## NOAA Technical Memorandum NMFS-SEFC-87



The Occurrence of <u>Penaeus</u> spp. in the Stomachs of Trawl-caught Fishes from the Northwestern Gulf of Mexico, 1981



**MARCH** 1982

U.S. DEPARTMENT OF COMMERCE National Oceanic and Atmospheric Administration National Marine Fisheries Service Southeast Fisheries Center Galveston Laboratory Galveston, Texas 77550



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# The Occurrence of <u>Penaeus</u> spp. in the Stomachs of Trawl-caught Fishes from the Northwestern Gulf of Mexico, 1981

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#### ABSTRACT

During the FRS OREGON II Texas Closure operations between 4 June and 4 July 1981, samples of trawl-caught finfish were obtained. The objectives of the study were to record the number of <u>Penaeus</u> spp. found in trawl-caught fishes and to document shrimp predator species. The stomachs from the trawlcaught fishes were examined for the presence of brown (<u>Penaeus aztecus</u>), white (<u>P. setiferus</u>), and pink (<u>P. duorarum</u>) shrimp. Thirteen brown shrimp were identified from the stomachs of 7598 fish. The collected data were compiled for further examination to determine the impact of fish predation on shrimp stocks and to estimate natural mortality due to predation.

#### INTRODUCTION

During the FRS OREGON II Texas Closure operations between 4 June and 4 July 1981, samples of trawl-caught finfish were obtained. The stomachs from these fish were later examined for the presence of brown (<u>Penaeus aztecus</u>), white (<u>P. setiferus</u>), and pink (<u>P. duorarum</u>) shrimp. The collected data were compiled for further examination to determine the impact of fish predation on shrimp stocks and to estimate natural mortality due to predation. The objectives of the study were to record the number of <u>Penaeus</u> spp. found in trawl-caught fishes and to document shrimp predator species.

#### METHODS

#### Trawling Procedures

The FRS OREGON II was used to conduct a trawl survey off the Texas coast from 5 to 35 fm based on a stratified sampling pattern of 100 randomly selected trawling sites (Fig. 1, Table 1). Stations located from 5 to 29 fm were sampled by trawling across the appropirate 1 fm depth stratum, and those of 30 fm or more were sampled by trawling across a 5 fm depth stratum to 35 fm. All stations were sampled at night with a 12.2 m (40 ft) semi-balloon shrimp trawl rigged with tickler chain and 2.4 m x 1.0 m (8 ft x 40 in) wooden doors. Trawls were pulled perpendicular to the shoreline as bottom topography permitted. Individual tows were limited to a maximum 30-minute bottom time, making a series of consecutive tows necessary to completely cover a given depth stratum on certain stations. Stations requiring 15 minutes or less of bottom time to completely cover the depth stratum were replicated immediately after the initial tow. An additional eight deep-water (i.e., 35-50 fm) stations were sampled by a 30-minute tow.

Four stations located on a transect perpendicular to the shoreline just south of San Luis Pass, Texas were visited three times during the study period by the FRS OREGON II. The stations, located in 7, 13, 20 and 24 fathoms, were visited at two-week intervals beginning in early June. At each station, simultaneous tows with port and starboard nets were made. Standard sample processing procedures were also used.

#### Sampling Procedures

On board the OREGON II the total weight of fishes from each trawl-haul on each station was recorded. Depending on catch size and trawl constraints, a maximum 100 lb randomly selected sample was collected from each trawl-haul and frozen for laboratory analyses.

#### Laboratory Procedures

In the laboratory, each sample was thawed and sorted according to species and size. In most cases fishes less than 150 mm standard length (SL) and all herbivorous fishes were discarded. However, in samples consisting of at least 75% carnivorous fishes less than 150 mm SL, at least 50% of these fishes were examined. All discarded fishes were identified to species, counted and numbers per species recorded.

