1987

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Robert J. Diaz
Virginia Institute of Marine Science

Mark Luckenbach
Virginia Institute of Marine Science

Sandra Thornton
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Morris H. Roberts Jr.
Virginia Institute of Marine Science

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Gloucester, VA 23062

Robert J. Livingston
Christopher C. Koenig
Gary L. Ray
Loretta E. Wolfe

Department of Biological Sciences
Florida State University
Tallahassee, FL 32306-2043

CR 812053

Project Officer

Dr. Thomas W. Duke
Office of the Director
Environmental Research Laboratory
Gulf Breeze, FL 32561

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ABSRTACT

The aim of this project was to evaluate the validity of using multi-species laboratory systems to assess the response of eatuarine benthic communities to an introduced stress. Over a 5-year period experiments in Apalachicola Bay, Florida, and the York River, Virginia, sought to (1) develop criteria for microcosm tests for evaluating the capacity of microcosms to model natural communities in the presence and absence of a pollution-induced stress, and (2) assess the validity of extrapolating test results from one location to another. Procedures for constructing, maintaining and sampling microcosms were tested and refined over the study period. A large number of laboratory and field tests were conducted synoptically over this period, including experiments in which microcosms and field sites were dosed with toxicants (mixed hydrocarbons in some and pentachlorophenol in others). We have investigated various methodologies for analysing and interpreting data derived from microcosm tests.

The most promising results were achieved with medium-sized microcosms (approximately 0.1 m^2) in relatively short-term experiments (5 weeks). Individual species response patterns in the microcosms were highly variable and seldom showed good agreement with patterns in the field. Species richness in the microcosms and field showed good temporal agreement and provided a conservative indicator of community response to toxic stress. An ecologically-based guild approach to grouping species proved to be a powerful and reliable method of extrapolating from microcosm test results to responses of field communities. Our findings suggest that results from estuarine benthic-derived microcosm toxicity tests may be used to predict some aspects of community response to toxic stress. Further, the results indicate some generality in these predictions which should permit cautious extrapolation to other field sites.

This report was submitted in fulfillment of contract number CR 812053 by the Virginia Institute of Marine Science and Florida State University under the sponsorship of the U.S. Environmental Protection Agency. This report covers a period from October 1981 to October 1985 and work was completed as of 1 March 1987.

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SECTION 1

INTRODUCTION

A priority of environmental toxicology is to predict the ecological effects of a toxic substance by extrapolating from controlled laboratory experiments. Until recently such experiments have generally been restricted to single-species acute tests. Much of the rationale for this approach has been based upon the assumption that acute tests with the most sensitive species provide conservative estimates of environmental impact, an assumption which has recently been criticized (Kimball and Levin, 1985; Cairns, 1983; 1986a). Despite the fact that arguments can still be made for the utility of single-species testing (Wies, 1985), there is growing recognition of the need for multi-species toxicity testing (Cairns, 1985).

As the use of multi-species laboratory test systems (microcosms) increases, a requisite part of the development must be field validation. We accept here the definition of validation offered by Cairns (1986b) as the testing of "the ability to predict the relationship between the response of the artificial laboratory system and the natural system." There are several components to any such evaluation. The first involves establishig criteria for conducting microcosm tests which are specific enough to reduce undesirable laboratory artifacts and general enough to be of utility in a range of habitats. Second, it is necessary to evaluate the capability of the laboratory system to model temporal patterns in the natural system in the absence of toxic stress. Only after this does it become appropriate to compare the response of the microcosm and field communities to a pollution-induced stress. Finally, if microcosm tests are to have applicability outside of the site-specific system in which they are conducted, it is necessary to evaluate the validity of extrapolating between systems.

Towards the end of validating an estuarine benthic microcosm test system, we initiated a 5-year program in two estuaries. Using macroinvertebrate and microbial communities from unvegetated, soft-sediment habitats in Apalachicola Bay, Florida and the York River tributary of the Chesapeake Bay, Virginia, we conducted a series of combined laboratory/field experiments to address the questions posed above. The details of the individual experiments have been reported earlier (Diaz et al., 1984, 1986; Livingston et al., 1985a, 1985b, 1985c, 1985d, 1986) and we will not dwell on those details here but rather summarize the overall project, its findings and draw conclusions regarding the use of benthic microcosms for predicting environmental consequences of toxic stress.

SECTION 2

CONCLUSIONS

Variability in natural estuarine systems is high, necessitating large numbers of experimental replicates and samples to observe even major responses. Careful attention must be paid to physical/chemical features of the microcosms throughout the tests to insure that conditions remain as close to those in the natural field sites as possible. Monitoring of toxicant levels and distribution within the microcosms throughout the experiment is necessary to evaluate dissipation and breakdown of the toxicant. Concurrent with laboratory testing, samples from the field sites are required to assess natural fluctuations in the benthic populations. Temporal variation in recruitment adds year to year and site to site variation in community responses in microcosm tests. To overcome this problem it is mandatory that microcosm tests be properly timed to correspond with known stages in recruitment cycles. Furthermore it is necessary that only community components which show good agreement between laboratory systems and field sites be used to evaluate response to toxins. In this respect species richness of the community and the numerical abundances of certain guilds (listed in Table 6) appear to be the best components to use.

We advocate an approach of categorizing species into "ecological types" or guilds which has several advantages. This categorization gives a managable number groupings--enough to provide some detail but few enough to permit reasonable detection of patterns. The emphasis on species groupings reduces the dependence of the predictions upon single species which may be highly variable in their occurrence from year to year. Those guilds which are observed to behave aberrantly in the laboratory may be excluded from the analyses *a priori*. And, the use of "ecological types" facilitates comparisons among sites which have different species compositions. However, this approach requires good ecological characterization of the species comprising the benthic community used in the testing. These ecological data are often difficult to obtain.

We conclude that laboratory microcosms can provide a valuable tool for assessing natural benthic community responses to toxic stress, provided that the caveats and conditions stated in this report are heeded.

SECTION 3

OBJECTIVES

The primary objectives of this project were:

(1) the development of criteria for conducting microcosm tests and interpreting the results;

(2) the evaluation of the capacity of a benthic microcosm system to simulate natural field communities in the absence of a toxicant;

(3) the comparison of response patterns of laboratory and field communities to a pollution-induced stress; and

(4) the determination of the validity of extrapolating from microcosm tests conducted in one locale to natural communities in another.

SECTION 4

STUDY SITES

The study sites in the Apalachicola Bay system (East Bay and St. George Sound) were located in polyhaline and oligohaline areas, and those in the York River in the meso-polyhaline portion of the estuary (see Fig. 1). All sites were shallow (1-2 m), unvegetated areas. Sediments in the oligohaline site were silty sand, and sediments in the polyhaline and meso-polyhaline sites were predominately fine sands. Each of the study sites are considered representative of extensive portions of temperate estuaries. For both the Virginia and Florida experiments, the laboratory microcosms were located near the field study sites. More details of the study sites are given in earlier reports (Diaz et al., 1984, 1986; Livingston et al., 1985, 1986).

