A PRELIMINARY EXAMINATION OF THE STOMACH CONTENTS OF FIVE SPECIES OF DEMERSAL FISH COLLECTED IN THE CHRISTIAENSEN BASIN, NEW YORK BIGHT APEX 1969-1970

by

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Introduction

Gross et al. (1976) and Sindermann (1976) have reviewed the problems of the impacts of human activities in the New York Bight. Of major concern is the effect of these activities, especially ocean dumping, on the distribution, productivity and consumability of fishery resources found in these waters. There is evidence that sediments are highly contaminated and benthic fauna altered in the vicinity of the New York Bight apex dredge spoil and sewage sludge dumpsites (Steimle et al., in press). Because many species of finfish feed heavily on benthic invertebrates, the contamination of the benthic environment and fauna or degradation of the forage value of the fauna may be a factor affecting distribution, productivity or consumability to humans of valuable finfish. An examination of the feeding habits of fish found in these areas can be valuable in understanding how the alteration of the quantity and quality of forage species can affect fishery resources in the area.

This preliminary analysis of gut content data is being done to bring this rather large data set into use and to make use of the information contained in the set to assist in the evaluation of the impact that sewage sludge dumping has had to the health and productivity of fisheries resources in the New York Bight.

This report is entirely based on archived data originally collected by C. Gibson, L. Rogers, J. O'Neill and others currently or formerly with the NMFS, NEFC, Sandy Hook Laboratory.

Methods

Collections of five species of demeral fish: silver hake, Merluccius bilinearis; red hake, Urophycis chuss; cunner, Tautogolabrus adspersus; yellowtail flounder, Limanda ferruginea; and winter flounder, Pseudopleuronectes