To examine the fish, the abdominal area was cut from the anus to the isthmus and the stomach was located. Relative stomach fullness was determined as follows: (1) a collapsed stomach was considered empty and was not examined further, (2) partial distention of the stomach was considered 50% full, and (3) maximum distention was considered 75-100% full. Distended stomachs were removed and contents were identified and grouped as crabs, fish, detritus, gastropods or shrimp. <u>Penaeus</u> spp. found in gut contents were measured and preserved in 10% formalin solution.



Figure 1. Chart of Texas Gulf Coast with FRS OREGON II station locations.

TABLE 1. Station locations and depth strata (fathoms) for the OREGON II Texas Closure survey. Asterisks (\*) indicate bottom obstructions in the vicinity of the station 1 per obstruction.

			DEPTH
STATION	LAT.	LONG.	STRATA (fm)
1	29008	93*52120	10-11
2	28°57'	930521	12-13
3	28°40'	93°52'30"	15-16
4	28°24	93°56'30"	28-29
5	29°05'	94°01'30	10-11
6	28°11'	94°02'10"	35-36
7	28°55'	94°09'10"	11-12 *
8	28°47'	94°12'30"	14-15
9	28°23'	94°11'	26-27 *
10	28°13'	94°11'	30-35 ***
11	29°25*	94°28'	6-7 *
12	28°59'	94°37'50	9-10
13	28°57'	94°35'10"	10-11
14	28°47 *	94°30'20*	13-14
15	28°42'	94°19'40*	16-17
16	28°22'	94°27'	25-26
17	28°56'10	95°05'	9-10
18	28°56 '20	95°05'	9-10
19	28°44'20	94°55'	13-14
20	28°29'	94°42'50	20-21
21	28°20'	94°35'40	24-25
<b>2</b> 2	28°58!	<b>9</b> 5°09 <b>'30</b>	7-8
23	28°54 '40	95°10'	89
24	28°42'10″	95°06'30	13-14
25	28°05 <b>'4</b> 0	94°48'20	30-35
26	28°43'	95°20'	9-10
27	28°16'30	95°05 <b>'30</b>	23-24*
28	28°38'30	95°43'	7-8
29	28°33'20	95°35'	10-11
30	28°33'30	95°25'	16-17*
31	28°19'20'	95°25'	18-19
32	28°19'20'	95°20	19-20
33	28°30'40	95°45'	11-12
34	28°06'40	95°40'30	23-24
30	28°18'30	95°50'	14-15
30	28-11-50	95*45*	10-19
37	20-04-40	90-40 058551	23-24 20-21
30	20-07-	95°35°	20-21 5-5
<b>3</b> 9	20,34,	90°00	3-0 15-16
41	20 13	90-00	15-16
42	20 12	90,00,	19-10
42	28013150	90,00,	10-13
44	28 13 30	90 23	19-20
45	28 03	20.10.	8-0
46	28000120	96 23	11-12
47	27°58'20	96°25'	14-15
48	27°57'	96°20'	21-22
49	27°55'	96°05'	29-30
50	27°57'20	96°55'	6-7
	<b></b>		