SECTION 5

ECOLOGICAL CHARACTERIZATRIONS

An essential part of this program was an understanding of the ecological backdrop against which the experiments were conducted. Weekly monitoring programs for infaunal macroinvertebrates have been ongoing at the Virginia site since 1979 (Diaz, 1984) and at the Florida site since 1981. Ten replicate samples per week were collected with 5.0 cm and 7.5 cm diameter hand-held corers in the York River and Apalachicola Bay sites, respectively. These samples were processed on a 250 um and a 500 um sieve series and all macrobenthic invertebrates identified to the lowest possible taxon and enumerated. Figure 2 shows weekly mean abundances of total macrofauna from the Apalachicola Bay and York River sites from October 1981 through April 1986 and indicates the dates of the laboratory/field experiments. An important point of comparison between these sites is the timing of recruitment events. In Florida peak recruitment generally occurred in the fall and the greatest abundances and species richness were observed in the winter. In Virginia the pattern was temporally reversed with recruitment peaks occurring in the spring. The relationship between the timing of the experiments and seasonal patterns of recruitment is crucial to the interpretation of variability in the data.

In addition to these background data on faunal abundances we have found that an appreciation of trophic structures and physical disturbance processes at each site is necessary for interpreting our experimental results. Predation by bottom-feeding fishes and decapods appears to be an important process shaping benthic communities at each site (Virnstein, 1977; Dugan and Livingston, 1982). Physical disturbance, both periodic (waves) and aperiodic (storms) impact on these communities. During the course of this project each site was impacted by at least one major storm event which hit during the laboratory/field experiments. The timing of microcosm tests in relation to predator utilization of the habitats and disturbance events in these sites was a crucial component of proper experimental design.

Another essential feature of our ecological characterization of the field sites was an understanding of species-specific functional roles in the community. Information on trophic, mobility and reporductive modes was a central part of our analysis effort. This is discussed in greater detail in the section on guild assignments. We emphasize at this point, however, that even with the extensive data which have been

collected from each of these sites, much of this type of detailed, species-specific information is lacking.

SECTION 6

METHODS

EXPERIMENTAL PROTOCOLS

The focus of experiments conducted during 1982 and 1983 was to establish criteria pertaining to microcosm construction, microcosm maintenance, test duration, sampling procedures and response variables. In addition treatments were employed to assess the impact of predator exclusion and inclusion in the field sites.

Microcosm communities were constructed of a series of cores collected with diver-operated box cores (10 x 20 cm; 10 cm deep). Cores were arranged contiguously on seawater tables in the same spatial arrangement as in the field. A wide range of microcosm sizes have been tested. During 1982 and 1983 experiments at both sites were conducted in microcosms ranging from 0.8 to 1.0 m^2 in size. Additional experiments in Florida in 1983 compared three microcosm sizes: 0.67 m^2 , 0.067 m^2 , and 0.0084 m^2 . The spring 1985 experiment in Virginia compared 1.00 m^2 and 0.11 m^2 microcosms. Our objectives here were twofold: (1) to assess whether microcosm size affected the ability of laboratory community dynamics to track those of the field, and (2) to determine whether it was preferable to use larger microcosms which could be sampled repeatedly or smaller ones which must be destructively sampled. The details of results from these experiments are given in earlier reports and are summarized as follows. Small microcosms (0.0084 m^2) contained fewer species than the field sites and showed considerable divergence in community parameters from the field. Medium (0.08 - 0.11 m^2) and large (0.67 - 1.00 m^2) microcosms contained similar numbers of species and generally showed the same degree of concordance between laboratory and field populations. Replicate large-sized microcosms were sampled repeatedly throughout the duration of experiments, while individual replicates of medium-sized microcosms were sampled at only one time period and discarded. The disturbance associated with repeated sampling of large microcosms was judged to have an impact on community and population dynamics, so we settled on the medium-sized microcosms (approximately 0.1 m^2). With a microcosm of this size a large number of replicates must be established at the initiation of an

experiment and a portion destructively sampled at each sampling time.

The sizes of the core samplers employed at each site (5 cm Virginia; 7.5 cm Florida) were based upon our experience with the field monitoring programs and were selected to provide adequate sampling of most resident macrofauna. Throughout the experiments the same size coring devices were used to collect laboratory and field samples.

Test durations in 1982 and 1983 ranged from 5 to 9 weeks during which time laboratory and field treatments were sampled synoptically on a weekly or biweekly basis. Samples were sieved on 250 um and 500 um mesh screens, and macroinvertebrates were identified to the lowest possible taxon and enumerated. A variety of community and population statistics were considered (see below) and most showed divergence between the laboratory and field 5 weeks after initiation. On this basis we adopted a 5-week duration for subsequent dosing experiments.

Containers with azoic sediments were placed in the seawater table at both sites during the 1985 experiments. These defaunated treatments were sampled and processed similarly to the microcosms and were used to monitor recruitment into the laboratory system through the seawater intakes.

Throughout the experiments physical and chemical measurements were made in the laboratory and field. Temperature, salinity, dissolved oxygen, sediment grain size and sediment organic content were monitored regularly. Periodic measurements of pH, sediment temperature and Eh were also made.

Field treatment locations were located haphazardly within pre-selected sites and marked with metal frame structures (2 m x 2 m bottom area x 3 m high). These frames served as a means of relocating sample sites and of holding a sample platform. The sample platform had a gridded array of sample ports which permitted individual core samples to be taken in pre-determined, random locations within the treatments. Field treatments in the various preliminary tests included (1) uncaged sites demarcated only by the open metal frames, (2) caged sites in which the frames were wrapped with screening to exclude predators, and (3) caged sites with predators included. In addition field treatments were dosed with toxin-laden sediments (see below). All field treatments were established in triplicate and each treatment replicate was sampled with 10-15 randomly located replicate cores.

A generalized protocol of these methods is given in Table 1 and a schedule of experiments is presented in Table 2. For greater details concerning the protocols for each test earlier reports (cited above) should be consulted.

DOSING PROCEDURES

Experiments in which both laboratory and field sites were dosed with toxicant-laden sediments were conducted in the fall of 1983 and the spring and fall of 1985. In 1983 "naturally" hydrocarbon contaminated sediments from the Elizabeth River, VA,

were used to dose both laboratory and field treatments in the York River and Apalachicola Bay. In both the spring and fall of 1985 uncontaminated sediments were coated with pentachlorophenol (PCP) to provide controlled-dose treatments for laboratory and field sites. Our goal here was to evaluate the response of the laboratory system to the stress relative to the response of the field system (Objective 3).

During the spring 1985 experiment we tested dosing procedures in which PCP contaminated sediments were added in approximately 1 cm and 0.1 cm thick layers. No overt effects of adding uncontaminated sediments were noted and we found that the greater thickness of sediment provided more reliable dosing of treatments, thus we adopted this procedure in the fall 1985 experiments. Laboratory dosing in each experiment was conducted by spreading contaminated sediments uniformily over the microcosm surface. Field dosing procedures involved two approaches. In the fall 1983 and spring 1985 experiments in both Apalachicola Bay and York River sites dosing was carried out by wrapping the metal frames with plastic to reduce water flow, adding the sediments to the enclosed water column, and removing the plastic after sediments had settled to the bottom. This procedure was successful in Apalachicola Bay, but not in the York River where the plastic wrapping was insufficient to stop the stronger currents (see Results and Fig. 10). During the fall 1985 experiment the same procedure was used in Apalachicola Bay and a dosing box was used in the York River to apply toxin-laden sediments. The dosing box was a large wooden box to which sediments were added through a door on the top, the box was then submerged and a false bottom removed to permit the sediments to fall to the sediment-water interface. These methodologies were successful at achieving dose equivalency between the field and laboratory treatments (Fig. 11).