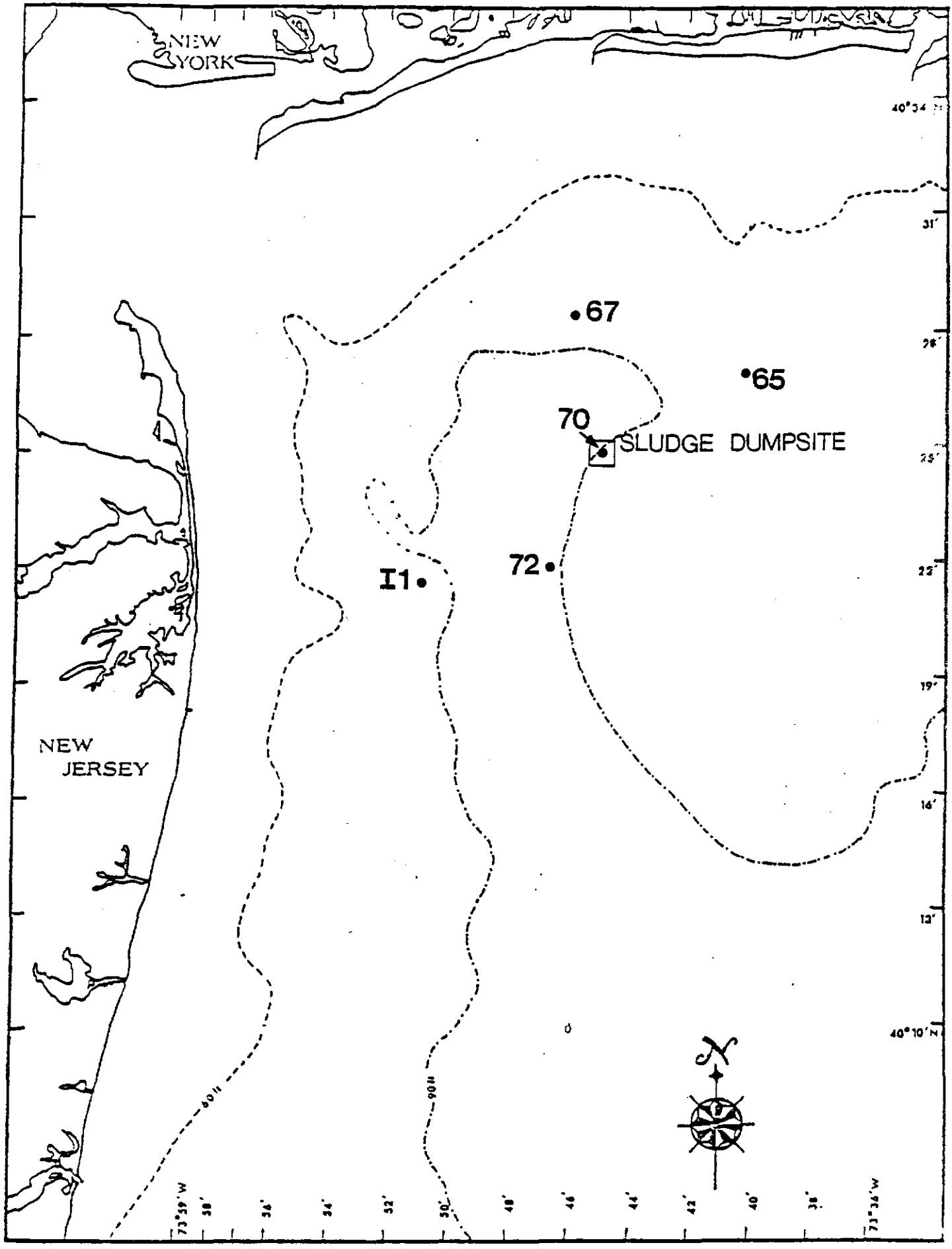

Figure 1. Location of fish stomach contents sampling, November 1969-June 1970.

americanus, were made at five stations in and around the Christiaensen Basin at the head of the Hudson Shelf Valley (Figure 1). These collections were made using a small bay trawl on up to six locations between November 1969 and June 1970. The sampling dates are: 20 November 1969; 2 and 26 February 1970; 5, 14 and 21 May 1970; 4 and 10 June 1970.

The stomach contents of 994 fish from those collections were cursorily examined and the types of material, organic and inorganic, were noted as well as relative quantity.

Results

The results of this analysis are presented for each sampling site in Tables 1-5. These results show that silver hake feed predominantly on Mysids, Crangon shrimp and fish at all stations. Red hake had a more diverse diet, with amphipods, polychaetes and crabs joining mysids and Crangon as major food items at all stations. Polychaetes were the major prey of both species of flounder at all stations, not only the two larger species noted in Tables 1-5, but many specimens of undetermined very small species (e.g. Capitella) were also freqently mentioned in the gut content descriptions. The flounder also preyed heavily on most other small benthic invertebrate groups as well, e.g. amphipods, clams (mostly just biting off siphons, leading me to suspect Tellina (Gilbert and Suchow, 1977)), and occasionally the burrowing anemone Cerianthiopsis. The two samples of cunner indicate they also had a diverse diet similar to flounders, but with more decapods being preyed upon, including lobsters.

Several types of human artifacts were also noted in the stomachs. The most common type is what was described as animal hair; this material was present in almost all species at all sampling locations, occurring in over half the stomachs in some instances. Other artifacts noted were paint chips,

paper or paper fibers, vegetable seeds, "bandaids", pieces of plastic, aluminum foil, cellophane, coal and a cigarette filter. None of these latter types were very common except perhaps the vegetable seeds.

Discussion

The food items found in the stomachs examined in this survey generally agree with the results of other diet studies of these species in the Middle Atlantic Bight (e.g. Maurer and Bowman, 1975; Sedberry and Musick, 1979; and Langton and Bowman, 1980, 1981). The prey species that have been indicated as dominant or common in the stomachs are relatively representative of species that are also dominant or common in the Christiaensen Basin, particularly the benthos which is relatively well studied (Steimle et al., in press; Caracciolo and Steimle, in press). The heavy predation of these species on the Flabelligerid polychaete, Pherusa affinis, have not been generally noted before in the previously cited literature, indicating the fish are opportunistically taking advantage of the relatively large population and biomass of this species in the upper Hudson Shelf Valley. With the exception of the artifacts found in the gut contents, the results of this survey do not indicate an apparent alteration in known feeding habits that might be attributed to dumping.

However, this normal feeding may indirectly have an inverse effect on the health or productivity of the population of these fish in this area. This adverse effect may be the result of fish consuming benthic infauna that is internally or externally contaminated with some of the toxic material, e.g. heavy metals, PCBs, that are known to occur in high concentrations in the area (Steimle et al., in press; Zdanowicz, pers. comm.). The significance of this mode of contaminant transfer relative to other potential sources of contaminants and affect on population health is still not well understood.

The presence of artifacts in the gut contents does indicate that the fish may have been feeding in the area influenced by the dumping of sewage sludge since most of the artifacts, e.g. hair, seeds, paper fibers, are known major identifiable constituents of the sludge. We can only speculate on the effect of these artifacts on the fish; however, these effects could possibly include such extreme effects as intestinal blockage, irritations and ulcers (several stomachs contain tumors).

References

Caracciolo, J. V. and F. W. Steimle. In press. An atlas of the distribution and abundances of dominant benthic invertebrates in the New York Bight apex with reviews of their life histories. NOAA Tech. Rept. NMFS SSRF.

