2.5
1025	3.63	3.87	2.78	4.06	3.95	3.67	3.07	3.28	3.89	3.53	3.13	2.43
1026	2.44	3.32	2.15	3.16	3.06	2.8	3.57	2.44	3.04	2.72	2.4	1.86
1027	2.84	3.74	2.58	3.55	3.53	3.34	4.22	3.04	3.5	3.24	2.93	2.44
1028	3.84	4.42	3.06	4.27	4.22	4	3.57	3.67	4.15	3.85	3.47	2.81
1029	3.54	3.88	2.77	4.01	3.93	3.64	3.51	3.24	3.85	3.52	3.13	2.47
1030	2.76	3.48	2.36	3.41	3.38	3.1	3.85	2.73	3.3	3.02	2.68	2.11
1031	3.23	3.99	2.74	3.82	3.82	3.52	4.26	3.27	3.75	3.49	3.15	2.57
1032	4.35	4.82	3.2	4.51	4.43	4.12	3.64	3.8	4.37	4.04	3.62	2.93
1033	3.63	4.3	2.76	3.97	3.86	3.63	xxx	3.28	3.82	3.51	3.12	2.49
1034	3.18	4.14	2.57	3.62	3.52	3.29	xxx	2.96	3.48	3.21	2.86	2.28
1035	xxx	4.67	2.93	4.19	4.07	3.8	xxx	3.45	4.01	3.72	3.33	2.62
1036	5.02	5.25	3.37	4.88	4.75	4.48	xxx	4.07	4.68	4.32	3.87	3.06
1037	4.59	5.24	2.85	4.33	4.19	3.88	xxx	3.4	4.15	3.72	3.24	2.4
1038	3.96	4.63	2.8	4.26	4.14	3.82	xxx	3.36	4.09	3.7	3.23	2.41
1039	4.71	4.94	3.11	4.75	4.61	4.22	xxx	3.65	4.53	4.09	3.51	2.58
1040	5.45	5.75	3.35	5.27	5.09	4.67	xxx	4.03	5.01	4.49	3.85	2.81
1041	5.44	5.28	3.15	5.11	4.89	4.43	xxx	3.71	4.82	4.27	3.6	2.53
1042	4.64	4.96	2.91	4.60	4.42	3.98	xxx	3.32	4.34	3.87	3.26	2.32
1043	5.2	5.19	3.27	5.06	4.93	4.43	xxx	3.9	4.81	4.33	3.74	2.77
1044	6.28	5.26	3.57	5.74	5.57	5.02	xxx	4.35	5.44	4.84	4.15	3.01
1045	5.87	5.63	3.12	5.01	4.81	4.32	xxx	3.48	4.69	4.11	3.41	2.28
1046	5.4	4.96	3.03	4.78	4.62	4.15	xxx	3.38	4.57	3.98	3.34	2.28
1047	5.79	5	3.19	5.23	5.06	4.57	xxx	3.81	4.93	4.37	3.68	2.52
1048	6.04	5.35	3.21	5.25	5.05	4.56	xxx	3.8	4.95	4.36	3.64	2.49
1049	6.28	5.35	3.43	5.60	5.43	4.84	xxx	4.1	5.26	4.68	3.94	2.76
1050	5.44	5.39	3.12	5.12	4.86	4.28	xxx	3.56	4.7	4.17	3.5	2.4
1051	6.09	5.39	3.65	5.38	5.28	xxx	xxx	4.33	xxx	4.85	4.22	3.14
1052	6.52	5.17	3.74	5.70	5.52	xxx	xxx	4.55	xxx	5.03	4.35	3.2
1053	6.03	5.17	3.47	5.54	5.18	xxx	xxx	4.02	5.04	4.52	3.9	2.88
1054	6	4.89	3.47	5.40	5.21	xxx	xxx	xxx	5.07	4.56	3.94	2.91

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1055	6.31	4.88	3.68	5.76	5.54	xxx	xxx	4.34	xxx	4.91	4.22	3.09
1056	6.1	5.24	3.59	5.55	5.36	xxx	xxx	4.2	xxx	4.73	4.07	2.96
1057	6.13	4.65	3.71	5.69	5.37	xxx	xxx	4.33	xxx	4.86	4.23	3.15
1058	5.9	5.34	3.61	5.49	5.16	xxx	xxx	4.15	xxx	4.69	4.08	3.04
1059	5.88	5.57	3.69	5.62	5.18	xxx	xxx	4.3	xxx	4.83	4.22	3.17
1060	6.26	4.59	3.83	5.96	5.52	xxx	xxx	4.56	xxx	5.11	4.45	3.31
1061	5.28	4.67	2.91	4.51	4.31	3.88	xxx	3.23	4.2	3.71	3.18	2.31
1062	5.77	4.91	3.3	5.19	5.04	4.55	xxx	3.89	5.14	4.38	3.81	2.9
1063	6.17	5.1	3.16	5.58	5.4	4.75	xxx	3.78	5.24	4.56	3.76	2.43
1064	5.04	4.13	2.84	4.71	4.55	4.04	xxx	3.29	4.42	3.88	3.22	2.13
1065	4.86	4.24	3	4.86	4.74	4.31	3.89	3.66	4.6	4.13	3.53	2.53
1066	5.22	4.74	3.08	5.00	4.86	4.41	3.98	3.73	4.71	4.21	3.58	2.57
1067	5.36	4.55	3.15	5.19	5.05	4.51	4.1	3.81	4.89	4.35	3.69	2.58
1068	4.29	4.18	2.64	4.24	4.15	3.64	3.27	2.98	4.04	3.55	2.97	2.03
1069	4.43	4.09	3.1	4.55	4.52	3.66	3.81	3.6	4.33	4.02	3.5	2.69
1070	5.02	4.57	3.29	5.07	4.97	4.1	4.21	4.02	4.74	4.41	3.86	2.96
1071	4.56	4.51	3.08	4.69	4.57	4.09	3.77	3.56	4.44	3.99	3.43	2.55
1072	4	3.57	2.87	4.36	4.34	3.87	3.58	3.36	4.19	3.77	3.24	2.44
1073	3.75	3.74	2.92	4.12	4.14	3.81	3.49	3.3	4.02	3.64	3.18	2.44
