deep-water stations within Little Bay was significantly less than all other stations sampled in June. Total macroinvertebrate density at all the intermediate depth stations within Little Bay was significantly less than all other stations sampled in June with the exception of the Little Bay deep stations. Total macroinvertebrate density at the deep water stations within Norton Basin was significantly less than all other stations sampled in June with the exception of those located in Little Bay (ANOVA, p=0.0001) (**Figure 4.1.3.1.1, Figure 4.1.3.1.2**). There were no significant differences in total macroinvertebrate densities among the remaining stations during June (**Appendix I-E**). Although not significantly different from each other, total macroinvertebrate densities at the Little Bay deep water and intermediate depth stations were significantly less than all other stations sampled in October. Similarly, total macroinvertebrate densities at the Norton Basin deep water and intermediate depth stations were significantly less than all other stations sampled in October with the exception of the Little Bay stations (ANOVA, p=0.0001) (**Figure 4.1.3.1.1, Figure 4.1.3.1.3**). There were no significant differences in total macroinvertebrate densities among all remaining stations during October (**Appendix I-F**).

4.1.3.2 Annelids

In June of 2002, mean density of annelids ranged from 0.0 ind. m^{-2} (LB2 - LB5, LB7, LB8) to 22,538.9 ind. m^{-2} (NB14). In October of 2002, mean density of annelids ranged from 0.0 ind. m^{-2} (LB1, LB2, LB5 - NB8, NB3) to 10,963.9 ind. m^{-2} (NB14). Annelid density at the deep-water stations within Little Bay was significantly less than all other stations sampled in June; annelid density at the intermediate depth stations within Little Bay was significantly less than all other stations sampled in June with the exception of the Little Bay deep stations. Annelid density at the deep-water stations within Norton Basin was significantly less than all other stations sampled in June with the exception of those located in Little Bay. Annelid density at stations located in the Norton Basin entrance channel was significantly greater than all other stations sampled in June (ANOVA, p=0.0001) (**Figure 4.1.3.2.1**). There were no significant differences in annelid densities among all remaining stations during June (**Appendix I-E**). Although not significantly different from each other, annelid densities at the Little Bay deep-water and intermediate depth stations were significantly less than all other stations sampled in October. Similarly, annelid densities at the Norton Basin deep-water and intermediate depth stations were significantly less than all other stations sampled in October with the exception of the Little Bay stations (ANOVA, p=0.0001) (**Figure 4.1.3.2.1**). There were no significant differences in annelid densities among all remaining stations during October (**Appendix I-F**).

4.1.3.3 Arthropods

In June of 2002, mean density of arthropods ranged from 0.0 ind. m^{-2} (LB3 - LB8, NB4, NB6) to 22,133.3 ind. m^{-2} (GH1). In October of 2002, mean density of arthropods ranged from 0.0 ind. m^{-2} (LB3 - LB9, NB1 - NB3, NB5) to 8,988.9 ind. m^{-2} (GH2). Although not significantly different from each other, arthropod densities at the Little Bay deep water and intermediate-depth stations were significantly less than all other stations sampled in June. Arthropod density at the deep-water stations within Norton Basin was significantly less than stations in the Norton Basin entrance channel and both of the reference areas (Grass Hassock Channel and the Raunt). Arthropod density at the intermediate depth stations within Norton Basin was significantly less than stations located in the Norton Basin entrance channel and in the Grass Hassock Channel reference area. Arthropod density at stations located in the Grass Hassock Channel reference area was significantly greater than all other stations sampled in June (ANOVA, p=0.0001) (**Figure 4.1.3.3.1**). There were no significant differences in arthropod densities among all remaining stations during June (**Appendix I-E**). Although not significantly different from each other, arthropod densities at the Norton Basin and Little Bay deep-water and intermediate-depth stations were significantly less than all other stations sampled in October. Arthropod density at stations located in the Norton Basin entrance channel was significantly less than both reference areas (Grass Hassock Channel and the Raunt). Arthropod