Gilbert, W. H. and E. F. Suchow. 1977. Predation by winter flounder (Pseudopleuronectes americanus) on the siphons of the clam, Tellina agilis. The Nautilus 91(1): 16-17.

Gross, M. G., R. L. Swanson and H. M. Stanford. 1976. Man's impact on the Middle Atlantic continental shelf and the New York Bight - Symposium summary. Am. Soc. Limnol. Oceanogr., Spec. Symp. 2: 1-13.

Langton, R. W. and R. E. Bowman. 1980. Food habits of fifteen northwest Atlantic Gadiform fishes. NOAA Tech. Rept. NMFS SSRF-740. 23 p.

Langton, R. W. and R. E. Bowman. 1981. Food of eight northwest Atlantic Pleuronectiform fishes. NOAA Tech. Rept. NMFS SSRF-749. 16 p.

Maurer, R. O. and R. E. Bowman. 1975. Food habits of marine fishes of the northwest Atlantic -- data report. Northeast Fisheries Center, Woods Hole, MA, Lab. Ref. 75-3. 90 p.

Sedberry, G. R. and J. A. Musick. 1977. Chapter 9. Food habits of fishes. In: Middle Atlantic Outer Continental Shelf Environmental Studies, Vol. II-C. Chem. and Biol. Benchmark Studies. VA Inst. Mar. Sci., Gloucester Pt., VA 23062. 80 p.

Sindermann, C. J. 1976. Effects of coastal pollution on fish and fisheries - with particular reference to the Middle Atlantic Bight. Am. Soc. Limnol. Oceanogr., Spec. Symp. 2: 281-301.

Steimle, F., J. Caracciolo and J. Pearce. In press. Impacts of dumping on New York Bight apex benthos. In: Ecological Stress in the New York Bight: Science in Management.

Zdanowicz, V. Personal communication. NOAA, NMFS, Northeast Fisheries Center, Highlands, NJ 07732.

Table 1. Analysis of fish stomachs collected at station 65, approximately 7 km ENE of the sewage sludge dumpsite. Gut contents data presented as percent frequency of occurrence in non-empty stomachs.

	Predator Species				
	Silver hake	Red hake	Yellowtail flounder	Winter flounder	Comments
I Gut Contents:					
A. Food items -					
Cerianthiopsis	0	0	0	9	
Bivalvia	0	0	53	6	mostly siphons-Tellina?
Cephalopoda	2	0	0	0	squid
Polychaeta	0	13	98	68	mostly Pherusa, Nephtys
Isopoda	0	0	9	6	
Amphipoda	3	9	32	24	Unciola, Anonyx noted
Mysidea	77	50	32	3	Neomysis noted
Crangon	26	88	38	9	
Brachyura	3	13	6	3	Cancer?
Echinarachnius	0	0	11	0	
Pisces	35	0	0	0	herring, silver hake, mackerel, flounder
B. Artifacts -					
Hair(animal?)	2	6	11	24	
II Sample Parameters:					
Total no. stomachs	69	36	65	40	
No. empty	3	4	18	6	
$\sim \bar{x}$ size(cm)	15	17	25	22	
Size range(cm)	7-39	11-36	11-30	9-35	
Samples per month:					
Nov	11	10	9	9	
Feb	0	2	11	4	
May	36	12	37	10	
Jun	22	12	16	18	

Table 2. Analysis of fish stomachs collected at station 67, approximately 4 km north of the sewage sludge dumpsite. Gut contents data presented as percent frequency of occurrence in non-empty stomachs.

	Predator Species				
	Silver hake	Red Hake	Yellowtail flounder	Winter flounder	Comments
I Gut Contents:					
A. Food items -					
Hydrozoa	0	0	0	9	
Cerianthiopsis	0	0	1	11	
Bivalvia	0	3	28	20	mostly siphons-Tell[illegible]
Cephalopoda	0	3	0	0	squid
Polychaeta	6	89	100	94	mostly Pherusa, Ne[illegible]
Isopoda	0	0	1	1	
Amphipoda	0	15	19	26	Photis and Caprellids noted
Mysidea	63	39	3	0	Neomysis noted
Crangon	53	57	1	2	
Brachyura	2	26	1	2	Cancer?
Pisces	22	5	0	0	herring, mackerel, and silver hake noted
B. Artifacts -					
Hair(animal?)	4	28	42	31	
Paint chips			1		
Paper				2	
Vegetable seeds				1	
"Bandaid"		2			
Plastic		2			
II Sample Parameters:					
Total no. stomachs	69	68	68	87	
No. empty	18	7	1	2	
$\sim \bar{x}$ size(cm)	20	28	30	20	
Size range(cm)	7-37	12-44	10-34	9-39	
Samples per month:					
Nov	10	8	6	3	
Feb	17	2	9	25	
May	31	28	40	41	
Jun	11	30	13	18	

Table 3. Analysis of fish stomachs collected at station 70, near the center of the sewage sludge dumpsite. Gut contents data presented as percent frequency of occurrence in non-empty stomachs.