1074	4.38	4.47	3.17	4.55	4.49	4.16	3.83	3.65	4.39	3.98	3.49	2.7
1075	4.38	4.25	3.13	4.63	4.48	4.09	3.72	3.5	4.36	3.92	3.37	2.49
1076	3.13	3.5	2.5	3.77	3.7	3.34	3.03	2.82	3.6	3.21	2.74	2.01
1077	3.23	3.63	2.82	3.93	3.93	3.48	3.42	3.26	3.87	3.54	3.17	2.55
1078	4.23	4.37	3.28	4.60	4.53	4.05	3.95	3.8	4.44	4.07	3.63	2.9
1079	4	4.14	3.06	4.43	4.16	3.88	3.56	3.37	4.16	3.75	3.27	2.49
1080	2.92	3.38	2.53	3.72	3.6	3.28	3.02	2.83	3.16	3.14	2.74	2.06
1081	3.02	3.44	2.74	3.81	3.81	3.44	3.32	3.17	3.73	3.43	3.06	2.45
1082	4.07	4.46	3.24	4.48	4.45	4.04	3.87	3.72	4.35	3.99	3.56	2.86
1083	3.8	4.32	2.98	4.29	4.2	3.82	3.5	3.29	4.1	3.7	3.19	2.44
1084	2.91	3.68	2.43	3.54	3.51	3.18	2.9	2.69	3.42	3.08	2.64	2.02
1085	2.99	3.85	2.57	3.59	3.58	3.35	3.14	2.99	3.5	3.22	2.87	2.33

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1086	4.18	4.5	3.26	4.61	4.51	4.22	3.96	3.79	4.41	4.06	3.61	2.88
1087	4.08	4.72	3.03	4.37	4.24	3.84	3.51	3.28	4.12	3.7	3.18	2.37
1088	3.09	4.15	2.68	3.79	3.7	3.34	3.04	2.81	3.62	3.25	2.8	2.13
1089	3.43	4.07	2.8	4.00	3.94	3.65	3.38	3.2	3.86	3.49	3.03	2.33
1090	4.4	4.5	3.21	4.59	4.47	4.13	3.81	3.62	4.39	3.97	3.45	2.63
1091	xxx	4.38	3.33	4.92	4.8	xxx	4.09	3.9	4.68	4.23	3.69	2.74
1092	xxx	4.16	2.96	4.37	4.3	xxx	3.56	3.35	4.17	3.75	3.25	2.36
1093	xxx	3.93	2.99	4.24	4.21	3.75	3.61	3.45	4.11	3.72	3.26	2.53
1094	xxx	4.62	3.28	4.61	4.53	4.07	3.92	3.77	4.43	4.03	3.56	2.78
1095	xxx	4.69	3.09	4.53	4.38	4.01	3.69	3.52	4.25	3.83	3.3	2.48
1096	xxx	4.41	2.99	4.35	4.22	3.85	3.54	3.37	4.1	3.69	3.17	2.39
1097	xxx	4.12	2.85	4.08	4	3.68	3.42	3.28	3.89	3.52	3.07	2.4
1098	xxx	4.34	3.2	4.70	4.6	4.25	3.95	3.78	4.48	4.05	3.52	2.7
1099	xxx	4.57	3.11	4.75	4.59	4.17	3.82	3.61	4.44	3.97	3.37	2.43
1100	xxx	4.2	2.98	4.50	4.35	3.94	3.59	3.39	4.21	3.77	3.19	2.27
1101	xxx	4.69	2.57	4.17	4.02	3.6	3.31	3.16	3.91	3.5	2.94	2.09
1102	xxx	4.63	2.85	4.38	4.22	3.83	3.58	3.45	4.12	3.72	3.17	2.33
1103	xxx	4.54	2.84	4.63	4.48	4.09	3.7	3.51	4.34	3.87	3.28	2.28
1104	xxx	4.65	2.61	4.26	4.15	3.74	3.32	3.08	4.01	3.52	2.93	1.96
1105	xxx	4.47	3.1	4.77	4.71	4.12	4.02	3.82	4.6	4.17	3.66	2.8
1106	xxx	4.63	3.04	4.72	4.64	4.05	3.98	3.79	4.51	4.08	3.58	2.71
1107	xxx	4.77	3.03	4.61	4.49	4.05	3.8	3.61	4.05	3.97	3.46	2.64
1108	4.46	4.53	3.06	4.73	4.57	4.12	3.86	3.68	4.46	4.05	3.52	2.69
1109	4.28	4.43	2.99	4.57	4.44	4.07	3.72	3.55	4.32	3.9	3.39	2.58
1110	4.37	4.47	3.04	4.67	4.58	4.2	3.86	3.69	4.44	4.01	3.51	2.68
1111	4.67	4.54	3.07	4.70	4.59	4.16	3.78	3.57	4.43	3.97	3.39	2.48
1112	4.43	4.31	2.99	4.56	4.44	4.02	3.64	3.44	4.3	3.86	3.29	2.44
1113	4.17	4.32	3.1	4.55	4.45	4.09	3.79	3.64	4.35	3.94	3.45	2.65
1114	4.19	4.1	3.04	4.57	4.47	4.1	3.79	3.63	4.38	3.93	3.43	2.6
1115	4.55	3.98	3.08	4.61	4.47	4.05	3.68	3.46	4.37	3.89	3.34	2.45
1116	4.31	4.56	3	4.40	4.27	3.89	3.58	3.39	4.16	3.74	3.24	2.43

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1117	4.16	4.18	3.09	4.50	4.4	3.96	3.75	3.59	4.31	3.91	3.43	2.67
1118	4.11	3.77	2.87	4.25	4.21	3.77	3.54	3.35	4.11	3.69	3.2	2.44
1119	3.82	4.14	2.89	4.12	4.1	3.75	3.48	3.3	4.01	3.62	3.19	2.48
1120	4.42	4.37	3.25	4.68	4.58	4.22	3.95	3.79	4.49	4.08	3.62	2.82