TOXICANT LEVELS

The hydrocarbon contaminated sediments from the Elizabeth River used in the fall 1983 experiments were applied at nominal concentrations; the wide variety of pollutants in these sediments prevented the actual levels from being monitored. Lu (1982) reported a detailed hydrocarbon analysis of the sediment at the station from which contaminated sediments were obtained. In the PCP-dosed experiments (spring and fall 1985) a high concentration (nominally 10 ppm) and a low concentration (nominally 1 ppm) were used. Actual concentrations of PCP in the laboratory and field treatments were monitored throughout the test duration. These analyses, which were carried out using methylene chloride extraction and standard gas-liquid chromatography methods with flame ionization and electron capture detection, proved to be costly and time consuming but necessary. These data were invaluable both for establishing when dose equivalency between the laboratory and field was achieved and for tracking the time course of the toxicant levels in each treatment.

GUILD ASSIGNMENTS

In the latter portion of this project we became aware of the need for grouping species for the purpose of analysis. Community-level statistics, though they provided some useful information, obscured much of the details of response within the community, and individual species population fluctuations were too numerous and variable to permit clear interpretation of community response. Grouping species according to higher taxonomic levels (e.g. polychaete families, oligochaeta, bivalvia) was attempted as a solution, but even closely related species can play different functional roles within a community, and the responses of species within these groups were often heterogenous. Thus we classified each species into functional groups based upon the manner in which they used resources, how they lived and moved in the sediments, and their mode of reproduction. The categories to which species were assigned are:

- Trophic Mode
  - scavenger
  - deposit-feeder
  - suspension feeder
  - interface feeder
  - predator
  - scraper
  - unknown
- Trophic Level
  - carnivore (>90% animal matter)
  - herbivore (>90% plant matter)
  - detritivore/omnivore
  - unknown
- Mobility Mode
  - burrower
    - mobile
    - sessile
  - tube-builder
    - mobile
    - sessile
  - epifaunal
    - mobile
    - sessile
- Reproductive Mode
  - planktonic larvae
  - demersal egg cases
  - brooders
  - asexual
  - unknown

Assignments were made using published information (esp., Fauchald and Jumars, 1979) and personal observations. In making these assignments we took a limited view of the environment, choosing

as our point of reference the spatial scales relevant to our treatments. Therefore species which move on scales of cm's to m's were classified as mobile. The intent of the reproductive mode category was to separate those species which have the capability of reproducing and recruiting from within the microcosms from those which do not. Therefore we pooled categories to create a composite classification:

Dispersal Mode
- limited dispersal
- wide dispersal
- variable dispersal
- unknown

Here again the spatial scale is defined to reflect our interest in processes relevant to the microcosms. For instance, maldanid polychaetes (represented primarily by Axiothella mucosa at the Apalichcola Bay site and by Clymenella torquata at the York River site) produce demersal egg cases which generally remain attached to the tops of the adult tubes until hatching. Juvenile maldanid polychaetes then crawl away and build tubes of their own. This type of reproduction leads to limited dispersal in the context of the microcosm since it permits these organisms to recruit from within the microcosm. Another example of a limited disperser in our categorization is Paranais litoralis, an asexually reproducing oligochaete. The limited dispersal category is not intended to imply that these species in nature do not exhibit wide ranging dispersal, but merely that they clearly have the capability of recruiting from within the microcosm. By contrast, other species have obligate planktonic stages which preclude successful development within the microcosms. These species are categorized as wide dispersers to indicate their inability to recruit from within the laboratory seawater tables. A few species are variable in their reproductive modes both between and within sites. The spionid polychaete Streblospio benedicti, for instance, exhibits variable reproductive strategies ranging from fully planktonic development to brooding (Levin, 1984). In the York River estuary S. benedicti appears to be entirely planktonic in its development and is therefore classified as a wide disperser in Virginia, while in Apalachicola Bay both types of development have been observed for S. benedicti and it is classified as a variable disperser in those experiments. Table 3 gives the functional group assignments for all species collected from the Florida and Virginia study sites. We recognize the tentative nature of some of these assignments and stress the need for more ecological data to refine this approach.

Unique combiniations of these functional groupings were used to define guilds, e.g deposit-feeding, detritivore/omnivore, mobile burrower, with wide dispersal. This approach yielded a total of 59 guilds in the two study areas, of which only 17 were composed of single species. The species compositions of dominant guilds in each site are given in Table 4. At each location the five most abundant guilds generally comprised >80% (and never

less than 40%) of the total number of individuals collected. Details of this for each test are given in Table 5.

This approach of categorizing species into guilds served two purposes. First, it permitted us to identify those guilds of organisms for which laboratory microcosm populations do not serve as good analogs of natural populations in the absence of any toxicant. These types of organisms can be excluded *a priori* from analyses to assess toxic impact. The second advantage to this approach is that the identification of types of organisms which act as ecological units facilitates comparisons between microcosms and field sites from different locations. For instance, while the species composition varies between the Virginia and Florida sites, functionally similar ecological groups are found in both sites and provide a basis for comparison.

DATA ANALYSIS

Throughout the course of this project we have made use of large numbers of replicates and the robustness of Analysis of Variance (ANOVA) to test for specific treatment effects in the highly variable data sets. This approach has generally been a powerful one and several significant treatment effects have been identified. For instance, ANOVA can test for significant differences in total abundance between laboratory field treatments. However, the central question we have posed is not so straightforwardly tested. In particular we ask, can microcosm test results be used to predict the response of natural communities? Cairns (1986b) pointed out that the absolute response in a microcosm test need not be identical to that in the natural system. It is simply necessary that we know the *relationship* between the response in the laboratory and the field. In this regard the temporal patterns of community, guild or species response in the laboratory and field may be very similar but of different magnitude and still be of utility for predictive purposes. Statistical procedures which test for differences between treatment means (such as ANOVA), but yield nothing about the similarity of pattern, would miss this similarity. Proper testing for similarity in such patterns would require a non-parametric pattern analysis capable of dealing with widely vairant data; we are not aware of such a test at present. Therefore, to answer this final question we are forced to rely upon subjective evaluations. The large number of experiments together with the persistence of many of the patterns add strength to these assessments.

SECTION 7

RESULTS AND DISCUSSION

The data generated by this project are voluminous, and any value gained by their complete inclusion here would be offset by the drawbacks of such a massive document. Therefore complete data files from the project have been archived in computer files at FSU and VIMS and are available on request. Below we present a summary of our findings emphasizing particularly those aspects which address the primary objectives outlined above.

PHYSICAL/CHEMICAL DATA

Care was taken to maintain physical and chemical characteristics of the microcosms as close to those of the field as possible, yet some differences still arose. Eh profiles and visual inspection of sediment color indicated that depth of the oxygenated layer within the microcosm sediments decreased with time. This effect was generally most pronounced after week 5 in any given test and led to significant changes in the depth distribution of organisms. Similar changes were not apparent in the field over similar time courses.

Surface sediment composition in the microcosms also showed differences from the field sites. Fine sediments (silts and clays) and organic content increased in the microcosms with time. These increases were the result of deposition of fine particles brought into the laboratory in the seawater system and were not observed in the field. In addition rapid changes in sediment composition in the field were observed in association with storm events which had no effect upon the microcosm sediment characteristics.

Water and sediment temperatures in the microcosms were slightly more variable than those in the field sites, but this degree of variation apparently was not sufficient to pose problems. Salinities in the laboratory and field treatments were similar throughout all experiments.

