MOLLUSCAN BIO-INDICATORS OF THE TIDAL MYAKKA RIVER AND INSHORE WATERS OF VENICE FLORIDA

FINAL REPORT

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"MOLLUSK SURVEYS IN DONA AND ROBERTS BAYS"
TASK 1.B
"HISTORICAL OYSTER SURVEY IN DONA AND ROBERTS BAYS"
TASK 2
"MOLLUSK SURVEY OF THE MYAKKA RIVER"

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EXECUTIVE SUMMARY

Mollusks are a dominant element of estuarine and tidal river ecosystems. Their number, diversity, dispersion, and condition have been studied for decades, forming a large and robust body of information on the adaptations of numerous taxa to the physical and chemical conditions unique to estuaries. The objectives of the studies reported here are to:

– Describe the present distribution of major macro-mollusk species and communities in the lower, tidal reach of the Myakka River, a tributary of Charlotte Harbor, and of Dona and Roberts Bays, near Venice, Florida, including their main tributaries;

– Identify taxa of potential importance to the ecological structure and functioning of these waters;

– Compare and contrast mollusk data collected by similar methods from other tidal rivers of southwest Florida;

– Conduct a preliminary survey of Dona and Roberts Bays, and their main tributaries to determine whether oyster reefs once occurred beyond their modern distribution.

In this report, results of mollusk surveys are presented first for the Myakka River, including ancillary surveys of Myakkahatchee Creek and Deer Prairie Creek. The Myakka is presented first to provide the context for interpretation of data from Venice. Results of the mollusk survey for Dona and Roberts Bays, including Shakett and Curry Creeks, are presented next. The report concludes with a preliminary survey of historic, buried oyster reefs in the same area.

One set of samples was collected from each waterway during the month of June, 2004. Samples were collected at one-kilometer intervals from the confluence of the Myakka River with Charlotte Harbor, to near Rocky Ford. In Dona and Roberts Bays, samples were collected at half-kilometer intervals from near Venice Inlet to the lower control structure on Shakett Creek and to a point 3.5 km up Curry Creek.

Myakka River

Twenty-three macro-mollusk species inhabited the tidal reach of the Myakka River. There were more species near the mouth of the river than in upstream reaches, especially in the river up to the Sarasota County line. Species in Charlotte County waters included numerous forms common to upper Charlotte Harbor. Species normally found in oligohaline river reaches extended down-river well into Charlotte County. Intertidal and subtidal fauna were similar with respect to species numbers but density patterns differed. Subtidal densities were greatest near the Harbor, whereas intertidal densities were greatest up-river. The 2004 molluscan fauna was essentially a mesohaline community in Charlotte County and an oligohaline- to-tidal-freshwater community in Sarasota County. Relative to dead shells, most live material was in range, with *Littoraria* the exception for being out of range, downstream. Compared to the main river, three tributaries had similar numbers of

species and lower numbers of individuals.

In the Myakka River, species comprising 90% of the fauna by count included *Corbicula fluminea, Polymesoda caroliniana, Rangia cuneata, Tagelus plebeius, Littoraria irrorata, Geukensia demissa granossissima, Crassostrea virginica,* and *Ischadium recurvum*. *Corbicula* occurred throughout the upper half of the study area and dominated the upper fourth. *Corbicula*'s primacy in these waters make it important in terms of system structure and function, though the present study does not indicate how. Interestingly, no dead shells of native species were found in the upper river, possibly signifying that shell erosion and dissolution, or possibly physical transport, have been sufficient to eliminate these forms from the river during the past 40 years.

Polymesoda was interesting because it is commonly found in the high intertidal zone within marshes, as it was in the Myakka River, but it was highly abundant as multiple cohorts in the low intertidal and was also abundant as juveniles in the subtidal zones of the river, a pattern observed during sampling in Shell Creek in April. It and the mussels that inhabit the edges of marshes and root zones of mangroves are probably very important as filter feeders, shoreline stabilizers, habitat for cryptic species, and food resources for predators. *Tagelus*, though thin-shelled, was abundant in shallows across a small area of the lower river. The species is highly valued prey for benthic decapod crustaceans, elasmobranchs, and teleosts, and in June there were signs that predators had moved into the shallows populated by *Tagelus* beds. This would account for their numbers being much lower than seen in Shell Creek. In addition to the three dominant species, two intertidal gastropods, *Neritina usnea* and *Littorina (Littoraria) irrorata*, are common on mangroves and marshes fringing the river. These species are important intertidal consumers, and prey for varied predators, but probably were under-sampled by the present effort. Reasons for periwinkle displacement out-of-range are unknown but could reflect blue crab predation. Dead oysters were present in the river in 2004, but probably were not important in regulating the structure or functioning of the river except insofar as accumulations of dead shell contribute to shoals and firmament of river bottoms. Subtidal *Mytilopsis*, for example, were frequently recovered from the subtidal as attachments to dead oyster valves.

In conclusion, the macro-molluscan fauna of the tidal Myakka River is abundant and organized along a distinct gradient corresponding to river position and salinity. Species richness and density values are comparable to those seen in other studied streams. Like the Peace River, the tidal Myakka has a reach near the transition from braided to open channels where mollusk community structure changes. Farther upstream in the Myakka, the exotic and invasive bivalve, *Corbicula fluminea*, presently dominates the mollusk fauna, with unknown consequence. Mollusk species richness, distribution and abundance can make useful contributions to future monitoring efforts.

Dona and Roberts Bays (DARB)

Thirty-four species were collected in the Dona-Roberts Bay system, of which the dominant species were *Crassostrea virginica, Tagelus plebeius, Chione cancellata, Anomalocardia auberiana, Ischadium recurvum, Tellina sp., Laevicardium mortoni, Cerithium atratum, Nassarius vibex,* and *Anomia simplex*. The remaining 10% of material was distributed over 13 common and another 10 numerically rare species. Waters west of US 41 were dominated by a marine and mesohaline fauna. Oysters dominate upper bay waters east of US 41. Indicators of oligohaline and tidal-fresh waters (*Tagelus, Polymesoda*) occurred in both systems, but another indicator, *Rangia cuneata,* did not. Nor was dead *Rangia* material collected. The channelized reach of Shakett Creek is impaired as mollusk habitat due to a lack of suitable substratum, and wide salinity variations.

In DARB, oysters play a much larger role, or have potential to, than in the Myakka River. Reefs are already conspicuous, large features of both streams. Even as dead reefs the structures influence currents and salinity, water quality, and biotic habitat potential. As living structures the reefs perform additional ecological functions of value. DARB mollusk data differ from any stream previously studied for regulatory purposes in southwest Florida, owing to the high proportion of marine species collected in the lower reaches of Dona and Roberts Bays. DARB waters contain a subset of the authentic Myakka fauna, including some key indicator species but not all. High salinity variability caused by extreme flow changes-- compressed over stream distances of a few kilometers before marine conditions prevail-- have created distinct mollusk communities in lower reaches; evanescent communities in middle reaches, and depauperate communities in upper reaches. In DARB, future management and monitoring may be improved by dwelling on a single species (*Crassostrea*) and its condition (growth, recruitment, disease, predation, mortality), rather than on general mollusk species richness, distribution and abundance.

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Mollusks are a dominant element of estuarine and tidal river ecosystems. Their number, diversity, dispersion, and condition have been studied for decades, forming a large and robust body of information on the adaptations of numerous taxa to the physical and chemical conditions unique to estuaries. Numerous studies have demonstrated that spatial and temporal trends in mollusk attributes vary in consistent form with variations of river flow, current speed, salinity, dissolved oxygen, and foodstuffs such as particulate organic carbon, phytoplankton, macrophytes, and prey.

In recent years, a variety of studies have been published which indicate the extent to which molluscan attributes can be related specifically to independent variables of interest in the present study-- freshwater inflow, salinity, and dissolved oxygen. Depending on the estuary, faunal groups, attributes, and collateral factors such as depth, sediment type, or tide range, relationships have been defined which satisfy criteria for statistical significance (Mote Marine Laboratory 2001; 2003; 2004).

In this report, results are presented first for the Myakka River, including ancillary surveys of Myakkahatchee Creek and Deer Prairie Creek. The Myakka is presented first to provide the context for interpretation of data from Venice. Results of the mollusk survey for Dona and Roberts Bays, including Shakett and Curry Creeks, are presented next. The report concludes with a preliminary survey of historic, buried oyster reefs in the same area.

The Study Areas

Adapted in part from Charlotte Harbor National Estuary Program (1999), *Synthesis of Existing Information*, and Jones (2003), *Dona and Robert's Bay Estuary Analysis*.

The Myakka River heads in Manatee County and flows through Sarasota and Charlotte counties before entering Charlotte Harbor near Hog Island. The basin's 600 square mile area is divisible into an upper sub-basin of 372 square miles and a coastal or lower basin of 225 square miles. The river is approximately 65 miles long. Major features of the river include Flatford Swamp and Tatum Sawgrass (Manatee County), upper and lower Myakka lakes, Deer Prairie Creek, Myakkahatchee Creek, Warm Mineral Springs (Sarasota County), and the wide estuarine setting of the lower river (Charlotte County). Upriver, adjacent lands slope about five feet per mile; downriver, slopes are about one foot per mile. Most of the basin lies in the Gulf Coastal Lowlands physiographic area, and the region is dominated by nearly level, poorly drained soils. Land use in the basin is 13% agriculture and 5% urban. Forests and wetlands are abundant in Manatee and Sarasota counties.

The Floridan is the basin's principal aquifer, which is mineralized in deeper zones. The discharge of Warm Mineral Springs is thermally and minerally enriched. Annual precipitation in the basin is about 50-55 inches with dry periods in November and April-May. Most rain falls in June-September. Mean annual flows are in the range of 2,000-4,000 cfs and co-vary with rainfall. Increasing trends in color, Nitrite-nitrate nitrogen, TKN, ortho-phosphate, and chlorophyll *a* are statistically significant in the lower Myakka River estuary (CHNEP, 1999).

Tidal effects extend upriver to about Rocky Ford (42.4 km from the river's mouth). From Rocky Ford to near Rambler's Rest RV Resort, the river is narrow and 2-3 meters deep, with small marsh features in areas of failed shoreline. Below Ramblers Rest the river widens, extensive marshes with a few mangroves dominate, and shoals are prevalent. The river widens further and runs as a braided channel to Charlotte County, where wide, open waters a meter deep grade into deeper waters near Charlotte Harbor.

Dona and Roberts Bays (DARB) are protected inland waters at the City of Venice, connected to the Gulf via Venice Inlet. DARB is a major watershed in Sarasota County, with an area of about 97 square miles (SWFWMD, 2000). Inland land use is primarily pasture and agriculture but nearer the coast land use is medium density residential. Roberts Bay is connected to Lemon Bay via a dug route of the Intracoastal Waterway, and its primary tributary is Curry Creek. Curry Creek is connected to the Myakka River near Border Road by a dug channel called Blackburn Canal. Dona Bay is formed as the drowned mouth of Shakett Creek, a natural stream that was channelized and extended inland through the re-routing of Cow Pen Slough. Cow Pen Slough's discharge is regulated by a control structure whereas Curry Creek is not. Cow Pen Slough's gates are open June 1-November 1 primarily for flood control and agriculture. The most downstream water control structure on Cow Pen Slough is located about 6 km upstream of Venice Inlet. This structure serves as a salinity barrier that separates the tidally affected waters of Shakett Creek from the fresh waters of Cow Pen Slough. The lift gates at this operable structure are typically closed in the dry season when waters spill over the structure spillway. The gates are opened in the wet season in response to rainfall events in order to transmit high flows. Until

recently, hydrologic and operations records were insufficient to estimate flows at this structure. However, Sarasota County has recently collected data which allow the calculation of flow estimates from Cow Pen Slough at this structure to Shakett Creek. Tidal waters within DARB have been filled and dredged extensively, and highway and railroad bridges cross the streams in their lower reaches, but both tidal streams are characterized by shallow channels, over wash mangrove islands, and oyster reefs.

METHODS

Mollusk populations and communities do not respond instantaneously to conditions of river flow, salinity, or other physicochemical variables. Spatial patterns in mollusk distribution develop as a result of differential reproductive periods, larval development rates, recruitment variables, life history characteristics, and mortality patterns and rates. As a result, a spatial pattern observed at a given time is the result of antecedent conditions, generally on the order of weeks to months.

One set of samples was collected from each waterway during the month of June, 2004.

A river kilometer system developed for the District's minimum flow studies was adapted for the Myakka River (**Figure 1**). Samples were collected at one-kilometer intervals from the confluence of the river with Charlotte Harbor (Cattle Dock Point = RK 0.0), to near Rocky Ford. Low water and dense vegetation prevented sampling within the 2 km closest to Rocky Ford.

A river kilometer system developed by Sarasota County for watershed studies was used for Dona and Roberts Bays (**Figure 17**). Samples were collected at half-kilometer intervals from near Venice Inlet (RK = 0.5) to the lower control structure on Shakett Creek (RK = 6.0) and to RK 3.5 on Curry Creek. For safety reasons, no sample was taken at RK 0.0 in Venice Inlet.

In each waterway, transects normal to the stream's center-line and intersecting it at half-kilometer or kilometer intervals were reconnoitered to decide the distribution of sampling effort across each transect. Because the primary objective of the study was to identify down-river patterns in species dispersion, samples were collected across each transect at representative sites, and intertidal and subtidal data were pooled as separate sets for the entire transect.

In single-channel reaches of the Myakka River, subtidal samples were collected close by opposite banks and at evenly spaced intervals across the channel. In reaches with islands and multiple channels, subtidal effort was distributed so as to sample in each channel or basin.

Collection of intertidal samples was biased by two criteria. First, accreting banks were preferred over eroding ones, meaning in practice that the insides of bends were preferred over outsides, and that samples were collected more from point-bars, mangrove islands, and shoals than from steeply inclined banks. Second, a preference was used for the bank judged to be least altered by human activity. Sea walls and filled areas were avoided where possible.

Subtidal samples (< MLW) were collected by a petite ponar grab rather than pipe cores

because larger bivalve such as *Rangia* were often missed or lost by the cores. Ponar grabs offered a larger sampling surface area (0.0232 square meters) than pipe cores (0.00456 square meters). A sample was comprised of two ponar grabs (surface area = 0.0464 square meters) at a given location. Five such subtidal samples were taken along each half-kilometer transect, giving a per-transect sampling surface area of 0.2320 square meters. Contents of each sample were concentrated over a 3.0 millimeter sieve, processed in the field (light samples), or bagged and returned to the Laboratory (heavy samples).

Intertidal samples (> MLW) were usually collected by spade although ponar grabs were sometimes used during high tides. Intertidal effort was the same as subtidal effort except that hand collections of particular species were sometimes added to intertidal samples so as to record the presence of rare or cryptic species. The gastropods *Neritina* and *Littorina*, for example, often were found in low numbers, near on supratidal vegetation. Oysters and mussels likewise grow cryptically behind mangrove roots or within crevices of fallen wood.

Specimens were sorted as live or dead and identified in the field or laboratory. For each species in each sample, median size was determined by arranging specimens from smallest to largest and measuring the median specimen to the nearest millimeter. Gastropods were measured from the apex to opposite end; bivalves were measured from front end to hind end. For data analysis, a mean value of median sizes was computed for each species. Condition was scored for each whole live animal or single dead valve as percent covered by mechanical erosion, shell dissolution, or other loss or damage.

RESULTS

A. Myakka River

A total of 51 sites was visited including three each in Myakkahatchee and Deer Prairie Creeks, and one in Blackburn Canal (**Appendix Table 1**). Contamination was rare except for the introduced and naturalized bivalve *Corbicula*. Only a few fossil shells were found at sites near steep and recently filled riverbanks and these were not counted, although lenses of fossilized shell exposed on riverbanks upstream of RK 35 were eroding and contributing marine material to that reach.

Species Richness

Twenty-three taxa of mollusks and one brachiopod were collected and all were identified to lowest practical taxon, usually species (**Table 1)**. Four species constituted 72% of specimen counts, and an additional eight species accounted for 98% of all counts, with the remaining species present only in low numbers or as one individual.

Species Accounts

Accounts are given below of the numerically dominant species and some of interest. Data are provided for all species in **Appendix Table 2.** Accounts emphasize down-river presence and absence in terms of live and dead specimens found both intertidally and subtidally, but other information is summarized on mean sizes, evidence of recruitment, and condition (as weathering

indices). As used here, mean size represents the arithmetic average of a set of median sizes measured for each species. Accounts are listed in descending order of the species' numerical abundance. Scales used to graph density and size data vary between species.

1. Corbicula fluminea

Corbicula fluminea is an introduced, naturalized freshwater bivalve with a tolerance for low salinities. *Corbicula* was the only non-native species of mollusk collected in the Myakka River, and was abundant upstream of Deer Prairie Creek. Overall, *Corbicula* was as common subtidally as intertidally but peak densities were subtidal (**Figure 2**). Live *Corbicula* were found dying and decomposing in the uppermost river as a result of ponding and exposure caused by very low antecedent flows. Interestingly, there is a peak in dead shell abundance between RK 25-30, well downstream of the observed *Corbicula* mortality. There was a general trend in size with the larger animals found upstream. Weathering of dead material increased with downstream position.

2. Polymesoda caroliniana

The marsh clam *Polymesoda* belongs to the same bivalve family as *Corbicula*, but differs from it by being larger, more intertidal, and a native species. *Polymesoda* was the second-most abundant species of mollusk in the Myakka River (**Figure 3**) and was occasionally more abundant subtidally than intertidally, owing to the recent settlement and maturation of a new cohort. In subtidal areas the cohort was 10-15 mm in size. Intertidally it was conspicuous along margins of intertidal wetlands, especially brackish marshes. *Polymesoda* occurred continuously throughout the river between RK 5 and 25. It occurred in very high abundance at some upriver transects and in general was found farther down-river than expected. *Polymesoda* size increased with distance away from the river mouth.

3. Rangia cuneata

Rangia cuneata is a large, robust bivalve common in tidal rivers and backwater bays with regular inputs of fresh water. In coastal areas with larger tidal range it tends to be regarded as primarily a subtidal species, especially in comparison to the marsh clam *Polymesoda caroliniana*, but in the tidal Myakka River it is also common intertidally. Like *Polymesoda*, *Rangia* is a characteristic member of the Myakka River's transitional fauna. Although not as abundant as *Polymesoda*, Rangia was present across a longer river reach than any other species excepting Corbicula. In a majority of cases both live and dead *Rangia* occurred together. It tended to be more abundant in as subtidal material in downstream reaches and as intertidal material in upstream reaches. Like *Polymesoda*, *Rangia* sizes increased with distance from the Harbor (**Figure 4**). Interestingly, live *Rangia* in the intertidal were larger than in the subtidal.

4. Tagelus plebeius

Tagelus, a member of the family of short razor clams, was common and often abundant throughout the lower reach of the tidal Myakka River. This species has particular habitat

requirements and its dispersion may be highly gregarious or clumped (Holland and Dean, 1977). It was dispersed over a longer reach and occurred at higher densities in the intertidal zone (**Figure 5**). *Tagelus* was found only through a small reach of subtidal transects centered on RK 10.0, but this corresponded to where live intertidal material was most abundant. No gradient in size was evident but weathering increased with proximity to the Harbor for both live and dead material. *Tagelus* is a fragile species and even live material can be weathered substantially.

5. Intertidal Gastropods

Littorina irrorata is the marsh periwinkle found on mangroves and emergent marshes near or above the water line. The periwinkle is the fifth most common record from the river. *Neritina usnea* is a shallow-water gastropod with intertidal to supratidal affinities, and is often found grazing on benthic algae mats, submerged aquatic vegetation, and emergent marsh species such as black needlerush, *Juncus roemerianus*. Nerites were tenth-most common but are discussed with periwinkles as the two dominant intertidal/supratidal gastropod species of the Myakka. Littorina extends from RK 0.0 to RK 16.0, mostly as live material (**Figure 6**). In contrast, nerites were collected from the river mouth to near RK 23.0, but primarily as dead material (**Figure 7**). Live periwinkles and nerites did not co-occur. Periwinkle size was unrelated to river location but upriver nerites were larger than those downstream. Periwinkles have hardy shells and no gradient in weathering was found, whereas the more fragile nerite was extensively weathered.

6. Mussels

Three species of mussels are 6th, 8th, and 9th in abundance within the Myakka River mollusk collection: *Geukensia demissa granossissima, Ischadium recurvum,* and *Mytilopsis leucophaeata*. All tend to be intertidal and located in the lower 10-15 km of the river (**Figures 8, 9, 10**), although some *Ischadium* and *Mytilopsis* were collected subtidally and *Mytilopsis* was fairly abundant among subtidal mollusks near RK 5.0. The tendency for subtidal *Mytilopsis* to occur in abundance in deep waters near river mouths has been observed elsewhere. *Geukensia* and *Ischadium* were rare subtidally but extremely common in the intertidal, well beyond abundances reported for particular transects. *Geukensia* forms dense masses along and within marsh-dominated shorelines in the lower river, whereas *Ischadium* was insinuated amongst oysters growing on and under mangroves in the same river reach. *Ischadium* size increased with increasing distance above the mouth of the river.

7. Crassostrea virginica

Oysters were encountered continuously from the mouth of the river to about RK 12.0 (**Figure 11**), but all material was from the intertidal zone and was dead. High weathering signified that this material was not recently alive.

Table 1. Summary list of Myakka River shelled species collected on 1.0 km transects.

	Cumulative Percent
Corbicula fluminea	36.9
Polymesoda caroliniana	53.4
Rangia cuneata	63.7
Tagelus plebeius	72.0
Littoraria irrorata	77.4
Geukensia demissa granossissima	82.2
Crassostrea virginica	86.8
Ischadium recurvum	90.3
Mytilopsis leucophaeata	92.4
Neritina usnea	94.3
Anomia simplex	96.2
Mulinia lateralis	98.0
Nassarius vibex	98.4
Planorbidae	98.7
Glottidia pyrimidata	99.0
Melongena corona	99.2
Tellina sp.	99.4
Anomalocardium auberiana	99.5
Crepidula fornicata	99.6
Cyclinella tenuis	99.7
Sphaerium sp.	99.8
Bulla striata	99.9
Noelia ponderosa	99.9
Neverita duplicatus	100.0
N = 24 taxa	

Community Pattern

The tidal mollusk community of the Myakka River, sampled as it was in this study, can be studied as a whole for patterns in number and kind as functions of strata and river position. **Figure 12** depicts patterns of live and dead species' overlap as functions of river kilometer. The upper panel depicts species sorted by first occurrence in an upstream direction; the lower panel, by first occurrence in a downstream direction. No species occurred throughout the length of the tidal river. Three species, *Corbicula, Polymesoda* and *Rangia*, were present as live and dead material at about half of all transects. The upstream limit of *Corbicula* was not determined in this survey but it is clear that the distributional limits of *Polymesoda* and *Rangia* fell within the tidal reach. *Tagelus* was present as live or dead material at every station below RK 15.0 and its downstream (Harbor) distribution was not determined in this survey.

In an upstream sort, new species are added regularly with distance to near RK 15.0. In the downstream sort, species are added slowly at first and then richness rises abruptly near RK 12.0 due primarily to dead mussels, oyster, and intertidal gastropods. Half of the species were patchily represented, and some were present as live-only or dead-only material. Most dead-only species accounts occurred in the lower 10 river kilometers.

On the basis of **Figure 12** it may be said that the tidal reach of the Myakka River is characterized by a molluscan community dominated by *Polymesoda* and *Rangia*, with a strong representation by *Tagelus* in the river's lower half and nearly complete domination of the upper reach by *Corbicula*. The sharp change in species richness at RK 12.0 (Sarasota-Charlotte County line) corresponds to the river's emergence from a channel that is braided among mangrove and marsh islands into a broad, shallow bay-like environment. This transition marked the upriver extent of fauna characteristic of the upper Harbor (Estevez, 1986), although reasons for the break are presently unknown.

Figures 13 and 14 depict species richness as number of taxa in relation to river kilometer. Live and dead taxa occur throughout the study area, with most live or dead species below RK 10.0.

Low richness at RK 0.0 is noteworthy but inconclusive without additional Harbor samples. The river mouth depression was caused more by a decline in the number of intertidal species, than subtidally (**Figure 14**). Intertidal species richness was approximately twice that seen in subtidal collections.

Densities of live and dead shells for all species, combined, were not particularly high (**Figures 15 and 16**) compared to other rivers, even in the downstream half of the study area where species richness was high. Live material outnumbered dead material in many transects but there was no tendency for shell densities to change with distance upstream of the Harbor. On the other hand, density patterns for intertidal versus subtidal collections exhibited definite and opposite gradients. Intertidal density increased with RK whereas subtidal density decreased. The largest increase in intertidal density was near RK 23.0 (Rambler's Rest), due mostly to the presence of *Corbicula*.

Tributaries

Samples were collected in 3 tributaries, Myakkahatchee Creek, Deer Prairie Creek, and Blackburn Canal (**Figure 1**). In Myakkahatchee and Deer Prairie, transects were established near the mouths, middle reaches, and upper ends of each stream. Myakkahatchee is a dredged flood control and navigation channel. Deer Prairie is an authentic stream with limited bank alterations. Both streams have regulated flow. Deer Prairie is impounded as a ranch pond by a fixed crest weir that interrupts stream flow at low stage. The Myakkahatchee Creek structure (WCS 101) is located about 4.2 km above the creek's confluence with the Myakka River. This structure serves as a salinity barrier that separates the tidal brackish reaches of Myakkahatchee Creek from its non-tidal freshwater reaches. During dry periods waters fall over the top of the structure spillway, while during wet periods lift gates are raised to transmit high flows. Myakkahatchee Creek is used as water supply by the City of North Port at an average rate of

about 2 cfs. The tidal reach of Myakkahatchee Creek also receives flow from the Cocoplum Waterway, which enters the Creek about 0.25 km downstream of WCS 101.

Blackburn Canal is an artificial waterway connecting to Curry Creek and thereby to Roberts Bay, built originally for flood control along the Myakka. Samples were taken within the canal near the Myakka River. Finding no material, samples were taken at stations progressively farther from the river until some mollusk material was finally encountered. This criterion was met about 400 m from the river.

Only 7 species were collected in these tributaries and of the 7 only 4, *Rangia, Polymesoda, Tagelus,* and *Corbicula* were collected live. Dead material included *Planorbidae, Ischadium,* and *Neritina*. By stream, Deer Prairie had 6 species, Myakkahatchee had 5, and Blackburn Canal had 1 species (*Rangia*). *Rangia* was the only species found alive as intertidal and subtidal material in all 3 tributaries. *Polymesoda* was found alive as intertidal and subtidal material in Myakkahatchee and Deer Prairie Creeks. Densities for all species were low throughout. Recruitment failure is suspected in Blackburn Canal and habitat constraints may be responsible for low diversity and abundance of mollusks in the other streams. The middle and upper reaches of Deer Prairie Creek have bottom sediments containing large amounts of autochthonous debris and coarse particulate organic matter. The bottom of Myakkahatchee Creek upstream of US 41 (4 km above the creek mouth) is a pudding of fine particulate organic matter with high water content and what appears to be a serious petroleum hydrocarbon problem.

B. Dona and Roberts Bays

A total of seventeen sites were visited with 12 in Dona Bay and Shakett Creek, and 5 in Roberts Bay and Curry Creek (**Figure 17**; **Appendix Table 3**). Fossil contamination was extensive because of widespread dredging and filling.

Species Richness

Thirty-four taxa of mollusks were collected and all were identified to lowest practical taxon, usually species (**Table 2)**. *Crassostrea* accounted for 32% of all material and it with another 9 species comprised 90% of the collection: *Tagelus plebeius, Chione cancellata, Anomalocardia auberiana, Ischadium recurvum, Tellina sp., Laevicardium mortoni, Cerithium atratum, Nassarius vibex,* and *Anomia simplex*. The remaining 10% of material was distributed over 13 common and another 10 numerically rare species.

Dona Bay and Shakett Creek

These waters contained twenty-six species. The two most abundant species were *Crassostrea* and *Tagelus*. Oysters occurred as live and dead material in intertidal and subtidal samples (**Figure 18**), although intertidal densities were much higher owing to the presence of reefs on some transects. The range of dead material (5.0 km) was larger than of live (2.5 km). *Tagelus* was also distributed throughout the system (**Figure 19**) and live material was collected from both depths. The footprint of dead material spanned a longer reach than live for subtidal collections; given their delicate shells, this pattern suggests that

subtidal clams have lived across the study reach in the recent past. Relatively high densities of the clam were encountered at RK 3.5, close by Mote's 1975 Station D3.