1121	4.05	4.05	2.93	4.28	4.16	3.79	3.5	3.33	4.04	3.62	3.16	2.37
1122	xxx	3.88	2.72	3.90	3.82	3.47	3.19	3	3.71	3.33	2.9	2.19
1123	xxx	3.57	3	4.29	4.19	3.86	3.56	3.37	4.09	3.7	3.23	2.49
1124	4.2	4.44	3.13	4.49	4.37	4.03	3.72	3.56	4.27	3.87	3.38	2.62
1125	3.77	3.69	2.9	4.16	4.08	3.74	3.47	3.33	3.97	3.59	3.13	2.43
1126	xxx	3.19	2.78	4.01	3.95	3.61	3.33	3.17	3.85	3.48	3.02	2.33
1127	xxx	3.68	2.57	3.73	3.65	3.34	3.09	2.95	3.57	3.22	2.79	2.15
1128	4.23	3.82	3.04	4.44	3.65	4.02	3.75	3.6	4.25	3.85	3.38	2.61
1129	3.53	3.87	2.32	3.60	3.48	3.18	2.89	2.89	3.42	3.01	2.51	1.67
1130	xxx	3.31	2.14	3.30	3.23	2.93	2.68	xxx	3.18	2.83	2.36	1.6
1131	xxx	3.55	2.52	3.74	3.72	3.41	3.15	xxx	3.62	3.25	2.75	1.92
1132	xxx	4.12	2.59	3.81	3.76	3.46	3.2	xxx	3.64	3.27	2.77	1.94
1133	xxx	4.96	2.62	3.96	3.87	3.54	3.28	xxx	3.76	3.39	2.91	2.1
1134	xxx	4.05	2.31	3.41	3.34	3.02	2.79	xxx	3.22	2.89	2.45	1.75
1135	xxx	3.12	2.17	3.08	3.04	2.8	2.6	xxx	2.95	2.69	2.32	1.76
1136	xxx	3.96	2.71	4.13	4.04	3.78	3.51	xxx	3.96	3.59	3.11	2.31
1137	xxx	4.13	3.04	5.01	4.82	4.34	3.89	xxx	4.7	4.15	3.49	2.31
1138	xxx	3.3	2.63	4.16	4.06	3.62	3.23	2.88	3.93	3.49	2.9	1.87
1139	xxx	3.91	2.26	3.17	3.18	2.99	2.79	2.67	3.09	2.85	2.52	2.01
1140	xxx	4.33	2.57	3.91	3.82	3.58	3.32	3.17	3.75	3.41	2.98	2.33
1141	xxx	4.36	2.55	4.11	3.94	3.53	3.18	2.94	3.87	3.41	2.83	1.96
1142	2.69	3.93		3.45	3.38	3.01	2.71	2.5	3.28	2.92	2.44	1.71
1143	3.52	4.3	1.86	4.04	4.02	3.67	3.34	3.14	3.88	3.51	3.01	2.22
1144	4.23	4.8	2.73	4.39	4.32	3.94	3.61	3.4	4.19	3.77	3.22	2.38
1145	4.17	4.82	2.91	4.36	4.25	3.87	4.01	3.33	4.12	3.71	3.17	2.33
1146	3.36	4.31	2.91	3.96	3.86	3.49	4.27	2.95	3.74	3.35	2.85	2.07
1147	3.83	4.59	2.62	4.39	4.33	3.98	2.66	3.47	4.22	3.82	3.31	2.52

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1148	4.77	5.22	3	4.87	4.76	4.39	xxx	3.85	4.64	4.18	3.61	2.71
1149	4.88	5.01	3.26	4.81	4.7	4.25	4.26	3.63	4.56	4.07	3.46	2.53
1150	4.17	5.05	3.2	4.36	4.3	3.87	xxx	3.28	4.15	3.71	3.15	2.32
1151	4.55	5.07	2.96	4.77	4.68	4.17	xxx	3.72	4.56	4.11	3.57	2.7
1152	5.39	5.41	3.25	5.33	5.19	4.62	xxx	4.1	5.05	4.53	3.92	2.9
1153	xxx	5.41	3.52	4.92	4.75	4.23	xxx	3.61	4.58	4.05	3.4	2.39
1154	xxx	5.52	3.22	4.99	4.83	4.31	xxx	3.68	4.68	4.15	3.51	2.49
1155	xxx	5.4	3.28	5.15	4.97	4.43	xxx	3.66	4.81	4.24	3.53	2.36
1156	xxx	5.38	3.23	5.39	5.18	4.6	xxx	3.78	5.02	4.41	3.66	2.46
1157	5.7	5.26	3.37	5.45	5.23	4.63	xxx	3.83	5.07	4.45	3.71	2.49
1158	5.94	5.85	3.28	5.55	5.32	4.71	xxx	3.89	5.15	4.52	3.77	2.52
1159	5.92	5.64	3.32	5.44	5.23	4.59	xxx	3.73	5.07	4.42	3.64	2.38
1160	6.03	5.42	3.18	5.40	5.2	4.57	xxx	3.72	5.05	4.41	3.64	2.4
1161	5.84	5.45	3.22	5.25	5.01	4.35	xxx	3.55	4.86	4.24	3.47	2.25
1162	6.36	6.06	3.08	5.79	5.51	4.82	xxx	3.87	5.34	4.65	3.8	2.46
1163	6.39	5.71	3.31	5.54	5.27	4.51	xxx	3.41	5.1	4.36	3.49	2.04
1164	6.1	5.06	3	5.34	5.14	4.42	xxx	3.38	4.97	4.28	3.45	2.04
1165	6.02	5.2	2.96	5.35	5.13	4.4	xxx	3.34	4.95	4.26	3.42	2.02
1166	6.61	5.34	2.95	5.97	5.65	4.85	xxx	3.64	5.48	4.68	3.76	2.23
1167	6.49	5.46	3.2	5.58	5.22	4.37	xxx	xxx	5.08	4.27	3.33	1.75
1168	5.73	4.9	2.79	5.01	4.76	3.99	xxx	xxx	4.62	3.94	3.09	1.65
