Gulf and Caribbean Research

Volume 2 | Issue 3

January 1968

Effects of Predation on Infaunal Invertebrates of Alligator Harbor, Florida

S.M.Z. Naqvi
Florida State University

Recommended Citation
Naqvi, S. 1968. Effects of Predation on Infaunal Invertebrates of Alligator Harbor, Florida. Gulf Research Reports 2 (3): 313-321.
Retrieved from https://aquila.usm.edu/gcr/vol2/iss3/6
DOI: https://doi.org/10.18785/grr.0203.06

Effects of Predation On Infaunal Invertebrates Of Alligator Harbor, Florida*

by

**S. M. Z. Naqvi
Department of Biological Sciences
Florida State University
Tallahassee, Florida

**—Present address: Department of Zoology, Mississippi State University, State College, Mississippi.

*—From a thesis submitted to the Department of Biological Sciences, Florida State University, Tallahassee, Florida, in partial fulfillment of the requirements for the degree of Master of Science.

ABSTRACT

A study of the effect of predation on infaunal invertebrates was carried out from July, 1965, to January, 1966, within the intertidal zone of Florida State University Marine Laboratory area at Alligator Harbor, located on the Northeast Gulf of Mexico. The animals were offered protection by wire-baskets of three different mesh sizes. Out of 1,112 infaunal invertebrates, 800 were recovered inside and 312 outside the baskets. The polychaetes, nemertines, phoronids, amphipods and bivalves made up the infauna; the polychaetes comprised the major part of it. Out of 34 species of polychaetes, six are reported from this area for the first time. The spawning period of two species of polychaetes and one gastropod was also observed, and the seasonal abundance of all polychaetes was noted. The depth preference of infaunal organisms was determined.

INTRODUCTION

Effect of predation on infaunal invertebrates has been a relatively neglected area of research. Practically no work has been done in the Gulf of Mexico, or for that matter in the United States in general. The only treatment available (Darnell 1958) deals with the predation of fishes, some shrimp and the blue crab, *Callinectes sapidus,* on infaunal but especially epifaunal invertebrates. Carikker (1951) observed the predation by *Busycon canaliculatum, B. carica, Urosalpinx cinerea, Polinices duplicata,* and *Callinectes sapidus,* on the infaunal bivalve, *Mercenaria mercenaria,* and epifaunal, *Modiolus demissus,* and *Crassostrea virginica.* A paper by Menzel and Nichy (1958) covered the aspects of distribution and feeding habits of some oyster predators in Alligator Harbor.

ACKNOWLEDGEMENTS

The author is indebted to Dr. Winston Menzel, Oceanographic Institute, Florida State University, for his constant guidance and suggestions during the entire research period. Grateful acknowledgements are made to Dr. Harry W. Wells for assistance in the identification of polychaetes, and to Drs. R. B. Brown and H. M. Stevenson, for their review of the manuscript.

MATERIALS AND METHODS

Within the laboratory area six stations were established. Wire baskets were made from quarter, half, and one-inch mesh wire, each having four sides and a top, with dimensions of 34 cm x 14 cm. They were pushed into the substratum to a depth of 8 cm and set in two rows, 12 cm apart and parallel to the shore. Station 1 was located east of the laboratory pier at mean low water level. Stations 2 and 3 were parallel and 10 meters apart, the former 2.5 meters and the latter 12.5 meters from the high water level, approximately mid-intertidal and low water levels, respectively. Stations 4 and 6 were also located on mean low water level, about 55 and 45 meters, respectively, from the laboratory pier; both approximately 12.5 meters from the high water level. Station 5 was in a man-made canal, southwest of the pier and 45 meters away from it, at the intertidal level.

Fifty-four baskets of variable mesh sizes were placed at these stations but samples from only 50 were accessible to quantitative and qualitative analysis, since four baskets at Station 5 were covered with sand. Quarter-inch mesh baskets were placed at every station, half-inch mesh baskets at Station 1, and one-inch mesh baskets at Stations 1, 2 and 3.

Samples were taken by a hand-made apparatus, based on a simple vacuum device; a plexiglass cylinder, 23 cm in length and 6 cm in diameter, with a wall thickness of 2 mm and a capacity of 320 cc. To obtain the sample, it was pushed into the substratum to a depth of 22 cm and a rubber stopper was fitted in firmly; the sampler was then pulled out slowly. For one basket removed, 4 samples were taken outside of it and 4 inside. Hence, a total of 8 samples was taken for each basket, totalling 400. Enough baskets were placed initially for all the samples, and they were not replaced when removed.

