



Monitoring Salt Marsh Vegetation and Nekton at Assateague Island National Seashore

2010 Summary Report

Natural Resource Data Series NPS/NCBN/NRDS—2011/312



ON THE COVER

Salt marsh at Assateague Island National Seashore.
Photograph by: Robin Baranowski

Monitoring Salt Marsh Vegetation and Nekton at Assateague Island National Seashore

2010 Summary Report

Natural Resource Report NPS/NCBN/NRDS—2011/312

Erika L. Patenaude

Penelope S. Pooler

National Park Service
Northeast Coastal and Barrier Network
University of Rhode Island
1 Greenhouse Rd
Kingston, RI 02881

October 2011

U.S. Department of the Interior
National Park Service
Natural Resource Program Center
Fort Collins, Colorado

The National Park Service, Natural Resource Stewardship and Science office in Fort Collins, Colorado publishes a range of reports that address natural resource topics of interest and applicability to a broad audience in the National Park Service and others in natural resource management, including scientists, conservation and environmental constituencies, and the public.

The Natural Resource Data Series is intended for the timely release of basic data sets and data summaries. Care has been taken to assure accuracy of raw data values, but a thorough analysis and interpretation of the data has not been completed. Consequently, the initial analyses of data in this report are provisional and subject to change.

All manuscripts in the series receive the appropriate level of peer review to ensure that the information is scientifically credible, technically accurate, appropriately written for the intended audience, and designed and published in a professional manner.

Data in this report were collected and analyzed using methods based on established, peer-reviewed protocols and were analyzed and interpreted within the guidelines of the protocols.

Views, statements, findings, conclusions, recommendations, and data in this report do not necessarily reflect views and policies of the National Park Service, U.S. Department of the Interior. Mention of trade names or commercial products does not constitute endorsement or recommendation for use by the U.S. Government.

This report is available from (<http://www.nps.gov/nero/science/>) and the Natural Resource Publications Management website (<http://www.nature.nps.gov/publications/nrpm>).

Please cite this publication as:

Patenaude, E. L., and P. S. Pooler. 2011. Monitoring salt marsh vegetation and nekton at Assateague Island National Seashore: 2010 summary report. Natural Resource Data Series NPS/NCBN/NRDS—2011/312. National Park Service, Fort Collins, Colorado.

Contents

	Page
Figures.....	v
Tables.....	vii
Executive Summary.....	ix
Acknowledgments.....	xi
Introduction.....	1
Methods.....	3
Permanent Site Selection	3
Nekton Sampling Station Selection and Data Collection.....	3
Vegetation Plot Selection and Data Collection	5
Data Summary	7
Nekton.....	7
Vegetation	7
Results.....	9
Nekton.....	9
Vegetation.....	13
Discussion.....	17
Literature Cited	19
Appendix A: Coordinates for nekton station locations at ASIS in 2010.	21
Appendix B: Coordinates for vegetation plot locations at ASIS in 2010.	29
Appendix C: Nekton species and community density at ASIS in 2010 summarized by site and visit.	39
Appendix D: Nekton species richness at ASIS in 2010 summarized by site and visit.	43
Appendix E: Vegetation species observed at ASIS in 2010.	45

Figures

Page

Figure 1. Locations of permanent nekton and vegetation monitoring sites established by NCBN in 2008 at Assateague Island National Seashore (ASIS).....	4
---	---

Tables

	Page
Table 1. Sampling dates and total number of nekton sampling stations at nine marsh sites at ASIS in 2010.....	5
Table 2. Sampling dates and total number of vegetation plots sampled at nine marsh sites at ASIS in 2010.....	6
Table 3. Definition of standard cover type categories used in the Northeast Coastal and Barrier Network salt marsh vegetation monitoring protocol (James-Pirri and Roman In Review-b).....	6
Table 4. Modified Braun-Blanquet scale and corresponding midpoint values for determining percent cover of each vegetation species and non-vegetation cover type.	7
Table 5. Nekton species and community composition (% catch) at ASIS in 2010.....	9
Table 6. Average density and standard deviation [individuals per 1 m ² ± SD (total count)] of nekton captured at ASIS in 2010.	10
Table 7. Average density and standard deviation [individuals per 1 m ² ± SD (total count)] of nekton captured for each habitat type at ASIS in 2010.....	11
Table 8. Average length [mm ± SD (no. measured)] of nekton during each sample visit at ASIS in 2010.	12
Table 9. Estimated nekton species richness (species richness ± SD) summarized by sampling visit at ASIS in 2010.	13
Table 10. Average values for physical characteristics [Average ± SD (no. of stations)] at nekton sampling stations at ASIS in 2010.	13
Table 11. Average percent cover (Avg. Cover % ± SD), frequency, and relative percent prevalence of each plant species and non-vegetation cover type at ASIS in 2010.....	14

Executive Summary

The Northeast Coastal and Barrier Network (NCBN) is one of 32 networks of parks created by the National Park Service (NPS) Inventory and Monitoring Program (I&M Program). The I&M Program has two components, 1) to collect baseline ecological inventory datasets and 2) to implement *Vital Signs* monitoring, a long-term ecological monitoring program, in each of the 32 networks. The Northeast Coastal and Barrier Network consists of eight parks linked by geography and shared ecological characteristics along the Northeastern Atlantic Coast. As part of the I&M Program, each network has developed detailed protocols for monitoring a select number of Vital Signs, or ecological indicators. Because the majority of parks in the NCBN are coastal parks, salt marsh monitoring was chosen as a high priority and protocols were developed for collecting long-term data on salt marsh vegetation and nekton (James-Pirri and Roman In Review-a,b). The objective of monitoring vegetation and nekton is to identify long-term trends in community structure, and to provide resource managers with a better understanding of the current status and condition of the salt marsh resources they manage.

The NCBN began implementation of the salt marsh vegetation and nekton protocols at Assateague Island National Seashore (ASIS) at nine permanent sites in 2008. This report summarizes the second year of vegetation and nekton data collected at ASIS. Monitoring will continue on a biennial basis.

Approximately fifty vegetation plots were sampled at each of the nine marsh sites (total = 449 plots) in July of 2010. The percent cover of each vegetation species and non-vegetation cover type within each 1 m² plot was visually estimated using a revised Braun-Blanquet method (Kent and Coker 1992). Thirty vegetation species and four non-vegetation cover types were recorded in 2010. Non-vegetation cover types recorded included bare ground, wrack & litter, water, and horse manure.

A total of 149 nekton stations were established at the nine marsh sites. Nekton in marsh pools and large tidal creeks were sampled with a 1m² aluminum throw trap (Kushlan 1981, Sogard & Able 1991, Raposa and Roman 2001). There were 12 species of nekton recorded at ASIS in 2010, including nine fish species, one crab species, and one shrimp species. Examination of percent catch data indicates that five species account for approximately 97% of all nekton captured. The most prevalent species, *Cyprinodon variegatus* (sheepshead minnow), accounts for approximately 54% of all nekton recorded at ASIS in 2010. The second most common species, *Fundulus heteroclitus* (common mummichog), accounts for approximately 23% of all nekton.

Acknowledgments

Many thanks to 2010 field crew members, Zachary Bourassa, Daphne Forster, Brandon Haynes, and Casey Nolan, for their hard work. We would also like to thank the staff at Assateague Island National Seashore for providing logistical support during the field season.

Introduction

National Park Service (NPS) managers need accurate information about how, when and why natural systems change over time in order to make sound management decisions. To address this need, the NPS initiated natural resource monitoring through the Natural Resource Challenge funded by Congress in 2000. The Inventory and Monitoring Program (I&M), the key component of this effort, organizes 270 park units into 32 networks tasked with conducting long-term ecological monitoring. Networks were required to develop a monitoring plan addressing the implementation of long-term monitoring of key ecological indicators or “vital signs.” Vital signs are defined as measurable, early warning signals that may indicate change in the long-term health of natural systems. Early detection of potential problems allows park managers to take steps in restoring or maintaining ecological health of park resources.

The Northeast Coastal and Barrier Network (NCBN) is made up of eight parks: Assateague Island National Seashore (ASIS, coastal Maryland and Virginia), Thomas Stone National Historic Site (THST, Charles County, MD), Cape Cod National Seashore (CACO, Cape Cod, MA), Gateway National Recreation Area (GATE, New York, NY and Sandy Hook, NJ), Fire Island National Seashore (FIIS, Long Island, NY), Sagamore Hill National Historic Site (SAHI, Oyster Bay, NY), Colonial National Historical Park (COLO, Virginia Peninsula), and George Washington Birthplace National Monument (GEWA, Westmoreland County, VA). Vital Signs chosen as part of the Network’s monitoring plan include salt marsh vegetation communities, nekton communities, essential estuarine water quality parameters and specific coastal geomorphologic features (Stevens et al. 2005). Detailed monitoring protocols have been developed and implemented in the eight parks. This annual report summarizes salt marsh vegetation and nekton community data collected at Assateague Island National Seashore in 2010 according to two protocols developed by James-Pirri and Roman, *Monitoring Nekton in Salt Marshes: A Protocol for the National Park Service’s Long-Term Monitoring Program, Northeast Coastal and Barrier Network* and *Monitoring Salt Marsh Vegetation: A Protocol for the National Park Service’s Long-Term Monitoring Program, Northeast Coastal and Barrier Network* (In Review-a,b).

Methods

Permanent Site Selection

All salt marsh areas were identified and delineated into 5-8 hectare areas using a GIS. Nine permanent monitoring sites (established in 2008) were randomly selected for vegetation and nekton sampling (Figure 1). Vegetation and nekton sampling will continue to be conducted at these nine sites on a biennial basis. Detailed information about the site selection process and sampling design can be found in the salt marsh monitoring protocols (James-Pirri and Roman In Review-a,b).

Nekton Sampling Station Selection and Data Collection

Nekton stations are re-randomized each sampling year. Depending on available habitat, between nine and 20 nekton sampling stations were established at each marsh site in 2010 (total number of stations = 149). Habitat types sampled included marsh pools/pannes and tidal creeks. All nekton sampling stations were randomly located along the perimeter of a pool or tidal creek. Nekton stations were sampled twice, once in early summer (mid- to late-June) and once in late summer (early-August) (Table 1). Universal Transverse Mercator (UTM) coordinates for each station are provided in Appendix A.

Nekton in marsh pools and creeks less than 1 m deep were sampled with a 1 m² aluminum throw trap (Kushlan 1981, Sogard and Able 1991, Raposa and Roman 2001). The throw trap is an enclosure sampler that has excellent capture efficiency and provides quantitative, repeatable results (Rozas and Minello 1997). The trap has an open top and bottom, is 0.5 m in height and 1m square, and the sides are covered with 3 mm (1/8 in) wire mesh. All nekton were collected from the trap with a 1 mm mesh dip net that fit snugly within the opposite sides of the trap.