1169	5.92	4.96	2.58	5.14	4.94	4.2	xxx	3.13	4.78	4.1	3.25	1.81
1170	6.09	5.54	2.71	5.23	5	4.25	xxx	3.16	4.84	4.14	3.28	1.83
1171	6.02	5.43	2.79	5.43	5.17	4.43	xxx	3.3	5.01	4.3	3.43	1.95
1172	5.3	4	2.85	4.98	4.76	4.09	xxx	3.06	4.61	3.95	3.16	1.76
1173	5.38	4.22	2.61	4.93	4.75	4.13	xxx	3.21	4.6	3.97	3.23	1.92
1174	6.04	5.35	2.73	5.40	4.94	4.48	xxx	3.45	5.01	4.32	3.5	2.11
1175	5.98	4.91	2.78	5.44	5.24	4.41	xxx	3.26	5.01	4.29	3.42	1.93
1176	4.42	4.01	2.19	4.09	3.98	3.31	xxx	2.37	3.78	3.23	2.56	1.37
1177	4.26	3.97	2.73	4.32	4.22	3.79	xxx	3.12	4.11	3.7	3.23	2.36
1178	5.56	4.75	3.13	5.37	5.22	4.68	xxx	3.9	5.04	4.46	3.81	2.67

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1179	5.02	4.66	2.73	4.92	4.72	4.03	xxx	3.01	4.56	3.96	3.24	2.05
1180	3.89	3.81	2.37	4.12	3.98	3.42	xxx	2.53	3.84	3.37	2.77	1.76
1181	3.82	3.76	2.52	4.01	3.92	3.46	xxx	2.61	3.8	3.36	2.86	2
1182	4.73	3.87	2.84	4.73	4.61	4.08	xxx	3.15	4.47	3.93	3.32	2.3
1183	4.66	4.14	2.68	4.68	4.49	3.82	xxx	2.69	4.35	3.79	3.11	1.98
1184	3.37	3.82	2.32	3.96	3.78	3.17	xxx	2.1	3.66	3.22	2.66	1.7
1185	3.34	3.2	2.4	3.77	3.71	3.2	xxx	2.3	3.59	3.19	2.71	1.9
1186	3.96	3.96	2.43	3.73	3.65	3.2	xxx	2.21	3.55	3.12	2.63	1.85
1187	4.04	4.05	2.68	4.19	4.09	3.14	xxx	2.71	3.99	3.55	3.06	2.28
1188	3.57	3.49	2.5	3.95	3.88	3.58	xxx	2.55	3.76	3.35	2.87	2.11
1189	2.83	3.17	2.24	3.30	3.23	3.38	xxx	2.35	3.12	2.82	2.46	1.89
1190	3.86	3.85	2.57	3.98	3.89	2.9	xxx	2.89	3.78	3.39	2.95	2.24
1191	3.88	4.7	2.46	4.08	3.95	3.51	xxx	2.7	3.82	3.33	2.81	1.88
1192	3.11	3.73	2.23	3.57	3.48	3.47	xxx	2.32	3.36	2.96	2.5	1.7
1193	2.88	3.49	2.13	3.20	3.17	3.03	xxx	2.29	3.06	2.73	2.32	1.68
1194	3.56	4	2.38	3.81	3.73	2.86	xxx	2.73	3.64	3.22	2.72	1.93
1195	4.41	4.1	2.8	4.69	4.57	3.37	xxx	3.09	4.44	3.9	3.25	2.18
1196	3.39	3.67	2.37	3.78	3.71	3.97	xxx	2.39	3.57	3.13	2.59	1.71
1197	3.15	3.77	2.49	3.54	3.54	3.18	xxx	2.73	3.44	3.12	2.74	2.15
1198	3.76	3.94	2.69	4.07	4.01	3.24	xxx	3.13	3.91	3.55	3.09	2.37
1199	3.87	4.16	2.72	4.14	4.06	3.68	xxx	3.05	3.94	3.53	3.02	2.22
1200	3.19	4.06	2.5	3.78	3.73	3.68	xxx	2.78	3.62	3.23	2.77	2.02
1201	3.32	4.01	2.66	3.87	3.85	3.36	xxx	3.07	3.74	3.39	2.97	2.26
1202	3.6	4.04	2.76	4.02	3.96	3.55	xxx	3.17	3.86	3.51	3.08	2.36
1203	3.92	4.21	2.87	4.24	4.14	3.65	xxx	3.16	4.03	3.6	3.08	2.29
1204	3.62	3.95	2.8	4.15	4.07	3.76	xxx	3.1	3.95	3.53	3.03	2.27
1205	3.65	4.17	2.79	4.10	4.01	3.69	xxx	3.13	3.9	3.49	3.02	2.24
1206	3.79	4.1	2.82	4.14	4.06	3.67	xxx	3.19	3.94	3.53	3.07	2.26
1207	4.13	4.4	2.94	4.20	4.12	3.73	3.42	3.2	3.98	3.58	3.12	2.33
1208	3.77	4.46	2.77	3.98	3.88	3.77	3.16	2.95	3.78	3.35	2.88	2.15
1209	3.83	4.32	3.01	4.33	4.26	3.52	3.58	3.37	4.15	3.76	3.3	2.6

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1210	3.87	4.49	2.93	4.22	4.16	3.9	3.47	3.26	4.04	3.63	3.18	2.46
1211	4.19	4.25	3.17	4.56	4.46	3.79	3.72	3.5	4.37	3.93	3.46	2.69
1212	4.39	4.6	3.19	4.60	4.49	xxx	3.73	3.5	4.38	3.94	3.45	2.65
1213	4.11	4.47	3.13	4.46	4.49	xxx	3.7	3.48	4.28	3.89	3.44	2.71
1214	4.4	4.31	3.21	4.63	4.52	xxx	3.8	3.58	4.41	4	3.53	2.75
1215	4.17	4.38	2.99	4.41	4.27	xxx	3.52	3.32	4.16	3.74	3.24	2.46
1216	4.46	4.6	3.2	4.73	4.59	xxx	3.84	3.62	4.5	4.06	3.54	2.72