Species richness declined monotonically with RK distance from Venice inlet (**Figure 20**), at a rate of about three species per kilometer. The end-members of the series (RK 0.5 and 6.0) had the fewest live species. In an up-river sort of the same data (**Figure 21**), species number increased linearly to RK 3.0 (railroad trestle) and then increased by only a few species. This does not mean that more species were found upstream than down– the converse is the actual case, but the *rate* of new species occurrences changed at this RK.

Roberts Bay and Curry Creek

These waters contained twenty-eight species. Except for *Lucina*, none was numerically abundant and the conid gastropod could be a fossil contaminant. As was the case in Shakett Creek, the two most abundant species were *Crassostrea* and *Tagelus*. Oysters did not occur as live and dead material in intertidal and subtidal samples (**Figure 22**) as they did in Shakett Creek, although the intertidal densities of dead material in Curry Creek were much higher than in Shakett Creek. The range of dead material (2.0 km) was larger than of live (found only at RK 3.0) and the size of dead material increased with distance from Roberts Bay. *Tagelus* was also distributed throughout the system (**Figure 23**), more so than oysters, and live material was collected from both depths. The footprint of dead material spanned the same reach as live for intertidal collections, but the dead footprint was larger than live for subtidal material. Relatively high densities of the clam were encountered at RK 2.5 in the middle of upper Roberts Bay.

Table 2. Summary list of DARB shelled species collected on 0.5 km transects.

Species	Cumulative Percent
Crassostrea virginica	31.8
Tagelus plebeius	50.4
Chione cancellata	61.7
Anomalocardia auberiana	68.1
Ischadium recurvum	73.5
Tellina sp.	78.5
Laevicardium mortoni	83.0
Cerithium atratum	86.3
Nassarius vibex	89.0
Anomia simplex	90.5
Neritina usnea	91.9
Lucina pedinata	92.9
Anadara transversa	93.7
Crepidula fornicata	94.5
Polymesoda caroliniana	95.2
Argopecten irradians	95.8
Cyclinella tenuis	96.4
Bulla striata	96.8
Littoraria irrorata	97.3
Macoma constricta	97.8
Mulinia lateralis	98.3
Mercenaria campechiensis	98.6
Urosalpinx tampensis	98.9
Unknown	99.1
Eupleura sulcidentata	99.2
Melongena corona	99.3
Noetia ponderosa	99.5
Planorbidae	99.6
Atrina sp.	99.7
Conus jaspideus	99.7
Corbicula fluminea	99.8
Cryptopleura sp.	99.9
Geukensia demissa gr.	99.9
Macrocallista nimbosa	100.0

Species richness declined monotonically with RK distance from Venice Inlet (**Figure 24**), at a rate of about 6 species per kilometer, twice that observed in Shakett Creek. The end-members of the series (RK 1.5 and 3.5) had four species each. In an up-river sort of the same data (**Figure 25**), species number increased rapidly and was highest for all transects at RK 2.0 and then increased by only a few species.

The systems compare favorably with respect to the percent of samples lacking live material (**Figure 26**). For subtidal material, there were an increasing percentage of samples without live mollusks as a function of RK in Shakett Creek. Species numbers compare favorably (**Figure 27**) though Roberts Bay intertidal communities are richer than in Dona Bay. Total densities decreased with RK in Shakett Creek, primarily in the subtidal, whereas high oyster densities in Curry Creek accounted for it having higher overall densities than Shakett Creek (**Figure 28**). Most of Curry Creek's extra densities were the consequence of dead material (**Figure 29**).

Results of a separate effort made to locate relict oyster reefs in the two waterways are reported in **Appendix 5**.

DISCUSSION

A. Myakka River

This section continues discussions developed in previous mollusk reports of findings in the Alafia and Peace Rivers, and Shell Creek.

Species-overlap curves allow two questions to be answered. First, how should the river fauna be sampled in order to maximize the probability of accurately defining a species' range? Second, how does the living component of a species lay relative to its "footprint" of dead remains accumulated over the period of years to decades?

In the first case, it is evident in all diagrams that the live-only fraction or single-stratum (intertidal;subtidal) fraction does not represent all of a species' spatial domain. As live material only, no species occurred with perfect continuity throughout its range along the Myakka River, although *Polymesoda* and *Corbicula* came close. Some species had nearly-continuously distributions, notably *Rangia* and *Tagelus*, but most species contained gaps when surveyed at one-kilometer intervals. Given the relatively intense effort made to sample the creek, such gaps could be interpreted as the result of natural variation in habitat variability and recruitment success, although it should be noted that gaps also appear in rivers sampled on half-kilometer intervals. To the extent a gap represented a result of consequence to the interpretation of data; the gap could be assessed more thoroughly by means of a follow-up visit. No follow-up visits were made to verify gaps in this study.

The second question regards the spatial relationship of a species' living members to its dead ones. Two species were only found as dead material (**Table 3**). Each of three species had live and dead specimens occurring over the same river ranges, and four (T*agelus, Polymesoda, Ischadium, and Tagelus*) had live ranges that were shifted downriver relative to dead material, or were out-of-range relative to dead material. Whether these species' live ranges had shifted during or as a result of the 2003 El Nino floods cannot be discerned from the data.

Table 3. Relation of Live to Dead Shell Distribution Patterns in the Tidal Myakka River.

Relative to dead shells, live animals are:	**Species:**
Out-of-range, downriver	*Littoraria, Nassarius, Glottidia*
Out-of-range, upriver	*Cyclinella*

Compared to analyses of this type for other studied rivers, two things are noteworthy. First, most Myakka River live material falls within the "footprint" of each species' respective dead material. Second, only one species, *Littoraria,* was substantially out of range, in this case, down-river. This pattern indicates that the species was formerly but recently distributed farther upriver than it was in 2004, and this is the first river instance of the periwinkle exhibiting this pattern. It is interesting that another gastropod, *Nassarius*, resembled *Littoraria* in this regard, but in the subtidal.

Oysters and Mussels

Although two species forming the largest biocoenosces in rivers tributary to Charlotte Harbor are the intertidal mussel *Geukensia demissa,* and the eastern oyster, *Crassostrea americana*, which occurred between high subtidal to mid-intertidal elevations, *Geukensia* is limited in range to a small reach of the lower river and oysters are rare in the Myakka River. As mentioned previously, *Geukensia* and *Ischadium* are probably more common and abundant than revealed by the survey, owing to the large area of marsh islands with interior waterways suitable for their growth. On balance, oysters are not a dominant feature of the study area and have not been in recent times.

River Comparison

The presence of twenty-three macro-mollusk species in the tidal Myakka River, as collected on one-kilometer intervals, represented about two-thirds of the species collected by benthic methods. In this regard it was similar to the Peace River (**Table 4**).

Table 4. Comparison of Mollusk Species Richness by River and Gear.

Effort	Species Number			
	Alafia	Peace	Shell	Myakka
Mollusk Survey	20	34	11	24
Invertebrate Survey	45	55	4	35

Mollusk species richness was lower than that observed in the tidal Peace River, where similar gear and effort were made as part of the hydrobiological monitoring program (Mote Marine Laboratory, 2001). The mollusk survey collected 70% more species in the Peace than in the Alafia, whereas the infaunal program collected 33% more species. Compared to mollusk diversity of the Peace River, the mollusk diversity of the Alafia was impaired. On balance, the species richness of the Myakka River is sensible given its size, condition, and geographic setting. The Myakka is considered a cleaner and more natural stream than the Alafia, but it is also larger. The role of habitat area as a regulator of species richness in tidal rivers deserves further study.

B. Dona and Roberts Bays

Dona Bay and its tributary, Shakett Creek, bear similarity to Roberts Bay and its tributary, Curry Creek, with respect to geography, segmentation of habitats, and mollusk communities. Both are in close proximity to Venice Inlet, a source of marine water, sediment, and faunal recruits. Both are divided by natural and built features into three homologous segments or reaches. The lower or western reach is broad, open, relatively deep, dominated by marine influences, and characterized by marine fauna. The lower reach is divided from a middle reach by US 41. The middle reach extends east of the highway through what was originally the "top" of Dona Bay and Roberts Bay. The middle reach is also broad but interspersed with oyster reefs. Older reefs have been colonized by mangroves and form overwash islands, leaving anastomosing waterways that are relatively shallow. Depending on time of year, the middle reach is transitional with respect to salinity, but it can be dominated by fresh water in wet seasons. Sediments and fauna of the middle reach are transitional, with relict marine influences and modern estuarine elements. The sediment system of the middle reach is dynamic. An upper or eastern reach begins where the middle reach narrows to enter a single channel, and continues into made waterways (Shakett becomes the lower, channelized reach of Cow Pen Slough; Curry becomes Blackburn Canal). Flows in the upper reach of each system can be very low, allowing for the inland penetration of marine waters and fauna, or very high. At very high flows, the upper reach is entirely fresh, mobile biota is advected out of the system, and sedentary and sessile estuarine fauna perish.

Relative to biodiversity, DARB waters were richer than the Myakka River in terms of total species number owing to the proximity of marine waters and fauna. Some species allowed as contemporary may have been fossil material, the consequence of extensive dredging throughout the lower reach of each Bay. Another noteworthy comparison is the absence of *Rangia cuneata* in DARB waters. DARB supports *Tagelus* and *Polymesoda*, species also present in the Myakka River in approximately the same river reaches as *Rangia*, and *Rangia* was found in the Blackburn Canal near the river, so the absence of *Rangia*– even as dead material– in Curry Creek and Roberts Bay is interesting. The mussel *Geukensia*, though present in DARB, was not as common or abundant as expected.

Oysters control the structure and ecological functioning of the middle reach in both waterways. Relative to Curry Creek, Shakett Creek seems unsaturated with respect to oyster reefs, but oysters are nonetheless a keystone species in both streams. The extent to which oyster reefs are alive or dead; buried, exposed, or overgrown by mangroves; or utilized by other fauna are unknown but oyster condition is under study by Sarasota County and the question of buried reefs is the subject of **Appendix 5**.

The channelized portion of Blackburn Canal was not surveyed in this effort, but the channelized reach of Shakett Creek leading to Cow Pen Slough was. Steep banks were created by canal construction and leave sparse intertidal habitat for mollusks. Subtidal mollusk data reflect a stressed benthic environment.

SYNTHESIS AND CONCLUSIONS

Objectives of the mollusk surveys are evaluated below:

1. Describe the present distribution of major macro-mollusk species and communities in the lower, tidal reach of the Myakka River, and of Dona and Roberts Bays, including their main tributaries.

Twenty-three macro-mollusk species inhabited the tidal reach of the Myakka River in June 2004. There were more species near the mouth of the river than in upstream reaches, especially in the river up to the Sarasota County line. Species in Charlotte County waters included numerous forms common to upper Charlotte Harbor. On balance, species normally found in oligohaline river reaches extended down-river well into Charlotte County. Intertidal and subtidal fauna were similar with respect to species numbers but density patterns differed. Subtidal densities were greatest near the Harbor, whereas intertidal densities were greatest up-river. The 2004 molluscan fauna was essentially a mesohaline community in Charlotte County and an oligohaline- to-tidal-freshwater community in Sarasota County. Relative to dead shells, most live material was in range, with *Littoraria* the exception for being out of range, downstream. Compared to the main river, three tributaries had similar numbers of species and lower numbers of individuals.

Thirty-four species were collected in the Dona-Roberts Bay system, of which the dominant species were *Crassostrea virginica, Tagelus plebeius, Chione cancellata, Anomalocardia auberiana, Ischadium recurvum, Tellina sp., Laevicardium mortoni, Cerithium atratum,*

Nassarius vibex, and *Anomia simplex*. The remaining 10% of material was distributed over 13 common and another 10 numerically rare species. Waters west of US 41 were dominated by a marine and mesohaline fauna. Oysters dominate upper bay waters east of US 41. Indicators of oligohaline and tidal-fresh waters (*Tagelus, Polymesoda*) occurred in both systems, but another indicator, *Rangia cuneata,* did not. Nor was dead *Rangia* material collected. The channelized reach of Shakett Creek is impaired as mollusk habitat due to a lack of suitable substratum, and wide salinity variations.

2. Identify taxa of potential importance to the ecological structure and functioning of the these waters.

In the Myakka River, species comprising 90% of the fauna by count included *Corbicula fluminea, Polymesoda caroliniana, Rangia cuneata, Tagelus plebeius, Littoraria irrorata, Geukensia demissa granossissima, Crassostrea virginica,* and *Ischadium recurvum*. *Corbicula* occurred throughout the upper half of the study area and dominated the upper fourth. *Corbicula*'s primacy in these waters make it important in terms of system structure and function, though the present study does not indicate how. Interestingly, no dead shells of native species were found in the upper river, possibly signifying that shell erosion and dissolution, or possibly physical transport, have been sufficient to eliminate these forms from the river during the past 40 years.

Polymesoda was interesting because it is commonly found in the high intertidal zone within marshes, as it was in the Myakka River, but it was highly abundant as multiple cohorts in the low intertidal and was also abundant as juveniles in the subtidal zones of the river, a pattern observed during sampling in Shell Creek in April. It and the mussels that inhabit the edges of marshes and root zones of mangroves are probably very important as filter feeders, shoreline stabilizers, habitat for cryptic species, and food resources for predators. *Tagelus*, though thin-shelled, was abundant in shallows across a small area of the lower river. The species is highly valued prey for benthic decapod crustaceans, elasmobranchs, and teleosts, and in June there were signs that predators had moved into the shallows populated by *Tagelus* beds. This would account for their numbers being much lower than seen in Shell Creek. In addition to the three dominant species, two intertidal gastropods, *Neritina usnea* and *Littorina (Littoraria) irrorata*, are common on mangroves and marshes fringing the river. These species are important intertidal consumers, and prey for varied predators, but probably were under-sampled by the present effort. Reasons for periwinkle displacement out-of-range are unknown but could reflect blue crab predation. Dead oysters were present in the river in 2004, but probably were not important in regulating the structure or functioning of the river except insofar as accumulations of dead shell contribute to shoals and firmament of river bottoms. Subtidal *Mytilopsis,* for example, were frequently recovered from the subtidal as attachments to dead oyster valves.

In DARB, oysters play a much larger role, or have potential to, than in the Myakka River. Reefs are already conspicuous, large features of both streams. Even as dead reefs the structures influence currents and salinity, water quality, and biotic habitat potential. As living structures the reefs perform additional ecological functions of value.

3. Compare and contrast mollusk data collected by similar methods from other tidal rivers of southwest Florida.

Mollusk data collected by the rapid survey methods employed here tend to under-estimate species richness and faunal densities because our large sieve passes more material than the fine sieve used for infaunal surveys. For example, twenty and thirty-four species were collected by rapid survey in the Alafia and Peace rivers, respectively, whereas infaunal methods collected forty-five species in the Alafia and fifty-five species in the Peace. The eleven species collected by rapid survey in Shell Creek is lower than caught in the Alafia or Peace, but Shell Creek is a low-salinity tributary and its fauna was found to be highly similar with respect to richness, and density, to an analogous reach of the nearby tidal Peace River. One unexpected outcome was that the mollusk survey in April 2004 would collect nearly three times as many species as the infaunal survey made in May 2003. This outcome is attributed to the large stream flows that had occurred prior to the 2003 infaunal sampling effort. Twenty-four species surveyed in the Myakka River fall between the Peace and Alafia.

DARB mollusk data differ from any stream previously studied for HBMP and MFL purposes in southwest Florida, owing to the high proportion of marine species collected in the lower reaches of Dona and Roberts Bays.

In conclusion, the macro-molluscan fauna of the tidal Myakka River is abundant and organized along a distinct gradient corresponding to river position and salinity. Species richness and density values are comparable to those seen in other studied streams. Like the Peace River, the tidal Myakka has a reach near the transition from braided to open channels where mollusk community structure changes. Factors responsible for this feature are presently unknown but amenable to discovery through the analysis of existing collateral data. Farther upstream in the Myakka, the exotic and invasive bivalve, *Corbicula fluminea*, presently dominates the mollusk fauna, with unknown consequence. Mollusk species richness, distribution and abundance can make useful contributions to future monitoring efforts.

DARB waters contain a subset of the authentic Myakka fauna, including some key indicator species but not all. High salinity variability caused by extreme flow changes-- compressed over stream distances of a few kilometers before marine conditions prevail-- have created distinct mollusk communities in lower reaches; evanescent communities in middle reaches, and depauperate communities in upper reaches. In DARB, future management and monitoring may be improved by dwelling on a single species (*Crassostrea*) and its condition (growth, recruitment, disease, predation, mortality), rather than on general mollusk species richness, distribution and abundance.

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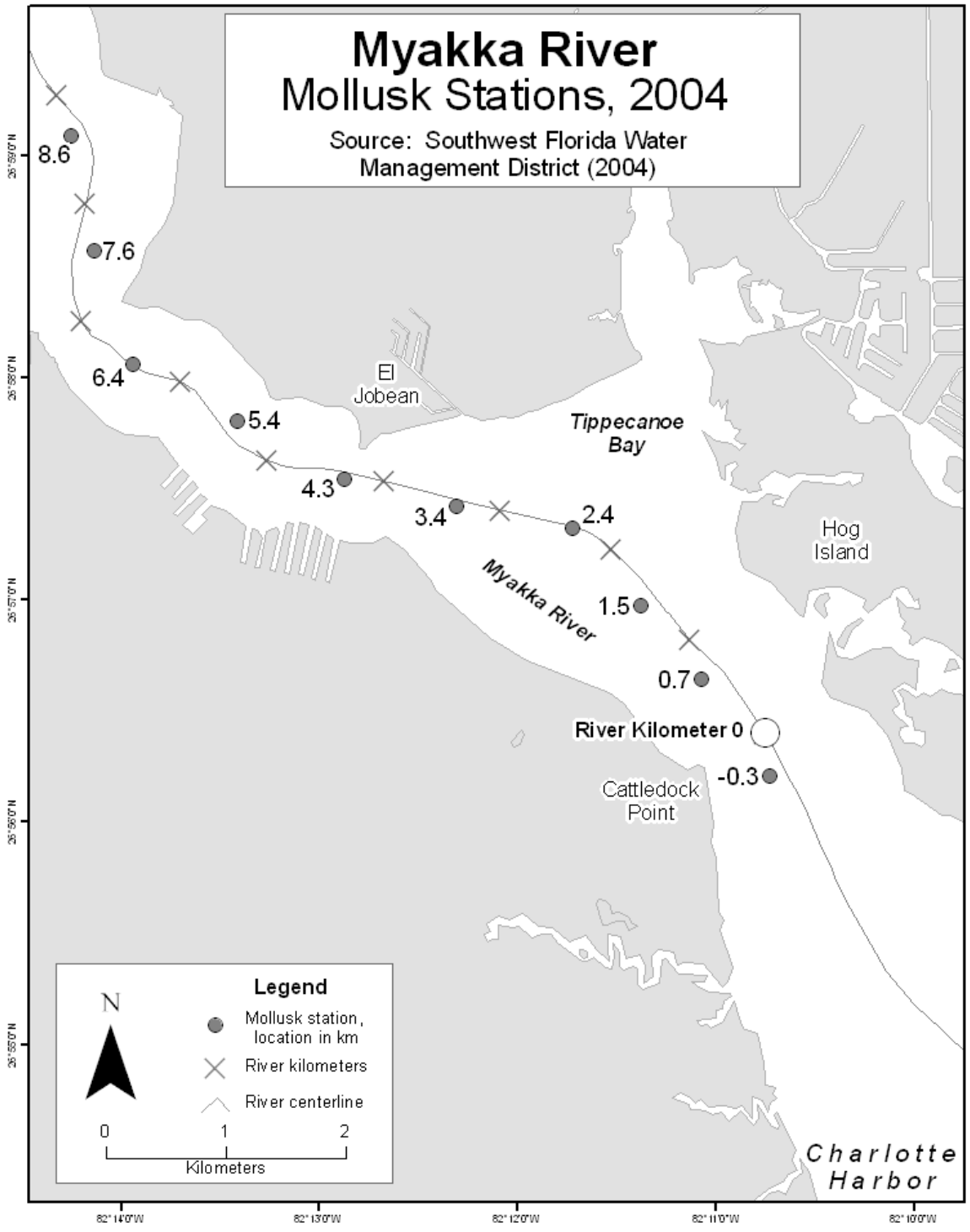

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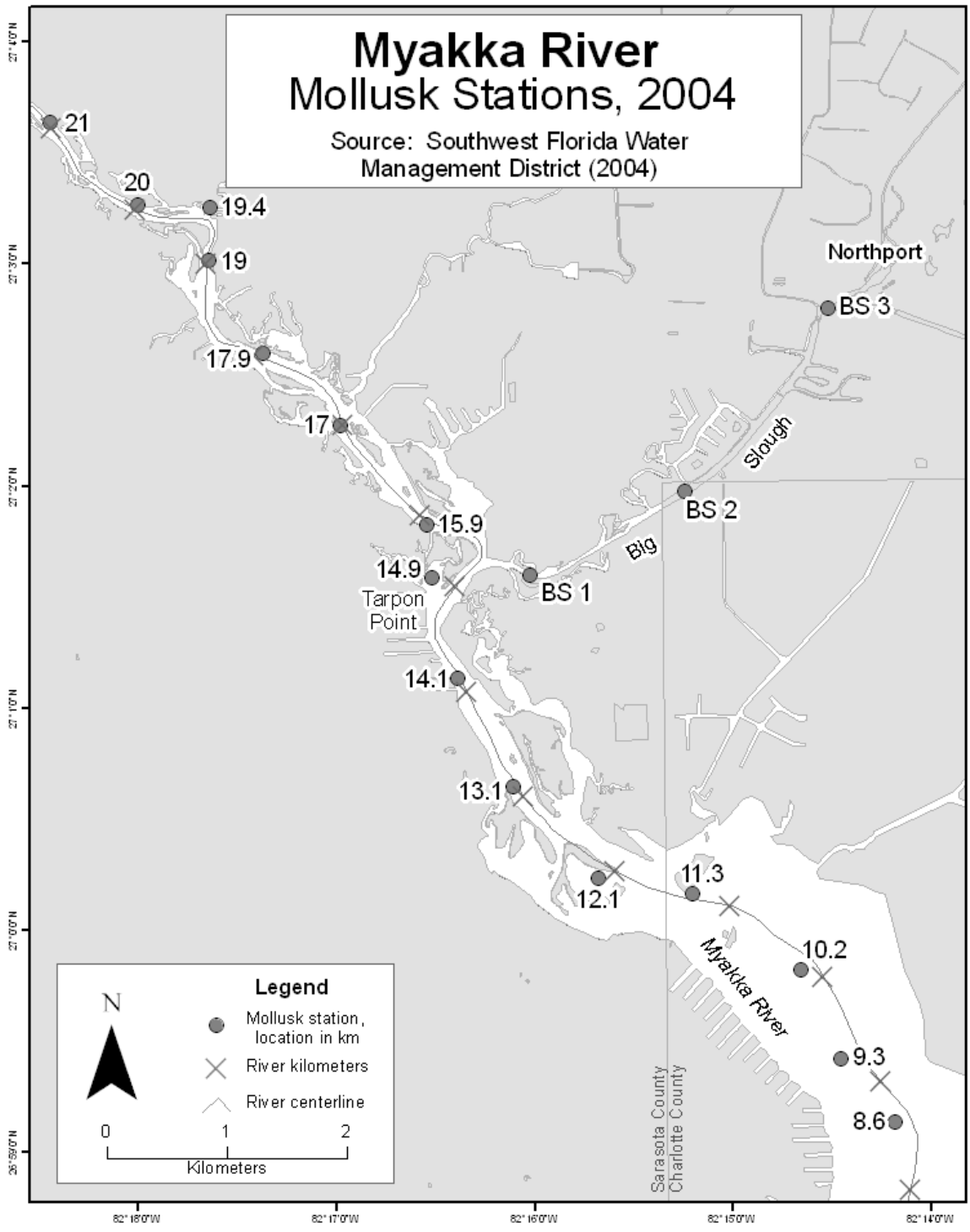

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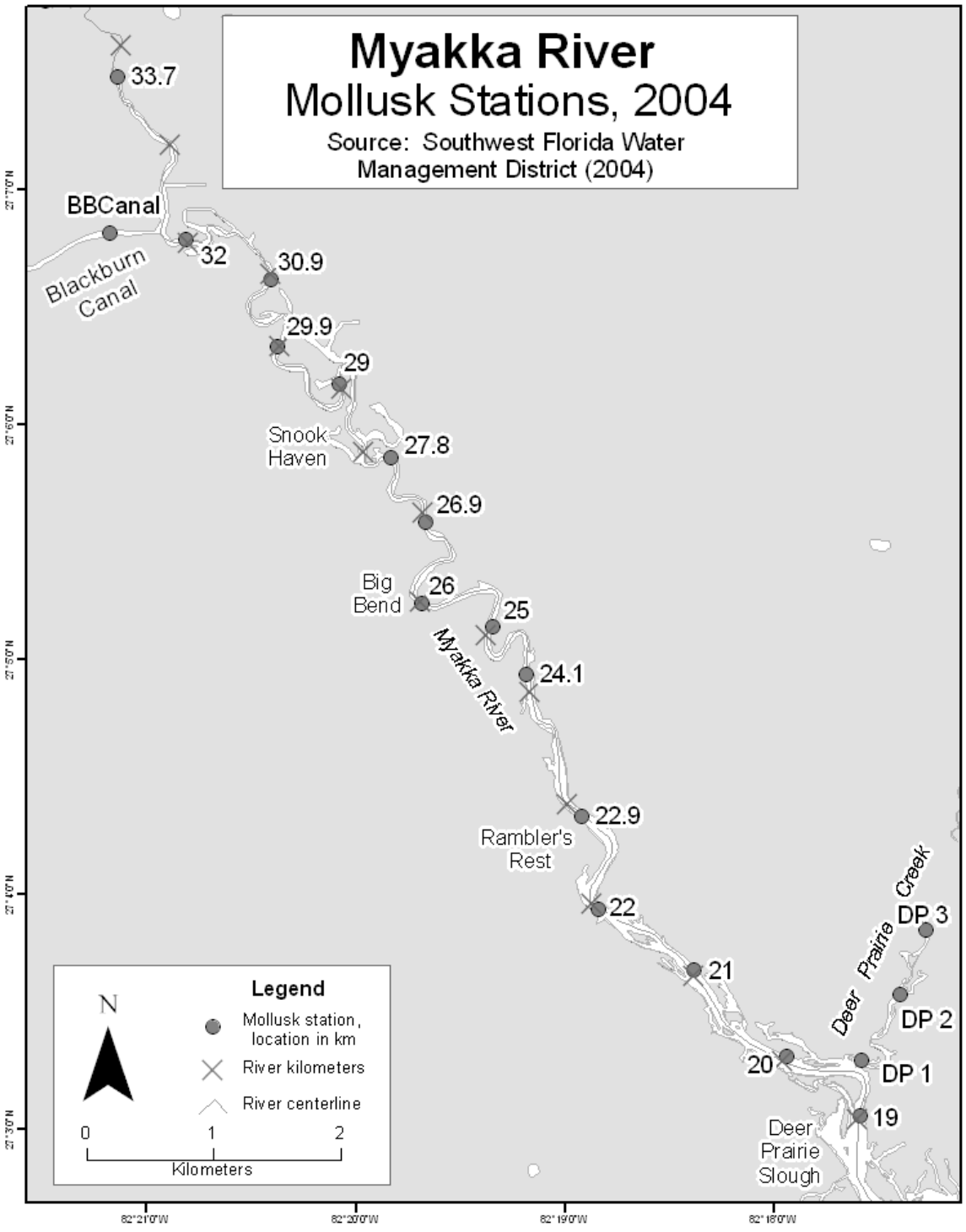