All fish and decapods were identified and enumerated. A representative number (up to 15 individuals) of each species collected was measured for length (fish & shrimp – total length; crabs – carapace width). Once identified and measured, all organisms were returned to the location from which they were collected.

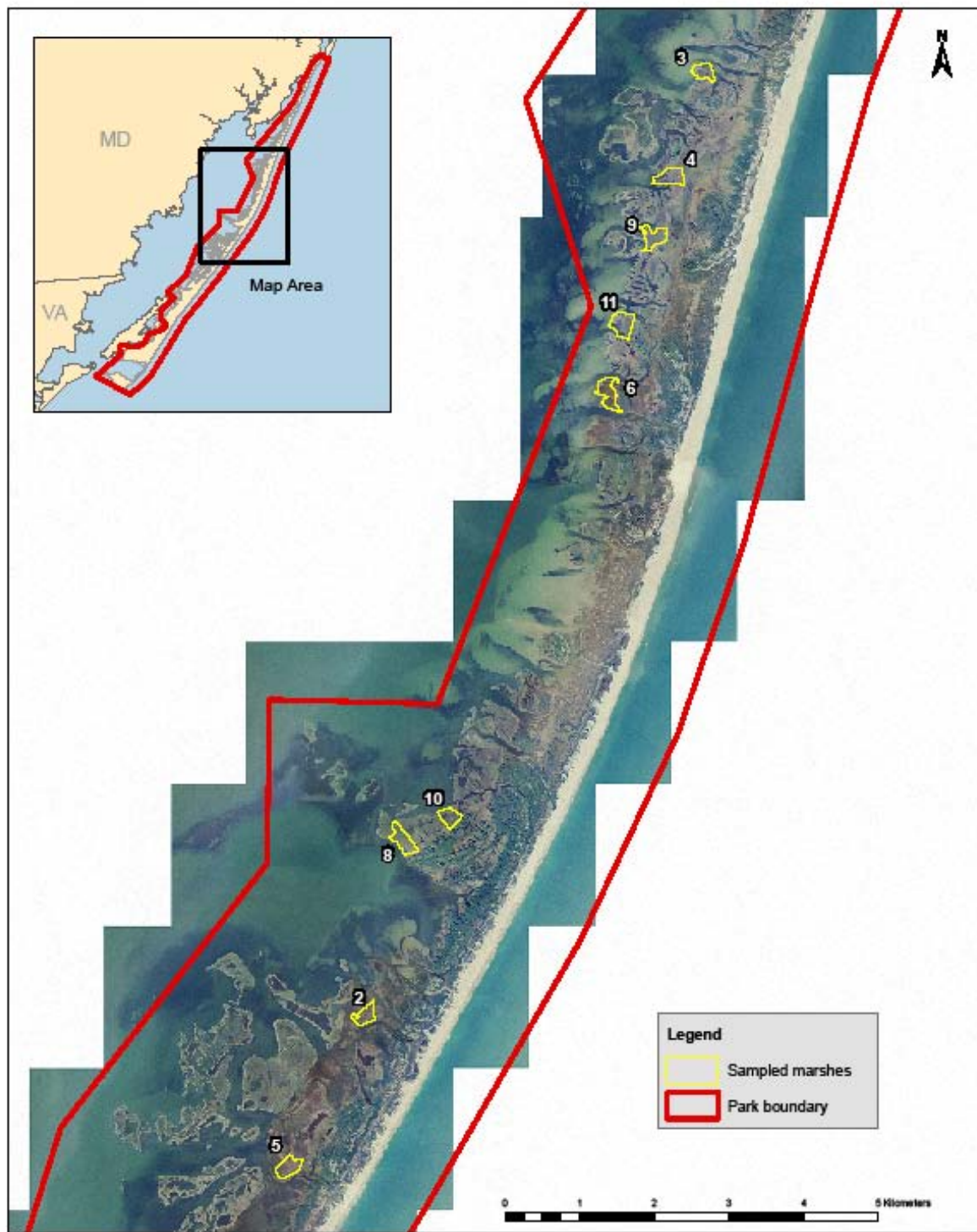


Figure 1. Locations of permanent nekton and vegetation monitoring sites established by NCBN in 2008 at Assateague Island National Seashore (ASIS). These nine sites will be monitored biennially.

Table 1. Sampling dates and total number of nekton sampling stations at nine marsh sites at ASIS in 2010. Sampling stations are displayed by habitat type. '--' indicates creek habitat not available. '*' one or more stations could not be sampled due to insufficient water or inaccessibility.

Site	Visit	Dates	Habitat		Total
			Tidal Creek	Pool/Panne	
2	1	6/18/2010	--	9	9
	2	8/10/2010	--	9	9
3	1	6/14/2010	4	13	17*
	2	8/6/2010	4	14	18
4	1	6/15/2010	4	12	16
	2	8/5/2010	4	9	13*
5	1	6/16/2010	--	15	15
	2	8/11/2010	--	15	15
6	1	6/17/2010	4	16	20
	2	8/14/2010	4	15	19*
8	1	6/22/2010	4	15	19
	2	8/14/2010	4	15	19
9	1	6/21/2010	4	15	19
	2	8/13/2010	4	14	18*
10	1	6/23/2010	--	15	15*
	2	8/13/2010	--	16	16
11	1	6/24/2010, 6/25/2010	0	14	14
	2	8/2/2010	0	10	10*

Vegetation Plot Selection and Data Collection

Vegetation was sampled using 1 m² plots randomly located within each marsh. Transects—extending from creek bank to upland—were systematically placed throughout the site based on a single random start. Plots were then randomly located by treating all transects as a single transect and randomly selecting 50 points along this total length. This combination of systematic transects and replicate plots is necessary to ensure interspersed of the plots throughout the marsh study area, thus providing a representative sample of all salt marsh communities (*e.g.*, low marsh, high marsh). Universal Transverse Mercator (UTM) coordinates for each station are provided in Appendix B.

Vegetation sampling was conducted at ASIS in July 2010 (Table 2). Approximately fifty, 1 m² plots were sampled at each site. Each plot was visited once during the summer. For each plot, all vegetation species and non-vegetation cover types were recorded (Table 3), and the estimated percent cover was visually estimated using a modified Braun-Blanquet cover scale (0: 0%; 1: <1%; 2: 1-5%; 3: 6-25%; 4: 26-50%; 5: 51-75%; 6: 76-100%), (Kent and Coker 1992).

Table 2. Sampling dates and total number of vegetation plots sampled at nine marsh sites at ASIS in 2010.

Site	Dates	Total
2	7/6/2010, 7/8/2010	50
3	7/8/2010	50
4	7/12/2010, 8/5/2010	49
5	7/14/2010	50
6	7/7/2010	51
8	7/9/2010	50
9	7/12/2010	50
10	7/13/2010	49
11	7/15/2010	50

Table 3. Definition of standard cover type categories used in the Northeast Coastal and Barrier Network salt marsh vegetation monitoring protocol (James-Pirri and Roman In Review-b).

Live vascular plants	Identified by species (herbaceous and shrubs).
Standing non-living vascular plants	Identified by species (e.g., <i>S. alterniflora</i> Not Living). This category only includes standing dead (attached) plants that are from a previous year's growth. There may be some dead leaves from this year's growth (e.g., the ends of leaves or leaves that are being replaced by new growth, etc.). In cases where dead leaves are from the current growing season, plant cover is recorded as live.
Macroalgae	Identified by species. This category generally includes the rockweeds (e.g., <i>Fucus</i> , <i>Ascophyllum</i>). Microalgae (e.g., diatom mats) and fine filamentous algae are not included in this category.
Bare ground	Includes mud, sand, microalgae cover, etc. These are areas that are not flooded with water and are devoid of standing live, standing dead, or macroalgae. There can be a thin film of surface water within the bare ground category.
Water	Permanent standing water is identified in plots that are partly within a creek, ditch, marsh pool, or flooded panne.
Wrack/litter	Wrack is material that has floated into the plot. This is generally dead (not attached) plant material, but could also be trash. Litter is dead plant material that is highly decomposed and is no longer attached.
Trash	Items such as logs, old piers, tires, etc.
Rock	Boulders or rocks can be found on the surface of northern New England marshes.

Data Summary

Nekton

Species composition, average density, average length of nekton, and standard deviations were all calculated using standard formulae. The same is true of the average values of the physical characteristics calculated for each habitat type during each visit. Details can be found in the Analysis and Reporting Standard Operating Procedure of James-Pirri et al. (In Review-a). Species richness was calculated using the algorithm described in Heltshe and Forester (1983). An explanation and example of using the algorithm is provided in the Analysis and Reporting Standard Operating Protocol of James-Pirri et al. (In Review-a).

Vegetation

Vegetation data were recorded using the modified Braun-Blanquet scale as described above (Kent and Coker 1992). For summary purposes, each Braun-Blanquet value was converted to the midpoint of the percent range it represented (Table 4) as described in Wikum and Shanholtzer (1978).

Table 4. Modified Braun-Blanquet scale and corresponding midpoint values for determining percent cover of each vegetation species and non-vegetation cover type.

BB Value	Percent Cover	Midpoint
0	0%	0%
1	< 1%	0.50%
2	1 - 5%	3%
3	6 - 25%	15.50%
4	26 - 50%	38%
5	51 - 75%	63%
6	76 - 100%	88%

Wikum and Shanholtzer (1978) outline a method for calculating an importance value for each species. So as not to confuse this value with ecological importance, we rename it a ‘relative prevalence’ value. The calculation is essentially identical to that described in Wikum and Shanholtzer’s publication. Although Wikum and Shanholtzer (1978) present their importance value as a sum of the percent frequency and percent cover values, this report takes the average of these values so that relative prevalence is on a more readily interpretable percent scale. We estimated the relative percent prevalence for each species and non-vegetation cover type present, which is equal to the average of the relative percent cover and the relative percent frequency.

Relative percent cover is the percentage of all plots that each species covers relative to all other species present in the plots. The sum of all relative percent cover values for all species and non-vegetation cover types equals 100%. Relative percent frequency is the number of plots where each species is present, relative to all other species observed in the plots. The sum of the relative percent frequency values for all species and non-vegetation cover type equals 100%.

Taking the average of the relative percent cover and the relative percent frequency gives the *relative percent prevalence* for each species and non-vegetation cover type. Because the relative percent prevalence incorporates both percent frequency and percent cover, it is likely to differ substantially from the average percent cover for a given species or non-vegetation cover type. The relative percent prevalence of a species provides information about how a species is distributed (*i.e.*, its ‘patchiness’) throughout the salt marsh. We also report the average percent cover of each species for all plots combined.

