4- Potential Fish Food Items Present in Ichthyoplankton Samples and on Rock Groins

Introduction

During processing of the intertidal (seine) fish food habit samples it was noted that several important food items did not occur in the intertidal or nearshore benthic samples. For instance, the amphipod *Jassa falcata* was common in the diet of silversides. Although this prey item was found in the offshore borrow area benthic samples, it was absent in the inshore samples. While it was possible that the fish were migrating back and forth between the beach and the deeper areas, it seemed unlikely due to the distances involved. Another amphipod commonly found in the silverside diet, *Hyale plumulosa*, was not present in any of the intertidal, nearshore or offshore sediments. In order to locate more likely sources for these food items, it was decided to examine the invertebrate assemblages in the residues of processed ichthyoplankton samples, to obtain additional infaunal samples from areas between the nearshore and offshore stations, and to sample the intertidal epifaunal assemblages of the rock groins.

Methods

***Monitoring Plan and Execution*:** Archived ichthyoplankton samples were simply re-examined. Because of the large number of ichthyoplankton samples, only the intertidal samples were completely processed. Nearshore ichthyoplankton samples taken in 1999 were also processed in order to make intertidal-nearshore comparisons. Sampling of the rocky groins was accomplished in August 1998, while infauna between the nearshore and offshore areas were sampled in June 1999.

***Sampling and Processing*:** Field sampling of ichthyoplankton was performed as described in Chapter 3. In the laboratory the volume of small samples was directly measured, while that of large samples was estimated. Where total sample volume was less than 50 ml, the entire sample was examined. If total sample volume exceeded 50 ml, a 25 ml subsample was removed after the sample had been thoroughly mixed. Samples were then examined under a dissecting microscope and potential fish food items identified and enumerated. Only those taxa encountered in the food habitats analysis (Chapter 5) were counted, thus many common plankters such as crab zoea, chaetognaths, and jellyfish were not enumerated. All samples were examined under 6X and 18X power to insure that both small taxa (e.g., copepods) and large taxa (e.g., shrimp) were accurately counted. Only a single field (the area seen under the microscope at a particular power) was examined for each sample and numbers of food items multiplied by the appropriate factor to estimate total abundance in the subsample (6X = 4 fields; 18X = 216 fields). Subsample abundance estimates were then multiplied by the appropriate factor based on the volume of the sample and the original volume of water filtered to report abundances as numbers of animals/100m^3. Values from individual samples were then averaged over sample dates to arrive at a single value for each date. Identifications were performed by Dr. Ray and subsequently verified by Barry Vittor and Associates (Mobile, AL).