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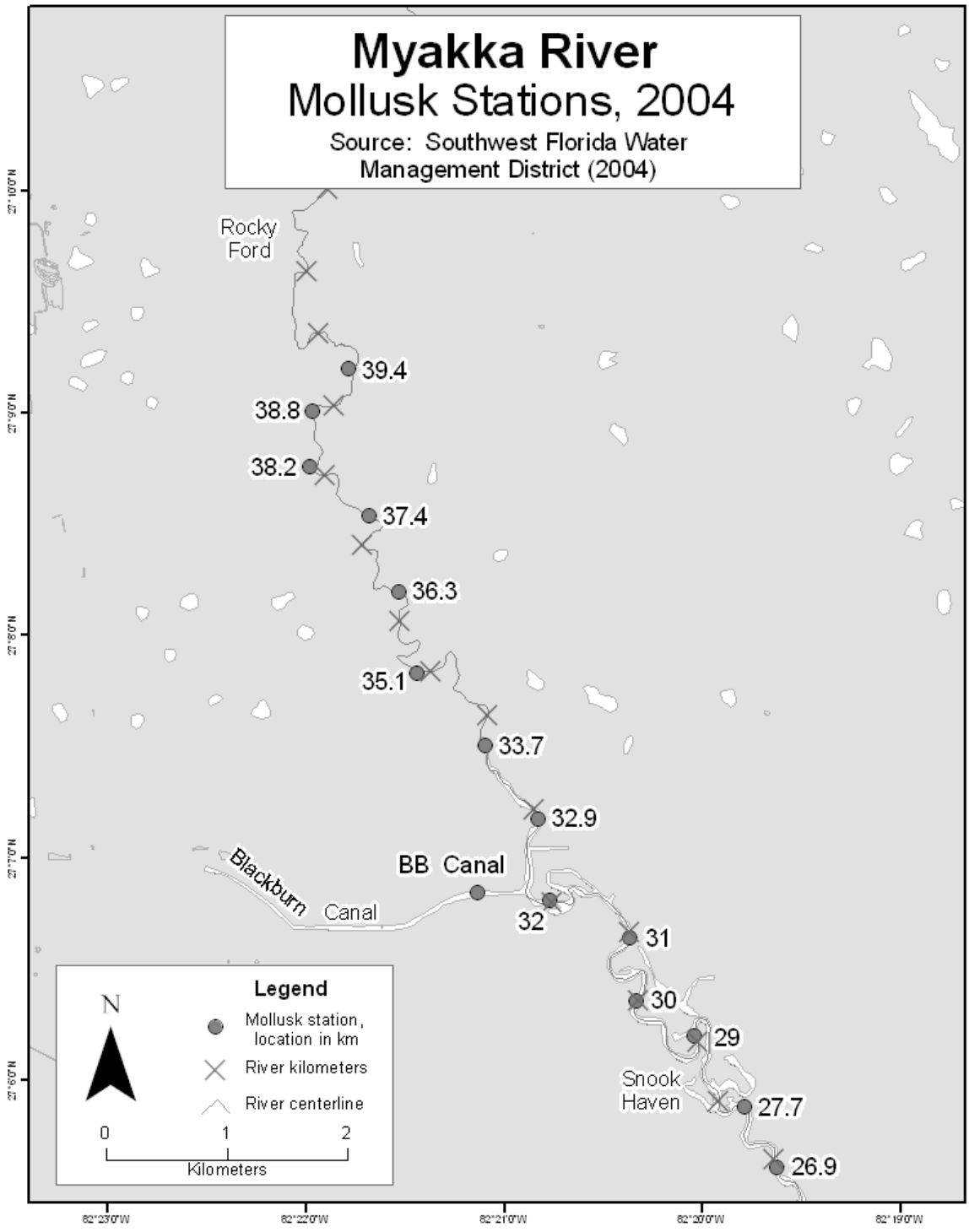

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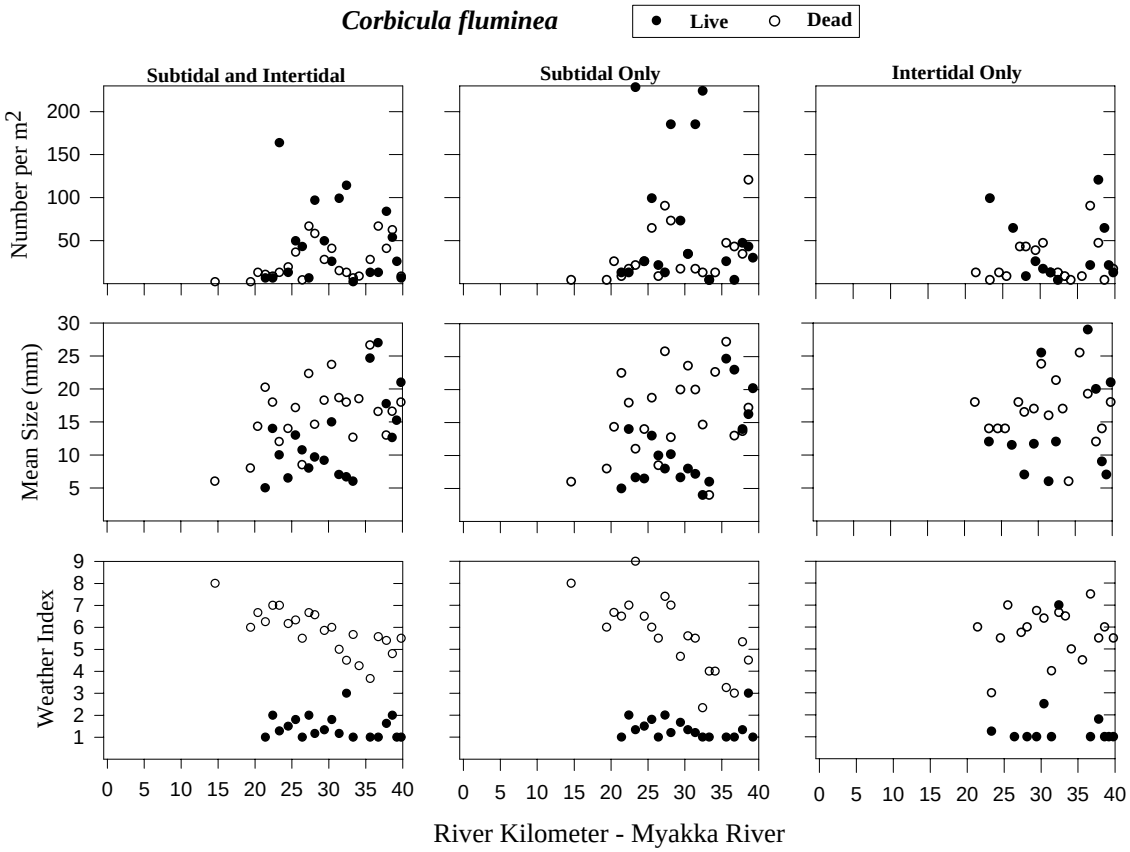

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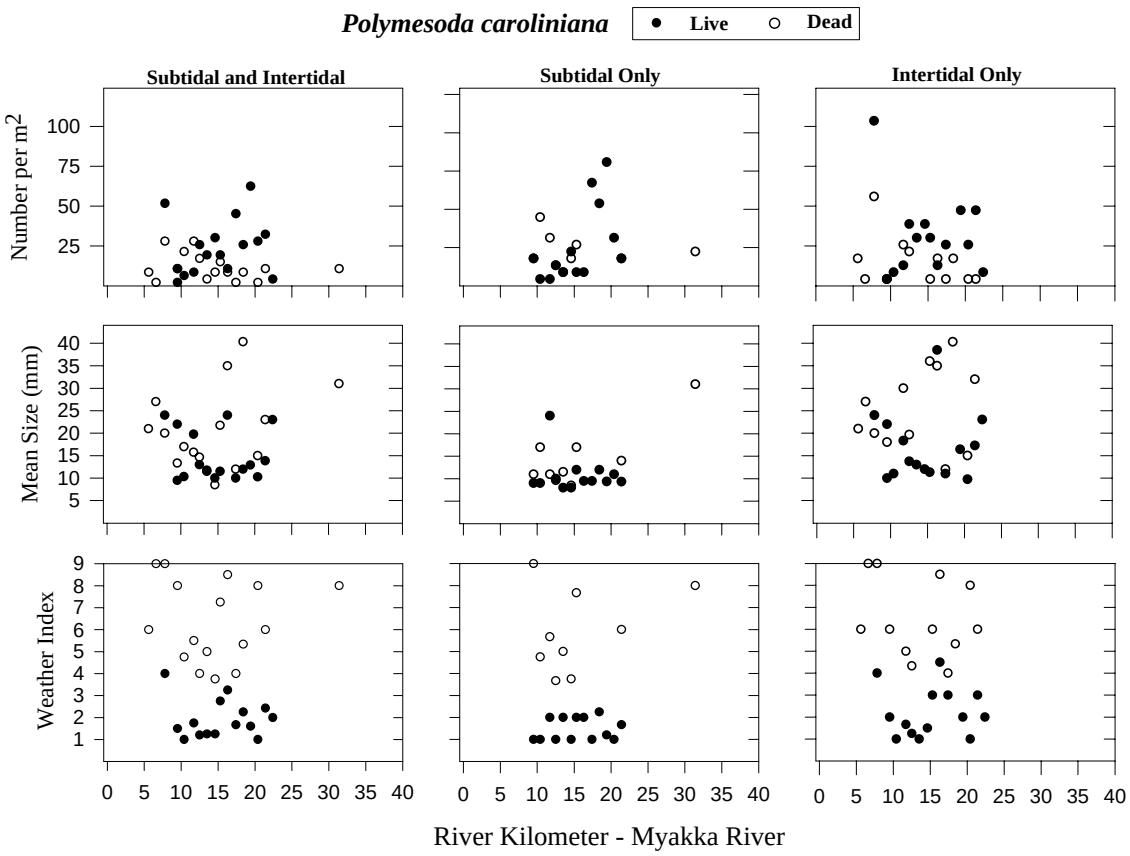

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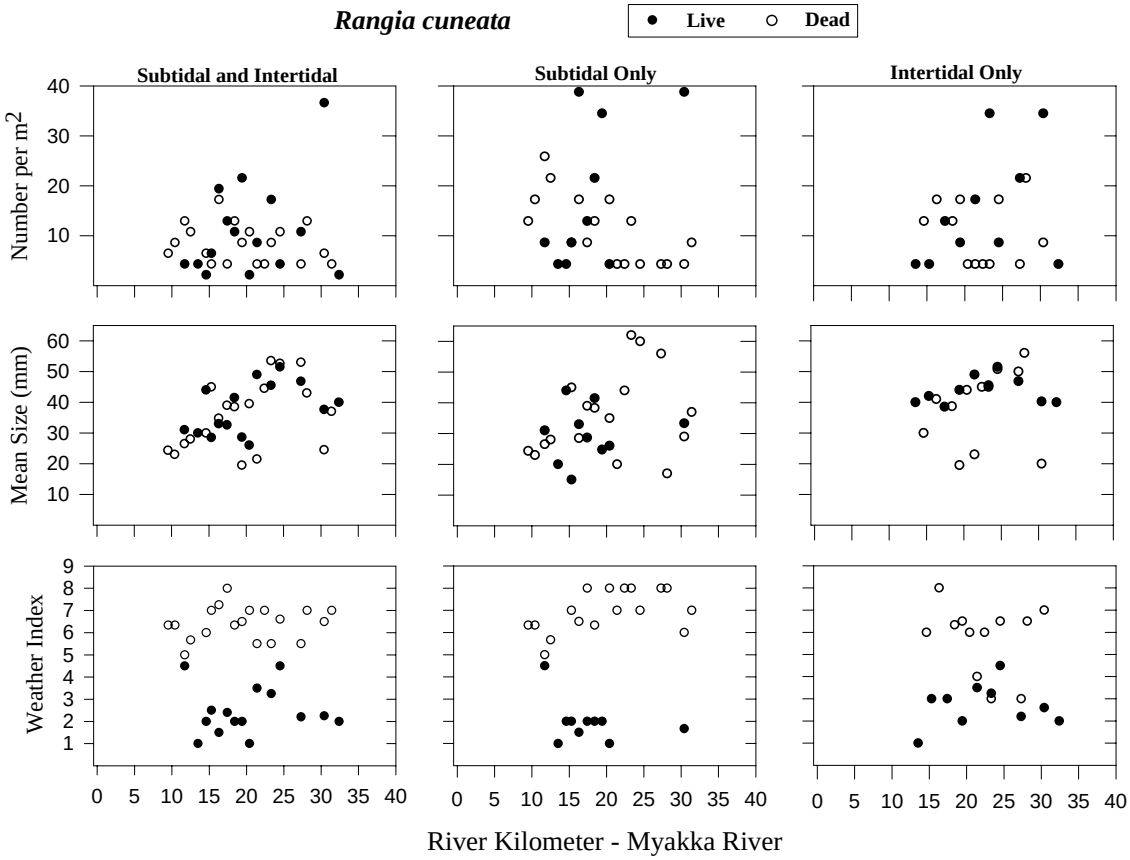

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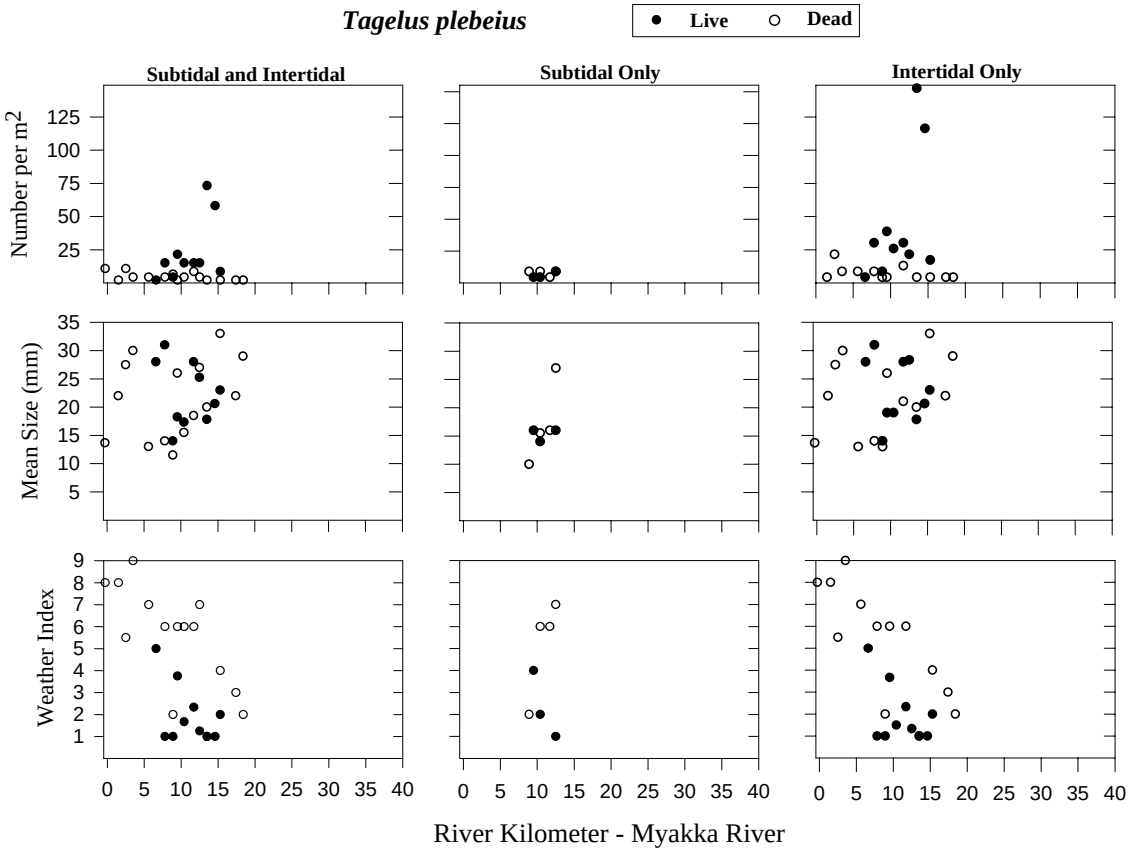

Figure 5. Density, size, and weather index values for live and dead collections of *Tagelus plebeius* as a function of distance from RK 0, in intertidal and subtidal strata.

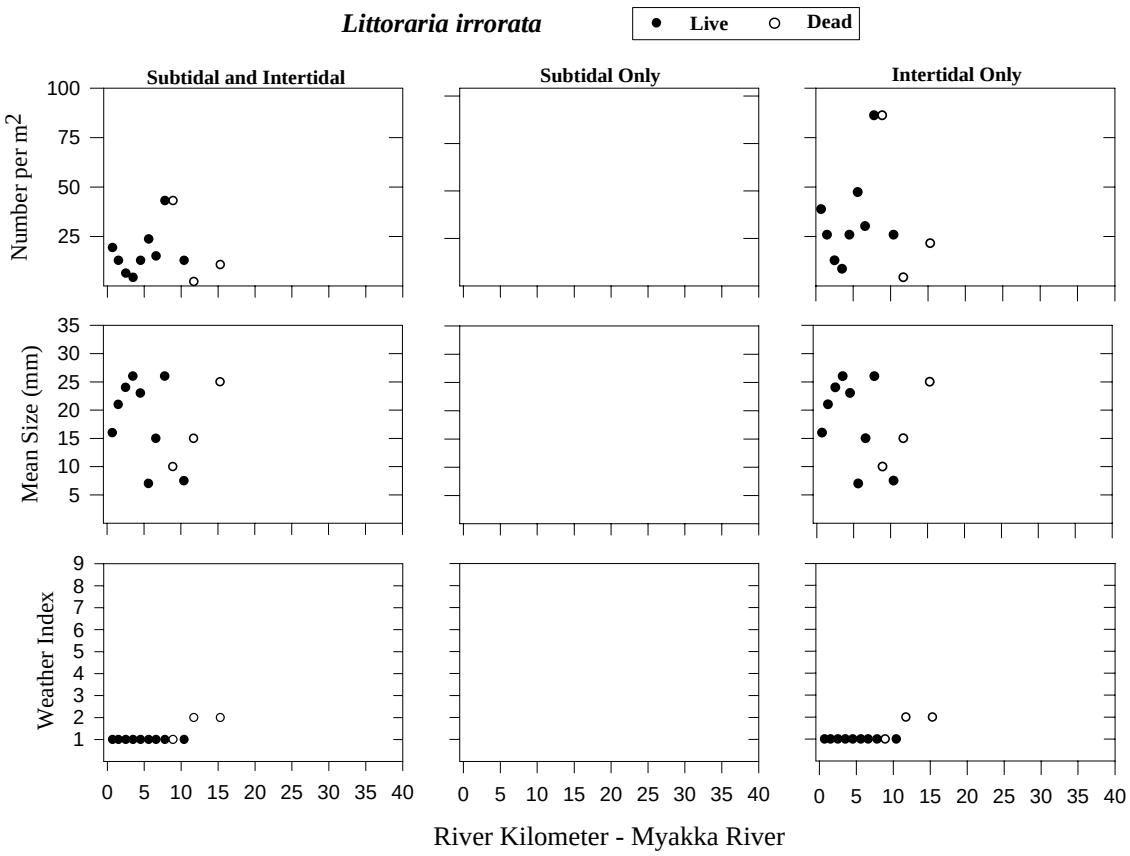

Figure 6. Density, size, and weather index values for live and dead collections of *Littoraria irrorata* as a function of distance from RK 0, in intertidal and subtidal strata.

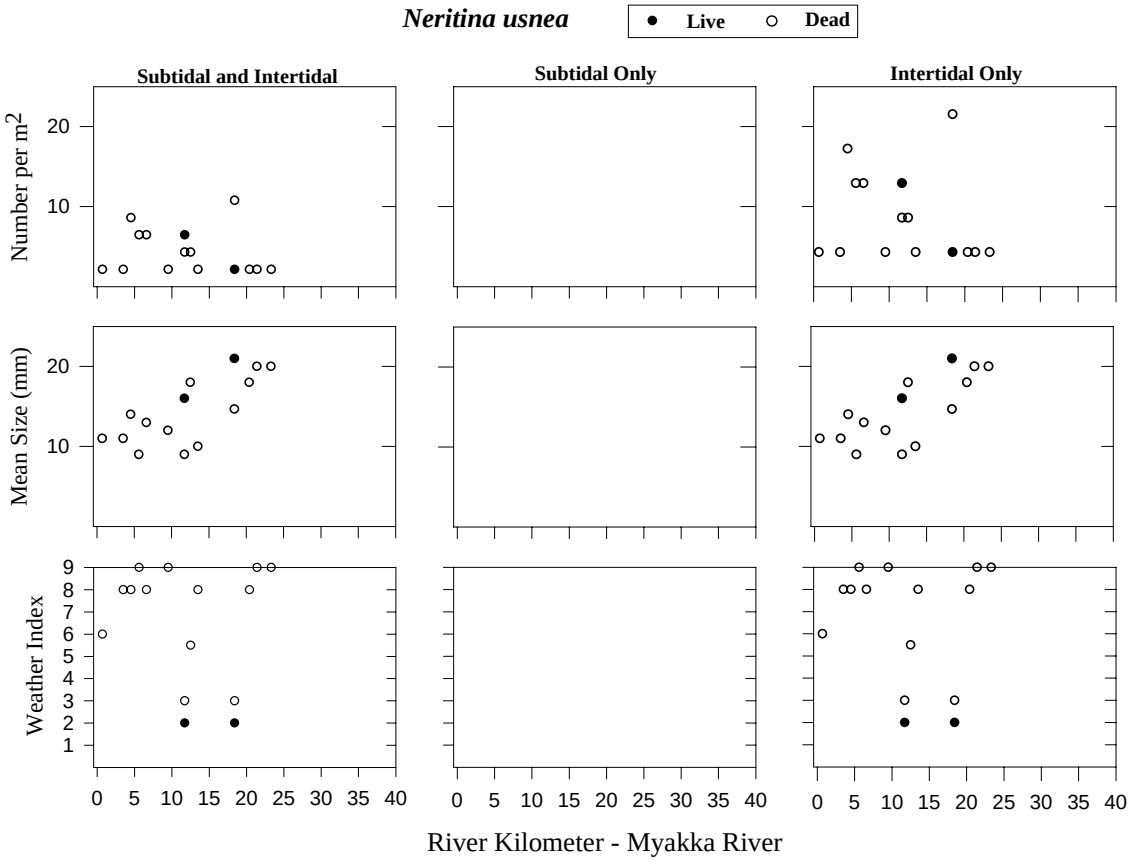

Figure 7. Density, size, and weather index values for live and dead collections of *Neritina usnea* as a function of distance from RK 0, in intertidal and subtidal strata.

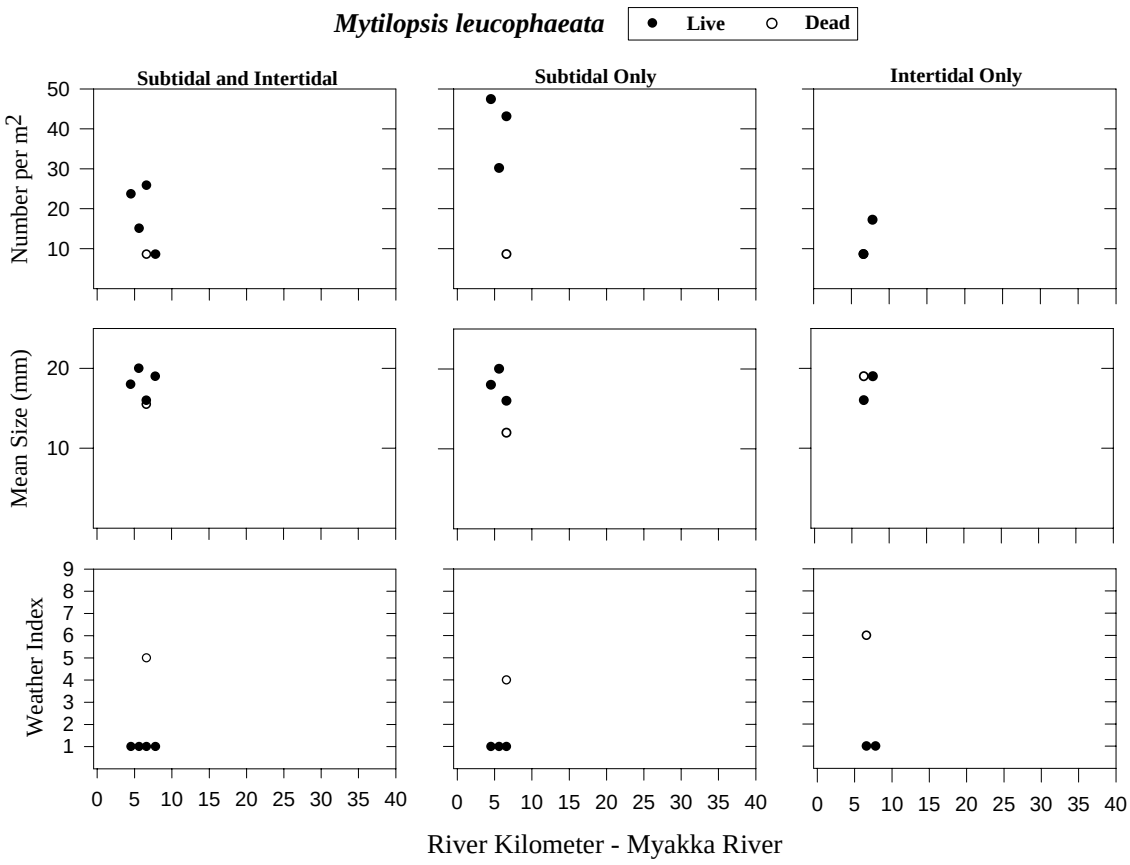

Figure 8. Density, size, and weather index values for live and dead collections of *Mytilopsis leucopheaeta* as a function of distance from RK 0, in intertidal and subtidal strata.

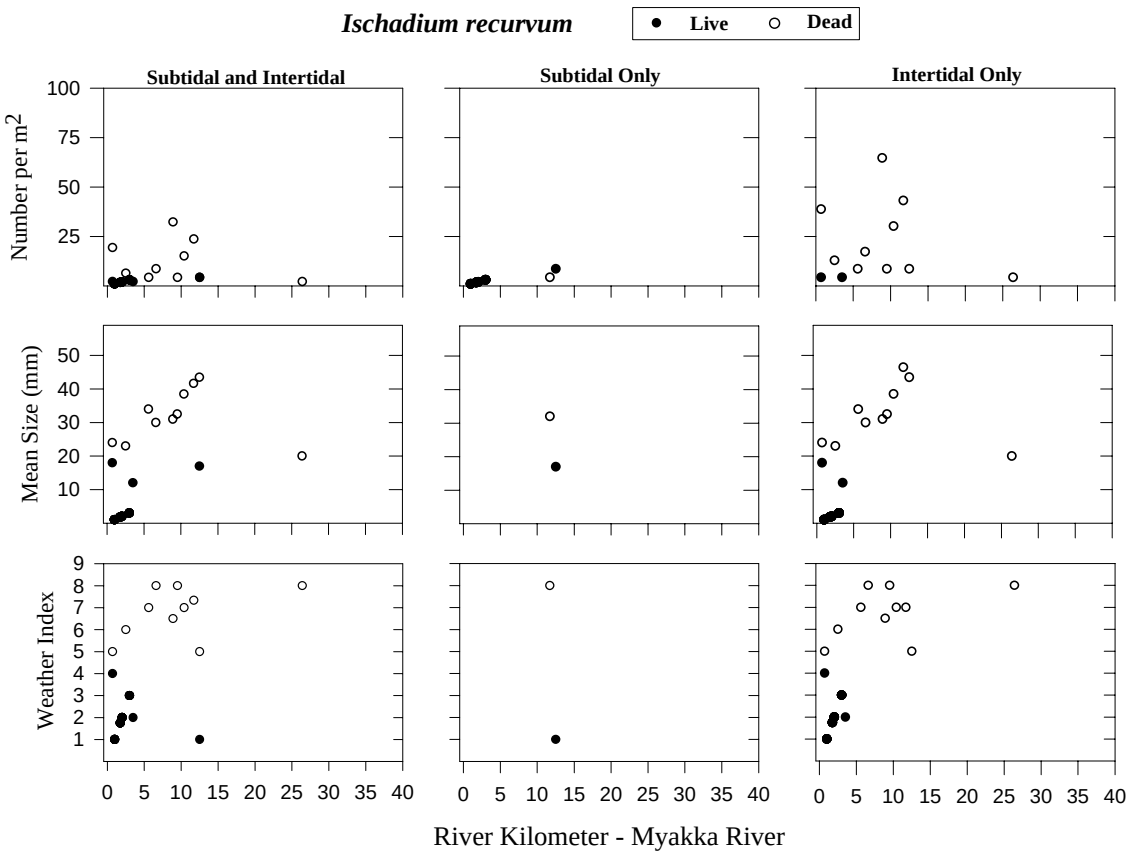

Figure 9. Density, size, and weather index values for live and dead collections of *Ischadium recurvum* as a function of distance from RK 0, in intertidal and subtidal strata.