Lastly, if any identified vegetation species in the sample plots are listed by the United States Department of Agriculture (USDA), the state of Maryland or the commonwealth of Virginia as exotic, invasive, threatened, endangered, or rare, these species are noted in the vegetation table. Information about plants listed by each state as exotic, invasive, threatened, endangered, or rare is available online (USDA 2010). In some cases, more specific information may be available on state websites. Information about plants listed by the state of Maryland as exotic or invasive is available online (Maryland Invasive Species Council 2010). Information about plants listed by the state of Maryland as threatened, endangered, or rare can be obtained from the Maryland Natural Heritage Program (2010). Information about plants listed by the commonwealth of Virginia as exotic or invasive is available online (Virginia Department of Conservation and Recreation 2009). Information about plants listed by the commonwealth of Virginia as threatened, endangered, or rare can be obtained from an online report produced by the Virginia Department of Conservation and Recreation (Townsend 2009).

If any species found in the sample plots are noted as being from one of these categories, plots with those categories of vegetation present will be noted in Appendix B, the list of all vegetation sample plots and their respective Universal Transverse Mercator (UTM) coordinates.

Results

Nekton

Eleven nekton species consisting of nine fish and two decapod species were captured at ASIS during the summer of 2010 at nine marsh sites. Fish comprised approximately 97% of all nekton captured (Table 5). Examination of nekton species and composition (% catch) indicates that three fish species, *Cyprinodon variegatus*, *Fundulus heteroclitus* and *Lucania parva*, account for approximately 91% of all nekton recorded at ASIS in 2010 (Table 5).

The average density of each species and community for each sampling visit is presented in Table 6. *Cyprinodon variegatus* had the highest density of all species captured in 2010, with *F. heteroclitus* following respectively. Species and community density summarized by sampling visit and habitat type (pool or creek) are shown in Table 7. Species and community densities for each sampling visit at each site are presented in Appendix C. The average length of each species is summarized in Table 8.

Calculating species richness provides additional information about the nekton community during the two sampling visits (Table 9). Species richness summarized by site and visit can be found in Appendix D.

Physical characteristics of nekton sampling stations were recorded during each visit. These measures provide limited insight into differences between habitats and visits that may affect nekton (Table 10). These data are collected to help explain anomalies in nekton observed at a particular location during a specific visit (*e.g.*, presence/absence of a particular species).

Table 5. Nekton species and community composition (% catch) at ASIS in 2010. Data are shown for each visit and both visits combined. n = total number of nekton caught at all nine sites. '-' indicates species was not present.

Community/Species	Common Name	Community/Species Composition (%)		
		Visit 1 (n = 5409)	Visit 2 (n = 4199)	Visits 1 & 2 (n = 9608)
Fish		98.7	94.6	96.9
Cyprinodon variegatus	Sheepshead minnow	58.2	48.7	54.0
Fundulus heteroclitus	Common mummichog	19.6	27.9	23.3
Lucania parva	Rainwater killifish	11.8	16.1	13.7
Brevoortia tyrannus	Atlantic menhaden	7.7	0.0	4.4
Menidia beryllina	Inland silverside	1.1	1.6	1.3
Leiostomas xanthurus	Spot croaker	0.2	-	0.1
Anguilla rostrata	American eel	< 0.05	0.1	0.1
Mugil cephalus	Striped mullet	< 0.05	0.1	< 0.05
Fundulus majalis	Striped killifish	-	< 0.05	< 0.05
Unknown fish	Unknown fish	-	< 0.05	< 0.05
Decapods		1.3	5.4	3.1
Palaemonetes pugio	Daggerblade grass shrimp	0.5	4.6	2.3
Callinectes sapidus	Blue crab	0.9	0.8	0.8

Table 6. Average density and standard deviation [individuals per 1 m² ± SD (total count)] of nekton captured at ASIS in 2010. n = number of nekton stations sampled at all nine sites. The difference in the number of stations sampled between visits was due to insufficient water or inaccessibility. '-' indicates species was not present.

Community/Species	Common Name	Average Density [individuals per 1 m ² ± SD (total count)]		
		Visit 1 (n =148)	Visit 2 (n = 137)	Visits 1 & 2 (n = 150)
Fish		36.1 ± 40.6 (5337)	29.0 ± 40.8 (3972)	32.7 ± 40.8 (9309)
Cyprinodon variegatus	Sheepshead minnow	21.3 ± 28.4 (3146)	14.9 ± 26.6 (2045)	18.2 ± 27.7 (5191)
Fundulus heteroclitus	Common mummichog	7.2 ± 14.3 (1062)	8.6 ± 17.4 (1173)	7.8 ± 15.8 (2235)
Lucania parva	Rainwater killifish	4.3 ± 20.1 (637)	4.9 ± 10.8 (678)	4.6 ± 16.3 (1315)
Brevoortia tyrannus	Atlantic menhaden	2.8 ± 16.9 (419)	-	1.5 ± 12.3 (419)
Menidia beryllina	Inland silverside	0.4 ± 1.6 (58)	0.5 ± 2.5 (66)	0.4 ± 2.1 (124)
Leiostomas xanthurus	Spot croaker	0.1 ± 0.8 (12)	-	< 0.05
Anguilla rostrata	American eel	< 0.05	< 0.05	< 0.05
Mugil cephalus	Striped mullet	< 0.05	< 0.05	< 0.05
Fundulus majalis	Striped killifish	-	< 0.05	< 0.05
Unknown fish	Unknown fish	-	< 0.05	< 0.05
Decapods		0.5 ± 1.5 (72)	1.7 ± 16.0 (227)	1.0 ± 11.1 (299)
Palaemonetes pugio	Daggerblade grass shrimp	0.2 ± 1.3 (25)	1.4 ± 15.9 (194)	0.8 ± 11.1 (219)
Callinectes sapidus	Blue crab	0.3 ± 0.6 (47)	0.2 ± 0.6 (33)	0.3 ± 00.6 (80)
Total Nekton		36.5 ± 40.9 (5409)	30.6 ± 46.1 (4199)	33.7 ± 43.5 (9608)

Table 7. Average density and standard deviation [individuals per 1 m² ± SD (total count)] of nekton captured for each habitat type at ASIS in 2010. n = number of nekton stations sampled at all nine sites. Differences in number of stations sampled between visits was due to insufficient water or inaccessibility. '-' indicates species was not present.

Community/Species	Common Name	Average Density [individuals per 1 m ² ± SD (total count)]			
		Visit 1		Visit 2	
		Pool / Panne (n = 124)	Tidal Creek (n = 24)	Pool / Panne (n = 117)	Tidal Creek (n = 20)
Fish		35.7 ± 39.2 (4423)	38.1 ± 48.0 (914)	26.9 ± 41.4 (3147)	41.3 ± 35.4 (825)
	Cyprinodon variegatus	22.5 ± 27.1 (2788)	14.9 ± 34.4 (358)	14.2 ± 26.9 (1662)	19.2 ± 25.2 (383)
	Fundulus heteroclitus	7.0 ± 13.6 (864)	8.3 ± 17.7 (198)	8.2 ± 17.1 (954)	11.0 ± 19.4 (219)
	Lucania parva	5.1 ± 21.9 (632)	0.2 ± 0.5 (5)	4.4 ± 9.9 (515)	8.2 ± 15.0 (163)
	Brevoortia tyrannus	0.7 ± 6.3 (92)	13.6 ± 38.3 (327)	-	-
	Menidia beryllina	0.4 ± 1.6 (45)	0.5 ± 1.6 (13)	0.1 ± 0.4 (14)	2.6 ± 6.3 (52)
	Leiostomas xanthurus	-	0.5 ± 0.9 (12)	-	-
	Anguilla rostrata	< 0.05	-	-	0.2 ± 0.9 (4)
	Mugil cephalus	-	< 0.05	< 0.05	0.1 ± 0.4 (2)
	Fundulus majalis	-	-	-	0.1 ± 0.2 (1)
	Unknown fish	-	-	-	0.1 ± 0.2 (1)
Decapods		0.4 ± 1.6 (51)	0.9 ± 1.0 (21)	0.3 ± 0.9 (39)	9.4 ± 41.8 (188)
	Palaemonetes pugio	0.2 ± 1.4 (24)	< 0.05	0.1 ± 0.7 (8)	9.3 ± 41.6 (186)
	Callinectes sapidus	0.2 ± 0.5 (27)	0.8 ± 1.0 (20)	0.3 ± 0.6 (31)	0.1 ± 0.3 (2)
Total		36.1 ± 39.6 (4474)	39.0 ± 48.1 (935)	27.2 ± 41.6 (3186)	50.7 ± 64.4 (1013)

Table 8. Average length [mm $\pm$ SD (no. measured)] of nekton during each sample visit at ASIS in 2010. Length data for each species was summarized over all stations sampled during each visit. '-' indicates that a species was not present.

Community/Species	Common Name	Average Length [mm ± SD (no. measured)]		
		Visit 1	Visit 2	Visits 1 & 2
Fish				
Anguilla rostrata	American eel	56.5 ± 10.6 (2)	98.2 ± 29.3 (5)	86.3 ± 31.7 (7)
Brevoortia tyrannus	Atlantic menhaden	51.6 ± 4.9 (97)	-	51.6 ± 4.9 (97)
Cyprinodon variegatus	Sheepshead minnow	16.9 ± 10.7 (1265)	27.3 ± 11.0 (780)	20.8 ± 11.9 (2045)
Fundulus heteroclitus	Common mummichog	35.6 ± 18.0 (642)	33.9 ± 16.5 (560)	34.8 ± 17.4 (1202)
Fundulus majalis	Striped killifish	-	62.0 (1)	62.0 (1)
Leiostomas xanthurus	Spot croaker	52.1 ± 6.3 (12)	-	52.1 ± 6.3 (12)
Lucania parva	Rainwater killifish	16.9 ± 5.1 (170)	24.1 ± 5.1 (423)	22.0 ± 6.0 (593)
Menidia beryllina	Inland silverside	33.5 ± 18.6 (57)	33.7 ± 11.0 (55)	33.6 ± 15.3 (112)
Mugil cephalus	Striped mullet	84.0 (1)	24.7 ± 8.1 (3)	39.5 ± 30.4 (4)
Unknown fish	Unknown fish	-	45.0 (1)	45.0 (1)
Decapods				
Callinectes sapidus	Blue crab	47.3 ± 24.9 (46)	65.5 ± 18.7 (28)	54.2 ± 24.3 (74)
Palaemonetes pugio	Daggerblade grass shrimp	33.7 ± 8.1 (18)	17.1 ± 9.3 (23)	24.4 ± 12.1 (41)

Table 9. Estimated nekton species richness (species richness $\pm$ SD) summarized by sampling visit at ASIS in 2010. Differences in number of stations sampled between visits was due to insufficient water or access limitations.