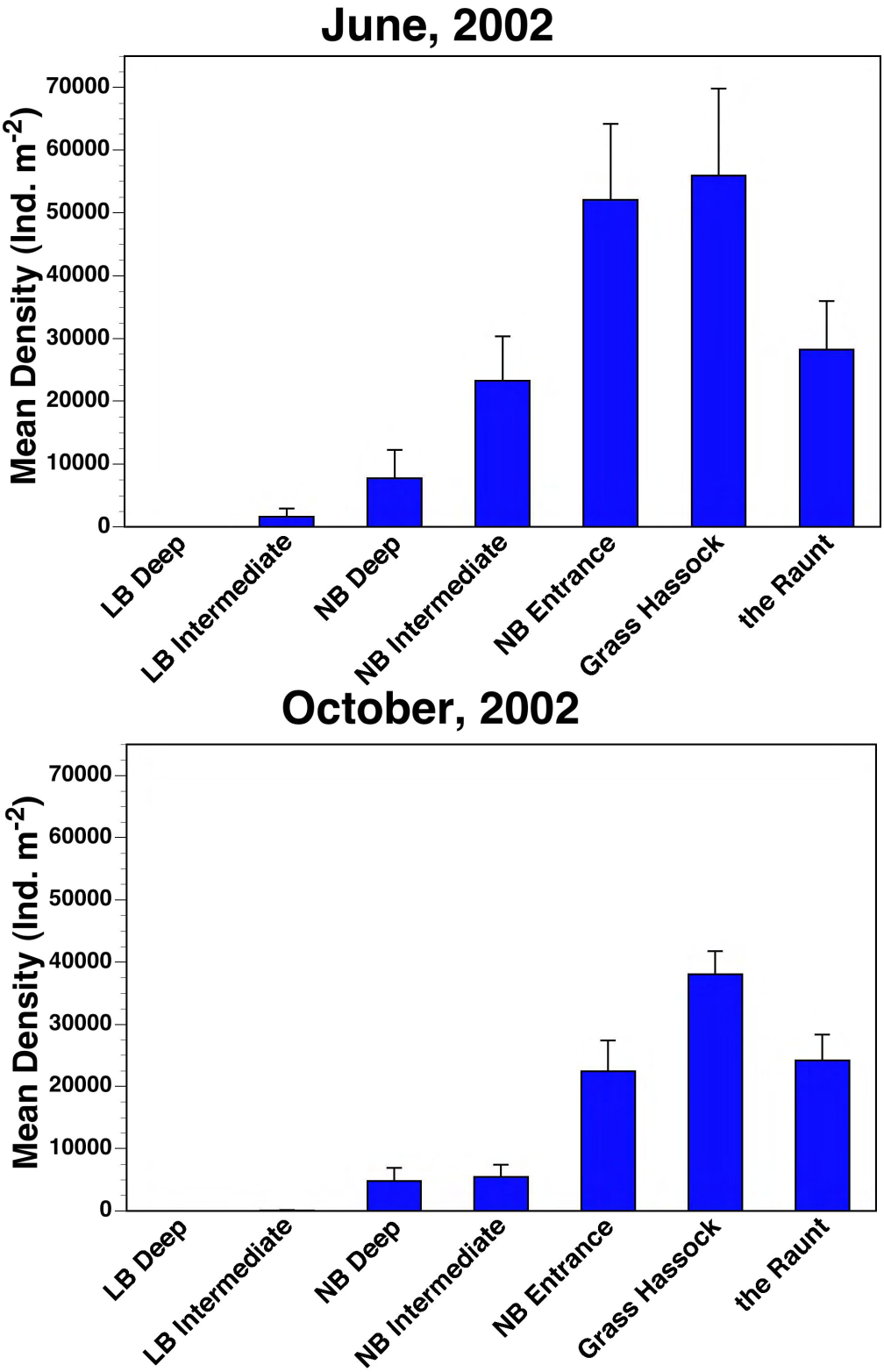

Figure 4.1.3.1.1 Total macroinvertebrate density (ind. m^{-2}), Norton Basin study and reference areas, June and October 2002.

Figure 4.1.3.1.2 Total macroinvertebrate density (ind. m^{-2}), Norton Basin study and reference areas, June 2002.

Figure 4.1.3.1.3 Total macroinvertebrate density (ind. m^{-2}), Norton Basin study and reference areas, October 2002.