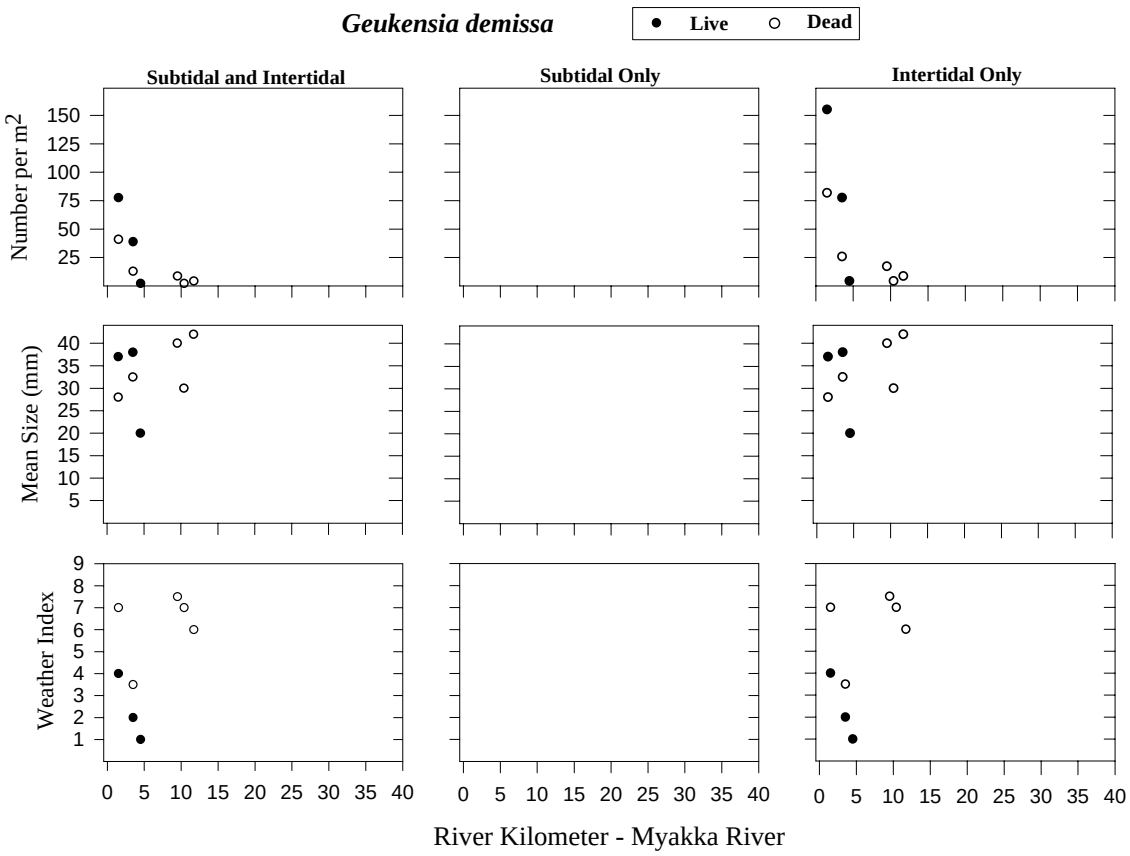

Figure 10. Density, size, and weather index values for live and dead collections of *Geukensia demissa* as a function of distance from RK 0, in intertidal and subtidal strata.

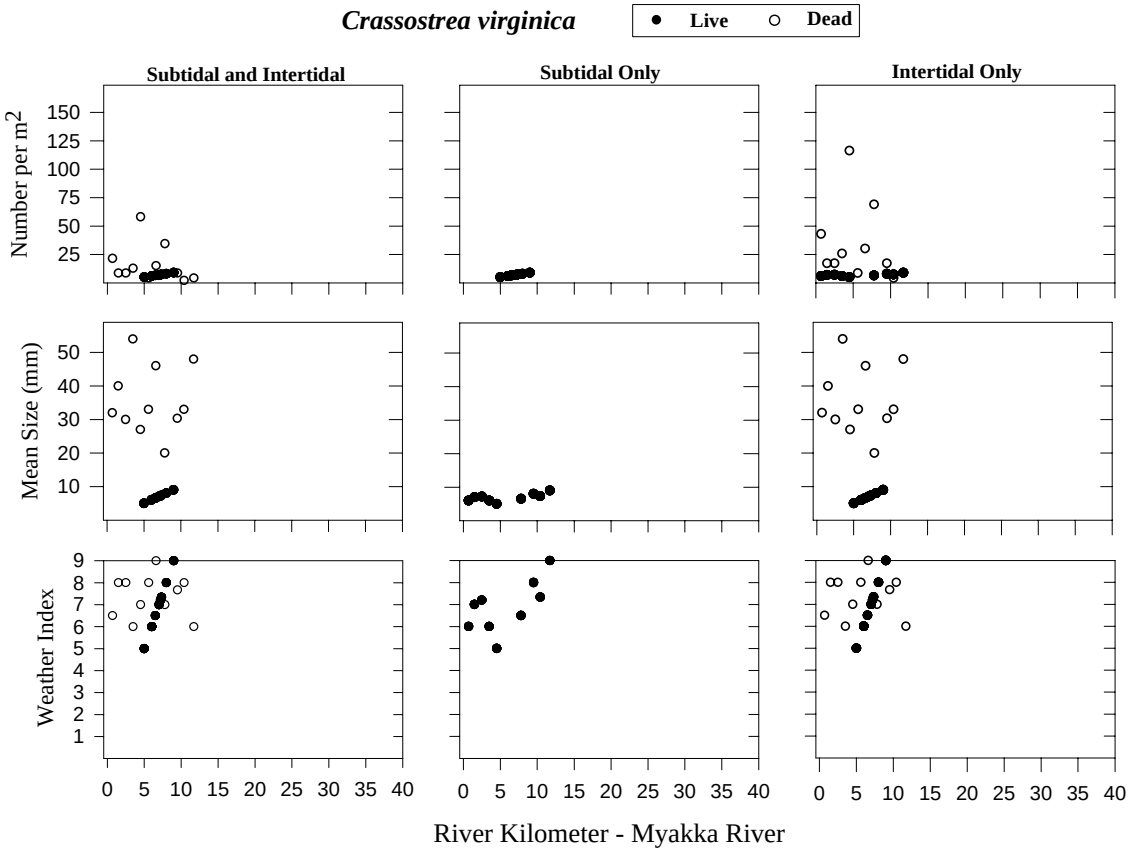

Figure 11. Density, size, and weather index values for live and dead collections of *Crassostrea virginica* as a function of distance from RK 0, in intertidal and subtidal strata.

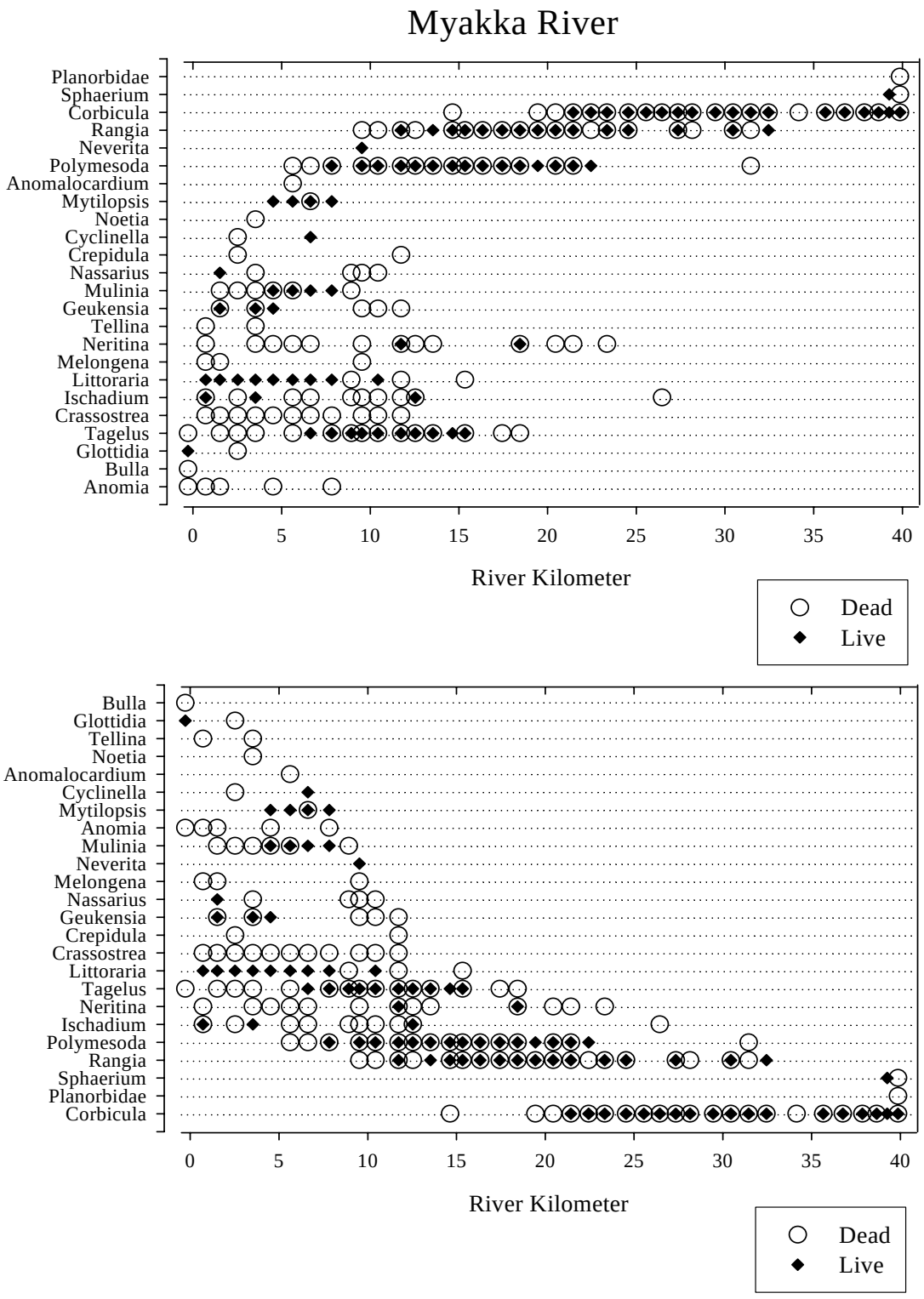

Figure 12. Dispersion of individual mollusk species in the Myakka River, sorted by first occurrence moving upstream (upper panel) and by first occurrence moving downstream (lower panel).

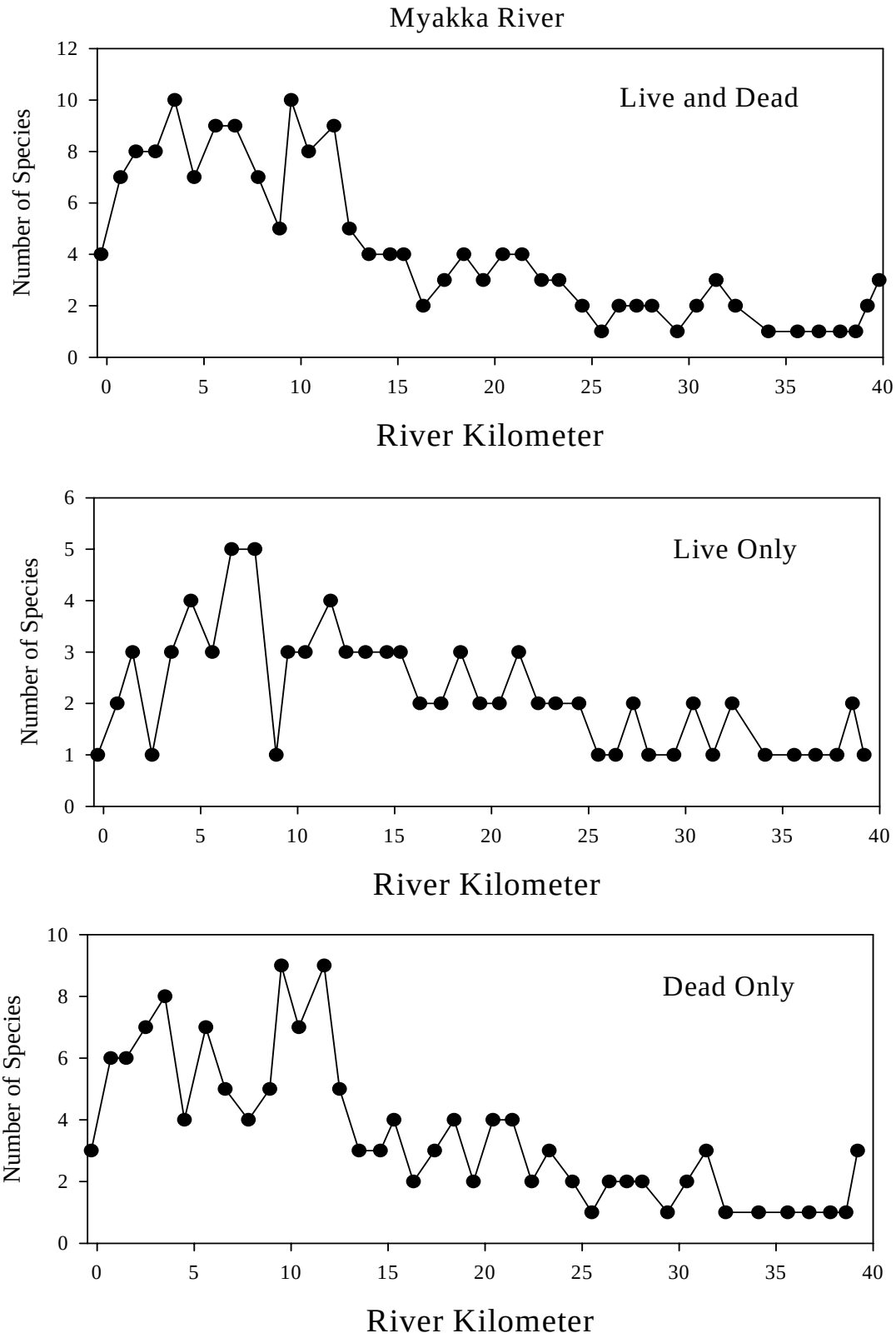

Figure 13. Species richness for live and dead mollusk collections relative to river kilometer.

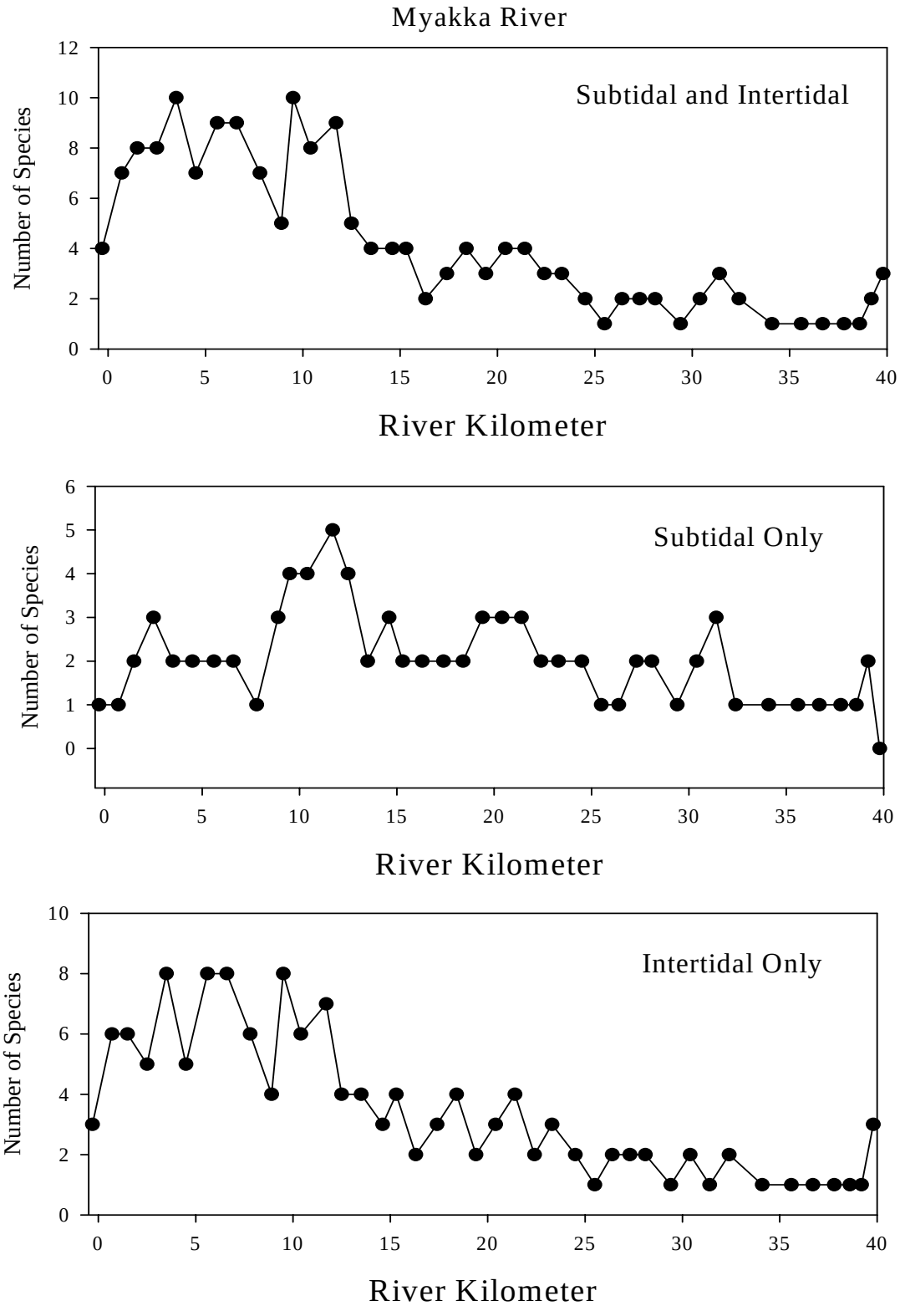

Figure 14. Species richness for intertidal and subtidal mollusk collections relative to river kilometer.

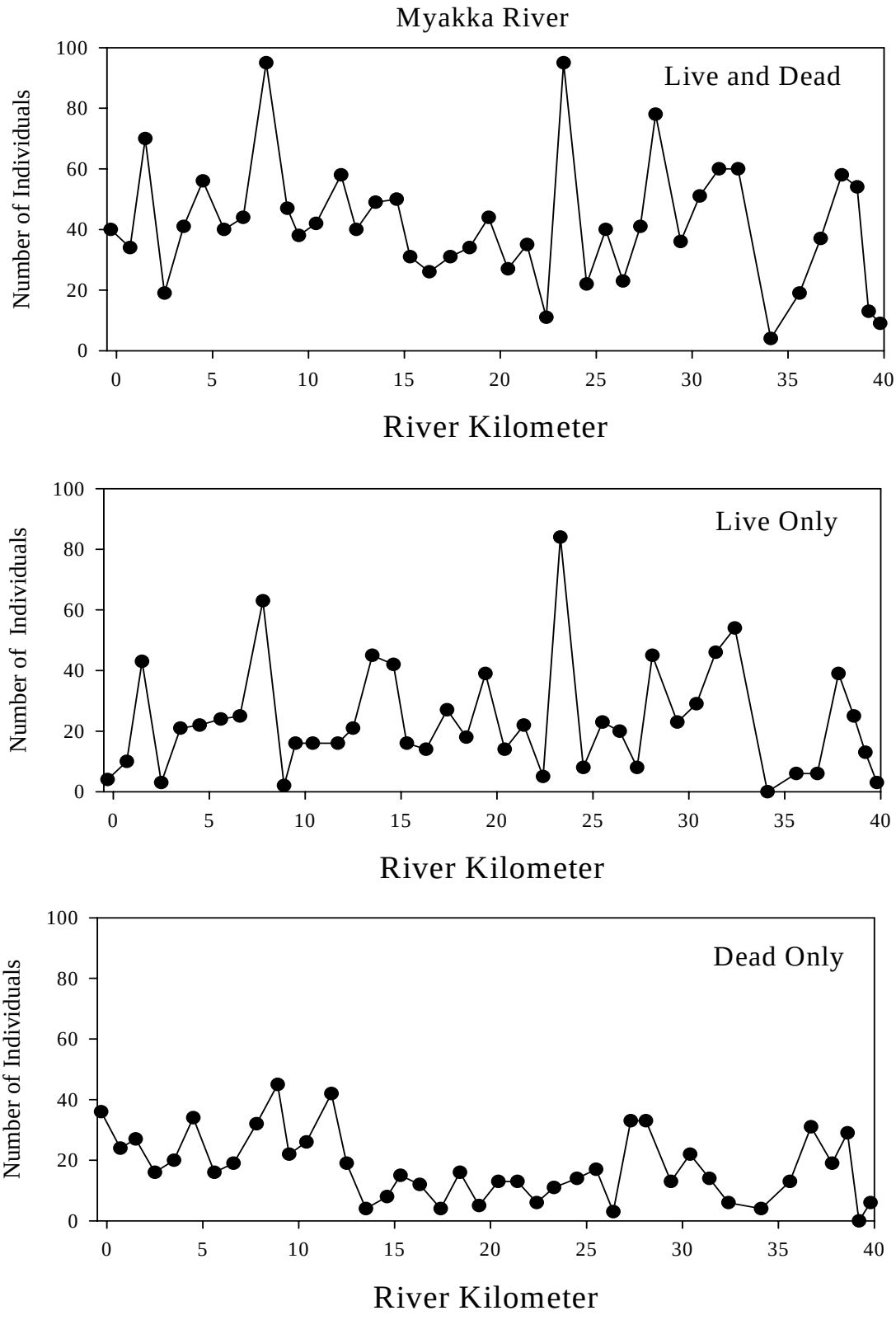

Figure 15. Faunal densities for live and dead mollusk collections relative to river kilometer.

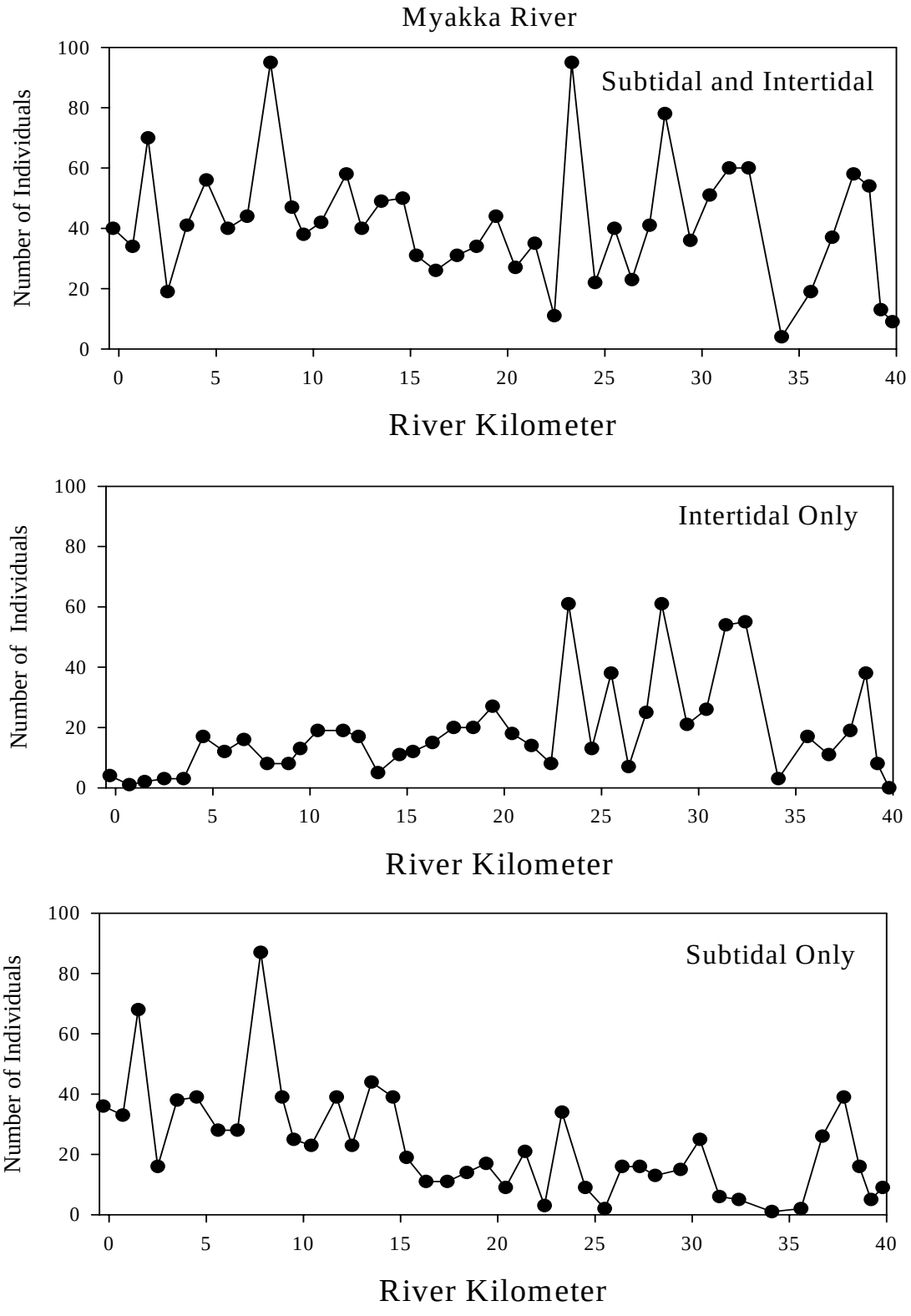

Figure 16. Faunal densities for intertidal and subtidal mollusk collections relative to river kilometer.

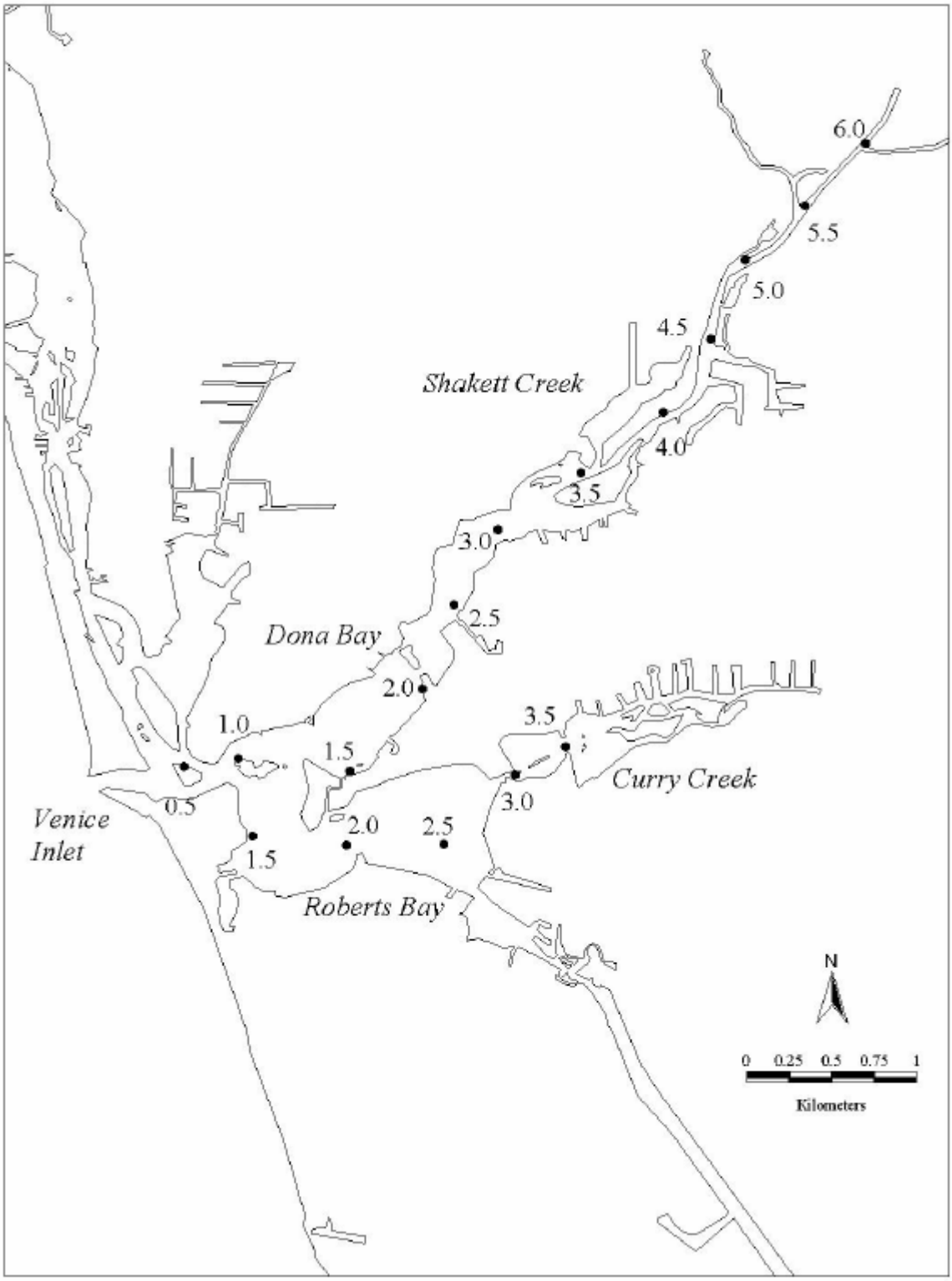

Figure 17. The tidal reaches of Dona and Roberts Bays, with Shakett and Curry Creeks. River kilometer (RK) 0.0 is at Venice Inlet's entry to the Gulf of Mexico. The RK system was developed by Sarasota County.