			DEPTH
STATION	LAT.	LONG.	STRATA (fm)
51	27°50 <b>'30</b> "	96°45'30″	13-14
52	27°48'30"	96°40'	17-18
53	27°46 <b>'40''</b>	96°30'	25 <b>-26</b>
54	27°46 '	96°50*	13-14
55	27°44 <b>'10''</b>	96°45'	17-18
56	27°43'10"	96°35'	24-25
57	27°44'10"	96°55'	11-12*
58	27°43 <b>'40</b> ″	96°55'	12-13*
59	27°39 <b>'40</b> "	96°55'	14-15
60	27°35'30″	96°45'	22-23
61	27°35'20″	97°02'30"	12-13
62	27°31'10"	96°52'30"	19-20
63	27°28'30″	97°00	16-17
64	27°28'10"	97°00	16-17
65	27°25'40"	96°52'30"	22-23
66	27°26'20*	97°16'	6-7
67	27°24 '50"	97°06*30"	13-14
68	27°22'50"	96*55*	21-22
69	27"17'40"	97.07.	15-16
70	27918130*	979051	16-17
71	27.201	060561154	21-224
72	279101101	979201	70
73	27910150	97-20-	/~0
74	269571	97°13°	TT-TT-
75	20 37 260110#	97°21°30"	270
75	20.30.10.	9/20	8-9
70	20-20-30"	97-12.	12-13
78	20.23.20	97-03-	19-20***
70 70	20-20-	97°17°30"	9-10
73 90	20-23-20	9/*15*	12-13
	20°52'	97°15	12-13
07 0T	26°4/'30"	97°11'30"	14-15
82	26°46'50"	97°06'30"	17-18
83	26°39'10"	96°56'30''	22-23
84 05	26°29'50"	97°05'	14-15
85	26°29'30"	97°02'30"	17-18
80	26°28'	97°02'30''	15-16
87	26°27'40″	96°56'30"	20-21
88	26°33'20″	96°45'	27-28*
89	26°12'40"	97°04'30"	10-11
90	26°14'40"	96°57'	16-17
91	26°19'40"	96°56'30"	18-19
92	26*09'10"	97°00'	14-15
93	26°10'30"	96*551	19-20
94	26°08'20"	96*551	18-19
<b>9</b> 5	26°06'50"	96°53'30"	20-21
96	26°01°20#	97°07'	7-8
<b>9</b> 7	26°01'10"	97*00'	15-16
98	26°02'30"	96*55*	17-18
<b>9</b> 9	25°58'50"	97°06'	8-9
100	25°59'30"	97*01*30*	13-14
Deep Water	<del>-</del> <del>-</del>		
STATIONS			
D-1	28°03'	94 • 48 •	35
D-2	28*001	94.481	45
D-3	27.50'	06 005 1 304	35
D-4	27-441	96 904 1	45
D5	279317	069261	35
D-6	27•28!	96 92 1	45
D-7	26-30-30*	96.47	3 <b>6</b>
D-8	26.937.30	96+371	B
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#### RESULTS

A total of 68,983 fish were collected of which 61,385 were discarded, a representation of 98 species. The species discarded in the laboratory are recorded in Table 2. <u>Syacium gunteri</u> was discarded most frequently (10,725 individuals, 18% of total discards). Other fish frequently discarded included <u>Stenotomus caprinus</u>, <u>Micropogonias undulatus</u>, <u>Chloroscombrus</u> chrysurus, Prionotus rubio, and Diplectrum bivittatum.

Stomachs from 81 species of fish were examined for the presence of <u>Penaeus</u> spp. Stomachs from a total of 7598 fish were examined (10% of total fish collected). A summary of size range, weight, the number of shrimp and number of <u>Penaeus</u> spp. found for the species-examined appears in Table 3. <u>Micropogonias undulatus</u> (95-163 mm SL) was the species with the greatest number of individuals examined. Other species examined in numbers greater than 300 include <u>Synodus foetens</u> (48-333 mm SL), <u>Cynoscion nothus</u> (76-219 mm SL), <u>Centropristis philadelphica</u> (85-224 mm SL), <u>Lepophidium graellsi</u> (95-140 mm SL), and <u>Leiostomus xanthurus</u> (87-164 mm SL). The column in Table 3 labeled "Total Shrimp" represents all species of shrimp found in the stomachs including <u>Penaeus</u> spp. Of the non-<u>Penaeus</u> species, <u>Trachypenaeus</u> spp. occurred most frequently and in greatest abundance, followed by Mysids and <u>Sicyonia</u> spp. Of the six fish species in which <u>Penaeus</u> spp. were found, more than 100 individuals were examined, except Lutjanus synagris, where 65 individuals were examined.