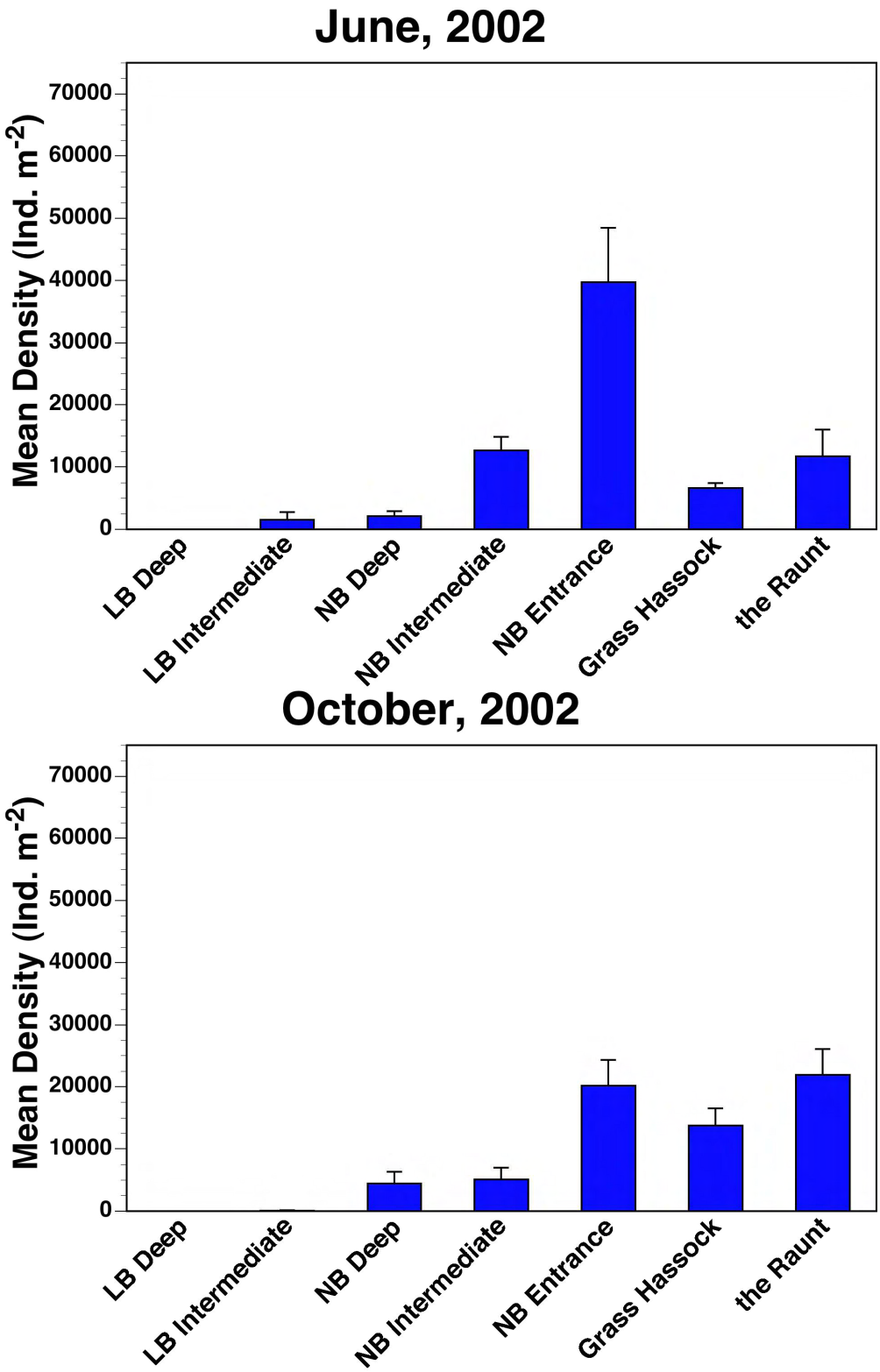

Figure 4.1.3.2.1 Annelid density (ind. m^{-2}), Norton Basin study and reference areas, June and October 2002.