1217	4.33	4.68	3.02	4.55	4.42	xxx	3.63	3.39	4.3	3.84	3.32	2.45
1218	4.09	4.44	2.94	4.36	4.28	xxx	xxx	3.24	4.19	3.69	3.2	2.38
1219	4.24	4.03	2.97	4.41	4.32	xxx	xxx	3.33	4.23	3.73	3.22	2.43
1220	4.53	3.63	3.08	4.66	4.51	xxx	3.53	3.49	4.4	3.94	3.38	2.54
1221	4.46	xxx	3.05	4.63	4.53	xxx	3.73	3.46	4.41	3.94	3.37	2.52
1222	4.14	xxx	2.97	4.41	4.34	xxx	3.71	3.33	4.22	3.78	3.25	2.42
1223	4.2	xxx	2.95	4.40	4.28	xxx	3.55	3.3	4.17	3.74	3.23	2.41
1224	4.75	xxx	3.14	4.79	4.64	xxx	3.52	3.57	4.54	4.06	3.5	2.62
1225	4.77	xxx	3.07	4.79	4.65	xxx	3.83	3.52	4.54	4.03	3.44	2.48
1226	4.02	xxx	2.83	4.30	4.21	xxx	3.79	3.17	4.08	3.63	3.11	2.24
1227	4.14	4.01	3.02	4.29	4.21	xxx	3.4	3.32	4.09	3.66	3.19	2.4
1228	4.71	4.67	xxx	4.70	4.58	xxx	3.5	3.61	4.46	3.99	3.47	2.61
1229	4.69	4.61	xxx	4.74	4.63	xxx	3.82	3.57	4.51	4.01	3.44	2.51
1230	3.76	3.87	xxx	4.09	4.01	xxx	3.82	3.03	3.92	3.47	2.96	2.15
1231	3.89	3.87	xxx	4.11	4.04	xxx	3.25	3.27	3.95	3.56	3.11	2.42
1232	4.73	4.59	3.18	4.69	4.58	xxx	3.42	3.72	4.47	4.03	3.52	2.72
1233	4.52	4.46	3.06	4.64	4.56	xxx	3.91	3.58	4.43	3.95	3.4	2.52
1234	3.55	3.64	2.7	3.95	3.91	xxx	3.8	3.03	3.79	3.39	2.92	2.16
1235	3.55	3.58	2.81	3.95	3.9	xxx	3.21	3.24	3.8	3.46	3.06	2.41
1236	4.52	4.44	3.16	4.64	4.53	xxx	3.36	3.74	4.43	4.01	3.53	2.75
1237	4.34	4.32	2.99	4.52	4.41	xxx	3.91	3.48	4.3	3.84	3.32	2.47
1238	3.18	3.49	2.55	3.72	3.68	xxx	3.69	2.85	3.59	3.18	2.76	2.08
1239	3.2	3.56	2.6	3.64	3.63	xxx	3.02	3.02	3.55	3.19	2.84	2.24
1240	4.29	4.31	3.05	4.44	4.37	xxx	3.12	3.65	4.29	3.87	3.42	2.66

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1241	4.1	4.14	2.88	4.34	4.22	xxx	3.79	3.38	4.14	3.68	3.19	2.4
1242	3.02	3.63	2.53	3.60	3.52	xxx	3.55	2.83	3.43	3.08	2.69	2.04
1243	3.19	3.47	2.56	3.63	3.64	xxx	2.96	3.05	3.55	3.23	2.86	2.24
1244	4.15	3.95	2.91	4.31	4.26	xxx	3.17	3.55	4.17	3.77	3.32	2.58
1245	3.8	3.99	2.77	4.20	4.05	xxx	3.71	3.32	3.96	3.56	3.1	2.37
1246	3.08	3.47	2.54	3.81	3.71	xxx	3.48	3.04	3.63	3.27	2.86	2.18
1247	3.1	3.52	2.49	3.61	3.55	xxx	3.18	2.96	3.49	3.14	2.76	2.12
1248	3.82	4.39	2.74	3.98	3.92	xxx	3.07	3.3	3.84	3.47	3.06	2.38
1249	3.82	4.15	2.68	4.08	3.97	xxx	3.41	3.27	3.87	3.46	3.02	2.27
1250	3.07	3.75	2.35	3.51	3.41	xxx	3.4	2.73	3.35	2.96	2.56	1.9
1251	2.99	3.83	2.52	3.56	3.52	xxx	2.85	3.02	3.47	3.15	2.82	2.26
1252	4.22	4.12	2.94	4.42	4.31	xxx	3.1	3.65	4.24	3.83	3.4	2.66
1253	3.93	4.28	2.64	4.18	3.99	xxx	3.79	3.15	3.93	3.47	2.96	2.15
1254	3.29	4.03	2.53	3.88	3.76	xxx	3.33	3.03	3.71	3.3	2.85	2.13
1255	3.62	4.49	2.56	3.91	3.84	xxx	3.18	3.05	3.75	3.32	2.83	2.03
1256	4.07	4.57	2.71	4.14	4.04	xxx	3.22	3.2	3.96	3.5	2.98	2.14
1257	4.31	4.28	2.77	4.30	4.18	xxx	3.39	3.32	4.09	3.62	3.1	2.17
1258	3.95	4.78	2.64	4.06	3.94	xxx	3.45	3.13	3.87	3.42	2.92	2.06
1259	4.31	4.87	2.98	4.59	4.5	xxx	3.32	3.64	4.41	3.92	3.37	2.46
1260	4.83	4.77	2.99	4.63	4.53	xxx	3.84	3.6	4.42	3.92	3.34	2.41
1261	4.37	4.95	2.84	4.33	4.22	xxx	3.81	3.39	4.12	3.67	3.15	2.32
1262	4.74	5.21	3.04	4.84	4.71	xxx	3.58	3.75	4.6	4.08	3.5	2.54
1263	5.09	4.9	2.99	4.91	4.74	xxx	3.97	3.56	4.64	4.05	3.36	2.24
1264	5	4.99	2.97	4.79	4.63	xxx	3.83	3.49	4.53	3.97	3.31	2.25
1265	5.16	4.97	3.04	4.95	4.78	xxx	3.75	3.64	4.67	4.09	3.41	2.35