Visit	No. of Stations	Observed No. of Species	Est. Species Richness $\pm$ SD
1	148	10	11.0 $\pm$ 1.0
2	137	10	12.0 $\pm$ 1.4
1 & 2	150	12	14.0 $\pm$ 1.4

Table 10. Average values for physical characteristics [Average $\pm$ SD (no. of stations)] at nekton sampling stations at ASIS in 2010. Not all parameters were measured all at stations. Data are summarized over Site 1 and 2 for each habitat type within each visit separately.

Habitat	Average $\pm$ SD (no. of stations)			
	Visit 1		Visit 2	
	Pool/Panne	Tidal Creek	Pool/Panne	Tidal Creek
Depth (cm)	24.5 $\pm$ 10.8 (122)	34.6 $\pm$ 13.0 (24)	24.8 $\pm$ 11.3 (116)	26.5 $\pm$ 8.6 (20)
Temperature ($^{\circ}$ C)	30.3 $\pm$ 3.1 (124)	30.3 $\pm$ 2.1 (23)	29.5 $\pm$ 4.3 (117)	28.2 $\pm$ 2.9 (20)
Salinity (ppt)	30.2 $\pm$ 6.0 (123)	26.8 $\pm$ 1.8 (23)	31.7 $\pm$ 7.7 (117)	30.0 $\pm$ 2.0 (20)
Dissolved Oxygen (mg/L)	4.9 $\pm$ 3.2 (122)	05.0 $\pm$ 2.2 (22)	05.3 $\pm$ 2.9 (117)	03.5 $\pm$ 2.4 (19)

Vegetation

Thirty vegetation species and four non-vegetation cover types (bare ground, wrack & litter, water, and horse manure) were recorded at nine marsh sites at ASIS in 2010 (Table 11). The average percent cover, relative percent prevalence, and frequency of each species or non-vegetation cover type are shown in Table 11. Appendix E provides the frequency of each species summarized by site.

Data are sorted by average percent cover of living vegetation species. Average percent cover of non-living vegetation (if present) is also shown for each species. As explained in the Data Summary section, the relative percent prevalence combines information about how much area each species covers relative to all other species present, and how frequently it appears throughout the sites relative to all others present.

None of the vegetation species observed in the 2010 plots are federally listed by the USDA as exotic, invasive, threatened, endangered, or rare (USDA 2010). Additionally, none of the species observed are listed by the state of Maryland (Maryland Natural Heritage Program 2010), or by the commonwealth of Virginia (Townsend 2009) as threatened, endangered, or rare. None of the species observed in 2010 are listed by the state of Maryland (Maryland Invasive Species Council 2010) or by commonwealth of Virginia (Virginia Department of Conservation and Recreation 2009) as exotic or invasive.

Table 11. Average percent cover (Avg. Cover % $\pm$ SD), frequency, and relative percent prevalence of each plant species and non-vegetation cover type at ASIS in 2010. Data were summarized over all 449 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 4). (NL) indicates standing non-living vegetation.

Species/Cover Type	Common Name	Avg. Cover % $\pm$ SD	Frequency	Relative Prevalence %
Water	Water	31.4 $\pm$ 39.4	199	18
<i>Spartina alterniflora</i>	Salt marsh cordgrass	22.9 $\pm$ 26.1	312	17.6
<i>Spartina alterniflora</i> (NL)	Salt marsh cordgrass (NL)	20.7 $\pm$ 28.3	290	16.1
<i>Spartina patens</i> (NL)	Salt meadow cordgrass (NL)	9.1 $\pm$ 23.4	97	6.3
Wrack/Litter	Wrack/Litter	9.0 $\pm$ 20.4	167	8.1
<i>Spartina patens</i>	Salt meadow cordgrass	8.8 $\pm$ 21.2	113	6.6
<i>Distichlis spicata</i>	Spikegrass	6.0 $\pm$ 13.2	164	6.8
<i>Distichlis spicata</i> (NL)	Spikegrass (NL)	5.2 $\pm$ 14.2	153	6.2
Bare ground	Bare ground	4.2 $\pm$ 14.0	83	3.9
<i>Iva frutescens</i>	Marsh elder	2.4 $\pm$ 10.0	48	2.2
<i>Salicornia virginica</i>	Virginia glasswort	0.8 $\pm$ 2.3	97	2.9
Unknown algae	Unknown algae	0.6 $\pm$ 5.8	7	0.4
<i>Myrica cerifera</i>	Southern bayberry	0.5 $\pm$ 5.0	9	0.4
<i>Baccharis halimifolia</i>	Eastern baccharis	0.2 $\pm$ 3.2	4	0.2
Unknown grass	Unknown grass	0.2 $\pm$ 2.2	10	0.4
<i>Limonium carolinianum</i>	Sea lavender	0.2 $\pm$ 1.2	26	0.8
<i>Juncus gerardii</i>	Saltmarsh rush	0.2 $\pm$ 2.5	6	0.2
<i>Iva frutescens</i> (NL)	Marsh elder (NL)	0.2 $\pm$ 1.1	15	0.5
<i>Ruppia maritima</i> (NL)	Widgeon grass (NL)	0.1 $\pm$ 3.0	2	0.1
<i>Salicornia maritima</i>	Slender glasswort	0.1 $\pm$ 1.3	12	0.4
<i>Myrica cerifera</i> (NL)	Southern bayberry (NL)	0.1 $\pm$ 1.9	2	0.1
<i>Poacea</i>	True grass	0.1 $\pm$ 1.8	1	0.1
<i>Ruppia maritima</i>	Widgeon grass	0.1 $\pm$ 1.1	4	0.1
<i>Toxicodendron radicans</i>	Poison ivy	0.1 $\pm$ 1.1	4	0.1

Table 11. Average percent cover (Avg. Cover % $\pm$ SD), frequency, and relative percent prevalence of each plant species and non-vegetation cover type at ASIS in 2010. Data were summarized over all 449 plots. Percent cover was estimated using the midpoint values of Braun-Blanquet percent ranges (Table 4). (NL) indicates standing non-living vegetation. (continued)

Species/Cover Type	Common Name	Avg. Cover % $\pm$ SD	Frequency	Relative Prevalence %
<i>Schoenoplectus pungens</i>	Common threesquare	0.1 $\pm$ 0.8	7	0.2
<i>Juncus gerardii</i> (NL)	Saltmarsh rush (NL)	< 0.05	2	0.1
<i>Elymus virginicus</i>	Virginia rye grass	< 0.05	6	0.2
Unknown shrub (NL)	Unknown shrub (NL)	< 0.05	1	0
<i>Salicornia</i> species	Glasswort species	< 0.05	9	0.3
Horse Manure	Horse manure	< 0.05	3	0.1
<i>Limonium carolinianum</i> (NL)	Sea lavender (NL)	< 0.05	2	0.1
<i>Parthenocissus quinquefolia</i>	Virginia creeper	< 0.05	2	0.1
<i>Schoenoplectus americanus</i>	Chairmaker's bulrush	< 0.05	2	0.1
<i>Aster</i> species	Aster species	< 0.05	1	< 0.05
<i>Atriplex patula</i>	Spear saltbush	< 0.05	1	< 0.05
<i>Eleocharis</i> species	Spikerush	< 0.05	1	< 0.05
<i>Elymus virginicus</i> (NL)	Virginia rye grass (NL)	< 0.05	1	< 0.05
<i>Juncus effusus</i>	Soft rush	< 0.05	1	< 0.05
<i>Juncus roemerianus</i>	Black needle rush	< 0.05	1	< 0.05
<i>Lythrum lineare</i> (NL)	Saltmarsh loosestrief (NL)	< 0.05	1	< 0.05
<i>Panicum virgatum</i>	Switchgrass	< 0.05	1	< 0.05
<i>Salicornia maritima</i> (NL)	Slender glasswort (NL)	< 0.05	1	< 0.05
<i>Schoenoplectus americanus</i> (NL)	Chairmaker's bulrush (NL)	< 0.05	1	< 0.05
<i>Smilax rotundifolia</i>	Common greenbriar	< 0.05	1	< 0.05
<i>Smilax rotundifolia</i> (NL)	Common greenbriar (NL)	< 0.05	1	< 0.05
<i>Solidago sempervirens</i>	Seaside goldenrod	< 0.05	1	< 0.05
<i>Suaeda maritima</i>	Herbaceous seepweed	< 0.05	1	< 0.05
<i>Vitis rotundifolia</i>	Muscadine grape	< 0.05	1	< 0.05

Discussion

This report summarizes the second year of nekton and vegetation data collection conducted at ASIS in 2010. Given the inherent inter-annual variability in the sampling design, it is not informative to make quantitative comparisons between two years of data. Continued monitoring will allow us to distinguish between inter-annual variability and significant trends in the nekton and vegetation communities.

Literature Cited

- Bertness, M. D. 1991. Zonation of *Spartina Patens* and *Spartina Alterniflora* in New England Salt Marsh. *Ecology* 20:138-148.
- Heltshe, J. F., and N. E. Forrester. 1983. Estimating species richness using the jackknife procedure. *Biometrics* 39:1-11.
- James-Pirri, M. J., C.T. Roman, J. L. Swanson. 2010. A method to quantitatively sample nekton in salt marsh ditches and small tidal creeks. *Transactions of the American Fisheries Society* 139:413-419.
- James-Pirri, M. J., C. T. Roman, and K. B. Raposa. In Development-a. Monitoring nekton in Salt Marshes - A Protocol for the National Park Service's Long-Term Monitoring Program, Northeast Coastal and Barrier Network. Submitted to Sara Stevens, National Park Service Northeast Coastal and Barrier Network.
- James-Pirri, M. J., C. T. Roman, and J. F. Heltshe. In Development-b. Monitoring Salt Marsh Vegetation - A Protocol for the National Park Service's Long-Term Monitoring Program, Northeast Coastal and Barrier Network. Submitted to Sara Stevens, National Park Service Northeast Coastal and Barrier Network.
- Kent, M., and P. Coker. 1992. Vegetation description and analysis: a practical approach. J. Wiley and Sons, Ltd., Chichester, England.
- Kushlan, J.A. 1981. Sampling characteristics of enclosure fish traps. *Transactions of the American Fisheries Society* 110:557-562.
- Maryland Invasive Species Council. Terrestrial Plants.
http://www.mdinvasivesp.org/list_terrestrial_plants.html (accessed 27 September 2011).
- Maryland Natural Heritage Program. 2010. Rare, Threatened and Endangered Plants of Maryland. Maryland Department of Natural Resources, Wildlife and Heritage Service, Annapolis, Maryland.
- Raposa, K. B., and C. T. Roman. 2001. Seasonal habitat-use patterns of nekton in a tide-restricted and unrestricted New England salt marsh. *Wetlands* 21:451-461.
- Rozas, L. P., and T. J. Minello. 1997. Estimating densities of small fishes and decapod crustaceans in shallow estuarine habitats: a review of sampling design with focus on gear selection. *Estuaries* 20:199-213.
- Sogard, S.M. and K.W. Able. 1991. A comparison of eelgrass, sea lettuce macroalgae, and marsh creeks as habitats for epibenthic fishes and decapods. *Estuarine, Coastal and Shelf Science* 33:501-519.