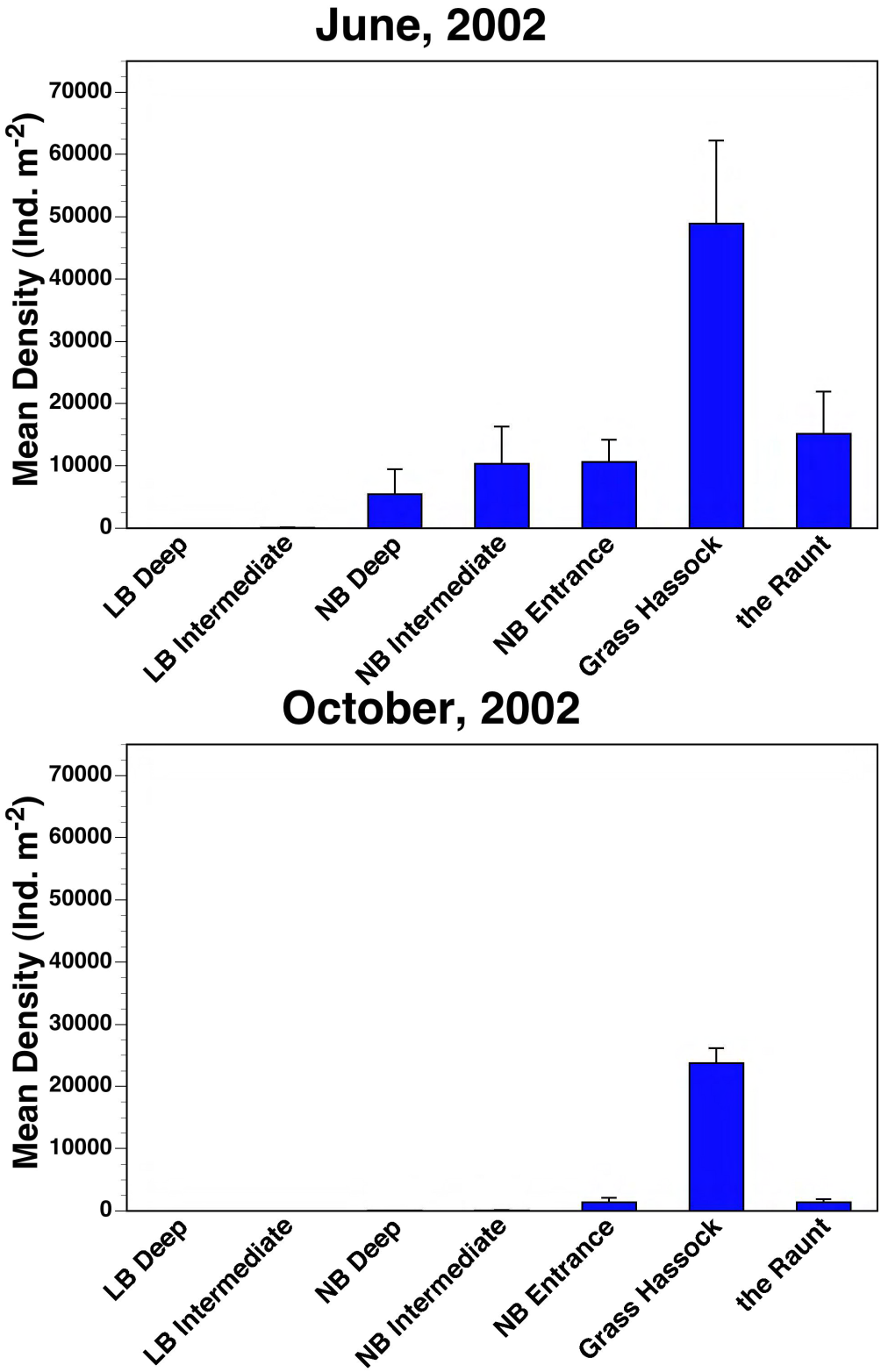

Figure 4.1.3.3.1 Arthropod density (ind. m^{-2}), Norton Basin study and reference areas, June and October 2002.

density at stations located within the Raunt reference area was significantly less than the deeper Grass Hassock Channel reference area (ANOVA, p=0.0001) (**Figure 4.1.3.3.1**).

4.2 Gill Net Sampling

4.2.1 May, 2002

Gill net collections from the bottom of Norton Basin during May (18 to 20 hrs duration, n=2) yielded 256 individuals representing 6 species (**Table 4.2.1.1**). The dominant species was striped searobin (*Prionotus evolans*). Gill nets deployed at mid-depth in Norton Basin (20 to 21 hrs duration, n=2) yielded 85 individuals representing 3 species (**Table 4.2.1.1**). The dominant species again was striped searobin. Gill nets deployed at the surface of Norton Basin (20 to 22 hrs duration, n=2) yielded 98 individuals representing 3 species (**Table 4.2.1.1**). The dominant species was Atlantic menhaden (*Brevoortia tyrannus*). Gill net collections from the shallow areas of Norton Basin (18 to 20 hrs duration, n=4) yielded 359 individuals representing 10 species (**Table 4.2.1.1**). The dominant species was striped searobin. Throughout the May gill net sampling in Norton Basin, the dominant species was striped searobin, representing 75.2% of the total collection. Atlantic menhaden represented 18.3%, and all other species represented less than 5% (**Figure 4.2.1.1**).