Thirteen <u>Penaeus</u> spp. were found and identified as <u>Penaeus aztecus</u>, brown shrimp. The greatest number of <u>P. aztecus</u> (5) were found in the stomachs of <u>Synodus foetens</u> and 4 <u>P. aztecus were found in Cynoscion arenarius</u> stomachs. A list of length, weight and stomach fullness of species in which <u>P. aztecus</u> shrimp were found, along with the tail length of the brown shrimp appears in Table 4. The <u>P</u>. <u>aztecus</u> found ranged in size from 20 to 62 mm tail length and the fish species in which these shrimp were found ranged in size from 119 to 244 mm (SL).

A correlation between shrimp size and fish size of the fish found to contain <u>P. aztecus</u> is illustrated in Figure 2. According to the data obtained from this study (See Equation 1), there is a direct correlation between fish size and size of consumed P. aztecus, 99% of the time (Fig. 2).

Equation:

y = -14.43 + 0.32x x = Shrimp (Tail length), y= Fish SL r = 0.79, p = 0.01 Table 2. Number and species of fish discarded.

SPEC	IES
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SPECIES	NUMBER
Syacium gunteri	10756
Stenotomus caprinus	8563
Micropogonias undulatus	6787
Chloroscombrus chrysurus	4352
Prionotus rubio	2895
Diplectrum bivittatum	2699
Peprilus burti	2631
Cynoscion nothus	2206
Sphoeroides parvus	1662
Citharichthys.spilopterus	1621
Halieutichthys aculeatus	1315
Porichthys plectrodon	1307
Lutjanus synagris	1161
Serranus atrobranchus	1123
Etropus crossotus	1106
Saurida brasiliensis	1088
Certropristis philadelphica	993
Lutjanus campechanus	739
Pricnotus paralatus	665
Prionotus tribulus	629
Prionotus salmonicolor	59 <b>5</b>
Trachurus lathami	587
Cyclopsetta chittendeni	570
Stellifer lanceolatus	531
Larimus fasciata	458
Mullus auratus	446
Bollmannia communis	422
Lepophidium graellsi	362
Scorpaena calcarata	357
Polydactylus octonemus	328
Prionotus stearnsi	319
Leiostomus xanthurus	318
Cynoscion arenarius	291
Ogcocephalus radiatus	266
Lagocephalus laevigatus	209
Synodus poeyi	203
Prionotus roseus	187
Opisthonema oglinum	183
Symphurus plagiusa	156
Monacanthus hispidus	128
Hoplunnis macrurus	111
Lagodon rhomboides	108
Harengula jaguana	106
Gymnachirus texaè	98
Anchoa hepsetus	96
Orthopristis chrysoptera	89
Urophycis cirratus	80
Bellator militaris	76
Ancylopsetta quadrocellata	67

SPECIES	NUMBER
Ancylopșetta dilecta	 65
Priacanthus arenarius	53
Brotuļa barbata	50
Centropristis ocyura	48
Antennarius radiosus	44
Brevoortia patronus	43
Scomber japonicus	42
Vomer setapinnis	40
Prionotus carolinus	35
Upeneus parvus	31
Urophycis floridana	31
Menticirrhus americanus	28
Prionotus ophryas	28
Prionotus scitulus	26
Etropus microstomus	19
Synodus foetens	19
Equetus umbrosus	18
Caulolatilus intermedius	16
Decapterus punctatus	15
Peprilus paru	15
Hoplunnis tenuis	14
Sardinella anchoa	14
Neomerinthe hemingwayi	13
Paralichthys squamilentos	11
Serraniculus pumilio	11
Syacium papillosum	11
Balistes capriscus	10
Histrio histrio	
Raja texana	9
Trichiurus lepturus	9
Anchoa mitchilli	8
Congrina flava	8
Engvophrvs senta	7
Brevoortia gunteri	, 5
Etrumeus teres	5
Cvclopsetta fimbriata	<u>ح</u>
Eucinostomus gula	
Aluterus schoepfi	3
Bairdiella chrysoura	3
Paralichthys lethostigma	2
Serranus subligarius	2
Calamus nodosus	2
Sphoeroides dorsalis	2
Acanthostracion guadricornis	<u>۴</u> ۱
Epinephelus flavolimbatus	1
Kathelostoma albigutta	т 1
Myrophus punctatus	⊥ 1
Antennarius scaber	1
Scomberomorus maculatus	1
artomorus macaratus	Ŧ

TOTAL

61385

Table 3. All species examined with size range, weight, number of "shrimp" and # Penaeus spp.