	Predator Species				
	Silver hake	Red hake	Yellowtail flounder	Winter flounder	Comments
I Gut Contents:					
A. Food items -					
Cerianthiopsis	0	0	11	16	
Bivalvia	0	0	27	24	mostly siphons-Tellina?
Polychaeta	14	47	77	95	mostly Pherusa noted
Cumacea	0	0	6	0	
Isopoda	0	0	11	22	Cirolana noted
Amphipoda	8	25	37	46	Gammarus and Leptocheirus noted
Mysidea	22	24	2	0	mostly Neomysis
Crangon	78	84	48	8	
Pandalid	5	0	0	0	
Brachyura	0	18	1	11	Cancer?
Pisces	27	8	0	0	silver hake noted
B. Artifacts -					
Vegetable seeds	0	0	22	0	cantalope and apple noted
Hair(animal?)	0	18	30	51	
Aluminum foil			1		
Cellophane		2	1		
Paper			13	3	
Plastic		4			
II Sample Parameters:					
Total no. stomachs	45	52	94	37	
No. empty	8	1	11	0	
∿ $\bar{x}$ size(cm)	30	25	30	17	
Size range(cm)	11-40	12-44	16-36	13-31	
Samples per month:					
Nov	10	10	10	2	
Feb	21	0	41	1	
May	11	30	41	29	
Jun	3	12	2	5	

Table 4. Analysis of fish stomachs collected at station 72, located 4 km south of the sewage sludge dumpsite. Gut content data presented as percent frequency of occurrence in non-empty stomachs.

	Predator Species					
	Silver hake	Red hake	Yellowtail flounder	Winter flounder	Cunner	Comments
I Gut Contents:						
A. Food items -						
Cerianthiopsis			4	67		
Bivalvia		8	36	33	57	mostly siphons but Spisula, Nucula, Yoldia and Arctica noted
Cephalopoda		3				squid
Polychaeta	9	35	88	67	71	mostly Pherusa, Nephtys
Cumacea		3				
Isopoda				22		
Amphipoda	5	30	44	56	86	Caprellids noted
Mysidea	82	40				
Crangon	45	63	16			
Pandalid					60	
Homarus					15	
Brachyura		15	4		29	Cancer and Ovalipes noted
Echinarachnius				32		
Pisces	18	5	4			herring noted
B. Artifacts -						
Vegetable seeds		3	4			
Hair(animal?)	5	10	12	44		
Coal			4			
Cellulose				11		
II Sample Parameters:						
Total no. stomachs	34	43	37	10	8	
No. empty	12	3	12	1	1	
$\sim \bar{x}$ size(cm)	25	20	30	25	22	
Size range(cm)	9-40	13-36	22-42	12-33	19-28	
Samples per month:						
Nov	10	8	7	0	-	
May	11	15	15	5	-	
Jun	13	20	15	5	8	

Table 5. Analysis of fish stomachs collected at station I1, located approximately 4 km southwest of sewage sludge dumpsite. Gut content data presented as percent frequency of occurrence in non-empty stomachs.

	Predator Species					
	Silver hake	Red hake	Yellowtail flounder	Winter flounder	Cunner	Comments
I Gut Contents:						
A. Food items -						
Hydrozoa	0	0	0	5	2	
Cerianthiopsis	0	0	0	23	2	
Bivalvia	0	0	11	0	2	
Polychaeta	6	32	89	91	35	mostly Pherusa
Isopoda	0	5	6	14	2	
Amphipoda	0	42	56	45	29	Caparellids note
Mysidea	75	42	0	0	0	
Crangon	19	58	17	0	29	
Pandalid	0	0	0	0	40	
Homarus	0	0	0	0	8	
Brachyura	0	11	0	0	13	Cancer, Ovalipes note
Pisces	25	5	0	0	4	
B. Artifacts -						
Hair(animal?)			56	18		
Paint chips			11			
Paper fibers				5		
Cigarette filter		5				
II Sample Parameters:						
Total no. stomachs	18	20	20	22	52	
No. empty	2	1	2	0	0	
$\sim \bar{x}$ size(cm)	20	20	30	15	20	
Size range(cm)	11-34	16-38	26-35	11-27	13-31	
Samples per month:						
Nov	8	10	10	0	-	
Feb	-	-	-	-	26	
May	10	10	10	22	26	