We refer the reader to earlier reports for more information regarding physio-chemical factors in each of the laboratory/field experiments. Here we emphasize our finding that careful attention to the parameters listed in Table 1(I.A) is an important component of successfully conducting a microcosm experiment. Divergence between the laboratory and field in one or more of these parameters will lead to divergence of the communities.

SYNOPSIS OF TEST RESULTS

Spring 1982 Experiments

Florida--

The field predator inclusion treatment followed the field controls in terms of the response of infaunal numerical abundance. The field exclusion treatment was characterized by high numbers (primarily Mediomastus ambiseta). An increase in total macrofaunal numbers was also observed in the laboratory, but not in the field controls (Fig. 3); these results were interpreted as the release of specific opportunistic polychaetes from predation pressure. Mediomastus was one of the few populations that was still recruiting at the time of the experiment. Species richness was generally unaffected by treatment (Fig. 3). The proportional abundance of functional feeding groups was more conservative, showing no change in the field controls and inclusion treatment and only slight changes in the field exclusion and laboratory treatments.

Virginia--

Species specific responses to treatments were variable. For six of the 11 dominant species there were significant differences in abundance among treatments, but only five species showed significant variation with time. Paranais littoralis and newly set bivalves were the only two forms to show effects of both treatment and time. Streblospio benedicti, Eteone heteropoda, and immature Capitellidae all increased with time. Polydora ligni decreased and newly set bivalves increased and then decreased with time. Variance to mean ratios for all eleven numerically dominant species exceeded one. Total macrofaunal abundances in the laboratory declined sharply between weeks 3 and 4, and by week 5 showed considerable divergence from the field controls (Fig. 3). Species richness in the laboratory was similar to the field treatments throughout most of the experiment, but began to diverge slightly by the fifth week (Fig. 3).

Fall 1982 Experiment

Florida--

These experiments were conducted in the oligohaline site. Abundance increased in the laboratory by week 4 (Fig. 4), probably attributable to a release from predation. Trends in total macrofauna abundance among the various field treatments were similar, as were species richness values across all treatments. When expressed as feeding modes and trophic groups, the various field treatments showed comparable patterns through time with a predominance of below-surface, deposit-feeding detritovores/omnivores. The laboratory treatments showed gradual change to a predominance of browsing omnivores. By the fifth week of the experiment laboratory treatments showed substantial divergence from the field treatment.

Virginia--

Total macrofaunal abundance began to diverge during the first week of the test (Fig. 4). Low, but significant, levels of recruitment into the field sites by Streblospio benedicti and Tubificoides spp. contributed to this pattern. Recruitment into the microcosm was essentially absent. These recruitment pulses in the field however were dampened (presumably by predation) and abundance levels in the laboratory and field appeared to be converging at termination of the experiment (week 6). Species richness values were similar in the microcosm and field throughout the experiment (Fig. 4).

Spring 1983 Experiment

Florida--

Results of the spring 1983 experiment (oligohaline, station 3) indicate similar results in the various field treatments with reduced numerical abundance in the laboratory microcosms (Fig. 5). Species richness trends were similar in all treatments. In this experiment, feeding modes and trophic group proportions were similar among all treatments in the field and laboratory. Both mean faunal abundance and species richness were representative of field conditions.

Virginia--

Macrofaunal recruitment occurred at the York River site during this test, but only two species showed dramatic increases: Streblospio benedicti and Eteone heteropoda. Both species reached their greatest abundances in the field cage treatments and remained low in abundances in the microcosms where their recruitment was restricted. Again, we interpret the lack of major population increases in the field control site as resulting from post-recruitment mortality (probably from predation). Both total macrofauna abundance and species richness reflect recruitment events which occurred in the field but not in the microcosms (Fig. 5).

Fall 1983 Experiment

Florida--

Results of this experiment (polyhaline, station ML) indicate similar macrofaunal numbers in the field treatments whereas numbers tended to be reduced in the laboratory treatments. A comparison of macrofaunal abundance in the field and laboratory (Fig. 6) reveals that recruitment occurred into the field sites but not into the microcosm. Once again, temporal patterns of species richness were similar in the various field and laboratory treatments, although numbers of species were lower in the laboratory microcosms. Functional feeding modes and trophic organization of the invertebrate assemblages were similar in all treatments; temporal variability of these indices was low with a predominance of below-surface deposit feeders as detrital-feeding omnivores. Toxic sediments did not appear to affect the field or

laboratory numerical abundances or species richness. Once again, functional feeding groups and the trophic organization appeared similar in all treatments (laboratory and field). The toxic sediments had no overt effect on the laboratory or field microcosms when viewed as feeding or trophic entities.

Virginia--

The microcosm treatments consistently had lower abundances and species richness than their field counterparts (Fig. 6). Increases in total abundance and species richness in the field by week 3 are indicative of recruitment events which did not occur in the laboratory. Individual species response in the control treatments (laboratory and field) were highly variable as some species increased and others declined over the period. The addition of non-toxic York River sediments to laboratory and field treatments did not substantially change either faunal abundance or species richness. Toxic Elizabeth River sediments caused declines in laboratory and field treatments, but the magnitude of the response was greater in the laboratory. The dose treatments altered total abundances, species richness and guild makeup.

Spring 1984 Experiments

Virginia--

Total macrofaunal abundances in this test were similar in the laboratory and field treatments until week 4 of the study when recruitment peaks occurred in the field. Recruitment did not occur in the microcosms at this time and result was a nearly 3-fold difference between abundances in the field and microcosm controls. Decline in numbers of macrofauna after the field recruitment peak was rapid and within one week abundances within the laboratory and field controls were again similar. Species richness was again a fairly conservative parameter and was generally similar between the laboratory and field treatments.

Spring 1985 Experiments

Florida--

Figures 10a and 10b show the concentrations of PCP in laboratory and field treatments during the time course of this experiment. Good dose-equivalency was achieved in the Florida experiments between laboratory and field concentrations. Dose-specific effects on total macrofauna and species richness are shown in Figures 12 and 13, respectively. The impact on field assemblages was less severe than on microcosm assemblages, with only slightly lowered abundances and small reductions in species richness evident. The laboratory effects included a relative increase carnivores. Laboratory controls showed increased abundance of subsurface deposit feeders relative to the field treatments. Dose related changes in functional groups did not occur in the field treatments. A real difference was evident in the vertical distribution of the infaunal populations between

laboratory controls and field populations. By the end of the experiment, high numbers were concentrated in the top two centimeters of the laboratory controls. In the laboratory, most species disappeared from the bottom-most layer (8-10 cm) by the end of the experiment. Axiothella mucosa contributed to most of the observed trends in vertical distribution. Species such as Mediomastus and Brania were adversely affected by both lab and field PCP treatments. This trend of relative dominance was directed by recruitment of Axiothella in the laboratory controls by the third week of the experiment (T3). Recruitment in the field was not affected by PCP treatment.

Virginia--

In the spring 1985 experiment, at the York River site, good dose equivalency between the laboratory and field treatments was not achieved (see Figs. 10a & 10b). PCP levels were consistently lower in the field than in the microcosm. Mean macrofaunal abundance in the laboratory declined markedly during the first week, but this decline was observed in undosed control treatments and was thus not a response to PCP dosing (Fig. 12). A slight reduction in macrofaunal abundance was observed in field dosed treatments relative controls (Fig. 12). Species richness showed a clear dose-specific response in the laboratory, but was unaffected by the lower doses achieved in the field (Fig. 13).