		SIZE (SL)	MEAN	MEAN	TOTAL	#PENAEUS	spp.
SPECIES	NUMBER	RANGE (MM)	LENGTH (mm)	WEIGHT(g)	SHRIMP	SHRIMP	
Micropogonias undulatus	2949	95-163	127.10	48.04	176	1	
Synodus foetens	944	48-444	192.04	72.34	42	5	
Cynoscion nothus	881	76-219	134.93	49.07	439	1	
Centropristis philadelphi	ca459	85-224	120.15	46.83	110	1	
Lepophidium graellsi	318	95-240	182.83	29.14	44	ō	
Leiostomus xanthurus	315	86-164	134 31	79 63	0	0	
Menticirrhus americanus	257	112-282	174 33	128 82	45	ů 0	
Diplectrum bivittatum	134	87-115	101 00	26.01	43	0 0	
Urophycis floridana	134	114-277	145 37	41 51	111	0	
Lutianus campechanus	118	65-200	107 31	45 73	20	0	
Cynoscion arenarius	108	134-239	177 00	99.82	42	4	
Larimus fasciatus	92	78-135	116 32	17 69	15		
Prionotus rubio	70	72-163	12/ 53	47.09	12	0	
Lutianus synagris	65	82-100	114 14	52 90	10	1	
Scomber japonicus	54	130-326	159 04	50.96	10	1	
Arius felis	45	132-293	101 76	130.06	0	C C	
Polydactylus octonomus	40	72-120	191.70	139.40	40	0	
Prionotus salmonigalor	71	72-130	110.10	32.40	49	0	
Chloroscombrug chrysurs	34 30	98-135	129.94	47.37	4	0	
Stollifor langealatur	32	99-1/2	125.50	39.88	7	0	
Scellifer lanceolatus	30	72-112	86.30	18.54		0	
Saurida brasiliensis	28	/8-125	99.36	11.39	3	0	
Lagodourit i it	27	92-1/5	125.26	65.60	0	0	
Lagodon Thomboides	24	91-147	119.54	54.27	0	0	
Prionotus tribulus	24	100-145	121.75	38.19	8	0	
Stenotomus caprinus	23	54-122	69.17	17.12	0	0	
Decapterus punctatus	20	133-170	151.35	52.38	0	0	
Orthopristis chrysoptera	20	112-1/6	135.85	67.64	0	0	
Priacanthus arenatus	20	150-205	183.00	167.38	10	0	
Cyclopsetta cnittendeni	19	100-224	178.95	100.16	0	C	
Ophiaion weishi	19	174-236	200.42	49.25	0	0	
Porichthys plectrodon	17	109-161	134.53	38.59	0	0	
Calamus nodosus	16	121-162	137.56	109.61	0	0	
Ophidion holbrooki	16	173-235	204.19	51.94	0	0	
Paralichthys lethostigma	14	138-265	216.57	252.01	0	0	
Serranus atrobranchus	13	71-88	80.38	17.12	1	0	
Gymnothorax nigromarginat	us 12	240-463	373.67	79.37	0	0	
Prionotus paralatus	12	113-133	120.92	33.79	0	0	
Brotula barbata	11	120-270	149.27	29.92	3	0	
Trichiurus lepturus	11	372-560	446.55	50.27	1	0	
Citharichthys spilopterus	10	70 <b>-</b> 119	91.40	19.20	0	0	
Cyclopsetta fimbriatta	10	118-227	184.30	114.73	0	0	
Mullus auratus	10	92-146	115.60	39.44	10	0	
Chaetodipterus faber	9	118-140	128.11	152.37	0	0	
Equetus umbrosus	8	114-134	123.88	41.34	0	0	
Trachurus lathami	8	142-156	150.00	59.49	0	0	
Prionotus roscus	7	112-144	121.70	40.86	4	0	
Raja texana	7	260-527	348,29	441.14	6	0	