Gill net collections from the bottom of Little Bay during May (16 to 24 hours duration, n=4) yielded no fish (**Table 4.2.1.2**). Gill nets deployed at mid-depth in Little Bay (16 to 24 hrs duration, n=4) yielded 26 individuals representing 2 species (**Table 4.2.1.2**). The dominant species was the Atlantic menhaden. Gill nets deployed at the surface of Little Bay (17 to 23 hours duration, n=4) yielded 178 individuals representing 5 species (**Table 4.2.1.2**). The dominant species again was Atlantic menhaden. Gill nets deployed from the shallow areas of Little Bay (17 to 24 hrs duration, n=4) yielded 271 individuals representing 7 species (**Table 4.2.1.2**). The dominant species was the striped searobin. Throughout the May gill net sampling in Little Bay, the dominant species was Atlantic menhaden representing 51.3% of the total collection. Striped searobin represented 39.1%, Atlantic horseshoe crab (*Limulus polyphemus*) represented 5.4%, and all other species represented less than 5% (**Figure 4.2.1.1**).

Gill net collections from the bottom of the Grass Hassock Channel during May (5.5 hrs duration, n=2) yielded 33 individuals representing 6 species (**Table 4.2.1.3**). The dominant species was striped searobin. CPUE at the bottom of Grass Hassock Channel (6400.0 g/hr) was greater than at the bottom of Norton Basin (3115.4 g/hr) or the bottom of Little Bay (0.0 g/hr). Gill nets deployed at mid-depth in Grass Hassock Channel (6.5 hrs duration, n=2) yielded 110 individuals representing 4 species (**Table 4.2.1.3**). The dominant species was Atlantic menhaden. CPUE at mid-depth in Grass Hassock Channel (4037.6 g/hr) was greater than at mid-depth in Norton Basin (898.5 g/hr) or at mid-depth in Little Bay (140.5 g/hr). Gill net collections from the surface of Grass Hassock Channel (6.5 hrs duration, n=2) yielded 42 individuals representing 2 species (**Table 4.2.1.3**). The species again was Atlantic menhaden. Mean CPUE at the surface of Grass Hassock Channel (1597.8 g/hr) was greater than at the surface of Norton Basin (900.6 g/hr) or the surface of Little Bay (768.7 g/hr). Throughout the May gill net sampling in Grass Hassock Channel, the dominant species was Atlantic menhaden representing 54.7% of the total collection. Striped searobin represented 40.9%, and all other species represented less than 5% (**Figure 4.2.1.1**).

Gill nets deployed at the bottom of the Raunt during May (7.3 hrs duration, n=2) yielded 32 individuals representing 12 species (**Table 4.2.1.4**). The dominant species in the Raunt were the Atlantic horseshoe crab and the striped searobin. CPUE in the shallow areas of the Raunt (1676.7 g/hr) was slightly lower than in the shallow areas of Norton Basin (1767.6 g/hr) but slightly greater than at the shallow areas of Little Bay (1669.7 g/hr). Throughout the May gill net sampling in the Raunt, the dominant species was Atlantic horseshoe crab representing 30.3% of the total collection. Striped searobin represented 24.2%: striped bass (*Morone saxatilis*); summer flounder (*Paralichthys*

Table 4.2.1.1 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Norton Basin, May 2002.

Norton Basin, Bottom (n=2)
Duration of set: 18 to 20 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Prionotus evolans	Striped Searobin	232	2520.62	240-430
Brevoortia tyrannus	Atlantic Menhaden	8	114.61	330-370
Libinia emarginata	Common Spider Crab	6	352.59	65-80
Tautoga onitis	Tautog	5	46.89	210-290
Morone saxatilis	Striped Bass	4	10.18	170-250
Raja eglanteria	Clearnose Skate	1	70.49	720
Total:		256	3115.39	65-720

Norton Basin, Mid-Depth (n=2)
Duration of set: 20 to 21 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Prionotus evolans	Striped Searobin	61	697.34	220-390
Brevoortia tyrannus	Atlantic Menhaden	23	197.72	300-380
Libinia emarginata	Common Spider Crab	1	3.44	70
Total:		85	898.50	70-390

Norton Basin, Surface (n=2)
Duration of set: 20 to 22 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Brevoortia tyrannus	Atlantic Menhaden	84	748.76	**270-380**
Prionotus evolans	Striped Searobin	13	151.82	310-400
Morone saxatilis	Striped Bass	1	n/a	n/a
Total:		98	900.57	270-400