Fortnightly, a quarter-inch mesh basket was removed from each station; the half-inch mesh basket from Station 1 every sixth week and one-inch mesh baskets from Stations 1, 2 and 3, after 24 weeks. The number of infaunal animals present inside and outside the baskets from each sample were counted numerically and adjusted per 1,000 cc of the substratum.

The upper and lower halves of each sample were kept separate, in order to determine the depth preference of the animals. Each

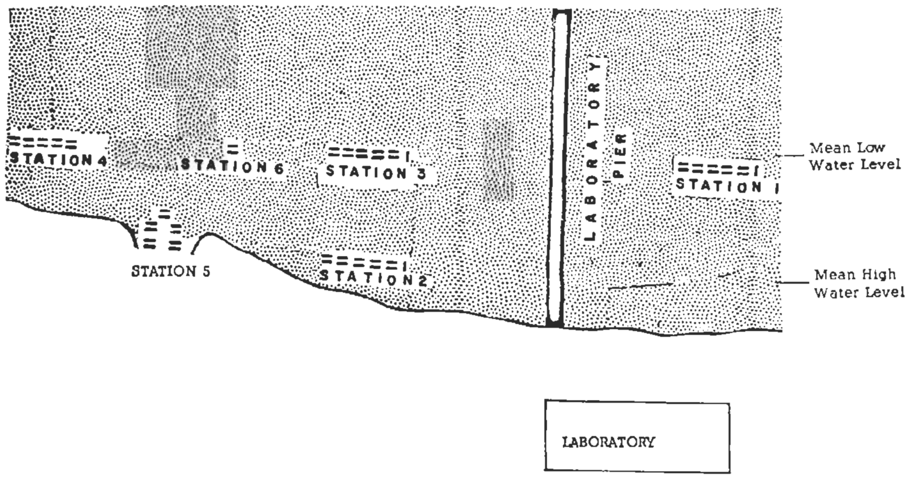

Figure 1. Arrangement of the stations at Florida State University Laboratory located at Alligator Harbor.

sample was sieved through a 2 mm-mesh wire screen to wash out the sand and mud particles. Special methods were adapted for the removal of tubicolous worms to ensure the least damage.

RESULTS AND DISCUSSION

Summary of the results is tabulated in Table 1, showing the breakdown in numbers of individuals within each infaunal species, inside and outside the baskets, occurring throughout the investigation period, as well as the depth preference and abundance of these animals.

Results obtained for the quarter-inch mesh baskets are explicit and most conclusive of all mesh sizes. At Stations 4 and 6, as many as fourfold animals were collected from inside the baskets. The former station had the largest number of infaunal invertebrates found inside and outside of any station, i.e., 408 and 111, respectively. The animal count for 1,000 cc of the substratum was 33.0 for the inside and 8.4 outside the baskets. Although a considerable increase in number of polychaetes from inside the baskets was partially a result of the juvenile stages of two polychaetes, the rest of the animals were also more numerous than outside the baskets.

The five baskets of half-inch mesh at Station 1 offered lesser protection as compared to the quarter-inch, a fact to be noted from the slight difference of inside and outside totals, i.e., 39, 31, numerically, and 6.06, 4.8 per 1,000 cc of the substratum, respectively.

One-inch mesh baskets offered no protection. The results obtained are discordant. At Station 1, the number of animals outside was greater than that inside. Very likely factors other than predation were also effective in depleting the number of infaunal organisms. A plausible reason for the low count was the retardation of free circula-