1266	5.46	4.99	3.13	5.21	5.02	xxx	3.9	3.78	4.89	4.28	3.57	2.43
1267	5.31	5.91	2.89	4.87	4.7	xxx	4.07	3.45	4.56	3.95	3.26	2.08
1268	5.34	5.37	2.95	4.99	4.81	xxx	3.74	3.55	4.68	4.06	3.36	2.17
1269	5.61	5.25	2.9	4.94	4.72	xxx	3.84	3.45	4.6	3.99	3.27	2.03
1270	5.71	6.03	2.91	4.92	4.69	xxx	3.75	3.41	4.58	3.97	3.24	2.03
1271	6.55	5.66	3.45	5.96	5.73	xxx	3.38	4.23	5.58	4.86	4.01	2.63

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1272	6.21	4.93	3.18	5.42	5.2	xxx	xxx	3.8	5.04	4.38	3.6	2.31
1273	5.8	5.16	3.26	5.23	5.05	xxx	xxx	3.87	4.89	4.33	3.66	2.6
1274	6.57	5.91	3.54	5.94	5.71	xxx	xxx	4.29	5.54	4.86	4.08	2.84
1275	6.32	5.68	3.19	5.56	5.31	xxx	xxx	3.8	5.17	4.47	3.66	2.36
1276	5.4	4.78	2.96	4.93	4.77	xxx	xxx	3.52	4.65	4.06	3.35	2.2
1277	5.67	4.9	3.17	5.19	5.01	xxx	xxx	3.81	4.88	4.3	3.61	2.47
1278	6.49	5.74	3.46	5.87	5.62	xxx	xxx	4.19	5.47	4.8	4.02	2.71
1279	6.4	5.56	3.17	5.60	5.35	xxx	xxx	3.76	5.2	4.5	3.67	2.29
1280	5.28	4.21	2.82	4.83	4.65	xxx	xxx	3.31	4.53	3.94	3.21	2.01
1281	5.53	4.59	3.07	4.82	4.7	xxx	xxx	3.61	4.57	4.04	3.4	2.37
1282	6.41	5.54	3.4	5.57	5.38	xxx	xxx	4.04	5.3	4.59	3.85	2.65
1283	6.22	5.4	3.14	5.50	5.28	xxx	xxx	3.71	5.13	4.43	3.61	2.27
1284	4.68	4.46	2.61	4.27	4.1	xxx	xxx	2.88	4	3.46	2.81	1.77
1285	4.62	4.2	3.16	4.75	4.62	xxx	xxx	3.75	4.52	4.07	3.55	2.72
1286	5.95	5.11	3.47	5.58	5.38	xxx	xxx	4.27	5.24	4.65	4	2.94
1287	5.8	4.83	3.3	5.42	5.2	xxx	xxx	3.97	5.09	4.47	3.78	2.69
1288	4.66	3.88	2.93	4.62	4.47	xxx	xxx	3.43	4.37	3.87	3.29	2.34
1289	4.31	3.92	2.92	4.32	4.22	xxx	xxx	3.39	4.13	3.73	3.25	2.43
1290	5.32	4.6	3.31	5.13	4.62	xxx	xxx	4.01	4.9	4.4	3.81	2.85
1291	5.07	4.83	2.97	4.81	4.69	xxx	3.74	3.56	4.59	4.02	3.38	xxx
1292	3.86	3.88	2.59	3.98	3.92	xxx	3.12	2.99	3.83	3.38	2.86	xxx
1293	3.88	3.92	2.74	4.02	3.99	xxx	3.37	3.24	3.9	3.51	3.05	xxx
1294	4.72	4.6	3.03	4.62	4.53	xxx	3.83	3.66	4.43	3.97	3.43	xxx
1295	4.52	4.42	2.82	4.42	4.29	xxx	3.55	3.35	4.19	3.71	3.16	xxx
1296	3.31	3.59	2.45	3.70	3.62	xxx	3.01	2.84	3.55	3.15	2.71	xxx
1297	3.36	3.55	2.59	3.63	3.6	3.37	3.17	3.07	3.54	3.21	2.86	xxx
1298	3.96	3.9	2.75	3.94	3.87	3.62	3.38	3.26	3.8	3.43	3.03	xxx
1299	4.12	4.19	2.91	4.30	4.22	3.91	3.63	3.48	4.15	3.73	3.28	xxx
1300	3.21	3.36	2.35	3.39	3.4	3.11	2.79	2.7	3.34	2.98	2.58	xxx
1301	2.88	3.25	2.43	3.30	3.37	3.17	xxx	2.9	3.31	3.05	2.75	xxx
1302	xxx	4.12	2.93	4.16	4.12	3.9	xxx	3.56	4	3.72	3.34	xxx

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1303	xxx	4.01	2.76	4.06	3.9	3.64	xxx	3.31	3.82	3.51	3.12	xxx
1304	3.28	3.74	2.68	3.85	3.74	3.49	xxx	3.21	3.7	3.38	3.03	xxx
1305	2.97	3.16	2.26	3.25	3.25	3.03	xxx	2.71	3.2	2.92	2.57	xxx
1306	3.09	3.27	2.32	3.27	3.25	3.04	xxx	2.73	3.21	2.94	2.59	xxx
1307	4.05	4.21	2.97	4.28	4.23	3.95	xxx	3.56	4.15	3.79	3.37	xxx
1308	3.57	3.75	2.69	3.88	3.85	3.59	xxx	3.21	3.78	3.44	3.05	xxx
1309	2.99	3.26	2.42	3.32	3.31	3.12	xxx	2.82	3.26	3.03	2.72	xxx
1310	3.44	3.72	2.69	3.78	3.74	3.53	3.33	3.22	3.69	3.43	3.08	xxx
1311	3.72	3.86	2.73	3.91	3.83	3.58	3.33	3.18	3.81	3.5	3.1	xxx
1312	3.48	3.71	2.67	3.82	3.76	3.54	3.31	3.18	3.72	3.44	3.07	xxx
1313	3.26	3.58	2.58	3.66	3.63	3.4	3.17	3.04	3.6	3.31	2.94	xxx