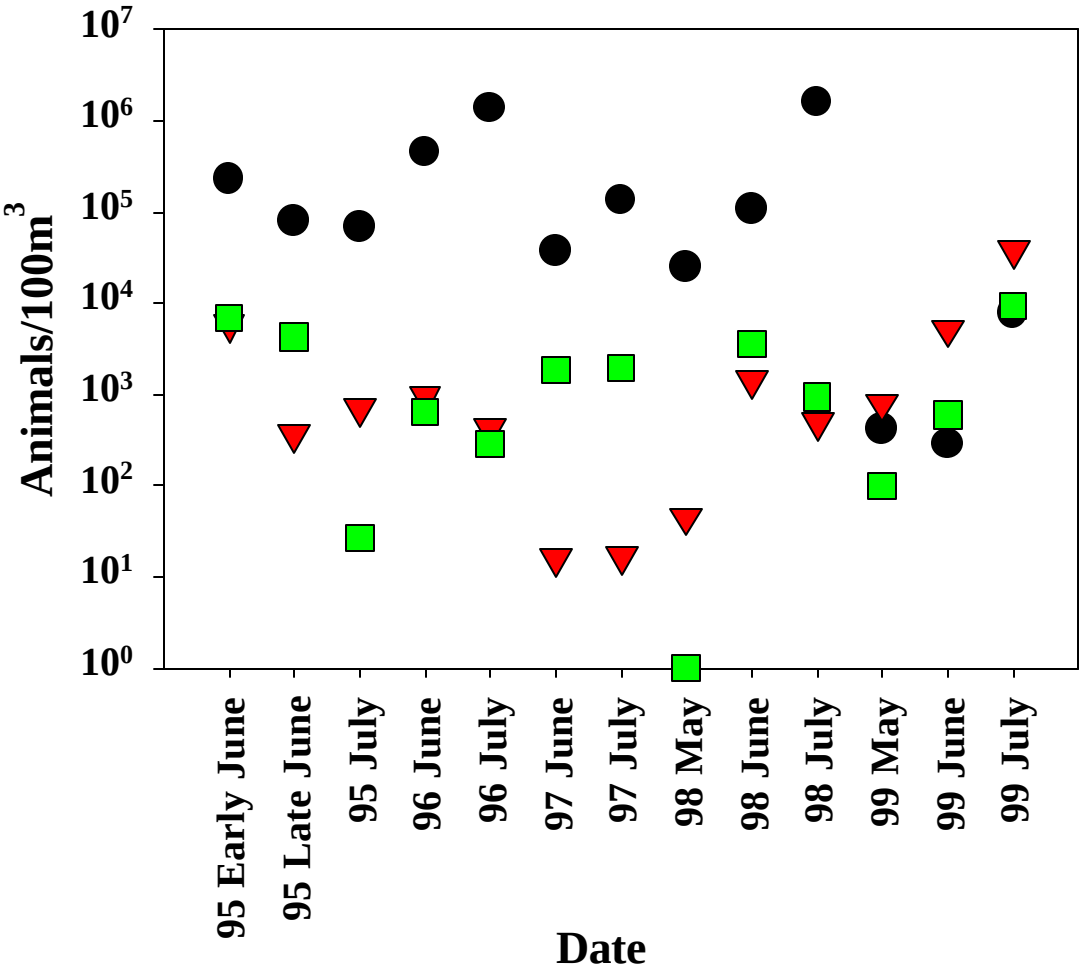

Figure 4-1. Abundance of Copepods, *Gammarus annulatus*, and Crab Megalops in Surfzone Ichthyoplankon samples. Circle = Copepods, Square = *Gammarus annulatus*, and Triangle = Crab Megalops.

Table 4-1. Summary data for potential fish food items collected in surfzone icthyoplankton. Values as Numbers of Animals/100m^3

Data	95 Early June	95 Late June	95 July	96 June	96 July	97 June	97 July	98 May	98 June	98 July	99 May	99 June	99 July
Insecta (LPIL)*	974	16	66	1200	310	84	30	1534	628	325	1975	19	124
Telmatogeton (LPIL)	8	9	1						1				18
Gammarus annulatus	5847	362	713	952	430	16	17	45	1451	499	797	5152	37568
G. mucronatus				6									
Jassa falcata	327	177	42	555	819	233	38	119	276	112	62	18	21
Unciola irrorata		31				1						3	
Hyale plumulosa	8	2	1	130	170		21	10		6			
Stenothoe minuta	4		2	14	17	5		1					10
Corophium insidiosum		21		4	22								
Parahasutorius attenatus		7	9		6	4	9						
Haustoriidae (LPIL)**			2		7		2					2	
Aeginina longicornis		13							16				
Talorchestia (LPIL)					7								
Hyperiidae (LPIL)					3								
Pseudoleptocuma minor					9								
Idotea balthica	69	100	890	1623	273	61	69		3	22	13		1
Edotia triloba	37	458	74	130	90	48	321	63	162	6	1		
Chirodotea tuftsi						1	2						
Parasitic Isopod		1	2	26	5	1		1	1				
Americamysis bigelowi		2											
Neomysis americana		2			59	2	30						
Emertia talpoida	1		1					3		6	19	6	2
Crab Megalops	6961	4235	27	641	285	1860	1960	1	3598	948	100	592	9375
Crangon septemspinosa	5	4	5	56	15			41	64		14	40	4435
Palaemonetes (LPIL)		28	15		124	3	566	32	71	1499			
Other Shrimp	13	2					4		2	20			
Cancer irroratus	527	418	1	272	19	26	18		95		2	170	5
Callinectes sapidus		13	2		1								
Ovalipes ocellatus							1215			1183			
Grapsidae (LPIL)							5						
Paguridae (LPIL)					5	2	33			66		5	1123
Stomatopoda (LPIL)							34		2				1