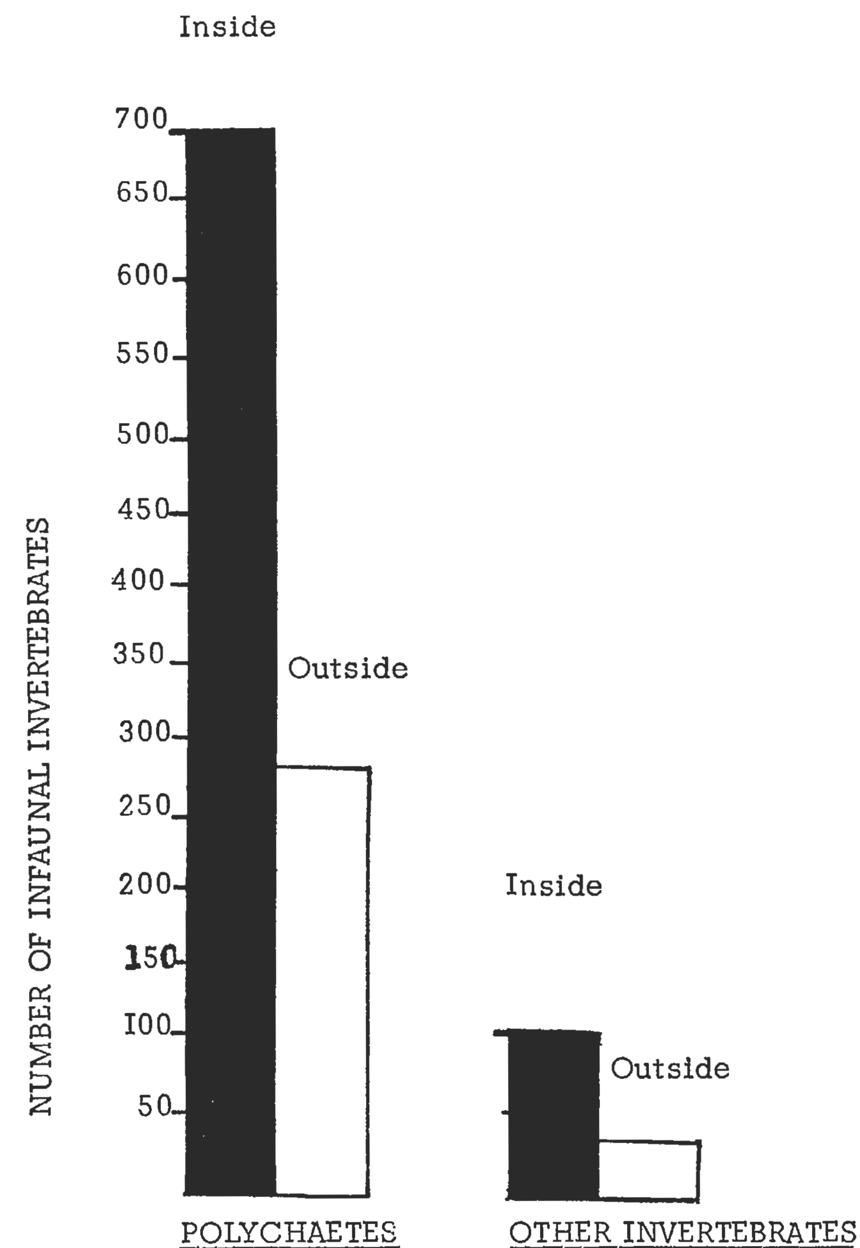

Figure 2. Distribution of polychaetes and other Infaunal Invertebrates, inside and outside the baskets.

tion of water due to a heavy infestation by colonial ascidians, *Styela plicata,* barnacles, *Cthamalus fragilis,* and bryozoans, *Bugula neritina.*

Data obtained by the individual count of animals present in upper and lower halves of the samples showed that 80% of the total were present only in upper 11 cm of the substratum, 18% occurred both in upper and lower, and only 2% exclusively from the lower-half of the samples.

Breeding periods of two species of polychaetes and a non-predatory gastropod, *Bulla striata,* were noted. The juvenile stages of the latter were found attached to the dead shells of *Terebra dislocata,* and *T. protexta,* during the month of January, 1966. Eggballs of the polychaete, *Axiothella mucosa,* were abundant from the last week of December, 1965, through January, 1966. Their juvenile stages were recovered from samples taken during this period.

Since this work is not primarily concerned with the types of predators, species which were the most effective in limiting the infaunal population can only be suggested.

The blue crab, *Callinectes sapidus,* is very abundant at Alligator Harbor and is known to devour immature bivalves and annelid worms. Menzel and Sims (1962) planted small hard clams, *Mercenaria mercenaria,* to test the feasibility of commercial clam farming. They found that only 5% to 8% mortality took place in those clams protected by fences, while the unprotected clams had 100% mortality; 90% of them were cracked by the blue crab. Another crab, *Menippe mercenaria,* does considerable damage to bivalves and is also abundant at Alligator Harbor (Menzel and Hopkins, 1955).