1314	3.26	3.58	2.57	3.63	3.6	3.37	3.13	3.01	3.58	3.28	2.91	xxx
1315	3.9	3.98	2.85	4.03	3.98	3.73	3.47	3.34	3.94	3.58	3.18	xxx
1316	3.62	3.87	2.8	3.98	3.93	3.67	3.43	3.3	3.89	3.53	3.15	xxx
1317	3.4	3.74	2.68	3.79	3.75	3.51	3.29	3.17	3.7	3.37	3.01	xxx
1318	3.45	3.66	2.62	3.67	3.65	3.4	3.15	3.02	3.6	3.27	2.9	xxx
1319	3.71	3.79	2.78	3.93	3.87	3.64	3.39	3.27	3.83	3.5	3.13	xxx
1320	3.95	4.05	2.92	4.20	4.11	3.89	3.65	3.52	4.08	3.72	3.33	xxx
1321	3.79	3.94	2.8	4.04	4	3.73	3.47	3.32	3.95	3.57	3.15	xxx
1322	3.66	3.82	2.73	3.91	3.88	3.6	3.33	3.17	3.83	3.45	3.04	xxx
1323	4.02	3.85	2.77	3.87	3.84	3.59	3.34	3.2	3.79	3.42	3.03	xxx
1324	4.55	4.22	2.96	4.25	4.19	3.93	3.67	3.54	4.13	3.74	3.31	xxx
1325	4.52	4.24	2.93	4.33	4.24	3.93	3.64	3.48	4.17	3.75	3.29	xxx
1326	3.73	3.73	2.61	3.73	3.69	3.38	3.11	2.95	3.64	3.24	2.83	xxx
1327	3.96	4.04	2.89	4.07	3.99	3.75	3.51	3.38	3.96	3.6	3.2	2.58
1328	4.65	4.36	3.1	4.39	4.43	4.09	3.82	3.68	4.26	3.89	3.44	2.74
1329	4.44	4.36	3.1	4.38	4.35	4.08	3.82	3.65	4.29	3.89	3.44	2.7
1330	3.89	3.94	2.82	3.97	3.96	3.69	3.44	3.28	3.9	3.53	3.13	2.43
1331	4.26	4.26	3.07	4.39	4.33	xxx	3.76	3.6	4.25	3.87	3.46	2.71
1332	5.16	5	3.48	5.10	4.98	xxx	4.35	4.17	4.91	4.45	3.95	3.09
1333	4.57	4.53	3.08	4.57	4.48	4.14	3.81	3.63	4.41	3.95	3.44	2.61

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1334	3.84	3.98	2.83	4.10	4.03	3.7	3.38	3.21	3.97	3.56	3.12	2.36
1335	4.14	4.14	2.97	4.23	4.13	3.84	3.53	3.38	4.07	3.68	3.27	2.57
1336	xxx	4.82	3.31	4.90	4.76	4.44	4.13	3.96	4.68	4.23	3.75	2.96
1337	xxx	4.61	3.06	4.61	4.53	4.15	3.82	3.62	4.44	3.95	3.42	2.57
1338	xxx	3.81	2.68	3.89	3.85	3.54	3.26	3.09	3.79	3.38	2.96	2.24
1339	xxx	3.81	2.75	3.82	3.75	3.5	3.26	3.1	3.69	3.32	2.96	2.32
1340	4.84	4.98	3.32	4.89	4.76	4.4	4.08	3.87	4.68	4.17	3.67	2.83
1341	5.24	5.41	3.44	5.46	5.33	4.84	4.43	4.17	5.21	4.62	3.98	2.87
1342	4.17	3.86	2.61	3.91	3.88	3.48	3.14	2.93	3.79	3.35	2.86	2.03
1343	3.79	3.72	2.76	3.85	3.82	3.5	3.35	3.22	3.77	3.46	3.13	2.52
1344	4.89	4.86	3.38	5.00	4.86	4.49	4.31	4.15	4.8	4.38	3.93	3.13
1345	4.62	4.68	3.1	4.62	4.53	4.16	3.85	3.65	4.46	3.98	3.46	2.64
1346	3.58	3.71	2.62	3.71	3.67	3.35	3.08	2.92	3.61	3.23	2.83	2.18
1347	3.54	3.55	2.65	3.63	3.59	3.35	3.13	3.01	3.53	3.23	2.9	2.38
1348	4.65	4.62	3.19	4.63	4.56	4.28	4.02	3.86	4.48	4.08	3.63	2.92
1349	4.7	4.6	3.05	4.63	4.54	4.15	3.83	3.62	4.46	3.98	3.43	2.59
1350	3.4	3.56	2.49	3.68	3.68	3.34	3.03	2.87	3.59	3.21	2.76	2.08
1351	3.65	3.81	2.8	3.89	3.88	3.65	3.4	3.3	3.82	3.49	3.12	2.51
1352	4.67	4.65	3.26	4.67	4.58	4.31	4.04	3.89	4.56	4.12	3.67	2.93
1353	4.54	4.52	3.08	4.56	4.49	4.15	3.84	3.7	4.41	3.95	3.47	2.68
1354	3.32	3.5	2.49	3.61	3.62	3.31	3.02	2.93	3.54	3.16	2.79	2.14
1355	3.4	3.47	2.59	3.57	3.58	3.36	2.82	3.02	3.51	3.2	2.88	2.34
1356	4.49	4.59	3.22	4.62	4.55	4.29	4.04	3.89	4.48	4.09	3.65	2.95
1357	4.12	4.16	2.81	4.16	4.07	3.77	3.48	3.32	3.98	3.55	3.11	2.37
1358	3.16	3.27	2.35	3.24	3.15	2.88	2.63	2.5	3.12	2.73	2.41	1.89
1359	xxx	4.35	3.09	4.53	4.42	xxx	3.8	3.64	4.28	3.94	3.52	2.82
1360	xxx	4.46	3.16	4.63	4.51	xxx	3.87	3.68	4.35	4.01	3.55	2.77
1361	4.02	3.86	2.9	4.02	3.91	3.68	3.46	3.33	3.87	3.54	3.22	2.68