Table 4-1. Summary data for potential fish food taxa collected in surfzone ichthyoplankton. Values as Numbers of Animals/100m^3

Data	95 Early June	95 Late June	95 July	96 June	96 July	97 June	97 July	98 May	98 June	98 July	99 May	99 June	99 July
Limulus polyphemus			1										
Copepoda (LPIL)	232519	79728	68020	453765	1379735	37018	136610	24991	107899	1595837	415	285	7930
Siphonstomatoida (LPIL)		1			10	5		5			2		
Scolelepis squamata	21	19		24	7	27	37	11	1	19	55	12	74
Nereis (LPIL)	12												
Polynoidae (LPIL)	22	9	1	14	29	1	4	2	5				
Pherusa affinis		17											
Cirratulidae (LPIL)		6											
Syllidae (LPIL)	1	10			2	3		12	3				
Tomopterus (LPIL)					8		401			4			
Phyllodocidae (LPIL)							1		1				
Paranaitis (LPIL)									1				
Rhynchocoela (LPIL)				1									
Mytilus edulis	3210	884	111	10155	5355	204	177	2835	704	103	616	827	23
Tellina agilis					6				6				
Nudibranch (LPIL)								7					

*Insecta is comprised of adult (flying) terrestrial insects- primarily carpenter ants and assortment of flies, beetles, and wasps

**Haustoriidae includes *Parahaustorius holmesi, Achanthohaustorius millsi, and Haustorius canadensis*

Table 4-2. Summary data for potential fish food items collected in surfzone and nearshore ichthyoplankton in 1999[1]

	May			June			July		
Taxa	Surfzone	Nearshore Surface	Nearshore Bottom	Surfzone	Nearshore Surface	Nearshore Bottom	Surfzone	Nearshore Surface	Nearshore Bottom
Gammarus annulatus	797	2.4	409.6	5152	62.7	2227.2	37568	0.4	1.0
Jassa falcata	62	1.3	6.8	18		0.6	21		
Americhelidium americanum			0.7						
Unciola irrorata				3					
Haustoriidae				2					
Phtois macrocoxa							10		
Idotea metallica		0.1				0.3			
Idotea baltica	13						12		
Edotia triloba	1	0.3	3.2		4.2	12.8			
Chirodotea tuftsi		0.2	0.7						
Parasitic Isopod		0.4			0.2				
Mysidopsis bigelowi			2.3						
Neomysis americana			3.2						
Emerita talpoida	19			6			2		
Crab Megalops	100	0.6		592	144.9	10.1	10495	48.0	52.0
Cancer irroratus (juv.)	2			170		0.8	5		
Ovalipes ocellatus (juv.)								X	
Juvenile Shrimp*	14	0.7	5.2	40	6.9	5.6	4592	30.4	397.7
Juvenile Paguridae				5			1123		
Platysquilloides enodis							1	1.1	1.2
Leptocuma minor			1.0			0.2			
Oxyurostylis smithi									
Siphonstomatoida (LPIL)	2								
Insects**	1975	0.1		19	0.2		337	0.8	0.3
Telmatogeton (LPIL)[G]							18		
Copepods	415	19.9	10.4	284	6016.5	3806.8	8109		
Mytilus edulis	616	1.4	3.4	827	0.3		23		
Scolelepis squamata	55			12			80		
Asabellides oculata			0.9						

Table 4-2. Summary data for potential fish food items collected in surfzone and nearshore icthyoplankton in 1999[1]

	May			June			July		
Taxa	**Surfzone**	**Nearshore Surface**	**Nearshore Bottom**	**Surfzone**	**Nearshore Surface**	**Nearshore Bottom**	**Surfzone**	**Nearshore Surface**	**Nearshore Bottom**
Syllidae		X			X			X	X
Phyllodicidae					X				X
Terebellidae									X
Tomopterus (LPIL)					X		X	X	