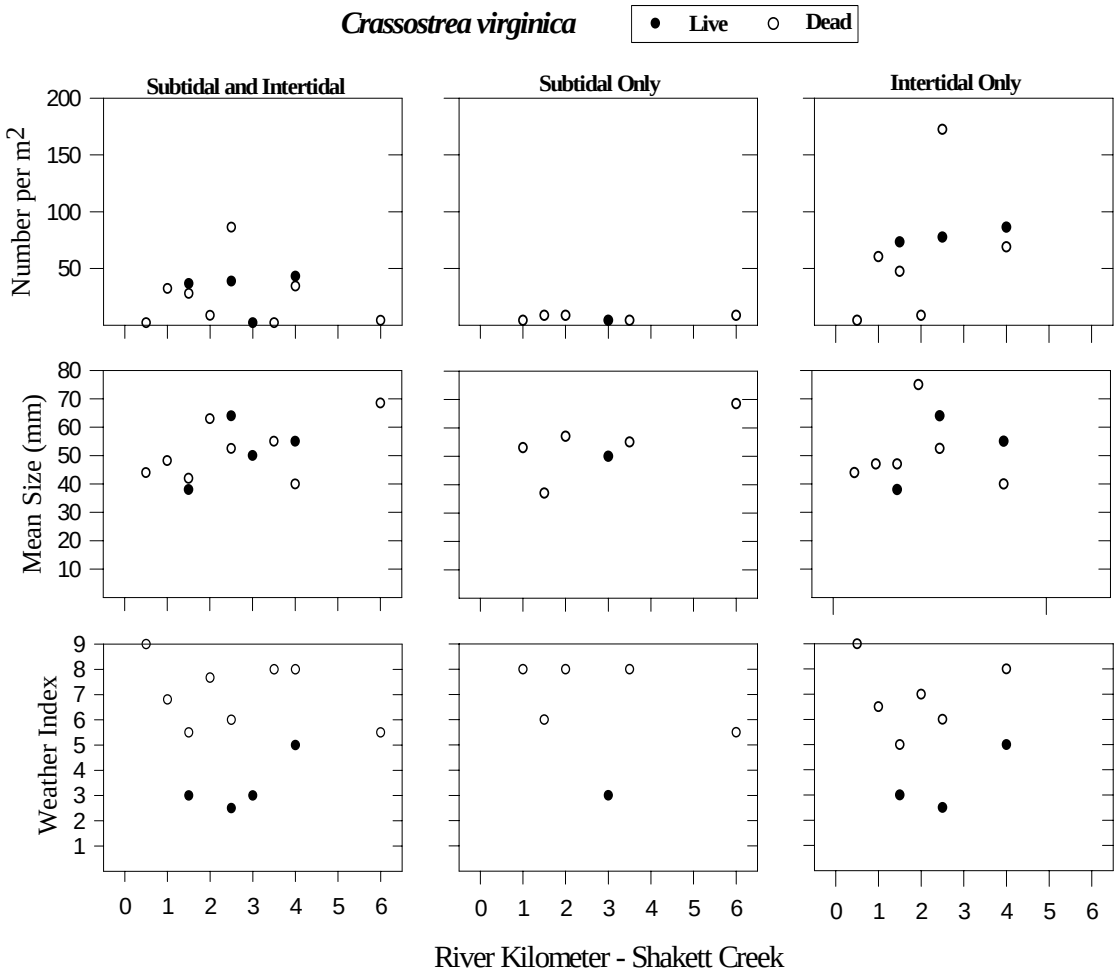

Figure 18. Density, size, and weather index values for live and dead collections of *Crassostrea virginica* as a function of distance from RK 0, in intertidal and subtidal strata of Dona Bay.

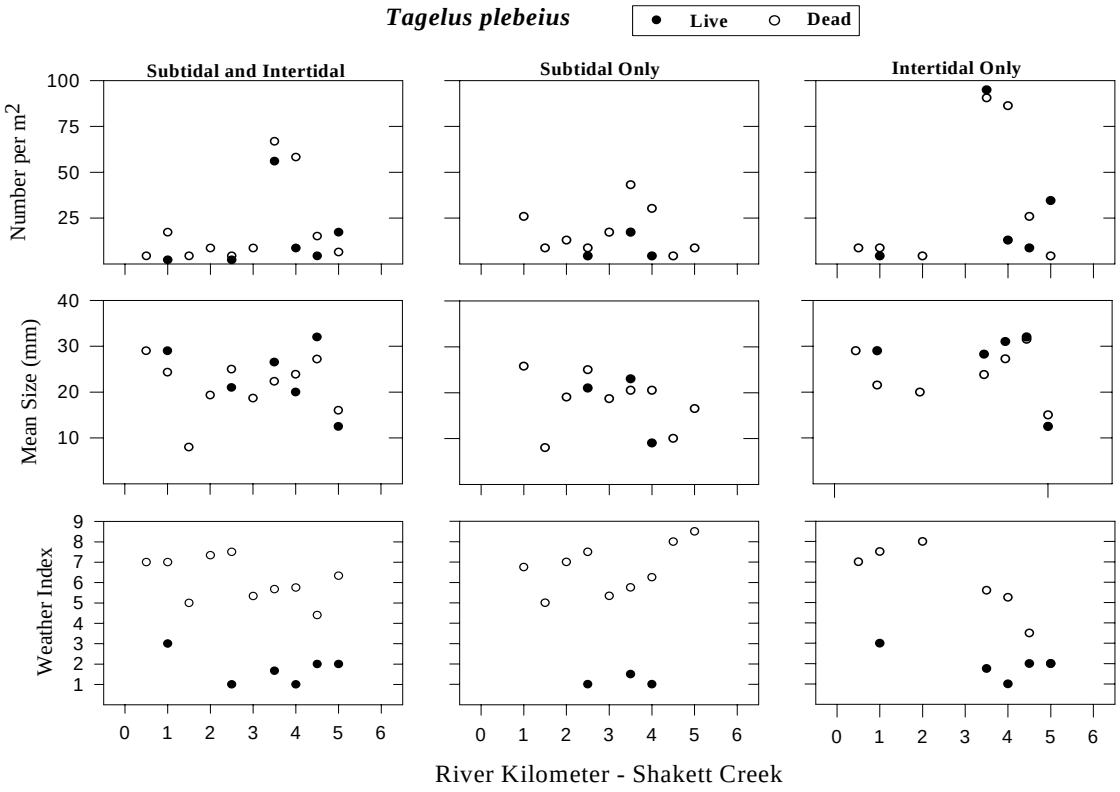

Figure 19. Density, size, and weather index values for live and dead collections of *Tagelus plebeius* as a function of distance from RK 0, in intertidal and subtidal strata of Dona Bay.

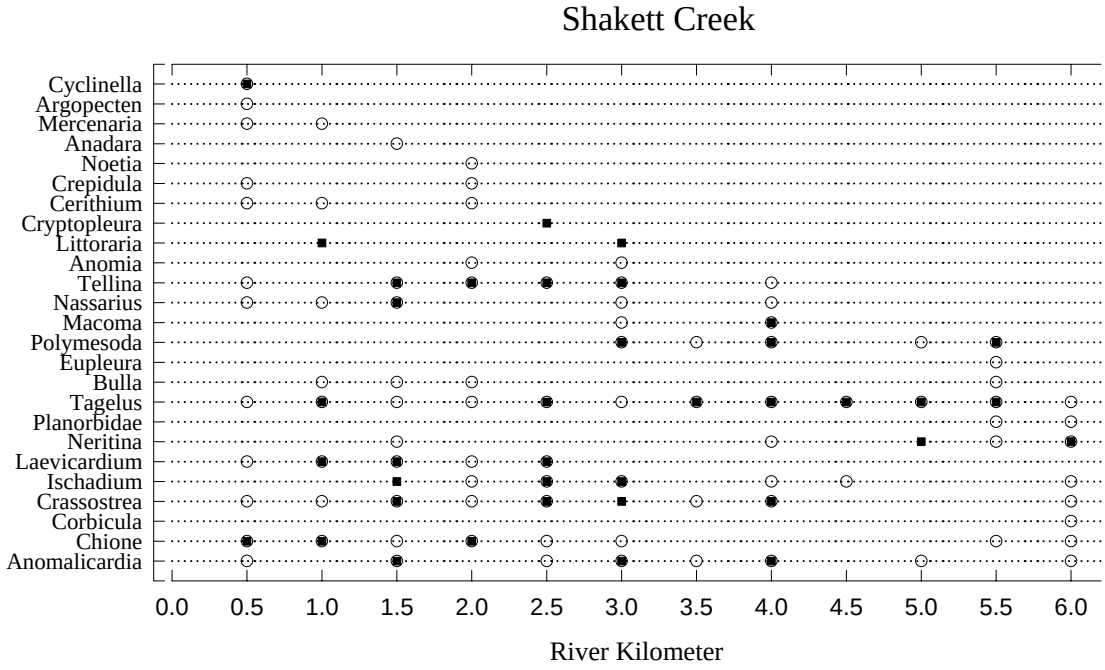

Figure 20. Dispersion of individual mollusk species in Dona Bay, sorted by first occurrence moving downstream.

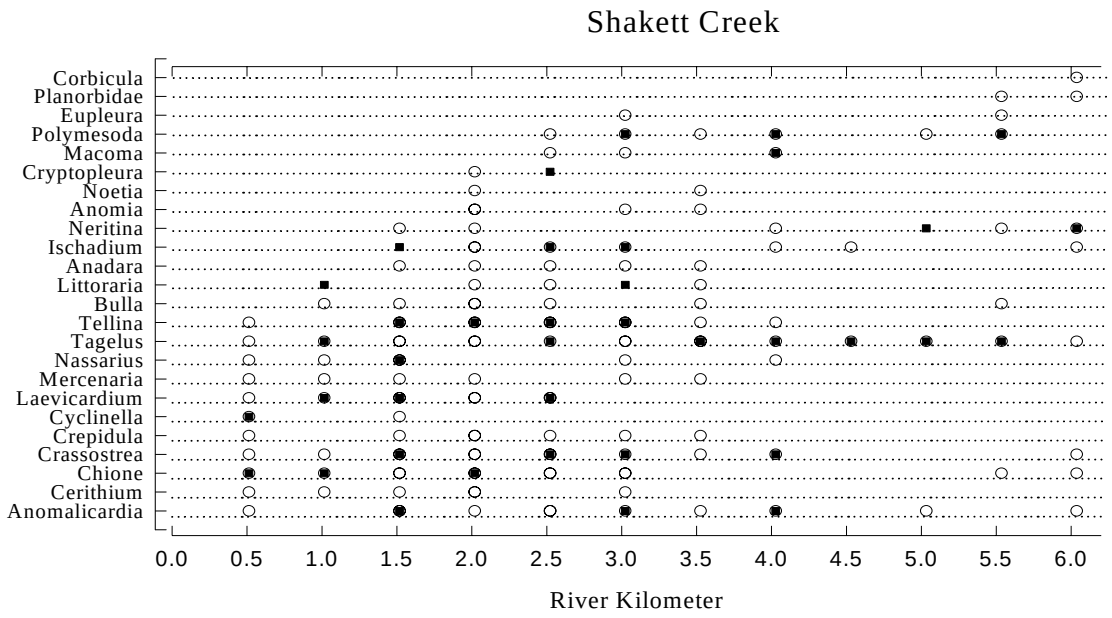

Figure 21. Dispersion of individual mollusk species in Dona Bay, sorted by first occurrence moving upstream.

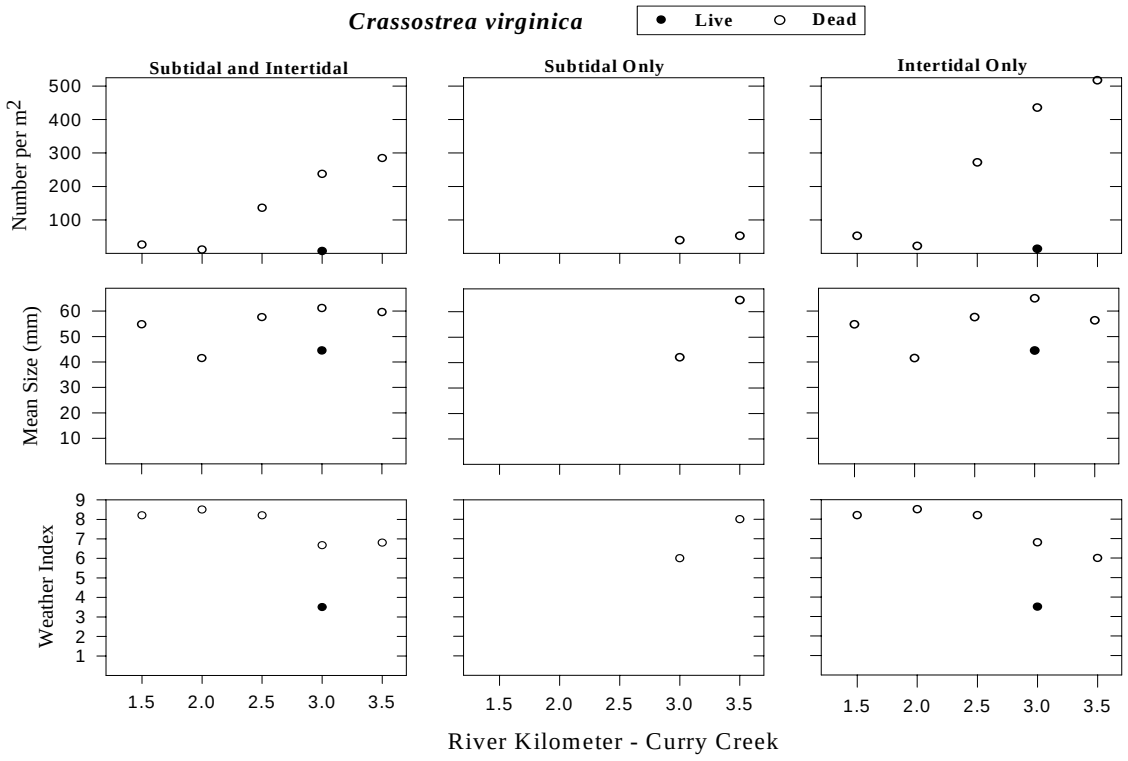

Figure 22. Density, size, and weather index values for live and dead collections of *Crassostrea virginica* as a function of distance from RK 1.5, in intertidal and subtidal strata of Roberts Bay.

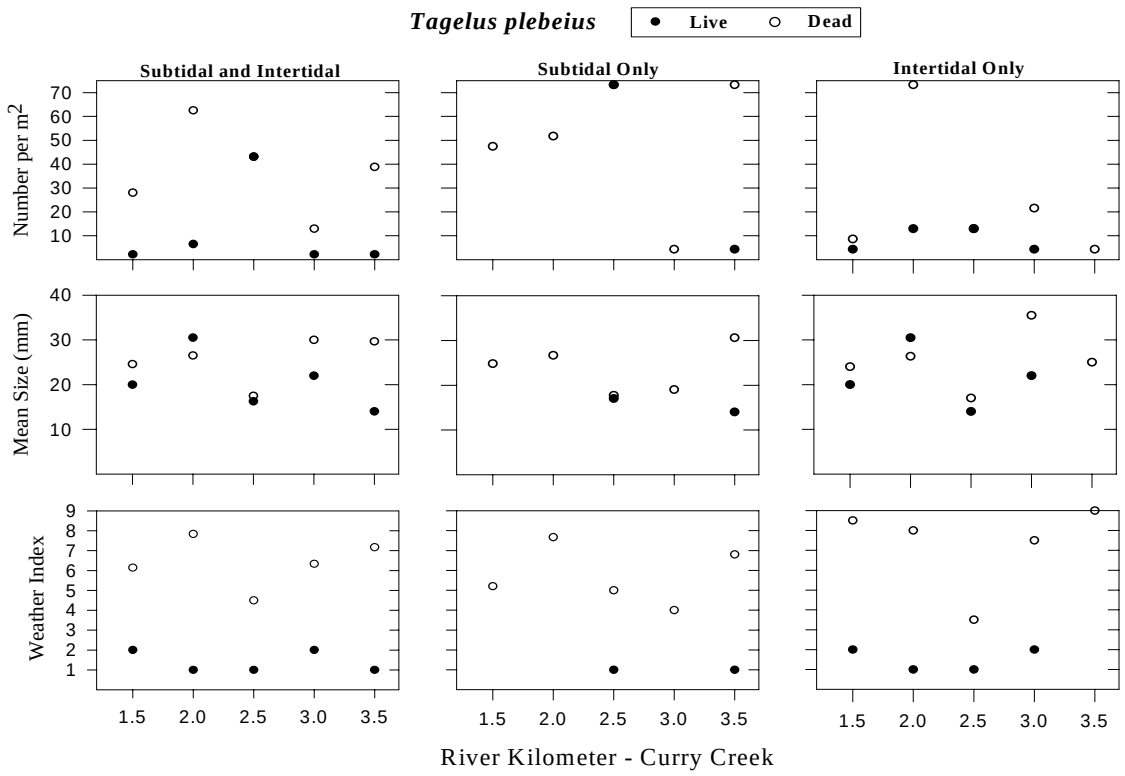

Figure 23. Density, size, and weather index values for live and dead collections of *Tagelus plebeius* as a function of distance from RK 1.5, in intertidal and subtidal strata of Roberts Bay.

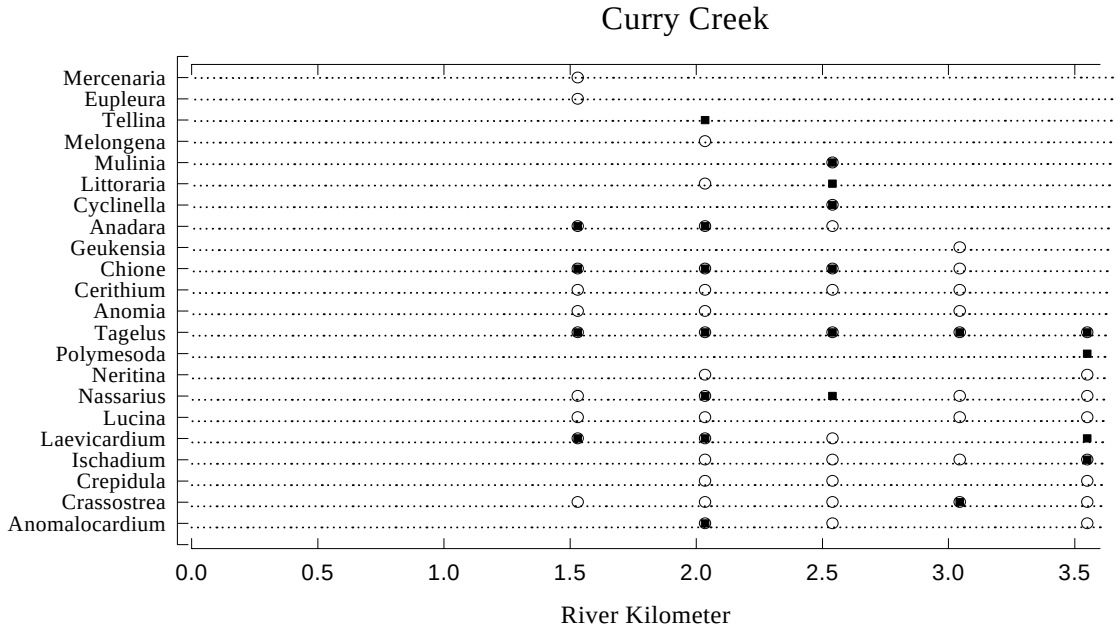

Figure 24. Dispersion of individual mollusk species in Roberts Bay, sorted by first occurrence moving downstream.

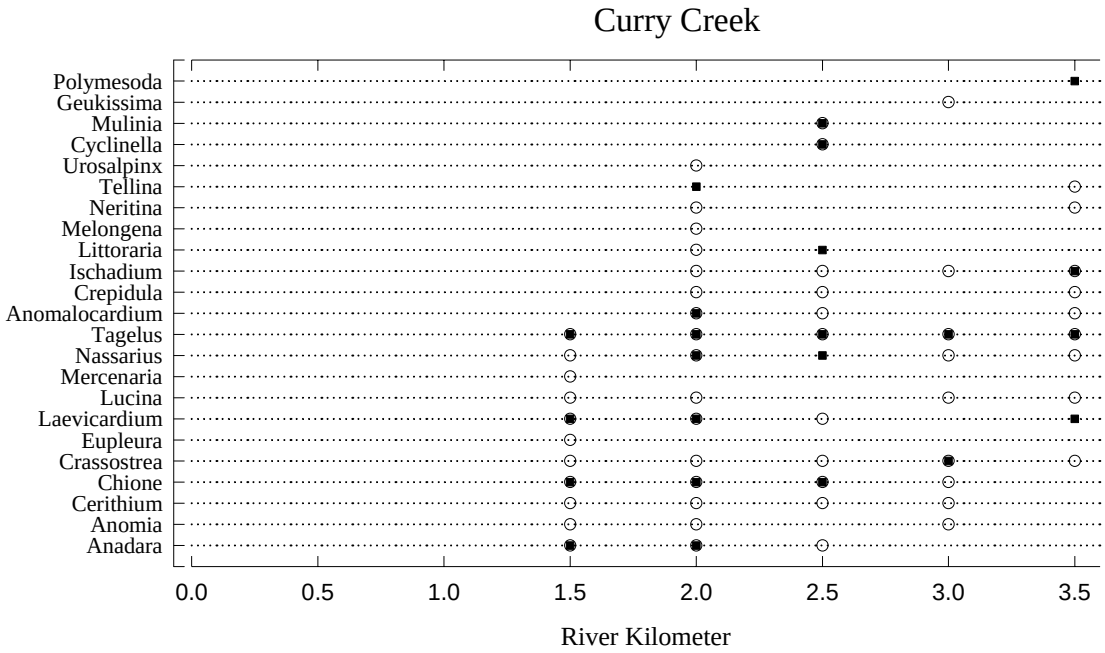

Figure 25. Dispersion of individual mollusk species in Roberts Bay, sorted by first occurrence moving upstream.

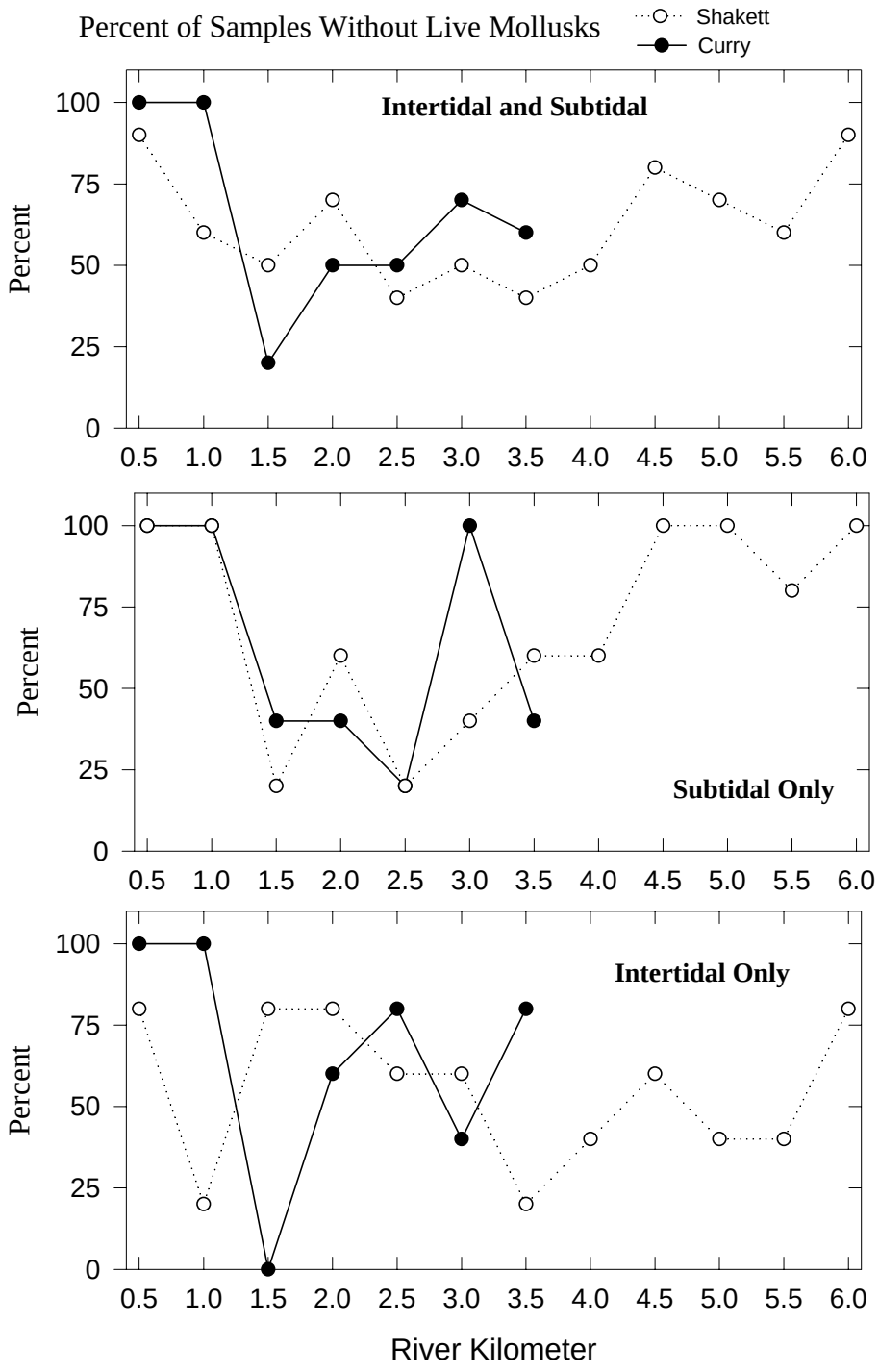

Figure 26. Percentage of samples lacking live mollusks as a function of RK and depth in Shakett and Curry Creeks.