Norton Basin, Shallow Area (n=4)
Duration of set: 18 to 20 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Prionotus evolans	Striped Searobin	294	1457.10	230-460
Brevoortia tyrannus	Atlantic Menhaden	31	174.32	300-390
Morone saxatilis	Striped Bass	9	11.35	125-265
Limulus polyphemus	Atlantic Horseshoe Crab	7	64.93	185-255
Libinia emarginata	Common Spider Crab	8	12.55	60-110
Tautoga onitis	Tautog	3	12.66	220-330
Callinectes sapidus	Blue Crab	4	7.64	110-150
Cynoscion regalis	Weakfish	1	24.78	660
Stenotomus chrysops	Scup	1	2.18	210
Alosa pseudoharengus	Alewife	1	0.11	115
Total:		359	1767.64	60-660

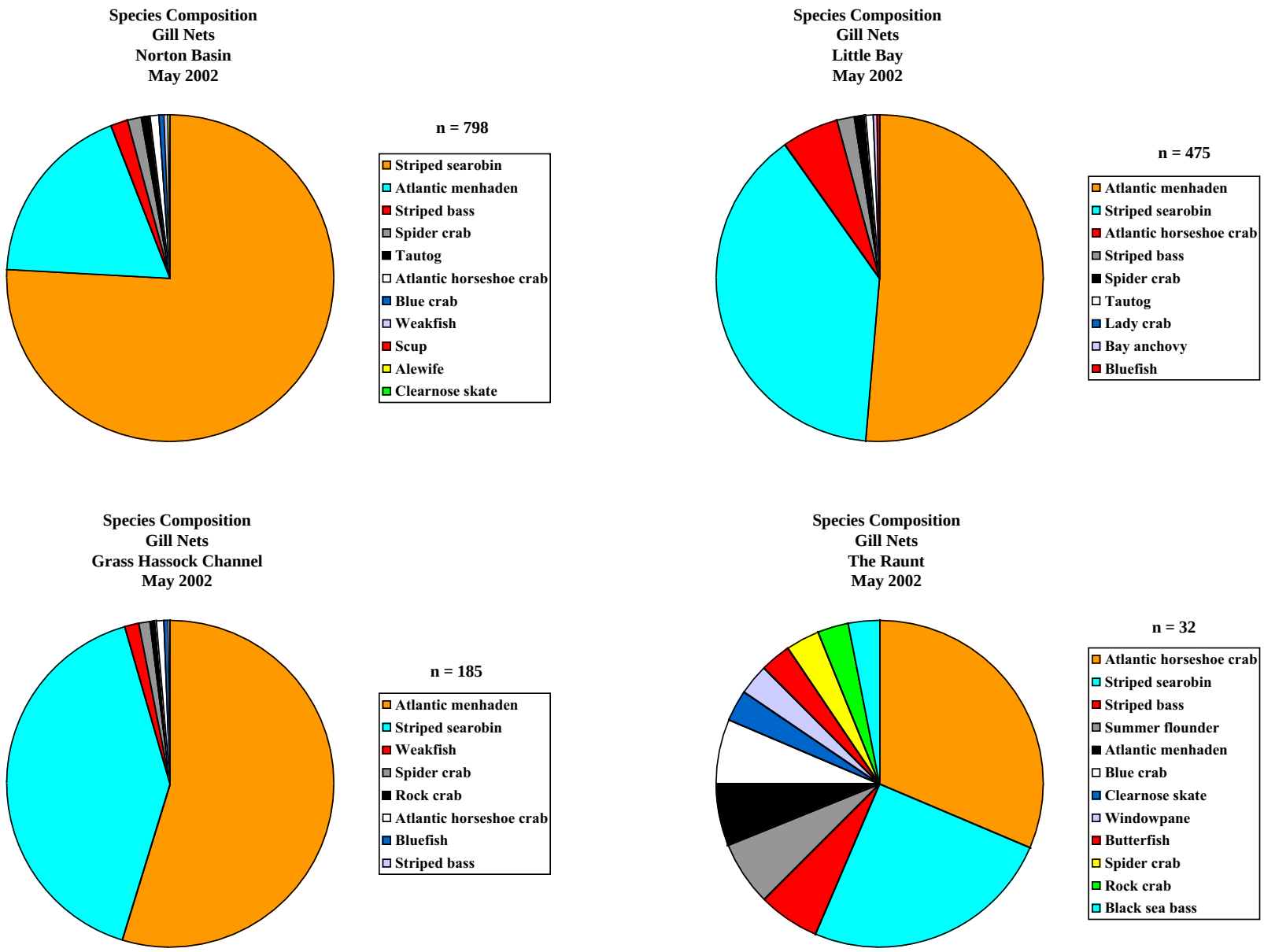

Figure 4.2.1.1 Species composition from gill net sampling efforts, May 2002.