[1]Values as Numbers Animals/100m3

**Crangon*, *Palaemonetes* , & *Penaeus*

**Mixture of Adult Hymenoptera, Diptera, Coleoptera, Hemiptera, & Homoptera

[G]Same taxon on groins

X = Present

Table 4-3. Summary Data for Rocky Groin Scrape Samples

Groin	Side	Barnacles	*Mytilus edulis*	*Ulva* (LPIL)	*Telmatogeton* (LPIL)	*Hyale plumulosa*
80	North	Heavy	Few	Heavy	Many	Few
80	South	Moderate	Few	Heavy		
82	North	Few	Moderate	Moderate	Many	Few
82	South	Few		Heavy		
84	North	Few	Moderate	Moderate		
84	South	Few	Few	Heavy	Moderate	Moderate
105	North	Heavy				
105	South	Moderate		Heavy		
109	North	Moderate	Few	Heavy	Moderate	Moderate
109	South	Moderate	Moderate	Heavy		
111	North	Moderate	Moderate	Heavy	Many	Few
111	South	Few	Heavy	Moderate	Many	Many

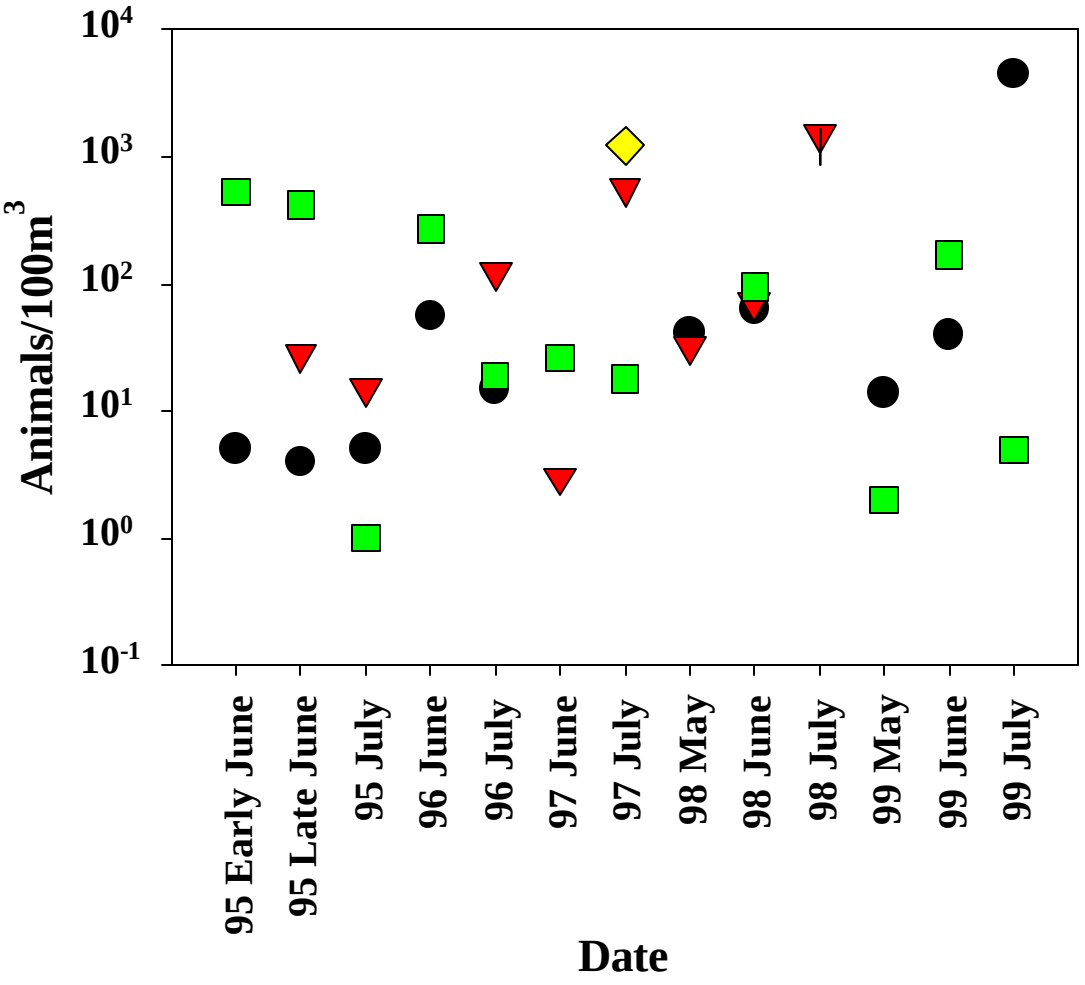

Figure 4-2 Abundance of Shrimp and Crabs in Surfzone Ichthyoplankon samples. Circle = *Crangon septemspinosa*, Square = *Palaemonetes* spp., Triangle = *Cancer irroratus*, and Diamond = *Ovalipes occelatus*.