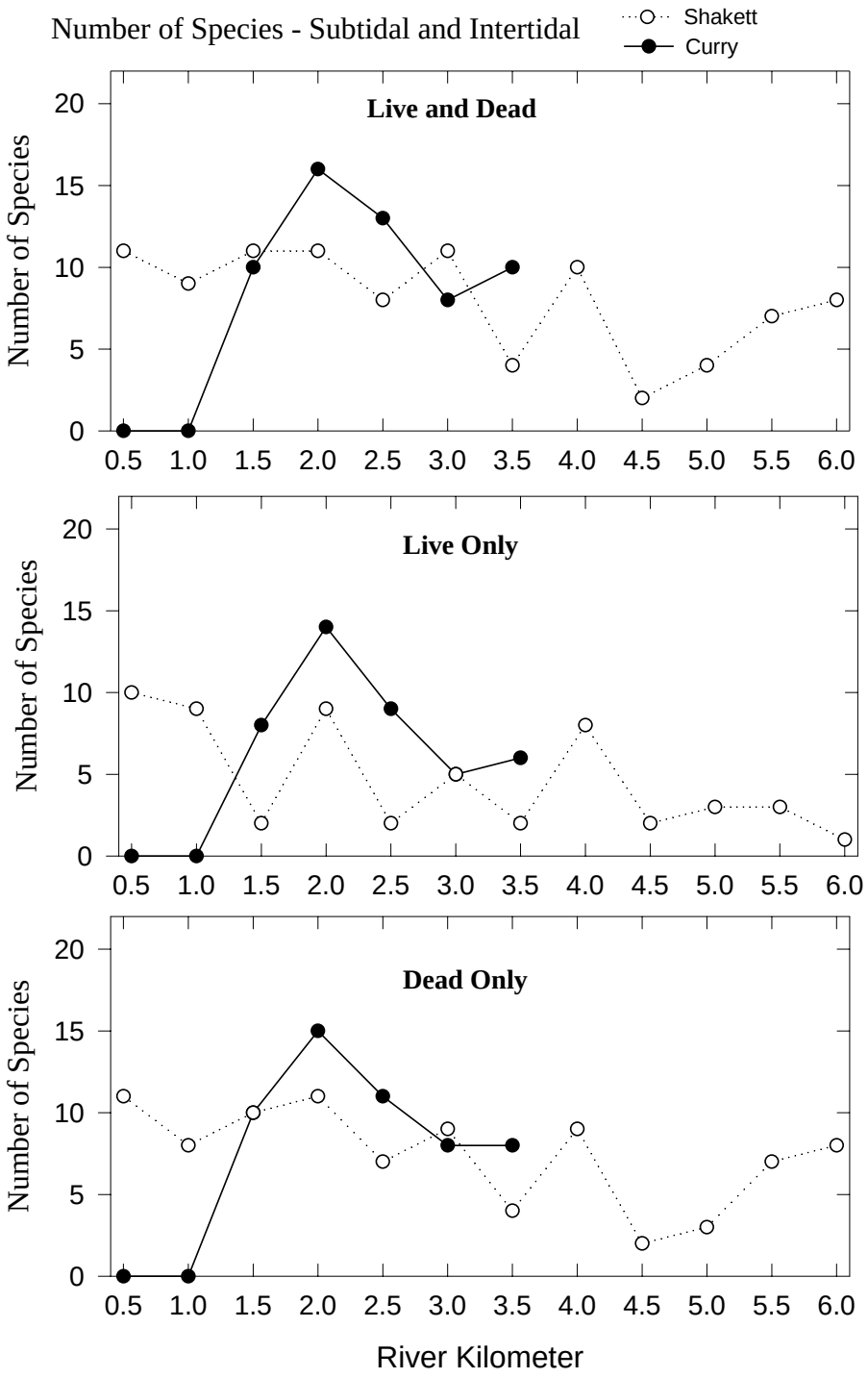

Figure 27. Number of live plus dead species as a function of RK and depth in Shakett and Curry Creeks.

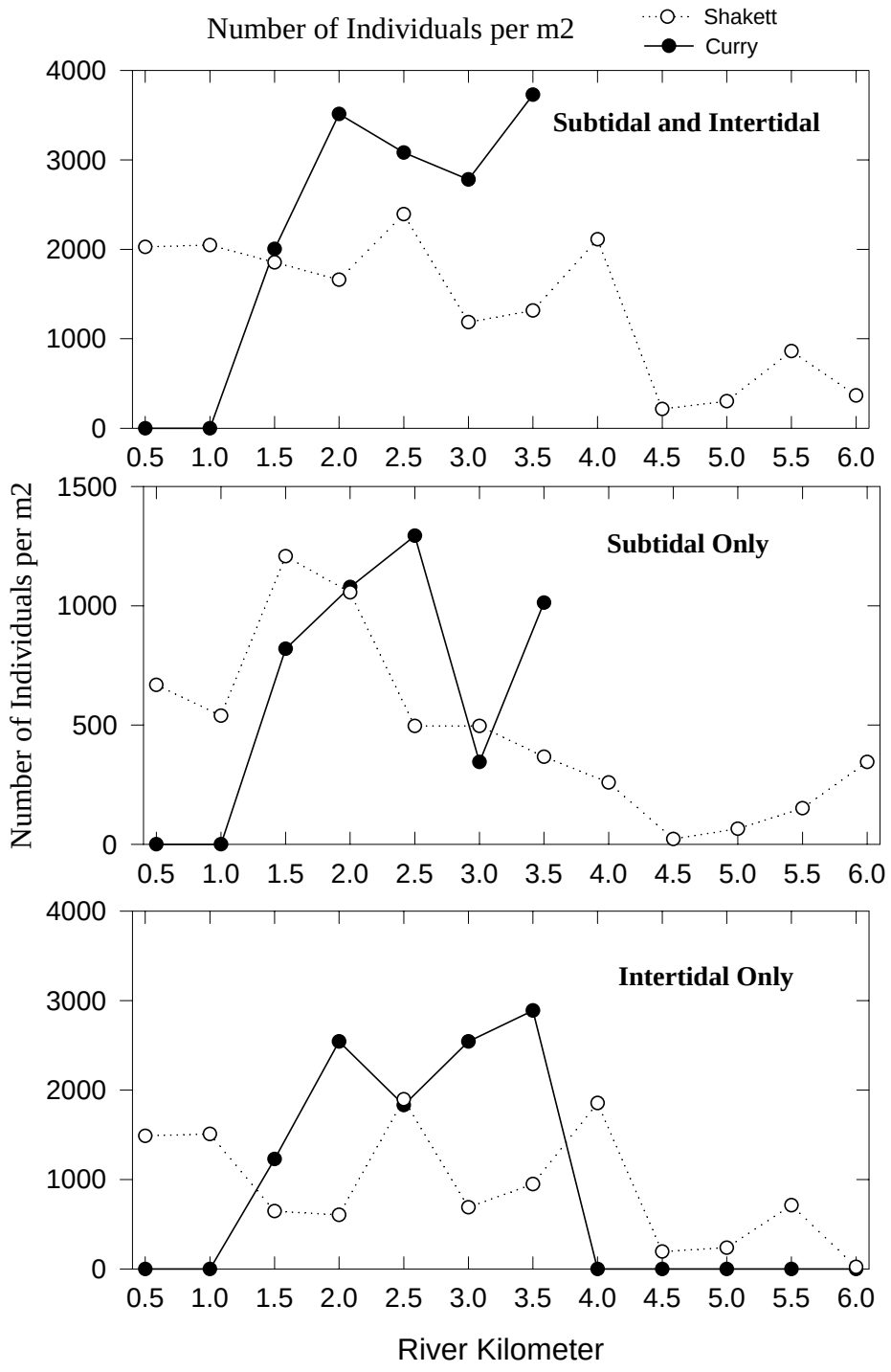

Figure 28. Live plus dead densities as a function of RK and depth in Shakett and Curry Creeks.

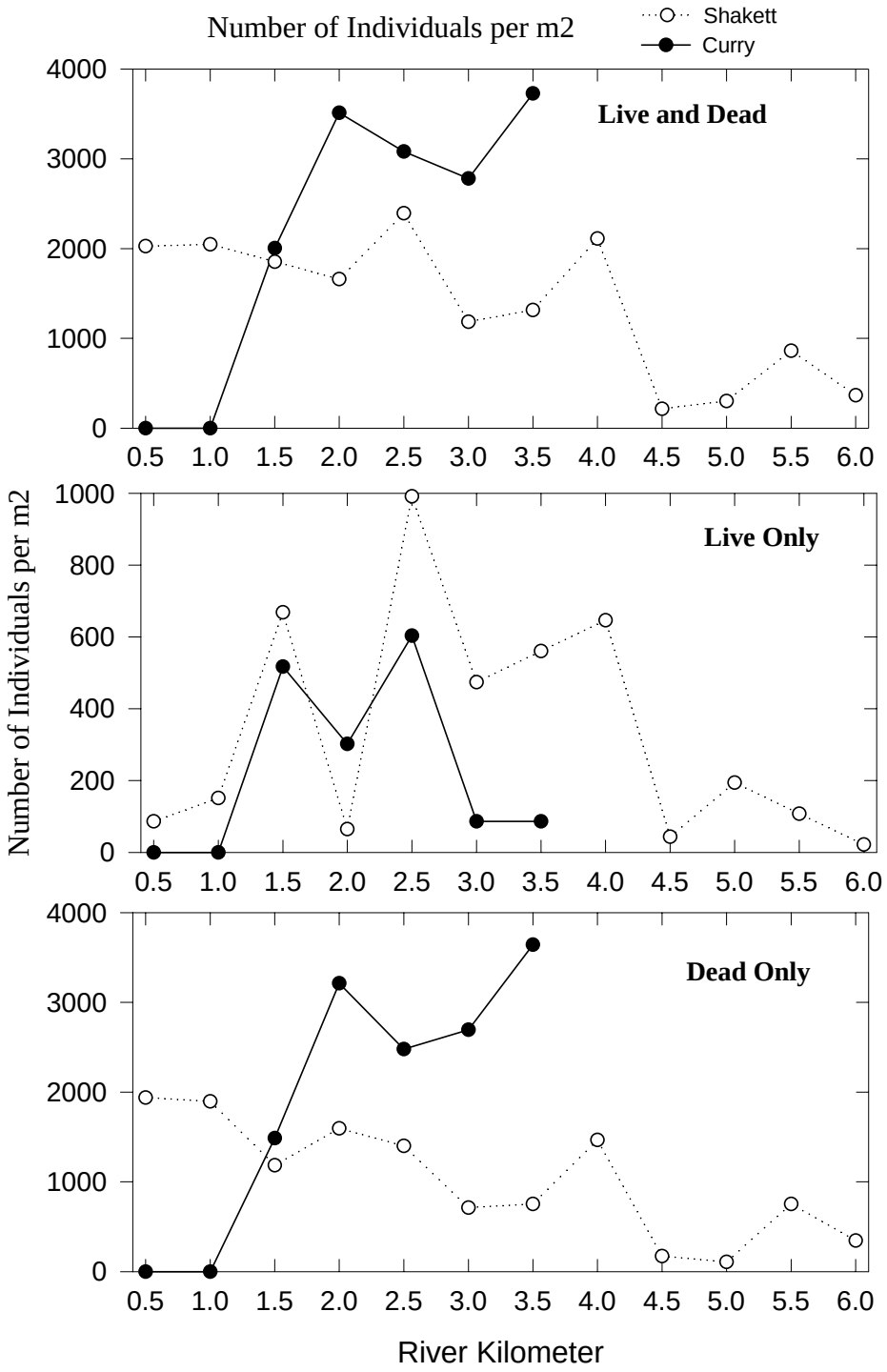

Figure 29. Intertidal plus subtidal densities as a function of RK and morbidity in Shakett and Curry Creeks.

APPENDIX 1

MYAKKA STATION DATA

APPENDIX 1
MYAKKA STATION DATA

APPENDIX TABLE 1

Myakka River Mollusk Survey: Station Data

River Kilometer	Date	Subtidal Time	Subtidal Latitude, deg N	Subtidal Longitude, deg W	Subtidal Depth, ft
3	6/29/2004	921	26.93594	82.17827	10.3
4		942	26.94328	82.18388	8.3
5		1053	26.94884	82.1889	7.6
6		1103	26.95474	82.19457	6.1
7		1147	26.95653	82.20427	11.1
8	6/30/2004	1029	26.95867	82.21371	12.8
9		1131	26.96315	82.22262	12.4
10		1156	26.96754	82.23132	7.4
11	6/29/2004	1358	26.97603	82.23443	5.1
12		1306	26.98473	82.23628	5.9
13	6/15/2004	1000	26.98954	82.24081	5.3
14		1126	26.99626	82.24405	4.1
15		1219	27.00202	82.253	1.6
16		1240	27.00332	82.26097	4.4
17		1344	27.0103	82.26794	5.9
18		1400	27.01851	82.27254	10.6
19	6/14/2004	1419	27.02605	82.27455	4.1
20		1323	27.03004	82.2749	7.4
21		1244	27.03751	82.28207	8.2
22		1201	27.04306	82.2885	6.2
23		1054	27.05003	82.29302	9.1
24	6/10/2004	1251	27.05434	82.29883	3.2
25		1212	27.06058	82.30614	3.6
26		1116	27.06501	82.31368	5.1
27		1018	27.0716	82.31483	6.8
28		938	27.08169	82.31914	8.3
29	6/8/2004	1512	27.08519	82.32182	4
30		1438	27.08691	82.32741	11.2
31		1355	27.09266	82.32698	5
32		1307	27.09726	82.32967	3.7
33		1233	27.10257	82.33378	1.5

APPENDIX TABLE 1

Myakka River Mollusk Survey: Station Data

River Kilometer	Date	Subtidal Time	Subtidal Latitude, deg N	Subtidal Longitude, deg W	Subtidal Depth, ft	
34		1200	27.10528	82.33862	2.1	
35		1115	27.11004	82.33907	1	
36		1036	27.11293	82.3458	1.3	
37	6/17/2004	1419	27.12458	82.35111	2.2	
38		1339	27.13007	82.35677	1.3	
39		1258	27.1362	82.35814	8	
40		1222	27.14188	82.36058	3	
41		1145	27.14564	82.36557	4	
42		1120	27.14982	82.36528	7	
44		1040	27.15295	82.36215	2	
BBCanal	6/17/2004	1455	27.11352	82.3519	2.6	Blackburn Canal
BS 1	6/14/2004	1506	27.02608	82.26635	12.5	Big Slough mouth
BS 2	6/15/2004	1452	27.03227	82.2532	9.2	Big Slough mid
BS 3		1535	27.04584	82.241	8	Big Slough top
DP 1	6/14/2004	1022	27.05404	82.29285	6.5	Deer. Pr. Cr. mouth
DP 2	6/10/2004	1435	27.05862	82.28968	4.1	Deer Pr. Creek mid
DP 3		1400	27.06319	82.28757	4.5	Deer Pr. Creek top

APPENDIX 2

MYAKKA SPECIES DATA

APPENDIX 2
MYAKKA SPECIES DATA

APPENDIX TABLE 2
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
Corbicula	44	i1	1	17	1	3	20	8
		i3				1	16	3
		i4	2	25	1			
	42	i1	2	6	1			
		i2	1	7	1			
		i3	2	8	1			
		s1	1	6	1			
		s2	2	21	1			
		s3	1	18	1			
		s4	2	36	1			
		s5	1	20	1			
	41	i1	7	10	1			
		i2				1	14	6
		i3	6	8	1			
		i4	1	8	1			
		i5	1	10	1			
		s1	3	16	2	4	20	6
		s2	1	18	1	7	16	3
		s3	2	13	8			
		s4	4	18	1	16	15	1
		s5				1	18	8
	40	i1	3	23	2	8	11	6
		i2	12	14	1			
		i3	8	19	2	3	13	5
		i4	1	26	2			
		i5	4	18	2			
		s1	5	16	1			
		s2	4	18	2			
		s3	2	8	1	1	11	4
		s4				2	13	6
		s5				5	17	6
	39	i1	4	36	1	5	22	7
		i2	1	22	1	3	20	7
		i3				12	18	8
		i4				1	17	8
		s2				1	23	1
		s3				1	4	2
		s5	1	23	1	8	12	6
	38	i2				1	25	6
		i4				1	26	3
		s1	1	24	1	8	19	5
		s2				1	38	5

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
		s4	4	27	1	1	27	2
		s5	1	23	1	1	25	1
	37	i2				1	6	5
		s1				1	24	4
		s4				1	22	5
		s5				1	22	3
	37A	s3	1	6	1			
		s4				1	4	4
		i1				1	11	8
		i4				1	23	5
	36	s1	1	4	1	1	16	3
		s2				1	5	1
		s4	51	4	1			
		s5				1	23	3
		i1				1	26	6
		i2	1	12	7			
		i3				1	9	9
		i4				1	29	5
	35	s1	2	18	2			
		s2	8	5	1	3	24	7
		s3	2	4	1	1	16	4
		s4	10	4	1			
		s5	21	5	1			
		i1				3	16	4
		i5	3	6	1			
	34	s1	3	6	1	2	28	4
		s2				1	9	9
		s3				1	28	7
		s4	3	9	2	2	27	5
		s5	2	9	1	2	26	3
		i1	1	26	1	1	20	7
		i2				3	26	5
		i3				4	25	7
		i4				1	30	6
		i5	3	25	4	2	18	7
	33	s1	2	11	3	1	14	6
		s3				1	30	4
		s4	8	5	1	2	16	4
		s5	7	4	1			
		i1				3	10	7
		i3	1	11	1	2	14	6
		i4	4	12	1	2	16	8
		i5	1	12	1	2	28	6
	32	s1	5	11	1	1	16	8

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
		s2	1	8	1	1	12	9
		s3	9	8	1	7	12	5
		s4	11	18	2	8	11	6
		s5	17	6	1			
		i1	2	7	1	1	18	5
		i3				3	24	
		i4				1	14	7
		i5				5	10	6
	31	s1				1	12	9
		s2				8	41	8
		s3	3	8	2	7	28	8
		s4				4	20	8
		s5				1	28	4
		i1				3	20	5
		i2				2	18	7
		i3				3	20	6
		i4				2	14	5
	30	s3	3	8	1	1	8	5
		s4				1	9	6
		s5	2	12	1			
		i4	14	11	1			
		i5	1	12	1			
	29	s1	6	13	3	8	20	5
		s2	4	20	2	2	24	8
		s3	6	13	2	4	15	5
		s4	2	8	1	1	16	6
		s5	5	11	1			
		i1				1	19	7
		i3				1	9	7
	28	s1				2	14	6
		s2				2	15	5
		s3	4	9	1	1	12	7
		s4	2	4	2	1	15	8
		i3				1	15	6
		i5				2	13	5
	27	s1				4	18	12
		s2	1	12	2			
		s3				1	4	6
		s4	34	4	1			
		s5	18	4	1			
		i1	7	1				
		i2	3	18	2			
		i3	4	11	1			
		i4	4	12	1			

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
		i5	5	18	1	1	14	3
	26	s2	1	16	3	2	28	7
		s3	1	18	2	1	16	7
		s5	1	8	1	1	10	7
	25	s1	3	5	1			
		s2				1	26	8
		s4				1	19	5
		i3				2	22	5
		i4				1	14	7
	24	s1				1	13	8
		s2				2	16	5
		s4				3	14	7
	DP3	s2	1	10	1			
		s4				1	16	7
	23	s2				1	8	6
	18	s2				1	6	8
Planorbidae	44	i1				1	10	5
	DP3	s2				5	24	7
Ribbed	44	i3				1	11	4
	42	s5	1	11	3			
Rangia	BB	i3	1	46	2			
	36	i3	1	40	2			
	35	s2				2	37	7
	34	s1	2	48	2			
		s4	2	25	2	1	29	6
		s5	5	27	1			
		i1	2	45	2			
		i2	2	42	1			
		i3	2	40	1			
		i4	1	30	6			
		i5	1	44	3	2	20	7
	32	s4				1	17	8
		i3				1	60	5
						4	52	8
	31	s4				1	56	8
		i1	1	44	3	1	50	3
		i2	1	42	2			
		i3	1	46	2			
		i4	1	60	1			
		i5	1	42	3			
	28	s5				1	60	7
		i1				1	61	7
		i2	1	55	5	1	61	7
		i3				1	60	4

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
		i5	1	48	4	1	21	8
	27	s1				3	62	8
		i1	1	45	5			
		i3	2	55	3			
		i4	1	36	2			
		i5	4	46	3	1	45	3
	26	s2				1	44	8
		i3				1	45	6
	25	s2				1	20	7
		i3	2	40	2			
		i4	2	58	5			
		i5				1	23	4
	24	s4	1	26	1			
		s5				4	35	8
		i2				1	44	6
	DP3	i2	3	44	2			
		i3	1	50	2			
		i4				1	40	7
		i5	3	47	3			
	DP2	s1	1	45	1			
		s2	1	44	5			
		s3	1	35	3	1	65	7
		s4	1	48	4			
		i2				1	58	7
		i3	1	52	1	1	58	7
		i4				2	66	7
		i5	1	47	2	1	52	7
	DP1	s1	1	46	2	1	40	3
		s3	1	36	1			
		i3				1	18	7
	23	s2	4	40	4			
		s3	2	11	1			
		s4	1	16	2			
		s5	1	32	1			
		i1				3	19	8
		i2	2	44	2			
		i5				1	20	5
	22	s1				1	20	7
		s3				1	43	6
		s4	1	41	2	1	52	6
		s5	4	42	2			

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
		i1				1	41	8
		i2				1	40	8
		i4				1	35	3
	21	s1	1	34	3			
		s2	1	38	2			
		s3	1	14	1	1	22	8
		s5				1	56	8
		i4	1	40	3			
		i5	2	37	3			
	20	s1	4	30	2	2	17	5
		s2	2	34	1			
		s4	1	32	1	2	40	8
		s5	2	36	2			
		i1				1	38	8
		i3				3	44	8
	19	s3	2	15	2	2	45	7
		i3	1	42	3			
	BS1	s1				1	30	8
		s3	1	40	2	2	26	7
		s4				1	47	8
		s5				1	50	6
		i1				1	36	7
		i4	1	46	2			
		i5				1	53	6
	13	s1				1	22	6
		s3				1	36	5
		s4				1	15	8
	14	s1				1	30	6
		s3				1	9	7
		s4				2	30	6
	15	s1				4	28	5
		s2				2	25	5
		s4	1	36	1			
		s5	1	26	8			
	16	s1				1	9	5
		s3				2	23	4
		s5				2	52	8
	17	i1	1	40	1			
		s1	1	20	1			
	18	s5	1	44	2			
		i5				3	30	6
	BS2	s2				1	50	7
		s3	1	50	2			
		s4	3	48	2	1	61	8

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
Polymesoda	35	s1				5	31	8
	26	i3	1	27	2			
		i4	1	19	2			
	25	s2	1	10	2	4	14	6
		s3	1	10	1			
		s4	2	8	2			
		i1	6	10	1			
		i3	1	32	6			
		i4	1	18	3			
		i5	3	9	2	1	32	6
	24	s1	2	10	1			
		s2	1	14	1			
		s3	4	9	1			
		i1	2	10	1	1	15	8
		i3	1	12	1			
		i4	2	7	1			
		i5	1	10	1			
	DP2	s4	1	13	1			
	DP1	s2	3	12	1			
		s3	2	11	2			
		s4	2	8	1			
		s5	6	4	1			
		i3	3	12	2			
		i4	1	14	2			
		i5	1	12	2			
	23	s1	8	10	2			
		s2	1	8	1			
		s3	1	9	1			
		s4	4	12	1			
		s5	4	8	1			
		i1	3	14	3			
		i2	3	15	2			
		i3	2	13	1			
		i4	2	9	1			
		i5	1	31	3			
	22	s1	3	15	2			
		s2	1	12	3			
		s3	6	11	2			
		s4	2	10	2			
		i3				1	37	5
		i4				2	44	4
		i5				1	40	7
	21	s1	4	9	1			
		s2	3	10	1			

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
		s4	2	8	1			
		s5	6	11	1			
		i2	2	10	2	1	12	4
		i3	4	12	4			
	20	s1	1	8	1			
		s3	1	11	3			
		i1	2	35	3			
		i2	1	42	6	3	30	8
		i5				1	40	9
	19	s2				1	20	9
		s4	2	12	2	4	20	6
		s5				1	11	8
		i2	1	9	3			
		i3	2	14	3			
		i4	4	11	3	1	36	6
	BS1	s4	2	7	1			
		s5	1	13	2			
		i2				1	9	8
		i3	2	16	3	1	16	6
		i4				1	16	7
		i5	1	16	1			
	13	s1				1	12	13
		s2				3	10	5
		s3	4	9	1			
		i4				1	18	6
		i5	1	10	2			
	14	i4	1	12	1			
		i5	1	10	1			
		s1				1	17	6
		s2	1	9	1	1	10	4
		s4				4	11	7
		s5				4	30	2
	15	i1				6	30	5
		i3	1	10	1			
		i4	1	31	2			
		i5	1	14	2			
		s1				3	10	6
		s2	1	24	2	3	14	5
		s3				1	9	6
	16	s1				1	3	5
		s3				1	17	5
		s4	3	10	1	1	9	1
		i1	2	22	1	1	30	6
		i2	2	9	1			

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
		i3	3	10	1	2	22	4
		i4	2	14	2			
		i5				2	7	3
	17	i1	1	10	1			
		i2	3	12	1			
		i4	3	17	1			
		s3				1	13	7
		s5	2	8	2	1	10	3
	18	s1				1	4	3
		s3	4	7	1	1	6	2
		s4	1	9	1	1	13	4
		s5				1	11	6
		i1	7	12	1			
		i5	2	12	2			
	BS2	s5	2	8	1			
		i3	1	5	1			
		i4	1	12	1			
	11	i5	24	24	4	13	20	9
	10	i2				1	27	9
	9	i2				4	21	6
Ischadium	30	i2				1	20	8
	DP3	s2				1	20	8
	BS1	s2				1	22	9
	13	i1				1	30	9
		i3				1	35	7
	14	i1				1	42	6
		i5				6	35	8
	15	i1				4	45	8
		i4				6	48	6
		s1				1	32	8
	16	s2	2	17	1			
		i2				1	53	8
		i3				1	34	2
	4	i3	1	18	4	9	24	5
	6	i2				3	23	6
	7	i4	1	12	2			
	12	i1				6	31	7
	12	i5				9	31	6
	9	i4				2	34	7
	10	i3				4	30	8
Neritina	27	i1				1	20	9
	25	i4				1	20	9
	24	i5				1	18	8
	DP3	s4				1	17	8

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
	22	i2				2	16	3
		i3				1	16	3
		i5	1	21	2	2	12	3
	BS1	s1				1	21	8
		s3				1	24	9
		i5	2	21	1			
	13	i5				1	12	9
	15	i3	3	16	2			
		i4				2	9	3
	16	i3				1	27	3
		i4				1	9	8
	17	i3				1	10	8
	4	i1				1	11	6
	7	i3				1	11	8
	8	i1				4	14	8
	10	i4				3	13	8
	9	i2				3	9	9
Tagelus	22	i1				1	29	2
	21	i3				1	22	3
	19	i2	1	19	2			
		i5	3	27	2	1	33	4
	BS1	s1	2	18	1			
		s2				2	31	7
		s5				1	27	8
		i1	2	24	3			
		i3	2	21	4			
	13	s5	1	16	4			
		i1	1	19	4			
		i3				1	26	6
		i4	3	24	4			
		i5	5	14	3			
	14	i1	1	16	2			
		i2	5	22	1			
		s2	1	14	2			
		s3				1	19	5
		s4				1	12	7
	15	i1	4	28	2	3	21	6
		i4	2	27	2			
		i5	1	29	3			
		s2				1	16	6
	16	s3	2	16	1			
		s5				2	27	7
		i1	2	40	2			
		i2	2	11	1			

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
		i4	1	34	1			
	17	i1	8	16	1			
		i2	2	13	1			
		i3	7	14	1			
		i4	12	26	1			
		i5	5	20	1	1	20	1
	18	i1	2	17	1			
		i2	4	28	1			
		i3	11	23	1			
		i4	9	20	1			
		i5	1	15	1			
	BS2	s4				1	16	5
		i5	1	28	7			
	3	i1				2	14	7
		i2				1	16	8
		i3				2	11	9
	5	i4				1	22	8
	6	i1				3	21	5
		i5				2	34	6
	7	i3				2	30	9
	12	s5				2	10	2
		i3	2	14	1	1	13	2
	11	i3	7	31	1	2	14	6
	10	i1	1	28	5			
	9	i3				2	13	7
Littorina	19	i1				5	25	2
	14	i3	1	9	1			
		i5	5	6	1			
	15	i4				1	15	2
	5	i5	6	21	1			
	6	i4	3	24	1			
	7	i5	2	26	1			
	12	i2				20	10	1
	11	i1	20	26	1			
	8	i1	6	23	1			
	10	i4	7	15	1			
	9	i1	11	7	1			
	4	i5	9	16	1			
Large razor	7	i1				1	42	5
Nassarius	13	s3				1	10	2
	14	s4				1	13	4
	5	s5	1	4	1			
	7	i1				1	8	3
	12	s5				2	10	2