- Stevens, S., B. Milstead, M. Albert, G. Entsminger. 2005. Northeast Coastal and Barrier Network Vital Signs Monitoring Plan. Technical Report NPS/NER/NRTR--2005/025. National Park Service. Boston, Massachusetts.
- Townsend, J. F. 2009. Natural Heritage Resources of Virginia: Rare Plants. Natural Heritage Technical Report 09-07. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Richmond, Virginia. Unpublished report.
- Virginia Department of Conservation and Recreation. 2009. Division of Natural Heritage. Invasive Alien Plant Species of Virginia.
http://www.dcr.virginia.gov/natural_heritage/documents/invlist.pdf (accessed 27 September 2011).
- United States Department of Agriculture. 2010. Natural Resources Conservation Service. Plants Database. <http://plants.usda.gov/java/> (accessed 27 September 2011).
- Wikum, D. A., and G. F. Shanholtzer. 1978. Application of the Braun-Blanquet Cover-Abundance Scale for Vegetation Analysis in Land Development Studies. 2:323-329.

Appendix A: Coordinates for nekton station locations at ASIS in 2010.

Table A-1. Coordinates for nekton station locations sampled at ASIS site 2 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A2P1_57_2010	480215	4213448
A2P2_128_2010	480134	4213352
A2P3_198_2010	480129	4213317
A2P4_4_2010	480112	4213318
A2P5_75_2010	480087	4213300
A2P6_242_2010	480129	4213263
A2P7_313_2010	480112	4213273
A2P8_118_2010	480093	4213236
A2P9_189_2010	480046	4213227

Table A-2. Coordinates for nekton station locations sampled at ASIS site 3 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A3C_176_2010	484639	4225825
A3C_48_2010	484743	4225792
A3C_67_2010	484724	4225802
A3C_71_2010	484721	4225805
A3P1_188_2010	484527	4225916
A3P10_107_2010	484702	4225884
A3P11_74_2010	484713	4225874
A3P12_69_2010	484745	4225855
A3P13_127_2010	484763	4225791
A3P14_304_2010	484789	4225865
A3P2_126_2010	484596	4225931
A3P3_206_2010	484599	4225931
A3P4_84_2010	484600	4225950
A3P5_93_2010	484604	4225909
A3P6_224_2010	484647	4225904
A3P7_301_2010	484689	4225918
A3P8_12_2010	484673	4225920
A3P9_37_2010	484710	4225900

Table A-3. Coordinates for nekton station locations sampled at ASIS site 4 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A4C_11_2010	484117	4224394
A4C_20_2010	484401	4224463
A4C_42_2010	484384	4224469
A4C_45_2010	484378	4224468
A4P1_225_2010	484383	4224413
A4P10_102_2010	484115	4224444
A4P11_22_2010	484007	4224479
A4P12_97_2010	484201	4224432
A4P13_168_2010	484207	4224403
A4P2_145_2010	484268	4224375
A4P3_155_2010	484303	4224323
A4P4_331_2010	484326	4224454
A4P5_340_2010	484380	4224499
A4P6_164_2010	484368	4224597
A4P7_84_2010	484164	4224497
A4P8_269_2010	484173	4224451
A4P9_93_2010	484097	4224457

Table A-4. Coordinates for nekton station locations sampled at ASIS site 5 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A5P1_13_2010	479052	4211479
A5P10_313_2010	479040	4211278
A5P11_118_2010	479050	4211162
A5P12_356_2010	479061	4211168
A5P13_66_2010	479070	4211143
A5P14_137_2010	479250	4211206
A5P15_304_2010	479279	4211233
A5P16_13_2010	479254	4211251
A5P17_180_2010	479355	4211221
A5P2_180_2010	479067	4211421
A5P3_251_2010	479097	4211442
A5P4_57_2010	479060	4211390
A5P6_198_2010	479012	4211314
A5P8_75_2010	479008	4211271
A5P9_242_2010	479045	4211267

Table A-5. Coordinates for nekton station locations sampled at ASIS site 6 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A6C_11_2010	483420	4221476
A6C_3_2010	483419	4221480
A6C_52_2010	483481	4221388
A6C_6_2010	483423	4221479
A6P1_33_2010	483578	4221354
A6P10_94_2010	483448	4221596
A6P11_270_2010	483454	4221656
A6P12_110_2010	483406	4221627
A6P13_14_2010	483356	4221656
A6P14_76_2010	483354	4221623
A6P15_33_2010	483331	4221725
A6P16_309_2010	483403	4221744
A6P2_85_2010	483508	4221385
A6P3_138_2010	483489	4221435
A6P4_94_2010	483476	4221446
A6P5_147_2010	483452	4221412
A6P6_199_2010	483447	4221446
A6P7_156_2010	483440	4221476
A6P8_209_2010	483488	4221577
A6P9_218_2010	483490	4221599

Table A-6. Coordinates for nekton station locations sampled at ASIS site 8 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A8C_105_2010	480603	4215735
A8C_201_2010	480513	4215721
A8C_230_2010	480619	4215556
A8C_75_2010	480616	4215760
A8P1_79_2010	480636	4215723
A8P10_260_2010	480710	4215591
A8P11_61_2010	480710	4215579
A8P12_17_2010	480698	4215572
A8P13_70_2010	480710	4215604
A8P14_122_2010	480727	4215605
A8P15_79_2010	480778	4215600
A8P19_290_2010	480736	4215500
A8P2_131_2010	480679	4215693
A8P20_360_2010	480774	4215451
A8P21_228_2010	480796	4215459
A8P3_184_2010	480659	4215667
A8P5_193_2010	480647	4215644
A8P6_246_2010	480626	4215664
A8P8_255_2010	480556	4215696

Table A-7. Coordinates for nekton station locations sampled at ASIS site 9 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A9C_121_2010	483996	4223727
A9C_176_2010	484034	4223704
A9C_223_2010	484038	4223754
A9C_78_2010	483930	4223566
A9P11_126_2010	483941	4223760
A9P12_64_2010	483935	4223769
A9P18_144_2010	484045	4223623
A9P21_269_2010	484124	4223750
A9P23_278_2010	484057	4223744
A9P24_104_2010	484089	4223763
A9P3_259_2010	483887	4223535
A9P31_21_2010	483952	4223716
A9P32_320_2010	483984	4223716
A9P34_135_2010	483950	4223641
A9P35_250_2010	484023	4223647
A9P36_31_2010	484056	4223808
A9P5_135_2010	483902	4223708
A9P6_74_2010	483907	4223730
A9P8_311_2010	483821	4223839
A9P9_250_2010	483925	4223799

Table A-8. Coordinates for nekton station locations sampled at ASIS site 10 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A10C_1_2010	481160	4216030
A10C_19_2010	481173	4216018
A10C_58_2010	481152	4216011
A10C_7_2010	481160	4216022
A10P1_356_2010	481180	4215999
A10P11_45_2010	481240	4215886
A10P12_2_2010	481297	4215905
A10P13_54_2010	481316	4215914
A10P14_107_2010	481316	4215924
A10P15_64_2010	481278	4215931
A10P16_116_2010	481291	4215945
A10P17_169_2010	481249	4215984
A10P18_125_2010	481265	4216003
A10P19_178_2010	481291	4216006
A10P2_66_2010	481145	4215982
A10P3_137_2010	481126	4215951
A10P6_239_2010	481221	4215944
A10P7_292_2010	481222	4215942
A10P8_344_2010	481182	4215894
A10P9_301_2010	481201	4215885

Table A-9. Coordinates for nekton station locations sampled at ASIS site 11 in 2010, UTM, Zone 18, NAD 83, meters.

Station ID	UTMX (east)	UTMY (north)
A11P1_166_2010	483514	4222653
A11P10_86_2010	483675	4222521
A11P11_176_2010	483671	4222510
A11P12_114_2010	483657	4222505
A11P13_52_2010	483569	4222504
A11P14_351_2010	483615	4222441
A11P15_0_2010	483590	4222409
A11P16_185_2010	483615	4222342
A11P2_104_2010	483471	4222633
A11P3_43_2010	483577	4222671
A11P4_342_2010	483684	4222653
A11P5_360_2010	483702	4222641
A11P6_95_2010	483592	4222611
A11P7_34_2010	483639	4222659
A11P8_225_2010	483692	4222589
A11P9_290_2010	483691	4222572

Appendix B: Coordinates for vegetation plot locations at ASIS in 2010.

Table B-1. Coordinates for vegetation plot locations sampled ASIS site 2 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A2V1010_2010	480161	4213272	A2V3310_2010	480184	4213377
A2V110_2010	480184	4213229	A2V3410_2010	480175	4213390
A2V1110_2010	480141	4213378	A2V3510_2010	480134	4213241
A2V1210_2010	479979	4213213	A2V3610_2010	480050	4213239
A2V1310_2010	480180	4213310	A2V3710_2010	480196	4213359
A2V1410_2010	480033	4213199	A2V3810_2010	480128	4213323
A2V1510_2010	480236	4213292	A2V3910_2010	480221	4213388
A2V1610_2010	479973	4213296	A2V4010_2010	480204	4213271
A2V1710_2010	480130	4213248	A2V410_2010	480204	4213343
A2V1810_2010	480133	4213387	A2V4110_2010	480159	4213200
A2V1910_2010	479946	4213266	A2V4210_2010	480091	4213165
A2V2010_2010	479971	4213298	A2V4310_2010	479971	4213225
A2V210_2010	480156	4213279	A2V4410_2010	480132	4213246
A2V2110_2010	480140	4213305	A2V4510_2010	480176	4213244
A2V2210_2010	480193	4213213	A2V4610_2010	480160	4213200
A2V2310_2010	480214	4213396	A2V4710_2010	480196	4213431
A2V2410_2010	480113	4213208	A2V4810_2010	480208	4213338
A2V2510_2010	479972	4213226	A2V4910_2010	480095	4213240
A2V2610_2010	480198	4213211	A2V5010_2010	480051	4213241
A2V2710_2010	480232	4213439	A2V510_2010	480067	4213289
A2V2810_2010	480141	4213230	A2V610_2010	480015	4213227
A2V2910_2010	479999	4213252	A2V710_2010	480115	4213274
A2V3010_2010	480097	4213233	A2V810_2010	480096	4213159
A2V310_2010	479954	4213253	A2V910_2010	480243	4213279
A2V3110_2010	480055	4213156	A2V4910_2010	480095	4213240
A2V3210_2010	480186	4213300	A2V5010_2010	480051	4213241