Fall 1985 Experiments

Florida--

Dose equivalency between the laboratory and field treatments was again achieved in the fall experiments in Florida (Figs. 11a & 11b). Experimental results were similar to those during the spring experiment with strong, dose-specific reductions in numerical abundance and species richness in the microcosm and slight effects in the high PCP treatment in the field (Figs. 14 & 15). Recovery was rapid in the field due to high recruitment and slower in the laboratory where recruitment was minimal. Species such as Mediomastus were again adversely affected by the laboratory PCP treatments. Recruitment of this species from within the laboratory was low, either as a direct or indirect result of PCP treatment. In the field recruitment was apparently unaffected by PCP exposure, with the possible exception of some very short-term effects on Mediomastus. Functional feeding and trophic organization were unaffected by PCP treatment in the field. In the laboratory, there were proportional changes in these relationships at high PCP concentrations which included trophic simplification. The percent of primary carnivores tended to be higher in the PCP-treated microcosms.

Virginia--

Comparable levels of PCP were achieved between laboratory and field treatments during the fall 1985 experiment (Figs. 11a & 11b). Macrofaunal abundance in the laboratory showed slight declines in the high dose treatment but was unaffected by the

lower dose (Fig. 14) In the field treatments total macrofauna abundance did not decline in response to PCP treatment; in fact recruitment peaks were evident earlier in the high dose treatment than elsewhere. Species richness in the laboratory declined sharply in the high dose treatment, but was unaffected in the microcosm low dose treatment (Fig. 15). A similar trend was observed in the field, with lowered species richness in the high dose treatment. This effect in the field however was less dramatic and recovery was fairly rapid (Fig. 15).

RECRUITMENT PATTERNS

The experiments outlined above were timed to coincide with peak recruitment seasons in both environments since this is the period during which the communities are expected to show the greatest sensitivity to toxic stress. However, recruitment of benthic invertebrates is highly variable both spatially and temporally, raising the need to distinguish between variability in the data resulting from recruitment variations and those resulting from treatment effects. Though the general timing of peak recruitment periods at each site is predictable and our experiments spanned portions of these periods (see Fig. 2), it is not possible in any given year to predict either the precise timing or magnitude of recruitment for any individual species. Differences in recruitment levels between the laboratory and the field can lead to order-of-magnitude differences in the abundances of individual species and total macrofaunal numbers.

The azoic sediment treatments in the seawater table at the Florida and Virginia sites have revealed that recruitment of macrobenthic invertebrates through the seawater systems is minimal. Recruitment events in the field during the course of an experiment may lead therefore to substantial differences betwen laboratory and abundances. For instance, at the York River site in the spring 1982 experiment recruitment of *Streblospio benedicti*, *Eteone heteropoda* and immature Capitellidae resulted in large differences between laboratory and field abundances throughout the experiment. In the fall 1982 experiment at the same site low levels of recruitment in the field by *S. benedicti* and *Tubificoides* spp. caused only moderate divergence between laboratory and field abundances. During the spring 1984 experiment laboratory and field abundances were similar until the fourth week when a large recruitment event by *S. benedicti* led to three-fold differences in total abundance. Similar temporal differences in recruitment were observed at the Florida site.

While recruitment of macrofauna into microcosms through the seawater system was negligible, recruitment from within the microcosms was occasionally substantial. Species which reproduce asexually, have demersal eggs or brood their young have the capability to reproduce and recruit from within the microcosms. When a species recruited from within the laboratory it suffered less mortality from epibenthic and demersal predators and from sediment disturbance than in field, resulting in large

differences between laboratory and field abundances. This appears to have occurred in the spring 1983 experiments in Florida during which Axiothella mucosa recruited via demersal eggs and increased dramatically in the laboratory. Also, in the spring 1985 experiment in Virginia the asexually reproducing Paranais littoralis attained higher densities in the laboratory than in the field.

In recognition of the interpretational difficulties which arise as a result of these recruitment differences we have taken two approaches towards drawing inferences from these data. First, as outlined above, guild designations include a reproductive component; this groups together species which at least have the potential to display similar recruitment differences between the laboratory and field. Second, the emphasis we place on similarity of temporal patterns of abundance rather than absolute magnitudes of abundance reduces the problems associated with varying levels of recruitment.

RESPONSE VARIABLES

An important part of addressing our objectives was to determine which (if any) characteristics of benthic macroinvertebrate communities were modelled well in the laboratory and could therefore be used to predict responses of natural communities. The greatest detail is of course obtained by examining the population responses of individual species, and in earlier reports we have devoted considerable attention to the dynamics of at least the dominant species. Some species-specific patterns have emerged from this effort [e.g. Streblospio benedicti response in the laboratory and field are similar when experiments are conducted during times of no recruitment; or Axiothella mucosa may undergo population explosions in the laboratory during its recruitment times]; these individual patterns may be pieced together in an effort to make generalized predictions. Yet the number of species is large and the variety of response patterns observed is great. No doubt many general patterns remain obscured by our inability to extract them from such variable data.

At the other extreme of response variables we have investigated the use of community-level indices to describe patterns in the field and microcosms. Total numbers of macrofauna, species richness, species diversity and evenness parameters have been reported for all treatments in each test in earlier reports. Some generalizations are possible. Figures 3-8 show mean total macrofaunal abundance and species richness values in control treatments for the six concurrent experiments conducted between 1982 and 1985 in both estuaries. In both the Apalachicola Bay and York River experiments mean total abundance of macrofauna in the microcosms was consistently a poor model of field abundances. Two problems occur which lead to this lack of concurrence. (1) Some animals recruit from within the microcosm where in the absence of epibenthic and demersal predators they experience large population increases which are not seen in the

field. This occurred in Florida in the spring 1982 test (Fig. 3), the fall 1982 test (Fig. 4) and the fall 1985 test (Fig. 8). In Virginia this situation was observed at the beginning of the tests in spring 1983 (Fig. 5) and spring 1985 (Fig. 7). (2) In other tests recruitment into field sites by species which lack the ability to recruit from within the microcosms resulted in increases in field abundances which were not tracked by the laboratory assemblages (Florida: spring 1983, Fig. 5; fall 1983, Fig. 6; spring 1985, Fig. 7; Virginia: fall 1982, Fig. 4; fall 1983, Fig. 6; fall 1985, Fig. 8). These problems make total macrofaunal abundance a poor statistic for tracking natural communities with laboratory models and a poor indicator of response to a toxin (Figs. 12 & 14).

Species richness values in laboratory and field controls were more often similar (Figs. 3-8). In most tests species richness in the laboratory controls was not significantly different from the field controls or the pattern of change was similar. Good examples of this latter phenomenon can be seen in the Apalachicola Bay data from spring 1983 to spring 1985 (Figs. 5-7). In a few instances there were exceptions to this patterns of concurrence; in spring 1982 species richness at week 5 had diverged between the York River site and the microcosms (Fig. 3) and field recruitment during the spring and fall of 1983 in the York River led to changes in species richness which were not reflected in the laboratory. In general, however, we find species richness to be a fairly conservative community descriptor which shows few laboratory artifacts. In addition species richness showed dose-specific responses to PCP treatment (Figs. 13 & 15).