Scrape samples were taken on both the north and the south facing sides of six rock groins in the northern reach of the project (between Asbury Park and Deal). All organisms in an area of approximately 0.1 m^2 were scraped from the groin using a paint scraper and the sample placed in a zip-lock bag. The sample was subsequently fixed in formalin and transferred to the Wetlands and Coastal Ecology Branch. After transfer to 70% ethanol, the samples were examined and qualitative estimates made of the relative abundances (few, moderate, high).

Infaunal samples were taken at two sites between the nearshore and offshore areas in June 1999 using methods previously described for the nearshore infaunal sampling. Data from these samples indicated that the infauna were similar to the nearshore assemblage and did not represent a potential source for the food items under investigation.

Results and Discussion

Surf Zone Plankton*:* Three invertebrate taxa dominated the surf zone plankton samples: copepods, the amphipod *Gammarus annulatus*, and megalops stage crab larvae (Figure 4-1 and Table 4-1). Other common potential fish food items in the plankton included adult terrestrial insects (primarily flying ants, wasps, flies, and beetles), the amphipods *Jassa falcata* and *Hyale plumulosa*, the isopods *Idotea balthica* and *Edotia triloba*, juveniles of the crab *Cancer irrorata* and the shrimps *Crangon septemspinosa* and *Palaemonetes* (LPIL), and the blue mussel *Mytilus edulis*. Juveniles of the crab *Ovalipes ocellatus* were not present often, but were exceeding abundant occasionally (Figure 4-2). Important fish food items such as the mole crab *Emerita talpoida* and the polychaete *Scolelepis squamata* were also present, although in small numbers.

Nearshore Plankton**:** Nearshore plankton samples were dominated by many of the same three taxa as the surfzone, but at lower abundances (Table 4-2). Highest abundances tended to be in bottom samples with the exception of copepods, which were always highest in surface samples. Taxa found exclusively in nearshore samples included the isopod *I. metallica*, the cumacean *Leptocuma minor* and polychaetes in the genus *Tomopterus* (LPIL) and in the families Syllidae, Phyllodocidae and Terebellidae.

Rock Groin Epifauna: The rock groins were dominated by barnacles, blue mussels (*Mytilus edulis)*, and the green alga *Ulva* (LPIL) (Table 4-3). In most cases only one of these taxa dominated individual samples. That is, mussels and algae were not common where barnacles were highly dominant, barnacles and algae were not common where mussel populations were dense, and barnacles and mussels were not highly abundant where *Ulva* was common. Although none of these taxa was present to any extent in the fish diets, two common food item taxa, the amphipod *H. plumulosa* and the chironomid (larva) *Telmatogon* (LPIL) were closely associated with their assemblages. *Telmatogon* (LPIL) tubes were commonly found attached to *Ulva* blades and thus were most numerous where the alga was abundant (Table 4-3). *H. plumulosa* apparently lives in the interstices between barnacles or

mussels and thus was most commonly found in association with heavy or moderate densities of these taxa.

Summary: Results indicate that virtually all of the common food items in surf zone fish diets are present in the surf zone plankton. Taxa such as copepods, crab megalops, and gammarid amphipods are the most common forms yet even larger organisms such as *S. squamata* and *E. talpoida* were routinely collected. The source of these food items varies considerably with some forms being permanent members of the plankton (e.g., copepods), while others are temporary residents (e.g., crab megalops and gammarid amphipods). Wave action is important in that a number of taxa are obviously dislodged from the bottom sediments (e.g., *Emerita* and *Scolelepis*) and others are washed off the rocks of the beach groins (e.g., *Telmatogon* and *H. plumulosa*). A few originate on the land and are deposited by the winds (e.g., flying ants). These findings underscore the complexity of high-energy beach food webs. Also, the importance of sampling both substrate and water column habitats to obtain a full understanding of trophic linkages is clear.