#### Table 3. continued

		SIZE(SL)	MEAN	MEAN	TOTAL	#PENAEUS	spp.
SPECIES N	UMBER	RANGE (mm)	LENGTH (mm)	WEIGHT(g)	SHRIMP	SHRIMP	
Rhizoprionodon terraenovae	7	140-600	267.57	369.86	0	0	
Sardinella anchovia	7	173-186	177.43	91.46	0	0	
Scorpaena calcarata	7	48-111	61.57	12.03	0	0	
Sphyrna tiburo	7	343-662	470.57	788.61	5	0	
Peprilus burti	6	72-136	89.33	33.47	1	0	
Urophycis cirratus	6	111-140	125.17	17.37	6	0	
Odontoscion dentex	5	105-117	109.20	31.46	4	0	
Ancylopsetta quadrocellata	. 4	123-197	176.50	137.53	0	0	
Balistes capriscus	4	189-210	197.00	302.85	0	Ũ	
Mustelus canis	4	342-375	359.25	370.55	1	е	
Opisthonema oglinum	4	162-166	164.25	107.25	0	0	
Sphyraena guachancho	4	220-224	229.50	106.55	0	0	
Trachinocephalus myops	4	118-130	123.75	25.40	0	0	
Bairdiella chrysoura	3	109-119	114.00	32.93	0	0	
Echeneis naucrates	3	189-655	467.33	650.55	0	Ο	
Haemulon aurolineatum	3	136-140	138.00	73.37	0	0	
Congrina fl <b>av</b> a	2	175-300	237.50	20.25	0	0	
Conodon nobilis	2	128-152	140.00	77.40	0	0	
Diplectrum formosum	2	163-166	164.50	103.75	0	0	
Prionotus scitulus	2	100-115	107.50	24.25	2	Ũ	
Ancylopsetta dilecta	1	174	174.00	146.30	0	0	
Archosargus prebatocephalu	s 1	191	191.00	269.00	Û	O	
Brevoortia gunteri	1	160	160.00	103.60	0	0	
Carcharhinus limbatus	1	133	133.00	129.70	0	0	
Carcharhinus porosus	1	330	330.00	581.00	0	0	
Caulolatilus microps	1	190	190.00	131.20	0	0	
Chilomycterus schoepfi	1	141	141.00	178.20	0	0	
Dasyatis sabina	1	245	245.00	412.00	0	0	
Lagocephalus laevigatus	1	103	103.00	31.10	0	0	
Myrophus punctatus	1	400	400.00	54.30	0	0	
Rypticus maculatus	1	116	116.00	41.60	0	0	
Scomberomorus maculatus	1	345	345.00	420.50	0	0	
Syacium papillosum	1	206	206.00	154.10	1	0	
Symphurus plagiusa	1	114	114.00	16.50	0	0	

TOTAL

7598

Table 4. Fish species in which penaeid shrimp were found, standard length, weight and stomach fullness, along with shrimp tail length.

Species	STANDARD LENGTH (mm)	WEIGHT (g)	% STOMACH FULLNESS	SPECIES OF PENAEID	TAIL LENGTH (mm)
Synodus foetens	244	152.7	50	Brown	53
	204	91.7	75	Brown	44
	174	47.6	50	Brown	24
	165	39.3	50	Brown	46
	178	57.2	50	Brown	53
Centropristis philadelphica	119	43.5	50	Brown	20
Lutjanus <u>synagris</u>	190	234.0	75	Brown	43
Cynoscion arenarius	203	84.2	50	Brown	60
	227	189.6	50	Brown	62
	229	216.2	50	Brown	62
	210	168.5	75	Brown	51
Cynoscion nothus	190	113.1	50	Brown	45
Micropogonias undulatus	149	71.4	75	Brown	no length taken