Between these two extremes of species-specific and community-level responses, we have investigated a number of approaches to summarizing individual species data without obscuring much of the relevant within community response. Categorization of species into higher taxonomic groupings is the most straightforward approach and it has the advantage, if successful, of alleviating the need for detailed species-level taxonomy in impact assessment. However, we find that very often individual species within a given taxon do not show similar patterns of concurrence between the laboratory and field. For instance, the pattern of abundance of Streblospio benedicti (a spionid polychaete) in the fall 1982 experiments in the York River was more similar to that of Scoloplos spp. (an orbiniid polychaete) than it was to the confamilial Polydora ligni, a pattern largely set by recruitment events occurring only in the field. In later experiments P. ligni has been observed to recruit into the microcosms.

A posteriori methods of grouping species have been attempted using cluster techniques (Diaz et al. 1984). These techniques can identify species groups which have similar abundances in the laboratory and field and groups which do not. Groups of the latter type can then be ignored when attempting to assess toxic impacts. A disadvantage of this approach is that it is entirely a posteriori and requires substantial experimentation for every

test. Moreover, we are posing questions regarding temporal patterns, not absolute abundances, so methods which group species by abundances are inappropriate. A more desirable approach would be to identify species groups which show similar patterns in the laboratory and field, and to do so *a priori* based upon their ecologies. Responses to stress should then be observed only in those groups found to be good laboratory models.

The guild approach to classifying species outlined earlier in this report is our attempt at such an *a priori* categorization. Figure 9 shows some composite values of abundances through all tests for nine of the numerically dominant guilds in the Apalachicola Bay and York River systems. We caution that since these figures are composites from all tests that they should not be taken as actual time courses of abundances, they merely serve as a convenient way to summarize a lot of data. The patterns in these figures discussed below are also evident in each of the individual tests. These plots show only abundances in field and laboratory controls and their intent is to identify those guilds for which laboratory assemblages are good models of the field.

The nine guilds represented in Figure 9 are those which comprise the five most abundant in each of the tests in Florida and Virginia (Table 5); they therefore include the majority of individuals collected. Of the nine guilds shown we interpret five of them as generally showing concurrence between laboratory and field abundance patterns (Table 6). Mobile burrowing pedators/omnivores with limited dispersal (Fig. 9, p. 56) generally showed good agreement between the microcosm and field in Virginia, but were present in only very low numbers in Florida. Mobile epifauna which were detritivorous/omnivorous scavengers with limited dispersal were again more abundant in Virginia but appear to be adequately modelled by both of our laboratory systems (Fig. 9, p. 57). For this guild the absolute abundances between the laboratory and field often differed, but the patterns were similar. Mobile burrowing, detrivivorous/ omnivorous, deposit-feeders with wide dispersal were always among the dominant guilds at each site (Table 5) and generally were well modelled in the laboratory through the first 5 weeks (Fig. 9, p. 58). Detritivorous/omnivorous, mobile tube-builders which feed at the sediment-water interface and have limited dispersal also showed good general agreement between laboratory and field populations (Fig. 9, p. 59). Recruitment peaks for this guild were not always of equal intensity between the laboratory and field but similar patterns were evident. Detritivorous/ omnivorous, mobile burrowers which feed at the interface and have limited dispersal had similar abundance patterns in the laboratory and field (Fig. 9, p. 60).

Four other common guilds [(1) detritivorous/omnivorous, mobile burrowing deposit-feeders with limited dispersal, (2) detritivorous/omnivorous, mobile tube-builders which feed at the sediment-water interface and have wide dispersal, (3) mobile burrowing, herbivorous suspension-feeders with wide dispersal, and (4) mobile-burrowing predators/carnivores with wide dispersal; Fig. 9, pp. 61-64] did not show good concurrence

between the laboratory and field. The general pattern among these four guilds was that the guild with limited dispersal sometimes underwent population blooms in the laboratory, while the guilds with wide dispersal had recruitment peaks in the field which were not reflected in the laboratory. These problems with these guilds did not occur in every experiment, but were present frequently enough to limit their utility as laboratory models of field populations.

We argue that only those components of macrobenthic communities which are modelled well in the laboratory should be used to assess toxic impact. Based upon the forgoing consideration of response variables, species richness and the numerical abundance of the guilds listed in Table 6 appear to be the most appropriate components in our systems. In the following section we therefore emphasize these components in our discussion of predicting field impact from microcosm tests. This is a conservative approach and we note that among those guilds we have termed as inadequately modelled in the laboratory are some which responded well in some tests but not in others. For instance, in the fall 1982 test in Florida mobile-burrowing predators/ carnivores with wide dispersal showed good agreement between numbers in the laboratory and field controls throughout the experiment, but divergence between microcosm and field patterns in other tests (Fig. 9, p. 64) caused us to reject this group as a good laboratory model. In practice it may be that our procedure of identifying guilds a priori is best used to flag species groups which are suspect in their concordance between laboratory and field; the response of these guilds in undosed treatments could be examined a posteriori to make decisions concerning their utility in predicting impacts of toxic stress.

A limitation to this approach as we employ it here is the lack of truly objective criteria for assessing differences in response patterns. As we pointed out above the issue here is how well temporal patterns of abundance in the laboratory model those in the field. (e.g., As one declines does the other decline?) This question is not amenable to answering with ANOVA or clustering techniques. Both of these techniques are dependent upon actual abundances rather than temporal patterns. Specialized non-parametric pattern analysis techniques may prove useful in the future for providing objective criteria.

PREDICTING RESPONSE TO TOXIC STRESS

Based upon the arguments made above we examined the response of species richness and the numerical abundances of the guilds listed in Table 6 to address the question, can the response of natural communities to a toxic stress be predicted from the response in the laboratory? The response of species richness to PCP dosing is shown in Figs. 13 & 15. The responses of the guilds listed in Table 6 are shown in Figs. 16 & 17. Table 7 summarizes the concordance between the laboratory and field observations. Since dose equivalency between the microcosms and field was not achieved in the Virginia spring 1985 experiment,

the observations from that test are omitted. From the information in Table 7 it is clear that the microcosm results provided reliable predictions of the response of the natural communities for those components listed. Moreover these results show that the response in a microcosm experiment at one location is frequently a good indicator of response at the other location. This result, however, is tempered by the fact that differences in recruitment times between locations may lead to discrepancies in responses.

The results of Table 7 are promising. In all but one case (for which sufficient numbers were present) the response to PCP treatment in the laboratory served as a good indicator of the field response. Our approach is a conservative one; by including only those components of the community we know to be well modelled in the laboratory, we virtually assure that the responses observed are related to the PCP treatment.

The findings of this study suggest that properly conducted multi-species tests with estuarine benthos may yield valuable information regarding responses of natural communities to an iduces stress, provided that sufficient knowledge of the ecology or the orgaisms is available and incorporated into evaluating the results.

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TABLE 1. GENERALIZED PROTOCOL FOR LABORATORY MICROCOSM/FIELD VALIDATION STUDIES

I. Laboratory microcosms (0.1-1.0 m^2)
   A. Physical/chemical data
      1. temperature (C)
      2. salinity (%)
      3. dissolved oxygen (ppm)
      4. pH
      5. sediment % organics
      6. sediment grain size
      7. sediment temperature, salinity, Eh
   B. Infaunal macroinvertebrates (500- and 250- sieves)
      1. repetitive cores (3 replicates, 1-3 treatments)
      2. vertical distribution (2-cm intervals)
      3. azoic sediment samples (500- and 250- sieves)
   C. Microbes
      1. repetitive cores (3 replicates, 1-3 treatments) (Florida only)

II. Field
   A. Treatments (3 replicates)
      1. unscreened platforms
      2. screened platforms (exclusion cages)
      3. screened platforms (predator-inclusion cages)
      4. weekly core samples (no platform)
      5. additional treatments (specific for individual experiments)
   B. Physical/chemical data (same as I.A.)
   C. Infaunal macroinvertebrates (same as I.B.)
   D. Microbes (same as I.C.)