Table 4.2.1.2 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Little Bay, May 2002.

Little Bay, Bottom (n=4)
Duration of set: 16 to 24 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Total:		0	0.00	0

Little Bay, Mid-Depth (n=4)
Duration of set: 16 to 24 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Brevoortia tyrannus	Atlantic Menhaden	24	131.28	275-370
Prionotus evolans	Striped Searobin	2	9.25	240-310
Total:		26	140.54	240-370

Little Bay, Surface (n=4)
Duration of set: 17 to 23 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Brevoortia tyrannus	Atlantic Menhaden	165	707.65	170-380
Prionotus evolans	Striped Searobin	13	51.61	300-380
Pomatomus saltatrix	Bluefish	1	7.18	430
Morone saxatilis	Striped Bass	1	1.68	220
Anchoa mitchilli	Bay Anchovy	1	0.57	70
Total:		178	768.68	70-430

Little Bay, Shallow Area (n=4)
Duration of set: 17 to 24 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Prionotus evolans	Striped Searobin	172	879.12	245-450
Brevoortia tyrannus	Atlantic Menhaden	56	327.58	280-385
Limulus polyphemus	Atlantic Horseshoe Crab	26	410.49	175-270
Morone saxatilis	Striped Bass	7	26.01	110-260
Libinia emarginata	Common Spider Crab	6	11.67	45-80
Tautoga onitis	Tautog	3	14.41	160-345
Ovalipes ocellatus	Lady Crab	1	0.37	40
Total:		271	1669.65	40-450

Table 4.2.1.3 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from Grass Hassock Channel, May 2002.

Grass Hassock Channel, Bottom (n=2)
Duration of set: 5.5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Prionotus evolans	Striped Searobin	112	4504.50	240-405
Brevoortia tyrannus	Atlantic Menhaden	25	1328.83	340-390
Cynoscion regalis	Weakfish	3	180.18	380-405
Libinia emarginata	Common Spider Crab	3	58.56	70-90
Cancer irroratus	Rock Crab	2	41.44	80-120
Morone saxatilis	Striped Bass	1	286.49	680
Total:		33	6400.00	70-680

Grass Hassock Channel, Mid-Depth (n=2)
Duration of set: 6.5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Brevoortia tyrannus	Atlantic Menhaden	97	3471.20	310-405
Prionotus evolans	Striped Searobin	10	367.20	250-360
Limulus polyphemus	Atlantic Horseshoe Crab	2	136.00	185-190
Cynoscion regalis	Weakfish	1	63.20	410
Total:		110	4037.60	185-410

Grass Hassock Channel, Surface (n=2)
Duration of set: 6.5 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Brevoortia tyrannus	Atlantic Menhaden	41	1522.60	295-395
Pomatomus saltatrix	Bluefish	1	75.20	445
Total:		42	1597.80	295-445

Table 4.2.1.4 Total abundance, mean CPUE (biomass in g/hr), and total length range of fish and macrocrustaceans collected in gill nets from the Raunt, May 2002.

The Raunt, Shallow Area (n=2)
Duration of set: 7.3 hrs

Scientific Name	Common Name	Total Abund.	Mean CPUE (g/hr)	TL Range (mm)
Limulus polyphemus	Atlantic Horseshoe Crab	10	753.42	175-260
Prionotus evolans	Striped Searobin	8	256.85	260-350
Morone saxatilis	Striped Bass	2	271.23	230-710
Paralichthys dentatus	Summer Flounder	2	154.11	370-530
Brevoortia tyrannus	Atlantic Menhaden	2	61.64	300-340
Callinectes sapidus	Blue Crab	2	27.40	50-150
Raja eglanteria	Clearnose Skate	1	102.74	630
Scopthalmus aquosus	Windowpane	1	19.18	260
Libinia emarginata	Butterfish	1	11.64	240
Libinia emarginata	Common Spider Crab	1	8.90	60
Cancer irroratus	Rock Crab	1	7.53	80
Centropristis striata	Black Sea Bass	1	2.05	80
Total:		32	1676.71	50-710

dentatus); Atlantic menhaden; and blue crab (*Callinectes sapidus*) each represented 6.1%; and all other species represented less than 5% (**Figure 4.2.1.1**).