Table B-2. Coordinates for vegetation plot locations sampled ASIS site 3 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A3V1010_2010	484697	4225908	A3V3210_2010	484636	4225939
A3V110_2010	484538	4225960	A3V3310_2010	484531	4225946
A3V1110_2010	484529	4225942	A3V3410_2010	484598	4225934
A3V1210_2010	484717	4225862	A3V3510_2010	484751	4225966
A3V1310_2010	484631	4225921	A3V3610_2010	484603	4225838
A3V1410_2010	484715	4225977	A3V3710_2010	484712	4225958
A3V1510_2010	484602	4225837	A3V3810_2010	484529	4225939
A3V1610_2010	484547	4225886	A3V3910_2010	484703	4225931
A3V1710_2010	484698	4225910	A3V4010_2010	484641	4225843
A3V1810_2010	484760	4225880	A3V410_2010	484615	4225886
A3V1910_2010	484812	4225822	A3V4110_2010	484648	4225863
A3V2010_2010	484628	4225915	A3V4210_2010	484615	4225986
A3V210_2010	484761	4225771	A3V4310_2010	484642	4225957
A3V2110_2010	484652	4225874	A3V4410_2010	484787	4225854
A3V2210_2010	484599	4225822	A3V4510_2010	484675	4225954
A3V2310_2010	484633	4225930	A3V4610_2010	484777	4225822
A3V2410_2010	484617	4225884	A3V4710_2010	484558	4225920
A3V2510_2010	484649	4225985	A3V4810_2010	484744	4225949
A3V2610_2010	484606	4225853	A3V4910_2010	484595	4225813
A3V2710_2010	484635	4225823	A3V5010_2010	484629	4225916
A3V2810_2010	484711	4225841	A3V510_2010	484748	4225843
A3V2910_2010	484610	4225856	A3V610_2010	484766	4225791
A3V3010_2010	484667	4225926	A3V710_2010	484692	4225997
A3V310_2010	484710	4225951	A3V810_2010	484578	4225989
A3V3110_2010	484585	4225895	A3V910_2010	484695	4225898

Table B-3. Coordinates for vegetation plot locations sampled ASIS site 4 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A4V1010_2010	484408	4224458	A4V3210_2010	484347	4224597
A4V110_2010	484371	4224570	A4V3310_2010	484175	4224558
A4V1110_2010	484387	4224418	A4V3410_2010	484079	4224472
A4V1210_2010	484299	4224422	A4V3510_2010	484092	4224472
A4V1310_2010	484350	4224460	A4V3610_2010	484355	4224528
A4V1410_2010	484393	4224437	A4V3710_2010	484381	4224484
A4V1510_2010	484214	4224604	A4V3810_2010	484222	4224624
A4V1610_2010	484251	4224490	A4V3910_2010	484053	4224431
A4V1710_2010	484213	4224557	A4V4010_2010	484294	4224598
A4V1810_2010	484325	4224485	A4V4110_2010	484280	4224444
A4V1910_2010	484372	4224596	A4V4210_2010	484089	4224495
A4V2010_2010	484135	4224536	A4V4310_2010	484331	4224484
A4V210_2010	484335	4224442	A4V4410_2010	484272	4224443
A4V2110_2010	484262	4224466	A4V4510_2010	484339	4224461
A4V2210_2010	484247	4224555	A4V4610_2010	484353	4224441
A4V2310_2010	484009	4224456	A4V4710_2010	484202	4224576
A4V2410_2010	484309	4224530	A4V4810_2010	484336	4224508
A4V2510_2010	484199	4224623	A4V4910_2010	484188	4224491
A4V2610_2010	484216	4224468	A4V5010_2010	484226	4224621
A4V2710_2010	484239	4224619	A4V510_2010	484123	4224450
A4V2810_2010	484364	4224615	A4V610_2010	484008	4224476
A4V2910_2010	484097	4224516	A4V710_2010	484390	4224526
A4V3010_2010	484262	4224555	A4V810_2010	484339	4224551
A4V310_2010	484127	4224473	A4V910_2010	484215	4224579
A4V3110_2010	484354	4224571			

Table B-4. Coordinates for vegetation plot locations sampled ASIS site 5 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A5V1010_2010	479082	4211220	A5V3310_2010	479167	4211229
A5V110_2010	479077	4211182	A5V3410_2010	478974	4211137
A5V1110_2010	479119	4211327	A5V3510_2010	478990	4211171
A5V1210_2010	479063	4211307	A5V3610_2010	479154	4211233
A5V1310_2010	478988	4211254	A5V3710_2010	478960	4211265
A5V1410_2010	479089	4211339	A5V3810_2010	479057	4211310
A5V1510_2010	479236	4211326	A5V3910_2010	479050	4211311
A5V1610_2010	479035	4211116	A5V4010_2010	479002	4211288
A5V1710_2010	479002	4211127	A5V410_2010	479251	4211276
A5V1810_2010	479215	4211330	A5V4110_2010	479203	4211176
A5V2010_2010	479110	4211128	A5V4210_2010	479009	4211166
A5V210_2010	479189	4211220	A5V4310_2010	479020	4211082
A5V2110_2010	478991	4211211	A5V4410_2010	479181	4211263
A5V2210_2010	479111	4211289	A5V4510_2010	479159	4211353
A5V2310_2010	479078	4211302	A5V4610_2010	479259	4211314
A5V2410_2010	478987	4211296	A5V4710_2010	479034	4211156
A5V2510_2010	479089	4211337	A5V4810_2010	479179	4211264
A5V2610_2010	479186	4211180	A5V4910_2010	478966	4211261
A5V2710_2010	479027	4211199	A5V5010_2010	479110	4211250
A5V2810_2010	478963	4211222	A5V510_2010	479030	4211279
A5V2910_2010	479010	4211286	A5V5810_2010	479128	4211203
A5V3010_2010	478986	4211174	A5V610_2010	479122	4211327
A5V310_2010	479102	4211213	A5V710_2010	479061	4211187
A5V3110_2010	479181	4211304	A5V810_2010	479286	4211349
A5V3210_2010	479116	4211370	A5V910_2010	479066	4211103

Table B-5. Coordinates for vegetation plot locations sampled ASIS site 6 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A6V1010_2010	483256	4221733	A6V3710_2010	483444	4221463
A6V1110_2010	483398	4221645	A6V3810_2010	483451	4221417
A6V1310_2010	483405	4221644	A6V3910_2010	483380	4221779
A6V1410_2010	483375	4221641	A6V4010_2010	483452	4221598
A6V1510_2010	483342	4221688	A6V410_2010	483376	4221734
A6V1610_2010	483539	4221375	A6V4110_2010	483386	4221643
A6V1710_2010	483337	4221645	A6V4210_2010	483305	4221735
A6V1810_2010	483467	4221554	A6V4310_2010	483440	4221509
A6V2010_2010	483416	4221418	A6V4410_2010	483418	4221508
A6V210_2010	483389	4221780	A6V4510_2010	483320	4221645
A6V2110_2010	483335	4221688	A6V4610_2010	483347	4221599
A6V2210_2010	483301	4221600	A6V4710_2010	483417	4221644
A6V2310_2010	483426	4221462	A6V4810_2010	483414	4221689
A6V2410_2010	483394	4221464	A6V4910_2010	483377	4221691
A6V2510_2010	483383	4221735	A6V5010_2010	483316	4221734
A6V2610_2010	483512	4221374	A6V510_2010	483366	4221688
A6V2710_2010	483427	4221779	A6V5210_2010	483397	4221645
A6V2910_2010	483519	4221373	A6V5310_2010	483408	4221645
A6V3010_2010	483414	4221690	A6V5510_2010	483432	4221508
A6V310_2010	483421	4221780	A6V5710_2010	483379	4221598
A6V3110_2010	483392	4221734	A6V5810_2010	483466	4221417
A6V3210_2010	483428	4221599	A6V610_2010	483450	4221462
A6V3310_2010	483252	4221734	A6V710_2010	483440	4221465
A6V3410_2010	483449	4221509	A6V810_2010	483428	4221599
A6V3510_2010	483483	4221418	A6V910_2010	483324	4221600
A6V3610_2010	483444	4221418			

Table B-6. Coordinates for vegetation plot locations sampled ASIS site 8 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A8V1010_2010	480564	4215827	A8V3210_2010	480594	4215747
A8V110_2010	480663	4215695	A8V3310_2010	480567	4215603
A8V1110_2010	480690	4215663	A8V3410_2010	480756	4215577
A8V1210_2010	480596	4215708	A8V3510_2010	480735	4215453
A8V1310_2010	480656	4215631	A8V3610_2010	480477	4215678
A8V1410_2010	480736	4215453	A8V3710_2010	480575	4215738
A8V1510_2010	480603	4215552	A8V3810_2010	480784	4215539
A8V1610_2010	480568	4215821	A8V3910_2010	480511	4215856
A8V1710_2010	480795	4215489	A8V4010_2010	480655	4215671
A8V1810_2010	480608	4215582	A8V410_2010	480517	4215774
A8V1910_2010	480659	4215589	A8V4110_2010	480590	4215603
A8V2010_2010	480678	4215412	A8V4210_2010	480598	4215669
A8V210_2010	480767	4215486	A8V4310_2010	480615	4215722
A8V2110_2010	480775	4215480	A8V4410_2010	480801	4215477
A8V2210_2010	480656	4215551	A8V4510_2010	480631	4215517
A8V2310_2010	480765	4215491	A8V4610_2010	480686	4215669
A8V2410_2010	480614	4215536	A8V4710_2010	480542	4215854
A8V2510_2010	480593	4215638	A8V4810_2010	480753	4215580
A8V2610_2010	480735	4215607	A8V4910_2010	480589	4215718
A8V2710_2010	480712	4215483	A8V5010_2010	480540	4215670
A8V2810_2010	480699	4215426	A8V510_2010	480685	4215556
A8V2910_2010	480576	4215547	A8V610_2010	480583	4215652
A8V3010_2010	480626	4215634	A8V710_2010	480785	4215501
A8V310_2010	480723	4215505	A8V810_2010	480611	4215688
A8V3110_2010	480553	4215653	A8V910_2010	480599	4215554