III. Variables analyzed
   A. Infaunal macroinvertebrates, epibenthic organisms
      1. numerical abundance (total and dominant species)
      2. ash-free dry weight biomass (total and dominant species)
      3. species richness
      4. species diversity and evenness indices
      5. functional group associations
      6. numerical response of guilds
   B. Microbes
      1. total biomass
      2. bacteria
      3. photosynthetic microbes
      4. microeukaryotes
      5. bacterial ecotype

TABLE 2. SAMPLING SCHEDULES FOR THE COMBINED (FSU-VIMS) EXPERIMENTAL PROGRAM (1981-1985)

I. Weekly samples
   A. FSU
      1. oligohaline stations (11/24/81-11/17/83)
      2. polyhaline station (11/25/81-3/15/84)
   B. VIMS
      1. polyhaline marine lab station (10/13/79-12/18/83)

II. Microbiological data
   A. FSU
      1. oligohaline stations (fall 1982; spring 1983)
      2. polyhaline stations (spring 1982)
   B. VIMS
      1. marine lab station (spring 1982)

III. Combined (field-laboratory) experiments
   A. Spring 1982
      1. Florida
      2. Virginia
   B. Fall 1982
      1. Florida
      2. Virginia
   C. Spring 1983
      1. Florida
      2. Virginia
   D. Fall 1983
      1. Florida
      2. Virginia
      3. Treatments included:
         a. Field controls
         b. Field predator exclusion cages
         c. Field predator inclusion cages
         d. Microcosm controls
         e. Field and lab treatments dosed with PCP
   E. Spring 1984
      1. Virginia only
   F. Spring 1985
      1. Florida (station ML)
      2. Virginia
      3. Treatments included:
         a. field controls
         b. microcosm controls
         c. replicate lab and field treatments dosed with PCP
         d. azoic sediments
   G. Fall 1985
      1. Florida (station ML)
      2. Virginia
      3. Treatments as in F.3.

Table 3a - Functional Group Assignments for Taxa Collected in Florida

TAXON	TROPHIC MODE/ LEVEL	DISPERSAL MOBILITY MODE
GAMMARUS MUCRONATUS	DEPOSIT FEEDER -HERBIVORE	-LIMITED DISPERS-BURROW(MOBILE)
ADELODRILUS SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ARENICOLA CRISTATA	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ARICIDEA FRAGILIS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ARICIDEA JEFFERSII	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ARICIDEA PHILBINAE	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ARICIDEA SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ARICIDEA SP. A	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ARICIDEA TAYLORI	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ARICIDEA WASSI	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
CTENODRILUS SERRATUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
DASYBRANCHUS SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ENCHYTRAEUS ALBIDUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ENCHYTRAEUS SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
HAEMONAIS WALDVOGELI	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
HAPLOSCOLOPLOS FOLIOSUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
HAPLOSCOLOPLOS FRAGILIS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
HAPLOSCOLOPLOS ROBUSTUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
IMMAT TUBIFICID W/O CAP SETAE	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
LIMNODRILOIDES SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
LIMNODRILOIDES WINCKELMANNI	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
MONOCULODES SP. (CF NYEI)	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
MONOPYLEPHORUS IRRORATUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
MONOPYLEPHORUS PARVUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
MONOPYLEPHORUS SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
NAINERIS SETOSA	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
NAIS COMMUNIS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
NAIS ELINGUIS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
OLIGOCHAETA	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
ORBINIA RISERI	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
PARANAIS LITORALIS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
PARAONIS FULGENS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
PHALLODRILUS MEDIOPORUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
PHALLODRILUS MONOSPERMATHECUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
PHALLODRILUS SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
SCOLOPLOS RUBRA	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
SMITHSONIDRILUS MARINUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
STYLARIA LACUSTRIS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
TUBIFEX LITORALIS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
TUBIFICOIDES BEMEDENI	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
TUBIFICOIDES GABRIELLAE	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
TUBIFICOIDES HETEROCHAETUS	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
TUBIFICOIDES PSEUDOGASTER	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
TUBIFICOIDES SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
TUBIFICOIDES SWIRENCOWI	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-BURROW(MOBILE)
CAECUM SP.	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-EPIFAU(MOBILE)
AXIOTHELLA MUCOSA	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-TUBE(SESSILE)
MALDANE SARSI	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-TUBE(SESSILE)
MALDANIDAE	DEPOSIT FEEDER -OMNI/DETRIT	-LIMITED DISPERS-TUBE(SESSILE)
SPECIARIA JOSINAE	DEPOSIT FEEDER -OMNI/DETRIT	UNKNOWN

Table 3a (cont'd)

TAXON	TROPHIC MODE/ LEVEL	DISPERSAL MOBILITY MODE	MODE
CAPITELLA CAPITATA	DEPOSIT FEEDER -OMNI/DETRIT	-VARIABLE DISPER-	BURROW(MOBILE)
CAPITELLA JONESI	DEPOSIT FEEDER -OMNI/DETRIT	-VARIABLE DISPER-	BURROW(MOBILE)
ARMANDIA AGILIS	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
COSSURA SOYERI	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
HOLOTHUROIDIA	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
MEDIOMASTUS AMBISETA	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
NOTOMASTUS HEMIPODUS	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
NOTOMASTUS LATERICEUS	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
PARANAITIS SPECIOSA	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
SIPUNCULA	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
OPHIUROIDEA	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	EPIFAU(MOBILE)
CISTENA GOULDI	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)
OWENIA FUSIFORMIS	DEPOSIT FEEDER -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(SESSILE)
CHAETOZONE SP.	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	BURROW(MOBILE)
CIRRATULIDAE	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	BURROW(MOBILE)
THARYX SP.	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	BURROW(MOBILE)
ERICHSONELLA (CF FILIFORMIS)	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	EPIFAU(MOBILE)
LEMBOS SMITHI	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	EPIFAU(MOBILE)
LEMBOS SP. 1	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	EPIFAU(MOBILE)
AMPELISCA VADORUM	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
AMPELISCA VERRILLI	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
AMPHARETIDAE	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
CARAZZIELLA HOBSONAE	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
COROPHIUM LOUISIANUM	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
COROPHIUM TUBERCULATUM	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
ERICHTHONIUS BRASILIENSIS	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
HOBSONIA FLORIDA	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
MELINNA MACULATA	INTERFACE FEED -OMNI/DETRIT	-LIMITED DISPERS-	TUBE(MOBILE)
CIRRIFORMIA TENTACULATA	INTERFACE FEED -OMNI/DETRIT	-VARIABLE DISPER-	BURROW(MOBILE)
POLYDORA LIGNI	INTERFACE FEED -OMNI/DETRIT	-VARIABLE DISPER-	TUBE(MOBILE)
POLYDORA SOCIALIS	INTERFACE FEED -OMNI/DETRIT	-VARIABLE DISPER-	TUBE(MOBILE)
POLYDORA SP.	INTERFACE FEED -OMNI/DETRIT	-VARIABLE DISPER-	TUBE(MOBILE)
SPIO PETTIBONEAE	INTERFACE FEED -OMNI/DETRIT	-VARIABLE DISPER-	TUBE(MOBILE)
STREBLOSPIO BENEDICTI	INTERFACE FEED -OMNI/DETRIT	-VARIABLE DISPER-	TUBE(MOBILE)
PARNEA TRUNCATA	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
TELLINA TEXANA	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	BURROW(MOBILE)
APOPRIONOSPIO PYGMAEA	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)
LOIMIA MEDUSA	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)
MAGELONA PETTIBONEAE	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)
MINUSPIO PERKINSI	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)
PARAPRIONOSPIO PINNATA	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)
POECILOCHAETUS JOHNSTONI	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)
PRIONOSPIO METESOBRANCHIA	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)
SCOLELEPIS SQUAMATA	INTERFACE FEED -OMNI/DETRIT	-WIDE DISPERSAL -	TUBE(MOBILE)