4.2.2. June, 2002

Gill net collections from the bottom of Norton Basin during June (7 hrs duration, n=2) yielded 65 individuals representing 4 species (**Table 4.2.2.1**). The dominant species was striped searobin. Gill net collections at mid-depth in Norton Basin (7 hrs duration, n=2) yielded 16 individuals representing 2 species (**Table 4.2.2.1**). The dominant species was Atlantic menhaden. Gill nets deployed at the surface of Norton Basin (7 hrs duration, n=2) yielded 6 individuals representing 3 species (**Table 4.2.2.1**). The dominant species was blue crab. Gill net collections from the shallow areas of Norton Basin (7 to 8 hrs duration, n=4) yielded 119 individuals representing 7 species (**Table 4.2.2.1**). The dominant species was striped searobin. Throughout the June gill net sampling in Norton Basin, the dominant species was striped searobin representing 63.1% of the total collection. Atlantic menhaden represented 12.6%, blue crab represented 11.7%, bluefish (*Pomatomus saltatrix*) represented 6.3%, and all other species represented less than 5% (**Figure 4.2.2.1**).

Gill net collections from the bottom, mid-depth, and surface of Little Bay during June (7-8 hrs duration, n=2) yielded no fish (**Table 4.2.2.2**). Gill net collections from the shallow areas of Little Bay (6 to 6.5 hrs duration, n=2) yielded a total of 9 individuals, all of which were striped searobin.

Gill nets deployed on the bottom of the Grass Hassock Channel during June (6 hrs duration, n=2) yielded 94 individuals representing 6 species (**Table 4.2.2.3**). The dominant species was striped searobin. Mean CPUE at the bottom of the Grass Hassock Channel (2524.2 g/hr) was greater than at the bottom of Norton Basin (1913.2 g/hr) or the bottom of Little Bay (0.0 g/hr). Gill net collections at mid-depth in Grass Hassock Channel (6.5 hrs duration, n=2) yielded 8 individuals representing 3 species (**Table 4.2.2.3**). The dominant species was bluefish. Mean CPUE at mid-depth in Grass Hassock Channel (227.6 g/hr) was lower than that observed at mid-depth in Norton Basin (635.7 g/hr) but greater than at mid-depth in Little Bay (0.0 g/hr). Gill nets deployed from the surface of the Grass Hassock Channel during June (6.5 hrs duration, n=2) yielded 21 individuals representing 4 species (**Table 4.2.2.3**). The dominant species again was bluefish. Mean CPUE at the surface of Grass Hassock Channel (562.5 g/hr) was greater than at the surface of Norton Basin (185.7 g/hr) or at the surface of Little Bay (0.0 g/hr). Throughout the June gill net sampling in Grass Hassock Channel, the dominant species was striped searobin, which represented 56.9% of the total collection. Bluefish represented 17.1%, blue crab represented 14.6%, Atlantic menhaden represented 7.3% and all other species represented less than 5 % (**Figure 4.2.2.1**).

Gill nets deployed at the bottom of the Raunt during June (4.5 hrs duration, n=2) yielded 125 individuals representing 9 species (**Table 4.2.2.4**). The dominant species in the Raunt was lady crab (*Ovalipes ocellatus*). Mean CPUE at the shallow areas of the Raunt (2800.6 g/hr) was markedly greater than at the shallow areas of Norton Basin (1522.8 g/hr) or the shallow areas of Little Bay (325.2 g/hr). Throughout the June gill net sampling in the Raunt, the dominant species was lady crab representing 58.4% of the total collection. Common spider crab (*Libinia emarginata*) represented 15.2%, striped searobin represented 9.6%, blue crab represented 7.2%, Atlantic horseshoe crab represented 6.4%, and all other species represented less than 5% (**Figure 4.2.2.1**).

4.2.3. August, 2002

Gill net collections from the bottom of Norton Basin during August (5.5 hrs duration, n=2) yielded 23 individuals representing 7 species (**Table 4.2.3.1**). The dominant species was searobin. Gill nets deployed at mid-depth in Norton Basin (5.5 hrs duration, n=2) 1 Atlantic menhaden (**Table 4.2.3.1**). Gill nets deployed at the surface of Norton Basin (5 to 5.5 hrs duration, n=2) yielded 2 blue crabs and 1 Atlantic menhaden (**Table 4.2.3.1**). Gill net collections from the shallow areas of Norton Basin (5.5 to 6 hrs duration, n=4) yielded 19 individuals representing 6 species (**Table 4.2.3.1**). The