1362	3.98	3.95	2.91	4.09	4.03	3.77	xxx	3.37	3.99	3.61	3.25	2.64
1363	3.53	3.55	2.61	3.66	3.63	3.41	xxx	3.04	3.62	3.27	2.93	2.34
1364	4.38	4.3	3.02	4.31	4.27	4.06	xxx	3.7	4.23	3.87	3.48	2.83

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1365	4.36	4.32	2.88	4.39	4.28	3.98	xxx	3.49	4.23	3.79	3.32	2.53
1366	4.2	4.31	2.9	4.40	4.29	4	xxx	3.54	4.26	3.83	3.37	2.58
1367	4.01	3.98	2.61	3.98	3.91	3.63	xxx	3.14	3.86	3.43	2.98	2.18
1368	4.29	4.27	2.75	4.28	4.17	3.88	xxx	3.36	4.13	3.66	3.2	2.36
1369	4.75	4.68	2.95	4.69	4.54	4.19	xxx	3.64	4.49	3.98	3.43	2.48
1370	4.47	4.36	2.82	4.41	4.3	3.96	xxx	3.43	4.22	3.76	3.23	2.34
1371	4.44	4.36	2.87	4.44	4.34	4.04	xxx	3.56	4.27	3.83	3.32	2.48
1372	4.84	4.55	2.92	4.59	4.46	4.13	xxx	3.6	4.37	3.9	3.37	2.5
1373	5.05	4.81	3.05	4.82	4.68	4.34	xxx	3.79	4.59	4.11	3.55	2.65
1374	5.32	5.11	3.18	5.11	4.95	4.58	xxx	4.01	4.86	4.33	3.74	2.76
1375	5	4.61	2.79	4.62	4.47	4.07	xxx	3.44	4.36	3.81	3.23	2.21
1376	4.63	4.36	2.73	4.40	4.28	3.92	xxx	3.32	4.19	3.69	3.13	2.19
1377	5.3	4.88	3.1	4.91	4.74	4.37	xxx	3.79	4.65	4.15	3.54	2.58
1378	5.82	5.35	3.25	5.36	5.14	4.69	xxx	4.04	5.04	4.46	3.8	2.71
1379	5.74	5.14	3.03	5.11	4.94	4.44	xxx	3.72	4.82	4.21	3.51	2.37
1380	4.76	4.34	2.74	4.39	4.28	3.89	xxx	3.29	4.18	3.68	3.08	2.12
1381	5.39	4.81	3.17	4.79	4.62	4.29	xxx	3.78	4.56	4.09	3.52	2.66
1382	6.2	5.48	3.39	5.40	5.17	4.74	xxx	4.12	5.09	4.53	3.87	2.85
1383	5.97	5.29	3.21	5.27	5.1	4.62	xxx	3.92	4.98	4.39	3.68	2.55
1384	4.81	4.37	2.84	4.42	4.32	3.94	xxx	3.34	4.21	3.73	3.13	2.19
1385	5.21	4.79	3.28	4.84	4.7	4.26	xxx	3.86	4.61	4.17	3.65	2.81
1386	6.4	5.73	3.62	5.69	5.46	4.91	xxx	4.4	5.36	4.8	4.16	3.12
1387	6.02	5.34	3.26	5.31	5.11	4.63	xxx	3.92	4.99	4.41	3.71	2.62
1388	4.84	4.41	2.92	4.51	4.39	4.02	xxx	3.42	4.27	3.79	3.21	2.3
1389	5.01	4.7	3.2	4.73	4.58	4.27	xxx	3.77	4.49	4.04	3.55	2.74
1390	6.45	5.82	3.63	5.69	5.45	5	xxx	4.38	5.35	4.78	4.15	3.13
1391	6.05	5.33	3.19	5.28	5.07	4.53	xxx	3.81	4.94	4.33	3.62	2.48
1392	4.8	4.33	2.83	4.41	4.3	3.9	xxx	3.3	4.17	3.68	3.11	2.17
1393	4.69	4.45	3.02	4.55	4.44	4.11	xxx	3.6	4.33	3.89	3.38	2.56
1394	6.12	5.58	3.45	5.53	5.32	4.84	xxx	4.19	5.22	4.64	3.98	2.94
1395	5.81	5.18	3.02	5.13	4.93	4.39	xxx	3.66	4.82	4.2	3.48	2.32

Tide Number	P1	P2	P3	P4	P6	P07	P8	P9	P11	P12	P13	P14
1396	4.49	4.13	2.66	4.22	4.11	3.73	xxx	3.17	4	3.53	2.96	2.03
1397	4.28	4.2	2.8	4.32	4.19	3.87	xxx	3.4	4.68	3.68	3.17	2.35
1398	5.78	5.45	3.31	5.42	5.19	4.7	xxx	4.04	5.1	4.51	3.84	2.78
1399	5.38	4.9	2.68	4.82	4.63	4.09	xxx	3.35	4.5	3.9	3.18	2
1400	3.93	3.71	2.24	3.75	3.67	3.31	xxx	2.78	3.56	3.13	2.59	1.69
1401	4.17	4.11	2.67	4.18	4.08	3.77	xxx	3.32	4.01	3.6	3.1	2.3
1402	5.26	4.99	3.01	4.97	4.81	4.37	xxx	3.77	4.72	4.19	3.56	2.55
1403	5.16	4.76	2.71	4.72	4.56	4.09	xxx	3.4	4.45	3.89	3.21	2.1
1404	3.6	3.53	2.22	3.64	3.57	3.25	xxx	2.72	3.48	3.07	2.54	1.68
1405	3.67	3.74	2.61	3.87	3.8	3.58	xxx	3.18	3.73	3.38	2.94	2.26
1406	4.57	4.57	2.93	xxx	4.47	4.16	xxx	3.65	4.39	3.94	3.38	2.53
1407	4.46	4.39	2.69	xxx	4.29	3.95	xxx	3.36	4.2	3.71	3.11	2.15
1408	3.59	3.65	2.38	xxx	3.7	3.43	xxx	2.94	3.62	3.21	2.72	1.89
1409	3.15	3.32	2.29	xxx	xxx	3.16	xxx	2.82	3.3	2.96	2.59	1.98