Table B-7. Coordinates for vegetation plot locations sampled ASIS site 9 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A9V1010_2010	483924	4223822	A9V3210_2010	484000	4223674
A9V110_2010	484063	4223637	A9V3310_2010	484144	4223673
A9V1110_2010	484064	4223747	A9V3410_2010	483899	4223856
A9V1210_2010	484043	4223639	A9V3510_2010	483934	4223674
A9V1310_2010	483927	4223712	A9V3610_2010	483846	4223747
A9V1410_2010	483926	4223639	A9V3710_2010	484135	4223709
A9V1510_2010	484010	4223675	A9V3810_2010	484110	4223710
A9V1610_2010	483918	4223640	A9V3910_2010	483856	4223747
A9V1710_2010	483868	4223711	A9V4010_2010	484032	4223746
A9V1810_2010	483924	4223640	A9V410_2010	484050	4223638
A9V1910_2010	484130	4223672	A9V4110_2010	483846	4223821
A9V2010_2010	483862	4223746	A9V4210_2010	483946	4223710
A9V210_2010	483852	4223747	A9V4310_2010	484131	4223817
A9V2110_2010	484169	4223744	A9V4410_2010	484124	4223707
A9V2210_2010	484155	4223745	A9V4510_2010	483886	4223786
A9V2310_2010	484067	4223818	A9V4610_2010	483963	4223602
A9V2410_2010	483874	4223674	A9V4710_2010	483938	4223712
A9V2510_2010	484047	4223674	A9V4810_2010	484017	4223711
A9V2610_2010	483990	4223710	A9V4910_2010	483880	4223750
A9V2710_2010	484082	4223817	A9V5010_2010	483845	4223821
A9V2810_2010	483980	4223674	A9V510_2010	483984	4223639
A9V2910_2010	484148	4223673	A9V610_2010	483887	4223531
A9V3010_2010	484139	4223744	A9V710_2010	483926	4223749
A9V310_2010	484113	4223673	A9V810_2010	484090	4223673
A9V3110_2010	483889	4223677	A9V910_2010	483916	4223747

Table B-8. Coordinates for vegetation plot locations sampled ASIS site 10 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A10V1010_2010	481209	4215951	A10V3410_2010	481144	4216011
A10V110_2010	481156	4215893	A10V3510_2010	481277	4215929
A10V1110_2010	481179	4216002	A10V3610_2010	481357	4215943
A10V1210_2010	481362	4215939	A10V3710_2010	481215	4215842
A10V1310_2010	481179	4215856	A10V3810_2010	481179	4216003
A10V1510_2010	481318	4215864	A10V3910_2010	481247	4215836
A10V1610_2010	481256	4215865	A10V4010_2010	481302	4215938
A10V1710_2010	481232	4215855	A10V410_2010	481269	4216041
A10V1810_2010	481208	4216003	A10V4110_2010	481204	4215909
A10V1910_2010	481325	4215944	A10V4210_2010	481375	4215960
A10V2010_2010	481256	4215966	A10V4310_2010	481217	4215883
A10V210_2010	481271	4215846	A10V4410_2010	481263	4216006
A10V2110_2010	481215	4216035	A10V4510_2010	481190	4215885
A10V2210_2010	481286	4216018	A10V4610_2010	481365	4215978
A10V2310_2010	481326	4215800	A10V4710_2010	481323	4215997
A10V2510_2010	481273	4215986	A10V4810_2010	481302	4215895
A10V2610_2010	481288	4215861	A10V4910_2010	481300	4215893
A10V2710_2010	481205	4215857	A10V5010_2010	481179	4215901
A10V2810_2010	481112	4216017	A10V510_2010	481330	4215855
A10V2910_2010	481172	4215960	A10V5610_2010	481195	4216021
A10V3010_2010	481148	4215904	A10V610_2010	481387	4215900
A10V310_2010	481256	4216017	A10V710_2010	481317	4215861
A10V3110_2010	481177	4215907	A10V810_2010	481162	4216026
A10V3210_2010	481325	4215948	A10V910_2010	481122	4215951
A10V3310_2010	481161	4215983			

Table B-9. Coordinates for vegetation plot locations sampled ASIS site 11 in 2010, UTM, Zone 18, NAD 83, meters.

Plot ID	UTMX (east)	UTMY (north)	Plot ID	UTMX (east)	UTMY (north)
A11V1010_2010	483504	4222599	A11V3410_2010	483635	4222492
A11V110_2010	483547	4222481	A11V3510_2010	483634	4222455
A11V1110_2010	483602	4222644	A11V3610_2010	483671	4222517
A11V1210_2010	483555	4222514	A11V3710_2010	483608	4222675
A11V1310_2010	483686	4222548	A11V3810_2010	483583	4222506
A11V1410_2010	483562	4222476	A11V3910_2010	483443	4222512
A11V1510_2010	483703	4222650	A11V4010_2010	483629	4222565
A11V1610_2010	483590	4222577	A11V410_2010	483677	4222548
A11V1710_2010	483552	4222518	A11V4110_2010	483632	4222632
A11V1810_2010	483672	4222658	A11V4210_2010	483580	4222613
A11V1910_2010	483683	4222474	A11V4310_2010	483607	4222605
A11V2010_2010	483703	4222613	A11V4510_2010	483566	4222546
A11V210_2010	483544	4222373	A11V4610_2010	483601	4222468
A11V2110_2010	483609	4222393	A11V4710_2010	483611	4222569
A11V2310_2010	483560	4222688	A11V4910_2010	483500	4222637
A11V2410_2010	483566	4222547	A11V5010_2010	483656	4222379
A11V2510_2010	483665	4222659	A11V5110_2010	483642	4222348
A11V2610_2010	483598	4222468	A11V5210_2010	483668	4222587
A11V2710_2010	483620	4222354	A11V5510_2010	483667	4222517
A11V2810_2010	483532	4222381	A11V5610_2010	483696	4222614
A11V2910_2010	483427	4222623	A11V5710_2010	483496	4222602
A11V310_2010	483701	4222579	A11V5810_2010	483581	4222648
A11V3110_2010	483502	4222495	A11V710_2010	483623	4222637
A11V3210_2010	483606	4222499	A11V810_2010	483658	4222520
A11V3310_2010	483544	4222659	A11V910_2010	483654	4222664

Appendix C: Nekton species and community density at ASIS in 2010 summarized by site and visit.

Table C-1. Average density and standard deviation [individuals per 1 m² ± SD (total count)] of nekton captured for each site and visit at ASIS in 2010 for sites 2, 3, and 4. '-' indicates that a species was not present.

Community/Species	Average Density [individuals per 1 m ² ± SD (total count)]					
	Site 2		Site 3		Site 4	
	Visit 1	Visit 2	Visit 1	Visit 2	Visit 1	Visit 2
Fish	49.4 ± 26.1 (445)	8.0 ± 13.7 (72)	11.8 ± 16.8 (200)	26.8 ± 37.3 (483)	43.2 ± 39.0 (691)	60.2 ± 46.5 (782)
Cyprinodon variegatus	35.4 ± 20.7 (319)	2.6 ± 7.3 (23)	6.7 ± 13.8 (114)	17.3 ± 27.5 (311)	39.3 ± 38.5 (628)	28.1 ± 22.8 (365)
Fundulus heteroclitus	13.3 ± 28.7 (120)	5.4 ± 10.8 (49)	2.6 ± 4.0 (44)	4.1 ± 10.0 (73)	3.0 ± 4.4 (48)	14.8 ± 16.9 (193)
Lucania parva	0.7 ± 1.1 (6)	-	0.5 ± 1.9 (9)	5.2 ± 8.6 (93)	0.6 ± 1.2 (9)	16.7 ± 17.3 (217)
Brevoortia tyrannus	-	-	-	-	0.1 (1)	-
Menidia beryllina	-	-	1.9 ± 3.8 (33)	0.3 ± 0.7 (5)	0.3 ± 1.3 (5)	0.5 ± 0.9 (7)
Leiostomas xanthurus	-	-	-	-	-	-
Anguilla rostrata	-	-	-	-	-	-
Mugil cephalus	-	-	-	-	-	-
Fundulus majalis	-	-	-	-	-	-
Unknown fish	-	-	-	0.1 (1)	-	-
Decapods	-	-	0.2 ± 0.4 (3)	0.2 ± 0.4 (3)	0.2 ± 0.5 (3)	0.5 ± 1.0 (7)
Palaemonetes pugio	-	-	-	-	-	-
Callinectes sapidus	-	-	0.2 ± 0.4 (3)	0.2 ± 0.4 (3)	0.2 ± 0.5 (3)	0.5 ± 1.0 (7)
Total	49.4 ± 26.1 (445)	8.0 ± 13.7 (72)	11.9 ± 16.7 (203)	27.0 ± 37.3 (486)	43.4 ± 39.1 (694)	60.7 ± 47.0 (789)

Table C-2. Average density and standard deviation [individuals per 1 m² ± SD (total count)] of nekton captured for each site and visit at ASIS in 2010 for sites 5, 6, and 8. '-' indicates that a species was not present.

Community/Species	Average Density [individuals per 1 m ² ± SD (total count)]					
	Site 5		Site 6		Site 8	
	Visit 1	Visit 2	Visit 1	Visit 2	Visit 1	Visit 2
Fish	25.0 ± 29.2 (375)	16.3 ± 20.7 (245)	21.1 ± 18.3 (421)	43.5 ± 54.4 (827)	42.5 ± 48.7 (807)	13.7 ± 16.2 (260)
Cyprinodon variegatus	23.1 ± 27.6 (346)	8.2 ± 15.1 (123)	14.9 ± 15.9 (297)	23.9 ± 38.2 (454)	27.3 ± 41.1 (519)	7.0 ± 16.0 (133)
Fundulus heteroclitus	1.8 ± 4.0 (27)	4.4 ± 12.3 (66)	3.2 ± 5.8 (63)	15.0 ± 22.4 (285)	15.1 ± 22.3 (286)	3.1 ± 6.1 (58)
Lucania parva	-	3.7 ± 6.0 (56)	0.1 ± 0.3 (2)	4.2 ± 13.9 (80)	0.1 (1)	1.2 ± 2.8 (23)
Brevoortia tyrannus	-	-	2.0 ± 8.7 (39)	-	-	-
Menidia beryllina	0.1 ± 0.5 (2)	-	0.4 ± 1.6 (7)	0.1 ± 0.3 (2)	0.1 (1)	2.3 ± 6.5 (44)
Leiostomas xanthurus	-	-	0.6 ± 2.0 (12)	-	-	-
Anguilla rostrata	-	-	-	0.2 ± 0.9 (4)	-	0.1 (1)
Mugil cephalus	-	-	0.1 (1)	0.1 ± 0.5 (2)	-	-
Fundulus majalis	-	-	-	-	-	0.1 (1)
Unknown fish	-	-	-	-	-	-
Decapods	0.3 ± 0.6 (4)	0.1 (1)	0.3 ± 0.6 (5)	10.0 ± 42.9 (190)	0.3 ± 0.7 (5)	-
Palaemonetes pugio	0.1 (1)	-	0.1 (1)	9.8 ± 42.7 (186)	-	-
Callinectes sapidus	0.2 ± 0.4 (3)	0.1 (1)	0.2 ± 0.5 (4)	0.2 ± 0.5 (4)	0.3 ± 0.7 (5)	-
Total	25.3 ± 29.3 (379)	16.4 ± 20.8 (246)	21.3 ± 18.2 (426)	53.5 ± 77.2 (1017)	42.7 ± 48.8 (812)	13.7 ± 16.2 (260)

Table C-3. Average density and standard deviation [individuals per 1 m² ± SD (total count)] of nekton captured for each site and visit at ASIS in 2010 for sites 9, 10, and 11. '-' indicates that a species was not present.