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
	12	i4				1	11	4
Melongena	13	i1				1	23	1
	4	i5				1	29	4
	5	i4				1	34	4
	4	i2				1	16	4
Crassostrea	13	i1				1	31	8
		i3				1	30	7
		i5				2	30	8
	14	i3				1	33	8
	15	i4				2	48	6
	4	i1				4	37	7
		i4				6	27	6
	5	i2				3	25	8
		i3				1	55	8
	6	i1				4	30	8
	7	i3				6	54	6
	11	i2				16	20	7
	8	i2				11	36	7
		i3				9	19	6
		i5				7	26	8
	10	i2				7	46	9
	9	i3				2	33	8
Polinices	13	i2	1	22				
Geukensia	13	i2				1	44	7
		i4				3	36	8
	14	i2				1	30	7
	15	i1				2	42	6
	5	i1	36	37	4	19	28	7
Crepidula	15	s1				1	14	4
	6	s5				1	12	5
Anomia	3	i1				8	11	6
		i2				9	10	6
		i3				4	18	5
		i5				9	18	5
	4	i4				1	11	6
	5	i4				1	22	7
	11	i3				1	17	6
	8	i5				1	18	7
Bulla	3	i2				1	16	7
Glottidia	3	s2	3	8	1			
		s3	1	9	1			
	6	s5				1	16	7
Mulinia	5	s5				1	11	5
	6	s5				1	16	7

APPENDIX TABLE 2 continued
Myakka River
2004

Species	RK	Sample	Live No.	Live mm.	Live Cond.	Dead No.	Dead mm.	Dead Cond.
	7	s5				1	8	4
	12	s5				4	11	4
	11	s5	8	12	1			
	8	s2	3	9	1			
	8	s4	1	16	1	2	12	3
	10	s2	3	12	1			
		s4	1	13	2			
	9	s5	4	16	1	1	15	5
	9	i5	2	9	1			
Cyclinella	6	i3				1	20	5
	10	i1	1	26	2			
Geukensia	7	i2	2	45	2	3	40	3
		i5	16	31	2	3	25	4
	8	i4	1	20	1			
Mytilopsis	11	i2	4	19	1			
	8	s1	11	18	1			
	10	s1	6	16	1			
		s2	4	16	1			
		s5				2	12	4
		i2	2	16	1	2	19	6
	9	s5	7	20	1			
Anomalocardium	9	i4				2	22	7
Tellina	4	s5				1	9	9
	7	s5				2	13	6

APPENDIX 3

DARB STATION DATA

APPENDIX 3
DARB STATION DATA

APPENDIX TABLE 3

DARB Mollusk Station Data

River Kilometer	Date	Subtidal Time	Subtidal Latitude, deg N	Subtidal Longitude, deg W	Subtidal Depth, ft
Curry Creek					
1.5	6/1/2004	1604	27.10998	82.45997	12.5
2	6/1/2004	1535	27.10951	82.45504	6
2.5	6/1/2004	1248	27.10955	82.44992	7.4
3	6/1/2004	1101	27.1132	82.44623	14.6
3.5	6/1/2004	909	27.11469	82.44359	2.9
Shakett Creek					
0.5	6/18/2004	1349	27.11365	82.46361	2.7
1	6/18/2004	1231	27.11406	82.46075	3.1
1.5	6/18/2004	1142	27.11339	82.45487	3.1
2	6/18/2004	1022	27.11772	82.45104	2.2
2.5	6/18/2004	949	27.12214	82.4494	
3	6/2/2004	1455	27.12609	82.44716	4
3.5	6/2/2004	1351	27.12913	82.44276	4.9
4	6/2/2004	1249	27.13232	82.43844	5.3
4.5	6/2/2004	1210	27.13604	82.4359	4.4
5	6/2/2004	1104	27.14024	82.43409	5.4
5.5	6/2/2004	1009	27.14308	82.43097	6.5
6	6/2/2004	932	27.14637	82.42779	8.1

APPENDIX 4

DARB SPECIES DATA

APPENDIX 4
DARB SPECIES DATA

Appendices: rows 4-275 are Dona and Roberts Bay (Curry and Shakett Creeks)
Past row 275 is a separate appendix for the Myakka River

Species	Creek/ River	River Km	tidal Inter-tidal	Live/ Dead	Count (0.232m2)	Mean Size (mm)	Weather Index
Anadara transversa	Curry	1.5	I	D	1	12.0	6.0
Anadara transversa	Curry	1.5	S	L	2	10.0	1.0
Anadara transversa	Curry	2.0	I	D	1	15.0	4.0
Anadara transversa	Curry	2.0	I	L	1	9.0	1.0
Anadara transversa	Curry	2.0	S	D	2	16.0	6.0
Anadara transversa	Curry	2.5	I	D	2	16.0	5.0
Anadara transversa	Curry	2.5	S	D	2	15.5	2.5
Anomalocardium auberiana	Curry	2.0	I	D	25	29.0	6.0
Anomalocardium auberiana	Curry	2.0	I	L	1	14.0	1.0
Anomalocardium auberiana	Curry	2.5	I	D	7	17.0	8.0
Anomalocardium auberiana	Curry	3.5	S	D	1	6.0	2.0
Anomia simplex	Curry	1.5	I	D	3	14.0	4.0
Anomia simplex	Curry	1.5	S	D	1	17.0	2.0
Anomia simplex	Curry	2.0	I	D	3	30.0	7.5
Anomia simplex	Curry	3.0	S	D	2	10.5	3.0
Argopecten irradians	Curry	2.0	I	D	2	16.0	2.5
Argopecten irradians	Curry	3.5	S	D	1	23.0	5.0
Atrina serrata	Curry	2.5	I	D	1	17.0	8.0
Cerithium atratum	Curry	1.5	I	D	7	27.0	5.8
Cerithium atratum	Curry	1.5	S	D	3	24.0	4.5
Cerithium atratum	Curry	2.0	I	D	16	26.7	5.0
Cerithium atratum	Curry	2.0	S	D	1	30.0	8.0
Cerithium atratum	Curry	2.5	I	D	1	30.0	7.0
Cerithium atratum	Curry	3.0	I	D	1	16.0	3.0
Chione cancellata	Curry	1.5	I	D	14	18.8	5.3
Chione cancellata	Curry	1.5	I	L	10	16.0	1.0
Chione cancellata	Curry	1.5	S	D	7	13.7	2.7
Chione cancellata	Curry	1.5	S	L	6	17.0	1.0
Chione cancellata	Curry	2.0	I	D	23	25.0	5.5
Chione cancellata	Curry	2.0	I	L	2	18.0	1.0
Chione cancellata	Curry	2.0	S	D	16	16.5	6.5
Chione cancellata	Curry	2.0	S	L	2	21.0	1.0
Chione cancellata	Curry	2.5	S	D	11	17.4	5.6
Chione cancellata	Curry	2.5	S	L	2	12.0	1.0
Chione cancellata	Curry	3.0	S	D	2	18.0	6.0
Conus sp.	Curry	2.0	I	D	1	26.0	6.0
Crassostrea virginica	Curry	1.5	I	D	12	54.8	8.2
Crassostrea virginica	Curry	2.0	I	D	5	41.5	8.5
Crassostrea virginica	Curry	2.5	I	D	63	57.6	8.2
Crassostrea virginica	Curry	3.0	I	D	101	65.0	6.8
Crassostrea virginica	Curry	3.0	I	L	3	44.5	3.5

Appendix 4 - DARB Species Data (Continued)

Crassostrea virginica	Curry	3.0	S	D	9	42.0	6.0
Crassostrea virginica	Curry	3.5	I	D	120	56.3	6.0
Crassostrea virginica	Curry	3.5	S	D	12	64.5	8.0
Crepidula fornicata	Curry	2.0	S	D	1	27.0	6.0
Crepidula fornicata	Curry	2.5	I	D	1	28.0	6.0
Crepidula fornicata	Curry	3.5	S	D	1	22.0	6.0
Cyclinella tenuis	Curry	2.5	I	D	1	15.0	5.0
Cyclinella tenuis	Curry	2.5	S	D	1	17.0	3.0
Cyclinella tenuis	Curry	2.5	S	L	1	17.0	1.0
Eupleura sp.	Curry	1.5	S	D	1	15.0	1.0
Geukensia demissa	Curry	3.0	I	D	1	32.0	9.0
Ischadium recurvum	Curry	2.0	I	D	3	26.0	7.0
Ischadium recurvum	Curry	2.5	I	D	1	14.0	7.0
Ischadium recurvum	Curry	3.0	I	D	2	13.0	8.0
Ischadium recurvum	Curry	3.5	I	D	5	20.0	4.0
Ischadium recurvum	Curry	3.5	S	D	1	26.0	8.0
Ischadium recurvum	Curry	3.5	S	L	1	7.0	1.0
Laevicardium mortoni	Curry	1.5	I	D	3	10.0	2.0
Laevicardium mortoni	Curry	1.5	I	L	2	14.0	1.0
Laevicardium mortoni	Curry	1.5	S	L	3	10.5	1.0
Laevicardium mortoni	Curry	2.0	I	L	1	10.0	1.0
Laevicardium mortoni	Curry	2.0	S	D	10	20.0	7.0
Laevicardium mortoni	Curry	2.0	S	L	1	8.0	1.0
Laevicardium mortoni	Curry	2.5	S	D	1	8.0	2.0
Laevicardium mortoni	Curry	3.5	S	L	1	9.0	1.0
Littoraria irrorata	Curry	2.0	I	D	1	9.0	1.0
Littoraria irrorata	Curry	2.5	I	L	1	22.0	1.0
Lucina pedinata	Curry	1.5	I	L	1	20.0	1.0
Lucina pedinata	Curry	1.5	S	D	1	31.0	4.0
Lucina pedinata	Curry	2.0	I	D	2	12.5	4.5
Lucina pedinata	Curry	3.0	I	D	3	30.5	6.0
Lucina pedinata	Curry	3.0	S	D	1	24.0	6.0
Lucina pedinata	Curry	3.5	S	D	7	29.7	4.7
Macrocallista nimbosa	Curry	3.0	I	D	1	26.0	6.0
Melongena corona	Curry	2.0	I	D	2	45.0	8.0
Mercenaria campechiensis	Curry	1.5	I	D	1	45.0	3.0
Mercenaria campechiensis	Curry	2.5	I	D	1	74.0	7.0
Mulinia lateralis	Curry	2.5	S	D	4	11.0	3.0
Mulinia lateralis	Curry	2.5	S	L	3	10.0	1.0
Nassarius vibex	Curry	1.5	S	D	3	10.0	8.5
Nassarius vibex	Curry	2.0	I	D	5	10.0	3.0
Nassarius vibex	Curry	2.0	I	L	2	10.0	1.0
Nassarius vibex	Curry	2.0	S	D	1	6.0	9.0
Nassarius vibex	Curry	2.5	S	L	1	12.0	1.0
Nassarius vibex	Curry	3.0	S	D	1	11.0	3.0
Nassarius vibex	Curry	3.5	I	D	1	10.0	6.0
Nassarius vibex	Curry	3.5	S	D	3	12.0	5.0
Neritina usnea	Curry	2.0	I	D	1	8.0	8.0
Neritina usnea	Curry	3.5	I	D	6	9.5	7.0

Appendix 4 - DARB Species Data (Continued)

Polymesoda caroliniana	Curry	3.5	I	L	1	24.0	1.0
Tagelus plebeius	Curry	1.5	I	D	2	24.0	8.5
Tagelus plebeius	Curry	1.5	I	L	1	20.0	2.0
Tagelus plebeius	Curry	1.5	S	D	11	24.8	5.2
Tagelus plebeius	Curry	2.0	I	D	17	26.3	8.0
Tagelus plebeius	Curry	2.0	I	L	3	30.5	1.0
Tagelus plebeius	Curry	2.0	S	D	12	26.7	7.7
Tagelus plebeius	Curry	2.5	I	D	3	17.0	3.5
Tagelus plebeius	Curry	2.5	I	L	3	14.0	1.0
Tagelus plebeius	Curry	2.5	S	D	17	17.8	5.0
Tagelus plebeius	Curry	2.5	S	L	17	17.0	1.0
Tagelus plebeius	Curry	3.0	I	D	5	35.5	7.5
Tagelus plebeius	Curry	3.0	I	L	1	22.0	2.0
Tagelus plebeius	Curry	3.0	S	D	1	19.0	4.0
Tagelus plebeius	Curry	3.5	I	D	1	25.0	9.0
Tagelus plebeius	Curry	3.5	S	D	17	30.6	6.8
Tagelus plebeius	Curry	3.5	S	L	1	14.0	1.0
Tellina sp.	Curry	2.0	I	L	1	20.0	1.0
Unknown	Curry	3.5	S	D	1	25.0	8.0
Urosalpinx tampensis	Curry	2.0	S	D	4	34.0	6.0
Anadara transversa	Shakett	1.5	S	D	1	16.0	6.0
Anomalocardium auberiana	Shakett	0.5	I	D	14	24.7	3.0
Anomalocardium auberiana	Shakett	0.5	S	D	10	27.5	6.5
Anomalocardium auberiana	Shakett	1.5	S	D	9	15.3	2.7
Anomalocardium auberiana	Shakett	1.5	S	L	4	15.0	2.0
Anomalocardium auberiana	Shakett	2.5	S	D	2	17.0	4.0
Anomalocardium auberiana	Shakett	3.0	S	D	1	18.0	3.0
Anomalocardium auberiana	Shakett	3.0	S	L	3	18.0	1.0
Anomalocardium auberiana	Shakett	3.5	S	D	2	18.0	7.0
Anomalocardium auberiana	Shakett	4.0	I	D	12	14.0	7.0
Anomalocardium auberiana	Shakett	4.0	S	L	1	12.0	1.0
Anomalocardium auberiana	Shakett	5.0	S	D	1	14.0	8.0
Anomalocardium auberiana	Shakett	6.0	S	D	1	31.0	6.0
Anomia simplex	Shakett	2.0	I	D	9	17.3	6.3
Anomia simplex	Shakett	2.0	S	D	1	13.0	7.0
Anomia simplex	Shakett	3.0	S	D	2	13.0	4.5
Argopecten irradians	Shakett	0.5	I	D	5	32.0	4.3
Argopecten irradians	Shakett	0.5	S	D	1	74.0	6.0
Bulla striata	Shakett	1.0	I	D	4	10.3	2.7
Bulla striata	Shakett	1.5	S	D	1	11.0	1.0
Bulla striata	Shakett	2.0	I	D	1	9.0	2.0
Bulla striata	Shakett	5.5	S	D	1	20.0	5.0
Cerithium atratum	Shakett	0.5	I	D	1	17.0	3.0
Cerithium atratum	Shakett	1.0	I	D	15	22.0	1.0
Cerithium atratum	Shakett	1.0	S	D	3	28.5	2.5
Cerithium atratum	Shakett	2.0	S	D	2	17.0	3.0
Chione cancellata	Shakett	0.5	I	D	19	20.0	5.7
Chione cancellata	Shakett	0.5	I	L	3	16.0	1.0
Chione cancellata	Shakett	0.5	S	D	10	26.0	5.0

Appendix 4 - DARB Species Data (Continued)

Chione cancellata	Shakett	1.0	I	D	8	12.7	4.7
Chione cancellata	Shakett	1.0	I	L	1	14.0	1.0
Chione cancellata	Shakett	1.0	S	D	1	28.0	9.0
Chione cancellata	Shakett	1.5	S	D	6	12.3	5.0
Chione cancellata	Shakett	2.0	I	D	4	15.0	6.5
Chione cancellata	Shakett	2.0	I	L	1	21.0	1.0
Chione cancellata	Shakett	2.0	S	D	10	13.0	6.5
Chione cancellata	Shakett	2.5	S	D	1	10.0	5.0
Chione cancellata	Shakett	3.0	I	D	4	12.0	7.0
Chione cancellata	Shakett	3.0	S	D	3	12.0	4.0
Chione cancellata	Shakett	5.5	S	D	1	11.0	5.0
Chione cancellata	Shakett	6.0	S	D	2	1.0	5.0
Corbicula fluminea	Shakett	6.0	S	D	1	10.0	5.0
Crassostrea virginica	Shakett	0.5	I	D	1	44.0	9.0
Crassostrea virginica	Shakett	1.0	I	D	14	47.0	6.5
Crassostrea virginica	Shakett	1.0	S	D	1	53.0	8.0
Crassostrea virginica	Shakett	1.5	I	D	11	47.0	5.0
Crassostrea virginica	Shakett	1.5	I	L	17	38.0	3.0
Crassostrea virginica	Shakett	1.5	S	D	2	37.0	6.0
Crassostrea virginica	Shakett	2.0	I	D	2	75.0	7.0
Crassostrea virginica	Shakett	2.0	S	D	2	57.0	8.0
Crassostrea virginica	Shakett	2.5	I	D	40	52.5	6.0
Crassostrea virginica	Shakett	2.5	I	L	18	64.0	2.5
Crassostrea virginica	Shakett	3.0	S	L	1	50.0	3.0
Crassostrea virginica	Shakett	3.5	S	D	1	55.0	8.0
Crassostrea virginica	Shakett	4.0	I	D	16	40.0	8.0
Crassostrea virginica	Shakett	4.0	I	L	20	55.0	5.0
Crassostrea virginica	Shakett	6.0	S	D	2	68.5	5.5
Crepidula fornicata	Shakett	0.5	S	D	3	23.0	8.0
Crepidula fornicata	Shakett	2.0	I	D	5	18.3	7.0
Crepidula fornicata	Shakett	2.0	S	D	1	16.0	5.0
Cryptopleura sp.	Shakett	2.5	S	L	1	20.0	2.0
Cyclinella tenuis	Shakett	0.5	I	D	2	20.0	7.0
Cyclinella tenuis	Shakett	0.5	I	L	1	29.0	1.0
Cyclinella tenuis	Shakett	0.5	S	D	2	19.0	2.0
Eupleura sp.	Shakett	5.5	S	D	1	10.0	5.0
Ischadium recurvum	Shakett	1.5	I	L	2	27.0	1.0
Ischadium recurvum	Shakett	2.0	I	D	2	14.0	7.0
Ischadium recurvum	Shakett	2.5	I	D	11	21.0	7.0
Ischadium recurvum	Shakett	2.5	I	L	19	28.0	0.0
Ischadium recurvum	Shakett	2.5	S	D	2	30.0	4.5
Ischadium recurvum	Shakett	3.0	I	D	9	35.0	4.7
Ischadium recurvum	Shakett	3.0	I	L	12	22.0	1.0
Ischadium recurvum	Shakett	3.0	S	D	1	7.0	2.0
Ischadium recurvum	Shakett	4.0	I	D	4	46.0	8.0
Ischadium recurvum	Shakett	4.5	I	D	1	19.0	7.0
Ischadium recurvum	Shakett	6.0	S	D	5	30.3	6.3
Laevicardium mortoni	Shakett	0.5	I	D	2	13.0	6.0
Laevicardium mortoni	Shakett	1.0	I	D	8	10.3	2.0

Appendix 4 - DARB Species Data (Continued)

Laevicardium mortoni	Shakett	1.0	I	L	1	8.0	1.0
Laevicardium mortoni	Shakett	1.0	S	D	11	9.7	5.7
Laevicardium mortoni	Shakett	1.5	S	D	7	11.0	6.0
Laevicardium mortoni	Shakett	1.5	S	L	3	9.5	1.0
Laevicardium mortoni	Shakett	2.0	S	D	7	8.0	5.3
Laevicardium mortoni	Shakett	2.5	S	D	4	11.0	5.0
Laevicardium mortoni	Shakett	2.5	S	L	1	15.0	1.0
Littoraria irrorata	Shakett	1.0	I	L	4	26.0	1.0
Littoraria irrorata	Shakett	3.0	I	L	1	26.0	1.0
Macoma tenta	Shakett	3.0	I	D	3	25.0	2.0
Macoma tenta	Shakett	4.0	I	D	2	38.0	7.0
Macoma tenta	Shakett	4.0	I	L	2	42.0	3.0
Mercenaria campechiensis	Shakett	0.5	I	D	1	57.0	7.0
Mercenaria campechiensis	Shakett	0.5	S	D	1	74.0	6.0
Mercenaria campechiensis	Shakett	1.0	I	D	1	112.0	5.0
Nassarius vibex	Shakett	0.5	I	D	3	13.5	2.5
Nassarius vibex	Shakett	1.0	I	D	11	10.8	2.5
Nassarius vibex	Shakett	1.0	S	D	3	10.0	3.0
Nassarius vibex	Shakett	1.5	S	D	1	13.0	2.0
Nassarius vibex	Shakett	1.5	S	L	2	11.0	1.0
Nassarius vibex	Shakett	3.0	S	D	1	9.0	1.0
Nassarius vibex	Shakett	4.0	I	D	2	14.0	7.0
Neritina usnea	Shakett	1.5	S	D	4	12.0	3.0
Neritina usnea	Shakett	4.0	I	D	3	21.0	8.0
Neritina usnea	Shakett	5.0	I	L	1	14.0	1.0
Neritina usnea	Shakett	5.5	I	D	3	13.5	8.5
Neritina usnea	Shakett	5.5	S	D	1	28.0	4.0
Neritina usnea	Shakett	6.0	I	L	1	20.0	3.0
Neritina usnea	Shakett	6.0	S	D	1	9.0	6.0
Noetia ponderosa	Shakett	2.0	I	D	1	16.0	4.0
Noetia ponderosa	Shakett	2.0	S	D	1	17.0	5.0
Planorbidae	Shakett	5.5	S	D	1	8.0	8.0
Planorbidae	Shakett	6.0	S	D	1	8.0	6.0
Polymesoda caroliniana	Shakett	3.0	I	D	1	57.0	7.0
Polymesoda caroliniana	Shakett	3.0	I	L	2	46.0	5.0
Polymesoda caroliniana	Shakett	3.5	I	D	1	49.0	6.0
Polymesoda caroliniana	Shakett	4.0	I	D	1	35.0	6.0
Polymesoda caroliniana	Shakett	4.0	I	L	1	36.0	2.0
Polymesoda caroliniana	Shakett	5.0	I	D	1	41.0	3.0
Polymesoda caroliniana	Shakett	5.5	I	D	2	25.0	7.5
Polymesoda caroliniana	Shakett	5.5	I	L	1	54.0	2.0
Tagelus plebeius	Shakett	0.5	I	D	2	29.0	7.0
Tagelus plebeius	Shakett	1.0	I	D	2	21.5	7.5
Tagelus plebeius	Shakett	1.0	I	L	1	29.0	3.0
Tagelus plebeius	Shakett	1.0	S	D	6	25.8	6.8
Tagelus plebeius	Shakett	1.5	S	D	2	8.0	5.0
Tagelus plebeius	Shakett	2.0	I	D	1	20.0	8.0
Tagelus plebeius	Shakett	2.0	S	D	3	19.0	7.0
Tagelus plebeius	Shakett	2.5	S	D	2	25.0	7.5

Appendix 4 - DARB Species Data (Continued)

Tagelus plebeius	Shakett	2.5	S	L	1	21.0	1.0
Tagelus plebeius	Shakett	3.0	S	D	4	18.7	5.3
Tagelus plebeius	Shakett	3.5	I	D	21	23.8	5.6
Tagelus plebeius	Shakett	3.5	I	L	22	28.3	1.8
Tagelus plebeius	Shakett	3.5	S	D	10	20.5	5.8
Tagelus plebeius	Shakett	3.5	S	L	4	23.0	1.5
Tagelus plebeius	Shakett	4.0	I	D	20	27.3	5.3
Tagelus plebeius	Shakett	4.0	I	L	3	31.0	1.0
Tagelus plebeius	Shakett	4.0	S	D	7	20.5	6.3
Tagelus plebeius	Shakett	4.0	S	L	1	9.0	1.0
Tagelus plebeius	Shakett	4.5	I	D	6	31.5	3.5
Tagelus plebeius	Shakett	4.5	I	L	2	32.0	2.0
Tagelus plebeius	Shakett	4.5	S	D	1	10.0	8.0
Tagelus plebeius	Shakett	5.0	I	D	1	15.0	2.0
Tagelus plebeius	Shakett	5.0	I	L	8	12.5	2.0
Tagelus plebeius	Shakett	5.0	S	D	2	16.5	8.5
Tagelus plebeius	Shakett	5.5	I	D	24	28.5	7.5
Tagelus plebeius	Shakett	5.5	I	L	3	30.3	1.5
Tagelus plebeius	Shakett	5.5	S	D	1	14.0	9.0
Tagelus plebeius	Shakett	5.5	S	L	1	11.0	1.0
Tagelus plebeius	Shakett	6.0	S	D	3	30.5	5.0
Tellina sp.	Shakett	0.5	I	D	15	15.0	8.0
Tellina sp.	Shakett	0.5	S	D	4	15.5	4.5
Tellina sp.	Shakett	1.5	S	D	11	12.0	5.0
Tellina sp.	Shakett	1.5	S	L	3	14.0	2.0
Tellina sp.	Shakett	2.0	I	D	2	14.0	6.5
Tellina sp.	Shakett	2.0	S	D	20	13.7	5.0
Tellina sp.	Shakett	2.0	S	L	2	13.5	1.5
Tellina sp.	Shakett	2.5	S	D	3	14.0	3.7
Tellina sp.	Shakett	2.5	S	L	6	14.0	1.0
Tellina sp.	Shakett	3.0	S	D	4	11.0	7.0
Tellina sp.	Shakett	3.0	S	L	3	16.0	1.0
Tellina sp.	Shakett	4.0	S	D	1	10.0	7.0
Unknown	Shakett	4.0	S	L	2	8.0	1.0
****************************MYAKKA River appendix starts here**							
Anomalocardium auberiana	Myakka	5.6	I	D	2	22.0	7.0
Anomia simplex	Myakka	-0.3	I	D	30	14.3	5.5
Anomia simplex	Myakka	0.7	I	D	1	11.0	6.0
Anomia simplex	Myakka	1.5	I	D	1	22.0	7.0
Anomia simplex	Myakka	4.5	I	D	1	18.0	7.0
Anomia simplex	Myakka	7.8	I	D	1	17.0	6.0
Bulla striata	Myakka	-0.3	I	D	1	16.0	7.0
Corbicula fluminea	Myakka	14.6	S	D	1	6.0	8.0
Corbicula fluminea	Myakka	19.4	S	D	1	8.0	6.0
Corbicula fluminea	Myakka	20.4	S	D	6	14.3	6.7
Corbicula fluminea	Myakka	21.4	I	D	3	18.0	6.0
Corbicula fluminea	Myakka	21.4	S	D	2	22.5	6.5

Appendix 4 - DARB Species Data (Continued)

Corbicula fluminea	Myakka	21.4	S	L	3	5.0	1.0
Corbicula fluminea	Myakka	22.4	S	D	4	18.0	7.0
Corbicula fluminea	Myakka	22.4	S	L	3	14.0	2.0
Corbicula fluminea	Myakka	23.3	I	D	1	14.0	3.0
Corbicula fluminea	Myakka	23.3	I	L	23	12.0	1.3
Corbicula fluminea	Myakka	23.3	S	D	5	11.0	9.0
Corbicula fluminea	Myakka	23.3	S	L	53	6.7	1.3
Corbicula fluminea	Myakka	24.5	I	D	3	14.0	5.5
Corbicula fluminea	Myakka	24.5	S	D	6	14.0	6.5
Corbicula fluminea	Myakka	24.5	S	L	6	6.5	1.5
Corbicula fluminea	Myakka	25.5	I	D	2	14.0	7.0
Corbicula fluminea	Myakka	25.5	S	D	15	18.8	6.0
Corbicula fluminea	Myakka	25.5	S	L	23	13.0	1.8
Corbicula fluminea	Myakka	26.4	I	L	15	11.5	1.0
Corbicula fluminea	Myakka	26.4	S	D	2	8.5	5.5
Corbicula fluminea	Myakka	26.4	S	L	5	10.0	1.0
Corbicula fluminea	Myakka	27.3	I	D	10	18.0	5.8
Corbicula fluminea	Myakka	27.3	S	D	21	25.8	7.4
Corbicula fluminea	Myakka	27.3	S	L	3	8.0	2.0
Corbicula fluminea	Myakka	28.1	I	D	10	16.5	6.0
Corbicula fluminea	Myakka	28.1	I	L	2	7.0	1.0
Corbicula fluminea	Myakka	28.1	S	D	17	12.8	7.0
Corbicula fluminea	Myakka	28.1	S	L	43	10.2	1.2
Corbicula fluminea	Myakka	29.4	I	D	9	17.0	6.8
Corbicula fluminea	Myakka	29.4	I	L	6	11.7	1.0
Corbicula fluminea	Myakka	29.4	S	D	4	20.0	4.7
Corbicula fluminea	Myakka	29.4	S	L	17	6.7	1.7
Corbicula fluminea	Myakka	30.4	I	D	11	23.8	6.4
Corbicula fluminea	Myakka	30.4	I	L	4	25.5	2.5
Corbicula fluminea	Myakka	30.4	S	D	8	23.6	5.6
Corbicula fluminea	Myakka	30.4	S	L	8	8.0	1.3
Corbicula fluminea	Myakka	31.4	I	D	3	16.0	4.0
Corbicula fluminea	Myakka	31.4	I	L	3	6.0	1.0
Corbicula fluminea	Myakka	31.4	S	D	4	20.0	5.5
Corbicula fluminea	Myakka	31.4	S	L	43	7.2	1.2
Corbicula fluminea	Myakka	32.4	I	D	3	21.3	6.7
Corbicula fluminea	Myakka	32.4	I	L	1	12.0	7.0
Corbicula fluminea	Myakka	32.4	S	D	3	14.7	2.3
Corbicula fluminea	Myakka	32.4	S	L	52	4.0	1.0
Corbicula fluminea	Myakka	33.3	I	D	2	17.0	6.5
Corbicula fluminea	Myakka	33.3	S	D	1	4.0	4.0
Corbicula fluminea	Myakka	33.3	S	L	1	6.0	1.0
Corbicula fluminea	Myakka	34.1	I	D	1	6.0	5.0
Corbicula fluminea	Myakka	34.1	S	D	3	22.7	4.0
Corbicula fluminea	Myakka	35.6	I	D	2	25.5	4.5
Corbicula fluminea	Myakka	35.6	S	D	11	27.3	3.3
Corbicula fluminea	Myakka	35.6	S	L	6	24.7	1.0
Corbicula fluminea	Myakka	36.7	I	D	21	19.3	7.5
Corbicula fluminea	Myakka	36.7	I	L	5	29.0	1.0