#### DISCUSSION

In a recent digestion study utilizing <u>Arius felis</u> and <u>Micropogonias</u> <u>undulatus</u><sup>1</sup>, it was determined that it takes 4 to 5 hours for these fish to digest <u>Penaeus aztecus</u> to an unrecognizable state. The shrimp removed from the stomachs examined in the present study apparently were preyed upon within 3 to 4 hours of capture. All <u>Penaeus</u> spp. removed from the fish stomachs were identified as brown shrimp (<u>P. aztecus</u>). All identified brown shrimp had intact grooved rostrums, some had tail grooves present.

Aside from the <u>P</u>. <u>aztecus</u> found, a total of 9230 shrimps were found in the examined fish stomachs. These shrimps consisted mainly of <u>Trachypenaeus</u> <u>similis</u>, as large as 45 mm tail length. Mysid shrimp and <u>Sicyonia</u> spp. also occurred but in lower numbers.

In this study, fishes preying upon <u>P</u>. <u>aztecus</u> were from 119 to 244 mm SL (Table 4). <u>Penaeus</u> spp. shrimp were found in low numbers in the stomachs of suspect species, i.e., croaker (<u>M</u>. <u>undulatus</u>), trout (<u>Cynoscion</u> spp.), flounder (Bothidae), catfish (<u>A</u>. <u>felis</u>), seabasses (Serranidae) and lizard fish (Synodus foetens).

Although the results from this study indicate that during the summer month of June <u>Penaeus</u> spp. were not found as dominant food source in the carnivorous fish captured, this does not necessarily mean that these fishes do not feed on <u>Penaeus</u> spp. during later developmental stages. Richard Christian, Biologist, LGL Associates (personal communication), while tagging white shrimp near West Hackberry site in Louisiana, examined hardhead catfish (<u>A. felis</u>) and Atlantic Sharpnose shark (<u>Rhizoprionodon terraenovae</u>) 450-600 mm (SL) and found several white shrimp in stomachs of each species.

<sup>1</sup>"Digestion rates on Penaeid shrimp", Divita et. al, 1981

According to Landry and Armstrong (1981), the following trophic analysis was made for the more dominant species occuring in the Gulf of Mexico. <u>P. aztecus</u> and <u>P. setiferus</u> were found in sea catfish stomachs, but were not considered a major food source during the summer. Sand seatrout taken during the fall continued to subsist on sergestid shrimp and fishes, particularly anchovies, but exhibited a preference (50%) for penaeid shrimp (<u>P. aztecus</u> and <u>P. setiferus</u>). The sand sea trout did not show preference for penaeids during summer. Silver seatrout stomachs yielded penaeid and sergestid shrimp, especially <u>Acetes americanus</u>, and engraulid fishes as dominant food items during summer. There was no mention of <u>Penaeus</u> spp. in stomachs from the Atlantic croaker. A small percent of penaeids were taken from the star drum (<u>Stellifer</u> lanceolatus) stomachs in the spring (1978-1979) samples.

The absence of <u>Penaeus</u> spp. shrimp in the fish stomachs examined in this study could possibly be attributed to the size and development stage of the fishes. Dr. Andre Landry, Texas A&M at Galveston Department of Marine Biology (personal communication), stated that in taking trawl specimens during spring (May-July) the majority of the catch would be smaller fishes, 50-200 mm SL. At this size, swimming speed and behavior could limit their ability to prey on large <u>P. aztecus</u>, and these small fish were more likely to prey on smaller finfish. In this study, there was a direct correlation between fish size and size of consumed <u>P. aztecus</u>, 99% of the time (Fig. 2).

Future studies using mid-water trawls and gill nets might be more successful at collecting larger fish. Gut analyses of larger fish stomachs might show an increased utilization of Penaeus spp. as a food source.

#### Literature Cited

Landry, A. M. and H. W. Armstrong, 1981. Demersal fishes and Macrocrustaceans, NOAA Tech. Mem. NMFS-SEFC-28.