Among the mollusks, the lightening whelk, *Busycon contrarium,* is a most serious enemy of the older stages of bivalves (Menzel and Nichy 1958). Carikker (1951) noticed that *Urosalpinx cinerea* drilled the shells of a bivalve, *Modiolus demissus,* and caused a high mortality. Drilled shells of *M. demissus* were often picked up in the samples; however, the extent of damage caused by the drills is not known.

Several fishes are known to feed upon bottom-dwelling crustaceans and infaunal mollusks. Only those recorded from Alligator Harbor and vicinity shall be mentioned. The sea-catfish, *Galeichthys felis,* has been noted for its selective feeding habits on worms and small crustaceans. Gunter (1945) examined 85 stomachs of this catfish which contained mud shrimp, *Callianassa jamaicense louisianensis,* which made up about 90% food of the larger catfish. Coincidently, it was noted that the shrimp, *Palaemonetes intermedius, Periclimenes longicaudatus,* and *Alpheus normanni,* were often present in very large numbers inside the baskets at every station. Protection from predation, in addition to water currents, seems to be important for these animals. Reid (1954) reported that some fish prefer to feed on amphipods and isopods, which make up the bulk of the interstitial fauna. The number of amphipods in the inside samples was always greater than outside.

Table 1. Summary of the results for infaunal invertebrates collected throughout the investigation period.

NAME OF ANIMAL — GROUP	INSIDE SAMPLES			OUTSIDE SAMPLES			ABUNDANCE	DEPTH PREFERENCE	
Polychaeta	Upper	Lower	T	Upper	Lower	T		Below 12 cm	Above 12 cm
Arabella iricolor	0	0	0	1	1	2	R		X
Armandia agilis	0	0	0	1	0	1	R		X
Axiothella mucosa	61	4	65	8	2	10	A		X
Branchioasychis americana	2	1	3	2	0	2	R	—	—
Cirratulus grandis	0	1	1	0	0	0	R	—	—
Cirriformia filigera	25	20	45	23	3	26	C	X	X
Cistenides gouldii	5	1	6	0	0	0	R		X
Diopatrea cuprea	2	1	3	1	0	1	R		X
Dodecaceria concharum	0	0	0	0	1	1	R	—	—
Dorvillea sociabilis	1	0	1	0	0	0	R	—	—
Eulalia myriacyclum	1	0	1	0	0	0	R	—	—
Glycera americana	9	1	10	4	3	7	C		X
Glycera dibranchiata	4	2	6	7	0	7	C	—	X
Haploscoloplos fragilis	28	20	48	6	0	6	C		X
Heteromastus filiformis	8	0	8	0	1	1	R		X
Loimia viridis	1	0	1	0	0	0	R	—	—
Magelona californica	16	40	56	30	12	42	A	X	X
Megalomma bioculatum	2	0	2	0	0	0	R		X
Melinna maculata	0	1	1	0	0	0	R	—	—
Neanthes succinea	1	0	1	0	0	0	R		X
Nephtys bucera	3	5	8	3	1	4	C	X	X
Nereiphylla fragilis	0	0	0	1	0	1	R		X
Nereis pelagica occidentalis	0	0	0	2	0	2	R		X
Notomastus latericeus	9	11	20	3	2	5	C	X	X
Onuphis eremita	233	43	276	41	34	75	A		X
Onuphis eremita oculata	8	6	14	15	6	21	C		X
Owenia fusiformis	2	0	2	0	0	0	R		X
Polydora websteri	2	0	2	0	0	0	R		X
Prionospio sp.	69	21	90	27	13	40	A	X	X
Pista palmata	1	0	1	0	0	0	R	—	—
Poecilochaetous johnsoni	0	1	1	0	3	3	R	—	—
Scoloplos rubra	12	17	29	13	6	19	A	X	X
Stylarioides inflata	1	0	1	0	0	0	R	—	—
Synsyllis longigularis	1	1	2	0	0	0	R		X
Brachiodontes exutus Bivalvia	4	4	8	1	0	1	R	X	X
Brachiodontes recurvus Bivalvia	2	0	2	2	0	2	R	—	—
Dosinia elegans Bivalvia	5	0	5	0	0	0	C		X
Nuculana acuta Bivalvia	4	0	4	2	0	2	R	—	—
Parastarte triquetra Bivalvia	2	6	8	0	0	0	C	—	X
Tagelus divisus Bivalvia	1	1	2	0	0	0	R	X	
Tellina versicolor Bivalvia	2	0	2	0	0	0	R		X
Mitrella lunata Gastropoda	12	0	12	2	0	2	C		X
Ampelisca macrocephala Amphipoda — Not counted in the totals									
Melita fresneli Amphipoda — Not Counted in the totals									
Phoronis architecta Phoronida	9	27	36	13	12	25	A	X	X
Cerebratulus lacteus Nemertea	0	7	7	0	0	0	R	X	X
Lineus socialis Nemertea	4	6	10	2	2	4	C	X	X
Tubulanus sp. Nemertea — Not Counted in the totals									
TOTAL NUMBER OF ANIMALS			800			312			
NUMBER OF ANIMALS PER 1000 cc.			12.5			4.6			