Appendix 4 - DARB Species Data (Continued)

Corbicula fluminea	Myakka	36.7	S	D	10	13.0	3.0
Corbicula fluminea	Myakka	36.7	S	L	1	23.0	1.0
Corbicula fluminea	Myakka	37.8	I	D	11	12.0	5.5
Corbicula fluminea	Myakka	37.8	I	L	28	20.0	1.8
Corbicula fluminea	Myakka	37.8	S	D	8	13.7	5.3
Corbicula fluminea	Myakka	37.8	S	L	11	14.0	1.3
Corbicula fluminea	Myakka	38.6	I	D	1	14.0	6.0
Corbicula fluminea	Myakka	38.6	I	L	15	9.0	1.0
Corbicula fluminea	Myakka	38.6	S	D	28	17.3	4.5
Corbicula fluminea	Myakka	38.6	S	L	10	16.3	3.0
Corbicula fluminea	Myakka	39.2	I	L	5	7.0	1.0
Corbicula fluminea	Myakka	39.2	S	L	7	20.2	1.0
Corbicula fluminea	Myakka	39.8	I	D	4	18.0	5.5
Corbicula fluminea	Myakka	39.8	I	L	3	21.0	1.0
Crassostrea virginica	Myakka	0.7	I	D	10	32.0	6.5
Crassostrea virginica	Myakka	1.5	I	D	4	40.0	8.0
Crassostrea virginica	Myakka	2.5	I	D	4	30.0	8.0
Crassostrea virginica	Myakka	3.5	I	D	6	54.0	6.0
Crassostrea virginica	Myakka	4.5	I	D	27	27.0	7.0
Crassostrea virginica	Myakka	5.6	I	D	2	33.0	8.0
Crassostrea virginica	Myakka	6.6	I	D	7	46.0	9.0
Crassostrea virginica	Myakka	7.8	I	D	16	20.0	7.0
Crassostrea virginica	Myakka	9.5	I	D	4	30.3	7.7
Crassostrea virginica	Myakka	10.4	I	D	1	33.0	8.0
Crassostrea virginica	Myakka	11.7	I	D	2	48.0	6.0
Crepidula fornicata	Myakka	2.5	S	D	1	12.0	5.0
Crepidula fornicata	Myakka	11.7	S	D	1	14.0	4.0
Cyclinella tenuis	Myakka	2.5	I	D	1	20.0	5.0
Cyclinella tenuis	Myakka	6.6	I	L	1	26.0	2.0
Geukensia demissa	Myakka	1.5	I	D	19	28.0	7.0
Geukensia demissa	Myakka	1.5	I	L	36	37.0	4.0
Geukensia demissa	Myakka	3.5	I	D	6	32.5	3.5
Geukensia demissa	Myakka	3.5	I	L	18	38.0	2.0
Geukensia demissa	Myakka	4.5	I	L	1	20.0	1.0
Geukensia demissa	Myakka	9.5	I	D	4	40.0	7.5
Geukensia demissa	Myakka	10.4	I	D	1	30.0	7.0
Geukensia demissa	Myakka	11.7	I	D	2	42.0	6.0
Glottidia pyramidata	Myakka	-0.3	S	L	4	8.5	1.0
Glottidia pyramidata	Myakka	2.5	S	D	1	16.0	7.0
Ischadium recurvum	Myakka	0.7	I	D	9	24.0	5.0
Ischadium recurvum	Myakka	0.7	I	L	1	18.0	4.0
Ischadium recurvum	Myakka	2.5	I	D	3	23.0	6.0
Ischadium recurvum	Myakka	3.5	I	L	1	12.0	2.0
Ischadium recurvum	Myakka	5.6	I	D	2	34.0	7.0
Ischadium recurvum	Myakka	6.6	I	D	4	30.0	8.0
Ischadium recurvum	Myakka	8.9	I	D	15	31.0	6.5
Ischadium recurvum	Myakka	9.5	I	D	2	32.5	8.0
Ischadium recurvum	Myakka	10.4	I	D	7	38.5	7.0
Ischadium recurvum	Myakka	11.7	I	D	10	46.5	7.0

Appendix 4 - DARB Species Data (Continued)

Ischadium recurvum	Myakka	11.7	S	D	1	32.0	8.0
Ischadium recurvum	Myakka	12.5	I	D	2	43.5	5.0
Ischadium recurvum	Myakka	12.5	S	L	2	17.0	1.0
Ischadium recurvum	Myakka	26.4	I	D	1	20.0	8.0
Littoraria irrorata	Myakka	0.7	I	L	9	16.0	1.0
Littoraria irrorata	Myakka	1.5	I	L	6	21.0	1.0
Littoraria irrorata	Myakka	2.5	I	L	3	24.0	1.0
Littoraria irrorata	Myakka	3.5	I	L	2	26.0	1.0
Littoraria irrorata	Myakka	4.5	I	L	6	23.0	1.0
Littoraria irrorata	Myakka	5.6	I	L	11	7.0	1.0
Littoraria irrorata	Myakka	6.6	I	L	7	15.0	1.0
Littoraria irrorata	Myakka	7.8	I	L	20	26.0	1.0
Littoraria irrorata	Myakka	8.9	I	D	20	10.0	1.0
Littoraria irrorata	Myakka	10.4	I	L	6	7.5	1.0
Littoraria irrorata	Myakka	11.7	I	D	1	15.0	2.0
Littoraria irrorata	Myakka	15.3	I	D	5	25.0	2.0
Melongena corona	Myakka	0.7	I	D	2	22.5	4.0
Melongena corona	Myakka	1.5	I	D	1	34.0	4.0
Melongena corona	Myakka	9.5	I	D	1	23.0	1.0
Mulinia lateralis	Myakka	1.5	S	D	1	11.0	5.0
Mulinia lateralis	Myakka	2.5	S	D	1	16.0	7.0
Mulinia lateralis	Myakka	3.5	S	D	1	8.0	4.0
Mulinia lateralis	Myakka	4.5	S	D	2	12.0	3.0
Mulinia lateralis	Myakka	4.5	S	L	4	12.5	1.0
Mulinia lateralis	Myakka	5.6	I	L	2	9.0	1.0
Mulinia lateralis	Myakka	5.6	S	D	1	15.0	5.0
Mulinia lateralis	Myakka	5.6	S	L	4	16.0	1.0
Mulinia lateralis	Myakka	6.6	S	L	4	12.5	1.5
Mulinia lateralis	Myakka	7.8	S	L	8	12.0	1.0
Mulinia lateralis	Myakka	8.9	S	D	4	11.0	4.0
Mytilopsis leucophaeata	Myakka	4.5	S	L	11	18.0	1.0
Mytilopsis leucophaeata	Myakka	5.6	S	L	7	20.0	1.0
Mytilopsis leucophaeata	Myakka	6.6	I	D	2	19.0	6.0
Mytilopsis leucophaeata	Myakka	6.6	I	L	2	16.0	1.0
Mytilopsis leucophaeata	Myakka	6.6	S	D	2	12.0	4.0
Mytilopsis leucophaeata	Myakka	6.6	S	L	10	16.0	1.0
Mytilopsis leucophaeata	Myakka	7.8	I	L	4	19.0	1.0
Nassarius vibex	Myakka	1.5	S	L	1	4.0	1.0
Nassarius vibex	Myakka	3.5	I	D	1	8.0	3.0
Nassarius vibex	Myakka	8.9	I	D	1	11.0	4.0
Nassarius vibex	Myakka	8.9	S	D	2	10.0	2.0
Nassarius vibex	Myakka	9.5	S	D	1	10.0	2.0
Nassarius vibex	Myakka	10.4	S	D	1	13.0	4.0
Neritina usnea	Myakka	0.7	I	D	1	11.0	6.0
Neritina usnea	Myakka	3.5	I	D	1	11.0	8.0
Neritina usnea	Myakka	4.5	I	D	4	14.0	8.0
Neritina usnea	Myakka	5.6	I	D	3	9.0	9.0
Neritina usnea	Myakka	6.6	I	D	3	13.0	8.0
Neritina usnea	Myakka	9.5	I	D	1	12.0	9.0

Appendix 4 - DARB Species Data (Continued)

Neritina usnea	Myakka	11.7	I	D	2	9.0	3.0
Neritina usnea	Myakka	11.7	I	L	3	16.0	2.0
Neritina usnea	Myakka	12.5	I	D	2	18.0	5.5
Neritina usnea	Myakka	13.5	I	D	1	10.0	8.0
Neritina usnea	Myakka	18.4	I	D	5	14.7	3.0
Neritina usnea	Myakka	18.4	I	L	1	21.0	2.0
Neritina usnea	Myakka	20.4	I	D	1	18.0	8.0
Neritina usnea	Myakka	21.4	I	D	1	20.0	9.0
Neritina usnea	Myakka	23.3	I	D	1	20.0	9.0
Neverita duplicatus	Myakka	9.5	I	L	1	22.0	0.0
Planorbidae	Myakka	39.8	I	D	1	10.0	5.0
Polymesoda caroliniana	Myakka	5.6	I	D	4	21.0	6.0
Polymesoda caroliniana	Myakka	6.6	I	D	1	27.0	9.0
Polymesoda caroliniana	Myakka	7.8	I	D	13	20.0	9.0
Polymesoda caroliniana	Myakka	7.8	I	L	24	24.0	4.0
Polymesoda caroliniana	Myakka	9.5	I	D	1	18.0	6.0
Polymesoda caroliniana	Myakka	9.5	I	L	1	10.0	2.0
Polymesoda caroliniana	Myakka	9.5	S	D	4	11.0	9.0
Polymesoda caroliniana	Myakka	9.5	S	L	4	9.0	1.0
Polymesoda caroliniana	Myakka	10.4	I	L	2	11.0	1.0
Polymesoda caroliniana	Myakka	10.4	S	D	10	17.0	4.8
Polymesoda caroliniana	Myakka	10.4	S	L	1	9.0	1.0
Polymesoda caroliniana	Myakka	11.7	I	D	6	30.0	5.0
Polymesoda caroliniana	Myakka	11.7	I	L	3	18.3	1.7
Polymesoda caroliniana	Myakka	11.7	S	D	7	11.0	5.7
Polymesoda caroliniana	Myakka	11.7	S	L	1	24.0	2.0
Polymesoda caroliniana	Myakka	12.5	I	D	5	19.7	4.3
Polymesoda caroliniana	Myakka	12.5	I	L	9	13.8	1.3
Polymesoda caroliniana	Myakka	12.5	S	D	3	9.7	3.7
Polymesoda caroliniana	Myakka	12.5	S	L	3	10.0	1.0
Polymesoda caroliniana	Myakka	13.5	I	L	7	13.0	1.0
Polymesoda caroliniana	Myakka	13.5	S	D	2	11.5	5.0
Polymesoda caroliniana	Myakka	13.5	S	L	2	8.0	2.0
Polymesoda caroliniana	Myakka	14.6	I	L	9	12.0	1.5
Polymesoda caroliniana	Myakka	14.6	S	D	4	8.5	3.8
Polymesoda caroliniana	Myakka	14.6	S	L	5	8.0	1.0
Polymesoda caroliniana	Myakka	15.3	I	D	1	36.0	6.0
Polymesoda caroliniana	Myakka	15.3	I	L	7	11.3	3.0
Polymesoda caroliniana	Myakka	15.3	S	D	6	17.0	7.7
Polymesoda caroliniana	Myakka	15.3	S	L	2	12.0	2.0
Polymesoda caroliniana	Myakka	16.3	I	D	4	35.0	8.5
Polymesoda caroliniana	Myakka	16.3	I	L	3	38.5	4.5
Polymesoda caroliniana	Myakka	16.3	S	L	2	9.5	2.0
Polymesoda caroliniana	Myakka	17.4	I	D	1	12.0	4.0
Polymesoda caroliniana	Myakka	17.4	I	L	6	11.0	3.0
Polymesoda caroliniana	Myakka	17.4	S	L	15	9.5	1.0
Polymesoda caroliniana	Myakka	18.4	I	D	4	40.3	5.3
Polymesoda caroliniana	Myakka	18.4	S	L	12	12.0	2.3
Polymesoda caroliniana	Myakka	19.4	I	L	11	16.4	2.0

Appendix 4 - DARB Species Data (Continued)

Polymesoda caroliniana	Myakka	19.4	S	L	18	9.4	1.2
Polymesoda caroliniana	Myakka	20.4	I	D	1	15.0	8.0
Polymesoda caroliniana	Myakka	20.4	I	L	6	9.8	1.0
Polymesoda caroliniana	Myakka	20.4	S	L	7	11.0	1.0
Polymesoda caroliniana	Myakka	21.4	I	D	1	32.0	6.0
Polymesoda caroliniana	Myakka	21.4	I	L	11	17.3	3.0
Polymesoda caroliniana	Myakka	21.4	S	D	4	14.0	6.0
Polymesoda caroliniana	Myakka	21.4	S	L	4	9.3	1.7
Polymesoda caroliniana	Myakka	22.4	I	L	2	23.0	2.0
Polymesoda caroliniana	Myakka	31.4	S	D	5	31.0	8.0
Rangia cuneata	Myakka	9.5	S	D	3	24.3	6.3
Rangia cuneata	Myakka	10.4	S	D	4	23.0	6.3
Rangia cuneata	Myakka	11.7	S	D	6	26.5	5.0
Rangia cuneata	Myakka	11.7	S	L	2	31.0	4.5
Rangia cuneata	Myakka	12.5	S	D	5	28.0	5.7
Rangia cuneata	Myakka	13.5	I	L	1	40.0	1.0
Rangia cuneata	Myakka	13.5	S	L	1	20.0	1.0
Rangia cuneata	Myakka	14.6	I	D	3	30.0	6.0
Rangia cuneata	Myakka	14.6	S	L	1	44.0	2.0
Rangia cuneata	Myakka	15.3	I	L	1	42.0	3.0
Rangia cuneata	Myakka	15.3	S	D	2	45.0	7.0
Rangia cuneata	Myakka	15.3	S	L	2	15.0	2.0
Rangia cuneata	Myakka	16.3	I	D	4	41.0	8.0
Rangia cuneata	Myakka	16.3	S	D	4	28.5	6.5
Rangia cuneata	Myakka	16.3	S	L	9	33.0	1.5
Rangia cuneata	Myakka	17.4	I	L	3	38.5	3.0
Rangia cuneata	Myakka	17.4	S	D	2	39.0	8.0
Rangia cuneata	Myakka	17.4	S	L	3	28.7	2.0
Rangia cuneata	Myakka	18.4	I	D	3	38.7	6.3
Rangia cuneata	Myakka	18.4	S	D	3	38.3	6.3
Rangia cuneata	Myakka	18.4	S	L	5	41.5	2.0
Rangia cuneata	Myakka	19.4	I	D	4	19.5	6.5
Rangia cuneata	Myakka	19.4	I	L	2	44.0	2.0
Rangia cuneata	Myakka	19.4	S	L	8	24.8	2.0
Rangia cuneata	Myakka	20.4	I	D	1	44.0	6.0
Rangia cuneata	Myakka	20.4	S	D	4	35.0	8.0
Rangia cuneata	Myakka	20.4	S	L	1	26.0	1.0
Rangia cuneata	Myakka	21.4	I	D	1	23.0	4.0
Rangia cuneata	Myakka	21.4	I	L	4	49.0	3.5
Rangia cuneata	Myakka	21.4	S	D	1	20.0	7.0
Rangia cuneata	Myakka	22.4	I	D	1	45.0	6.0
Rangia cuneata	Myakka	22.4	S	D	1	44.0	8.0
Rangia cuneata	Myakka	23.3	I	D	1	45.0	3.0
Rangia cuneata	Myakka	23.3	I	L	8	45.5	3.3
Rangia cuneata	Myakka	23.3	S	D	3	62.0	8.0
Rangia cuneata	Myakka	24.5	I	D	4	50.8	6.5
Rangia cuneata	Myakka	24.5	I	L	2	51.5	4.5
Rangia cuneata	Myakka	24.5	S	D	1	60.0	7.0
Rangia cuneata	Myakka	27.3	I	D	1	50.0	3.0

Appendix 4 - DARB Species Data (Continued)

Rangia cuneata	Myakka	27.3	I	L	5	46.8	2.2
Rangia cuneata	Myakka	27.3	S	D	1	56.0	8.0
Rangia cuneata	Myakka	28.1	I	D	5	56.0	6.5
Rangia cuneata	Myakka	28.1	S	D	1	17.0	8.0
Rangia cuneata	Myakka	30.4	I	D	2	20.0	7.0
Rangia cuneata	Myakka	30.4	I	L	8	40.2	2.6
Rangia cuneata	Myakka	30.4	S	D	1	29.0	6.0
Rangia cuneata	Myakka	30.4	S	L	9	33.3	1.7
Rangia cuneata	Myakka	31.4	S	D	2	37.0	7.0
Rangia cuneata	Myakka	32.4	I	L	1	40.0	2.0
Solen viridis	Myakka	3.5	I	D	1	42.0	5.0
Sphaerium partumeium	Myakka	39.2	S	L	1	11.0	3.0
Sphaerium partumeium	Myakka	39.8	I	D	1	11.0	4.0
Tagelus plebeius	Myakka	-0.3	I	D	5	13.7	8.0
Tagelus plebeius	Myakka	1.5	I	D	1	22.0	8.0
Tagelus plebeius	Myakka	2.5	I	D	5	27.5	5.5
Tagelus plebeius	Myakka	3.5	I	D	2	30.0	9.0
Tagelus plebeius	Myakka	5.6	I	D	2	13.0	7.0
Tagelus plebeius	Myakka	6.6	I	L	1	28.0	5.0
Tagelus plebeius	Myakka	7.8	I	D	2	14.0	6.0
Tagelus plebeius	Myakka	7.8	I	L	7	31.0	1.0
Tagelus plebeius	Myakka	8.9	I	D	1	13.0	2.0
Tagelus plebeius	Myakka	8.9	I	L	2	14.0	1.0
Tagelus plebeius	Myakka	8.9	S	D	2	10.0	2.0
Tagelus plebeius	Myakka	9.5	I	D	1	26.0	6.0
Tagelus plebeius	Myakka	9.5	I	L	9	19.0	3.7
Tagelus plebeius	Myakka	9.5	S	L	1	16.0	4.0
Tagelus plebeius	Myakka	10.4	I	L	6	19.0	1.5
Tagelus plebeius	Myakka	10.4	S	D	2	15.5	6.0
Tagelus plebeius	Myakka	10.4	S	L	1	14.0	2.0
Tagelus plebeius	Myakka	11.7	I	D	3	21.0	6.0
Tagelus plebeius	Myakka	11.7	I	L	7	28.0	2.3
Tagelus plebeius	Myakka	11.7	S	D	1	16.0	6.0
Tagelus plebeius	Myakka	12.5	I	L	5	28.3	1.3
Tagelus plebeius	Myakka	12.5	S	D	2	27.0	7.0
Tagelus plebeius	Myakka	12.5	S	L	2	16.0	1.0
Tagelus plebeius	Myakka	13.5	I	D	1	20.0	1.0
Tagelus plebeius	Myakka	13.5	I	L	34	17.8	1.0
Tagelus plebeius	Myakka	14.6	I	L	27	20.6	1.0
Tagelus plebeius	Myakka	15.3	I	D	1	33.0	4.0
Tagelus plebeius	Myakka	15.3	I	L	4	23.0	2.0
Tagelus plebeius	Myakka	17.4	I	D	1	22.0	3.0
Tagelus plebeius	Myakka	18.4	I	D	1	29.0	2.0
Tellina sp.	Myakka	0.7	S	D	1	9.0	9.0
Tellina sp.	Myakka	3.5	S	D	2	13.0	6.0

APPENDIX 5

RELICT OYSTER REEFS IN DONA/ROBERTS BAYS

APPENDIX 5 - RELICT OYSTER REEFS IN DONA/ROBERTS BAYS

Corresponding to Task 1.B, Sarasota County Contract 2004-134, Work Order 04-03

The objective of this task was to determine whether Shakett or Curry Creeks, or the bays they form, contain historic oyster reefs that are presently buried and, if so, whether the reefs extended the known range of oyster reefs in either water way.

This effort was made on December 2-3, in order that favorable tides would facilitate sampling methods. In order to locate buried reefs, a set of steel rods of varying lengths and diameters were employed. A rod was driven by hand into sediment until refused by a subsurface feature. The depth of refusal, plus water depth if the site was submerged, time and GPS position were recorded.

Prior to searching for buried oyster reefs of unknown location, preliminary sampling was conducted in three known settings:

1. Existing oyster reefs
2. Areas putatively devoid of reefs at any time
3. Reefs known to have existed in 1948 but now gone

Surveys began in Curry Creek, on visible reefs, for the purpose of establishing the sound and feel of refusal by oyster shell at various depths. Probes made in deeper "channel" areas where oysters may have never grown established that the bottom was dominated by unconsolidated sediments to a depth of at least 2 m. However, occasional and very local refusals were encountered even in these areas, suggesting a diffuse dispersion of solitary shells or clumps beneath the contemporary sediment surface.

Two reefs known from Jones (2003) to have existed in 1948 but not now were investigated.

Former Reef 1 is located near RK 3.25 on the south side of the route used by boats. It is a small feature that extends southwest from the northwest tip of a mangrove island. An approximate position is 27.11407 deg N, 82.44491 W. The sediment surface had an irregular relief and no distinguishing surface features. Twelve probes were made across the length and width of the area. All were refused with shell signatures. Refusal ranged from 14-66 cm below sediment surface (mean 53.1 cm; std. dev. 14.3 cm). There is approximately twice the amount of sediment here than can be explained by sea level rise. The source of surplus sediment is uncertain.

Former Reef 2 is a large system between Reef 1 and the railroad trestle, approximately where a manatee caution sign is located. Eight of ten probes were refused there over depths of 39-67 cm (mean 52.1 cm; std. dev. 9.6 cm).

Probes at two known former reefs found them to be 50-60 cm below the sediment surface. Knowing that, and having acquired some local experience with oyster refusal signatures, an effort was made to find oyster reefs in other areas.

The first area investigated was a large shoal upstream of the trestle and main reef system of Curry Creek. The shoal was exposed at 1341 and presented a rounded relief, highest in the middle, with some minor depressions and holes. Fifteen of 35 probes were refused (the shoal was primarily sand); refusal ranged from 47-80 cm (mean 65.4 +/- 9.2). I had the definite impression that reefs were present under this shoal, but with no cues with which to create a predictive model there was no efficient way to survey the shoal in its entirety.

As I was wondering how or whether to continue probing the shoal I noticed some small patches of low vegetation. Walking toward them I also noticed that large burrows crossed the shoal in obtuse and angle angles, with a disposition amongst them not unlike that seen in modern oyster reefs (Figure 1– two burrow systems are visible in the middle of the photograph).

Random probes along and across the burrow groups were refused in a manner consistent with the presence of buried oyster reefs, but this could not be established in any detail owing to the necessity to survey upstream reaches of the creek that might add to the known range of oysters.

For the record, the two small dark spots behind the burrows depicted in Figure 1 are new beds of submerged aquatic vegetation, probably *Eleocharis sp.* Larger green patches are comprised of algae. The positions of two beds are 27.11552 deg N, 82.44152 W; and 27.11553 deg N, 82.44169 W.

The remainder of the survey was made by motoring upstream to power lines east of Albee Farm Road (27.11752 deg N, 82.42953 W) and returning downstream. Dead barnacles and no oysters were seen on bridge pilings. No sites seemed suitable as historic oyster reef habitat until reaching the downstream ends of mid-channel mangrove islands. Three of these were surveyed.

Exploratory Site A. (27.11628 deg N, 82.44071 W) This island point was closest to the north bank of Curry Creek. Ten probes were made on 1 m centers around the point toward and into the canopied interior of the island. Half returned solid refusals ranging from 29-70 cm.

Exploratory Site B. (27.11591 deg N, 82.44014 W) This island point was inside a cove formed by the islands. Only one of ten probes was refused, at 65 cm.

Exploratory Site C. (27.11574 deg N, 82.44117 W) Being the western-most point of the southern mid-channel island. Nine of 10 probes were solidly refused over a range of 20-51 cm (33.2 cm +/- 10.8 cm). Being the last stop of the day, and finding that refusal was relatively close to the surface, this site was excavated by hand. Large oyster shells were found at depth.

Shakett Creek was surveyed from the Cow Pen Slough control structure down to Dona Bay. No oysters were present in the first half kilometer of the waterway below the structure but at approximately 600 m dead oysters were found along the bank. Other isolated small patches of dead oysters were observed farther downstream.

A side channel heads north at 27.14291 deg N, 82.43121 W and the point at this junctured was probed for oyster. None of 10 probes to 1.5 m was refused.

Approximately 1.3 km below the structure a backwater on the north side of the channel presents a point of uplands and fringing mangrove. None of 25 probes to 1.5 m was refused.

The environment downstream of Laurel Road presents more undisturbed waters, shorelines, and bottom than upstream of the bridge. There are signs of old, sparse oysters on the bridge pilings.

A substantial reef occurs at 27.13340 deg N, 82.43675 W, near Red Daymark 46. Others were found near Red Daymark 42. Based on the abundance of oyster downstream of Laurel and Albee Farm Roads, there does not seem to be any significant amount of oyster habitat left unoccupied. Nor does there seem to be any likely sites where former reefs lay buried below sediment.

Finally, some effort was made to search for oyster reefs within a kilometer of Venice Inlet. Owing to the extent of physical changes caused by dredging and filling it was difficult to locate candidate sites. Two large shoals on the Roberts Bay side of the inlet were studied. One at 27.11005 deg N, 82.45928 W is underlain and comprised of shell of mixed size and origins, and includes some oyster and rock material. Numerous probes were immediately refused everywhere across the shoal. Another shoal at 27.11227 deg N, 82.45868 was entirely sand in nature.

A mangrove point bar on the east side of the Intracoastal Waterway 1.13 km north of Venice Inlet, was variously refused at depths of 15-36 cm, but probes made along this shoreline also were refused, suggesting that the underlying material was either natural marine material or dredge spoil. In either event, this site is not closer to Venice Inlet that Lyons Bay reefs already mapped by Jones (1993) and therefore the site would not change the known range of oyster in the area.

In summary, Curry Creek has numerous extant oyster reefs. Other reefs were found at the downstream points of mid-channel mangrove islands upstream of the modern range of extant oysters. A large shoal may cover a number of former oyster reefs and the potential of using crustacean burrows as proxies for their location deserves to be evaluated formally. Shakett Creek, on the other hand, has an upstream reach wrecked by channelization. It is impossible to know whether oyster reefs once grew there, but modern reefs still do in the creek downstream of Laurel Road and there seem to be many likely sites where former reefs lay buried below sediment.

Evidence for old oyster reefs near Venice Inlet is scant, and based on the creek surveys reported here, unlikely. Shakett Creek may have had oyster reefs upstream of their modern location but that cannot be known with certainty because of channelization. Curry Creek has some old reefs upstream of modern ones and there may be many more reefs buried within the range of modern ones that are presently unknown.