Community/Species	Average Density [individuals per 1 m ² ± SD (total count)]					
	Site 9		Site 10		Site 11	
	Visit 1	Visit 2	Visit 1	Visit 2	Visit 1	Visit 2
Fish	21.1 ± 23.1 (401)	57.7 ± 54.5 (1039)	44.0 ± 49.0 (836)	2.2 ± 3.9 (35)	82.9 ± 55.4 (1161)	22.9 ± 26.0 (229)
Cyprinodon variegatus	15.5 ± 16.3 (295)	30.6 ± 39.8 (550)	9.7 ± 25.5 (185)	0.9 ± 2.2 (14)	31.6 ± 28.7 (443)	7.2 ± 7.3 (72)
Fundulus heteroclitus	5.2 ± 7.8 (98)	21.8 ± 30.3 (393)	14.0 ± 20.6 (266)	0.2 ± 0.5 (3)	7.9 ± 4.7 (110)	5.3 ± 7.9 (53)
Lucania parva	0.1 (1)	5.1 ± 8.8 (91)	0.2 ± 0.4 (3)	0.9 ± 2.4 (15)	43.3 ± 52.5 (606)	10.3 ± 17.0 (103)
Brevoortia tyrannus	-	-	19.9 ± 43.6 (379)	-	-	-
Menidia beryllina	0.4 ± 0.9 (7)	0.3 ± 1.2 (5)	0.2 ± 0.4 (3)	0.1 ± 0.3 (2)	-	0.1 (1)
Leiostomas xanthurus	-	-	-	-	-	-
Anguilla rostrata	-	-	-	-	0.1 (1)	-
Mugil cephalus	-	-	-	0.1 (1)	-	-
Fundulus majalis	-	-	-	-	-	-
Unknown fish	-	-	-	-	-	-
Decapods	0.4 ± 0.8 (8)	0.7 ± 1.1 (13)	0.6 ± 0.8 (12)	0.2 ± 0.5 (3)	2.3 ± 4.2 (32)	1.0 ± 2.2 (10)
Palaemonetes pugio	-	0.1 (1)	-	-	1.6 ± 4.0 (23)	0.7 ± 2.2 (7)
Callinectes sapidus	0.4 ± 0.8 (8)	0.7 ± 1.0 (12)	0.6 ± 0.8 (12)	0.2 ± 0.5 (3)	0.6 ± 0.8 (9)	0.3 ± 0.7 (3)
Total	21.5 ± 23.1 (409)	58.4 ± 54.5 (1052)	44.6 ± 49.0 (848)	2.4 ± 3.8 (38)	85.2 ± 56.0 (1193)	23.9 ± 26.1 (239)

Appendix D: Nekton species richness at ASIS in 2010 summarized by site and visit.

Table D-1. Estimated nekton species richness (Est. Species Richness $\pm$ SD) summarized by at ASIS in 2010.

Site	No. of Stations	Observed No. of Species	Est. Species Richness $\pm$ SD
2	9	3	3.0
3	18	6	6.9 $\pm$ 2.6
4	16	6	6.9 $\pm$ 2.6
5	15	6	6.9 $\pm$ 2.6
6	20	10	10.0
8	19	7	8.9 $\pm$ 3.0
9	19	6	6.9 $\pm$ 2.6
10	20	7	8.0 $\pm$ 2.8
11	14	7	7.9 $\pm$ 2.8

Table D-2. Estimated nekton species richness (Est. Species Richness $\pm$ SD) summarized by site and visit at ASIS in 2010.

Site	Visit	No. of Stations	Observed No. of Species	Est. Species Richness $\pm$ SD
2	1	9	3	3
2	2	9	2	2
3	1	17	5	5
3	2	18	6	6.9 $\pm$ 0.9
4	1	16	6	6.9 $\pm$ 0.9
4	2	13	5	5
5	1	15	5	5.9 $\pm$ 0.9
5	2	15	4	4.9 $\pm$ 0.9
6	1	20	9	10.9 $\pm$ 1.3
6	2	19	8	8
8	1	19	5	6.9 $\pm$ 1.3
8	2	19	6	7.9 $\pm$ 1.3
9	1	19	5	5.9 $\pm$ 0.9
9	2	18	6	6.9 $\pm$ 0.9
10	1	19	6	6
10	2	16	6	6.9 $\pm$ 0.9
11	1	14	6	6
11	2	10	6	6.9 $\pm$ 0.9

Appendix E: Vegetation species observed at ASIS in 2010.

Table E-1. Species and cover type frequency by site, ASIS 2010.

Species/Cover Type	Common Name	Site (no. of plots)									
		2 (50)	3 (50)	4 (49)	5 (50)	6 (51)	8 (50)	9 (50)	10 (49)	11 (50)	All (449)
<i>Spartina alterniflora</i>	Salt marsh cordgrass	24	42	38	19	33	45	42	36	33	312
<i>Spartina alterniflora</i> (NL)	Salt marsh cordgrass (NL)	22	42	37	17	26	43	37	35	31	290
Water	Water	0	7	45	21	18	2	38	31	37	199
Wrack/Litter	Wrack/Litter	20	25	6	9	24	28	14	24	17	167
<i>Distichlis spicata</i>	Spikegrass	33	16	12	23	14	10	22	19	15	164
<i>Distichlis spicata</i> (NL)	Spikegrass (NL)	35	15	13	21	11	11	21	16	10	153
<i>Spartina patens</i>	Salt meadow cordgrass	27	0	7	30	10	6	15	7	11	113
<i>Salicornia virginica</i>	Virginia glasswort	17	10	10	7	5	13	12	6	17	97
<i>Spartina patens</i> (NL)	Salt meadow cordgrass (NL)	23	0	2	31	10	7	12	5	7	97
Bare ground	Bare ground	14	21	0	0	19	13	3	11	2	83
<i>Iva frutescens</i>	Marsh elder	16	0	1	16	1	0	4	3	7	48
<i>Limonium carolinianum</i>	Sea lavender	5	1	2	2	0	1	11	1	3	26
<i>Iva frutescens</i> (NL)	Marsh elder (NL)	5	0	0	6	0	0	2	0	2	15
<i>Salicornia maritima</i>	Slender glasswort	1	1	1	2	3	2	0	1	1	12
Unknown grass	Unknown grass	2	0	0	5	2	0	0	1	0	10

Table E-1. Species and cover type frequency by site, ASIS 2010. (continued)

Species/Cover Type	Common Name	Site (no. of plots)									
		2 (50)	3 (50)	4 (49)	5 (50)	6 (51)	8 (50)	9 (50)	10 (49)	11 (50)	All (449)
<i>Myrica cerifera</i>	Southern bayberry	4	0	0	2	0	0	0	3	0	9
<i>Salicornia species</i>	Glasswort species	1	0	0	1	0	1	4	1	1	9
<i>Schoenoplectus pungens</i>	Common threesquare	2	0	0	4	0	0	0	0	1	7
Unknown algae	Unknown algae	0	1	0	0	1	0	1	2	2	7
<i>Elymus virginicus</i>	Virginia rye grass	0	0	0	3	0	0	0	3	0	6
<i>Juncus gerardii</i>	Saltmarsh rush	3	0	0	1	0	0	1	0	1	6
<i>Baccharis halimifolia</i>	Eastern baccharis	1	0	0	1	1	0	0	0	1	4
<i>Ruppia maritima</i>	Widgeon grass	0	2	0	0	0	0	0	0	2	4
<i>Toxicodendron radicans</i>	Poison ivy	0	0	0	1	3	0	0	0	0	4
Horse Manure	Horse Manure	3	0	0	0	0	0	0	0	0	3
<i>Juncus gerardii</i> (NL)	Saltmarsh rush (NL)	2	0	0	0	0	0	0	0	0	2
<i>Limonium carolinianum</i> (NL)	Sea lavender (NL)	0	0	1	0	0	1	0	0	0	2
<i>Myrica cerifera</i> (NL)	Southern bayberry (NL)	2	0	0	0	0	0	0	0	0	2
<i>Parthenocissus quinquefolia</i>	Virginia creeper	1	0	0	1	0	0	0	0	0	2
<i>Ruppia maritima</i> (NL)	Widgeon grass (NL)	0	0	0	0	0	0	1	0	1	2
<i>Schoenoplectus americanus</i>	Chairmaker's bulrush	1	0	0	0	0	0	0	1	0	2
<i>Aster species</i>	Aster species	0	0	1	0	0	0	0	0	0	1

Table E-1. Species and cover type frequency by site, ASIS 2010. (continued)

Species/Cover Type	Common Name	Site (no. of plots)									
		2 (50)	3 (50)	4 (49)	5 (50)	6 (51)	8 (50)	9 (50)	10 (49)	11 (50)	All (449)
<i>Atriplex patula</i>	Spear saltbush	0	0	0	1	0	0	0	0	0	1
<i>Eleocharis species</i>	Spikerush	0	0	0	0	0	0	0	0	1	1
<i>Elymus virginicus (NL)</i>	Virginia rye grass (NL)	0	0	0	0	0	0	0	1	0	1
<i>Juncus effusus</i>	Soft rush	0	0	0	0	0	0	0	0	1	1
<i>Juncus roemerianus</i>	Black needle rush	0	0	0	1	0	0	0	0	0	1
<i>Lythrum lineare (NL)</i>	Saltmarsh loosestrief (NL)	0	0	1	0	0	0	0	0	0	1
<i>Panicum virgatum</i>	Switchgrass	0	0	0	1	0	0	0	0	0	1
<i>Poacea</i>	True grass	1	0	0	0	0	0	0	0	0	1
<i>Salicornia maritima (NL)</i>	Slender glasswort (NL)	0	1	0	0	0	0	0	0	0	1
<i>Schoenoplectus americanus (NL)</i>	Chairmaker's bulrush (NL)	0	0	0	0	0	0	0	1	0	1
<i>Smilax rotundifolia</i>	Common greenbriar	0	0	0	1	0	0	0	0	0	1
<i>Smilax rotundifolia (NL)</i>	Common greenbriar (NL)	1	0	0	0	0	0	0	0	0	1
<i>Solidago sempervirens</i>	Seaside goldenrod	0	0	0	1	0	0	0	0	0	1
<i>Suaeda maritima</i>	Herbaceous seepweed	0	0	0	0	0	0	1	0	0	1
Unknown shrub (NL)	Unknown shrub (NL)	0	0	0	1	0	0	0	0	0	1
<i>Vitis rotundifolia</i>	Muscadine Grape	0	0	0	1	0	0	0	0	0	1