OBSERVATIONS

The seasonal abundance of polychaetes was observed during the entire investigation period. On the basis of individual count of each species, they fall into two main categories. The first were common during December and January, and the second occurred in equal abundance throughout. The majority of species followed the latter pattern. Those most abundant during December and January were: *Axiothella mucosa, Prionospio* sp., *Magelona californica, Cirriformia filigera,* and *Haploscolopos fragilis.*

The following species of polychaetes are reported from this area for the first time:

Cirriformia filigera delle Chiaje is one of the most common species found here (Table 1). Hartman (1951) recorded this species from Lemon Bay, Sarasota County, Florida, and Englewood, Florida. It is also known from both sides of the North Atlantic Ocean and south to Brazil. Only few specimens of a cirratulid, *Cirratulus grandis* Verrill, were found at this region. However, it is very common along the entire coast of New England. *Dorvillea sociabilis* Webster is also a rare species, found with an ascidian, probably as a commensal. Two specimens of *Megalomma bioculatum* Ehlers were collected in the samples. This species was originally recorded by Ehlers (1887) off Florida. *Poecilochaetus johnsoni* Claparede is uncommon. Other species of this genus have been reported from the Atlantic coast of Ireland and Norway. The last species, *Stylarioides inflata* Hartman, is more widely distributed on the Pacific side of North America, from Oregon to Lower California. It has also been recorded from Lemon Bay, Sarasota County, Florida (Hartman 1951).

LITERATURE CITED

Carikker, M. R. 1951. Observations on the penetration of tightly closed bivalves by *Busycon,* and other predators. Ecology 32 (1): 61-104.

Darnell, R. M. 1958. Food habits of fishes and larger invertebrates of Lake Pontchartrain, Louisiana, an estuarine community. Pub. Inst. Mar. Sci. Texas. 5 :353-416.

Ehlers, E. 1887. Reports in the results of dredging, under the direction of L. F. Pourtales, during the years 1868-1870, and of Alexander Agassiz, in the Gulf of Mexico (1877-1878), and in the Caribbean Sea (1878-1879), in the U. S. Coast Survey Steamer *Blake.* Reports on the annelids. Mem. Mus. Comp. Zool. Harvard. 15 : 1-333.

Gunter, G. 1945. Studies on marine fishes of Texas. Pub. Inst. Mar. Sci. Texas. 1 (1) :1-190.

Hartman, Olga. 1951. The littoral marine annelids of the Gulf of Mexico. Pub. Inst. Mar. Sci. Texas. 2 (1) :7-124.

Menzel, R. W., and S. H. Hopkins. 1955. Crab predators of oysters in Louisiana. Proc. Nat. Shellfish. Assoc. 46 :177-184.

Menzel, R. W., and F. W. Nichy. 1958. Studies of the distribution and feeding habits of some oyster predators in Alligator Harbor, Florida. Bull. Mar. Sci. Gulf and Carib. 8 (2) :315-329.

Menzel, R. W., and H. W. Sims. 1962. Experimental farming of hard clams, *Mercenaria mercenaria,* in Florida. Proc. Nat. Shellfish. Assoc. 53 :103-109.

Reid, G. K., Jr. 1954. An ecological study of the Gulf of Mexico fishes in the vicinity of Cedar Key, Florida. Bull. Mar. Sci. Gulf and Carib. 4 (1) :1-94.