Table 3a (cont'd)

TAXON	TROPHIC MODE/ LEVEL		DISPERSAL MOBILITY MODE	
SCOLELEPIS TEXANA	INTERFACE FEED	-OMNI/DETRIT	-WIDE DISPERSAL	-TUBE(MOBILE)
SPIOPHANES BOMBYX	INTERFACE FEED	-OMNI/DETRIT	-WIDE DISPERSAL	-TUBE(MOBILE)
PHORONIDA	INTERFACE FEED	-OMNI/DETRIT	-WIDE DISPERSAL	-TUBE(SESSILE)
ARABELLA SP.	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
AUTOLYTUS SP.	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
DORVILLEA SP.	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
EHLERSIA SP.	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
LUMBRINERIS LATREILLI	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
MARPHYSA SANGUINEA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
MICROPHTHALMUS SP.	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
OPHIODROMUS ABSCURA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
PETTIBONEIA SP.	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
PSEUDOSYLLIDES CURACOENSIS	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
SCHISTOMERINGOS RUDOLPHI	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
SYLLIS CORNUTA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-BURROW(MOBILE)
CAPRELLA PENANTIS	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-EPIFAU(MOBILE)
CAPRELLIDAE	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-EPIFAU(MOBILE)
LUCONACIA INCERTA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-EPIFAU(MOBILE)
MELONGENA CORONA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-EPIFAU(MOBILE)
TANAIDACEA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-EPIFAU(MOBILE)
AMERICONUPHIS MAGNA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-TUBE(SESSILE)
DIOPATRA CUPREA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-TUBE(SESSILE)
ONUPHIS EREMITA OCULATA	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-TUBE(SESSILE)
POLLINICES DUPLICATUS	PREDATOR	-CARNIVORE	-LIMITED DISPERS	-UNKNOWN
AMPHINOME ROSTRATA	PREDATOR	-CARNIVORE	-VARIABLE DISPER	-BURROW(MOBILE)
GRUBEULEPIS SP.	PREDATOR	-CARNIVORE	-VARIABLE DISPER	-BURROW(MOBILE)
HARMOTHOE SP.	PREDATOR	-CARNIVORE	-VARIABLE DISPER	-BURROW(MOBILE)
LEPIDONOTUS SUBLEVIS	PREDATOR	-CARNIVORE	-VARIABLE DISPER	-BURROW(MOBILE)
POLYNOIDAE	PREDATOR	-CARNIVORE	-VARIABLE DISPER	-BURROW(MOBILE)
SIGALIONIDAE	PREDATOR	-CARNIVORE	-VARIABLE DISPER	-BURROW(MOBILE)
AGLAOPHAMUS VERRILLI	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
ANCISTROSYLLIS HARTMANAE	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
ANCISTROSYLLIS PAPILLOSA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
CABIRA INCERTA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
ETEONE HETEROPODA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
ETEONE LACTEA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
EUMIDA SANGUINEA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
GLYCERA AMERICANA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
GLYCINDE SOLITARIA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
GONIADIDAE	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
GYPTIS BREVIPALPA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
GYPTIS VITTATA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
NEPHTYS BUCERA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
NEPHTYS INCISA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
NEPHTYS PICTA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
PARAHESIONE LUTEOLA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
PARANDALIA AMERICANA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
PHYLLODOCE ARENAE	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
PHYLLODOCIDAE	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)

Table 3a (cont'd)

TAXON	TROPHIC MODE/ LEVEL		DISPERSAL MOBILITY MODE	MODE
PHYLLODOCIDAE SP. 2	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
SIGAMBRA BASSI	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
SIGAMBRA TENTACULATA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-BURROW(MOBILE)
CUMACEA	PREDATOR	-CARNIVORE	-WIDE DISPERSAL	-EPIFAU(MOBILE)
LAEONEREIS CULVERI	PREDATOR	-OMNI/DETRIT	-VARIABLE DISPER	-TUBE(MOBILE)
NEREIDAE SP.	PREDATOR	-OMNI/DETRIT	-WIDE DISPERSAL	-BURROW(MOBILE)
NEREIS FALSA	PREDATOR	-OMNI/DETRIT	-WIDE DISPERSAL	-BURROW(MOBILE)
NEREIS MICROMMA	PREDATOR	-OMNI/DETRIT	-WIDE DISPERSAL	-BURROW(MOBILE)
WEBSTERNEREIS TRIDENTATA	PREDATOR	-OMNI/DETRIT	-WIDE DISPERSAL	-BURROW(MOBILE)
NEREIS SUCCINEA	PREDATOR	-OMNI/DETRIT	-WIDE DISPERSAL	-TUBE(MOBILE)
PYCNOGONIDA	SCAVENGER	-CARNIVORE	-LIMITED DISPERS	-EPIFAU(MOBILE)
ANTHURIDAE	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
APANTHURA MAGNIFICA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
BATEA CATHARINENSIS	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
BRANIA CLAVATA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
BRANIA WELLFLEETENSIS	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
CASSIDINIDEA OVALIS	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
CASSIDINIDEA SP.	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
CYATHURA POLITA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
EXOGONE DISPAR	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
LISTRIELLA BARNARDI	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
MONOCULODES SP. 2	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
MUNNA REYNOLDSI	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
ODONTOSYLLIS ENLOFA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
SPHAEROSYLLIS TAYLORI	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
SYNCHELIDIUM AMERICANUM	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
XENANTHURA BREVITELSON	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-BURROW(MOBILE)
EDOTEA SP. (CF MONTOSA)	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
ELASMOPUS LEVIS	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
GRANDIDIERELLA BONNIEROIDES	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
LEMBOS SP.	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
LEUCOTHOE SPINICARPA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
LYSIANOPSIS ALBA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
MELITA APPENDICULATA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
MELITA ELONGATA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
MELITA SP.	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
MICRODEUTOPUS HANCOCKI	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
MICRODEUTOPUS MYERSI	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
NASSARIUS VIBEX	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-EPIFAU(MOBILE)
AMPITHOE SP.	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-TUBE(MOBILE)
CERAPUS SP. (CF TUBULARIS)	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-TUBE(MOBILE)
CYMADUSA COMPTA	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-TUBE(MOBILE)
MICROPROTOPUS RANEYI	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-TUBE(MOBILE)
PHOTIS MACROMANUS	SCAVENGER	-OMNI/DETRIT	-LIMITED DISPERS	-TUBE(MOBILE)
CHIRONOMIDAE	SCAVENGER	-OMNI/DETRIT	-UNKNOWN	-UNKNOWN
PLATYNEREIS DUMERILI	SCAVENGER	-OMNI/DETRIT	-WIDE DISPERSAL	-BURROW(MOBILE)

Table 3a (cont'd)

TAXON	TROPHIC MODE/ LEVEL		DISPERSAL MOBILITY MODE	MODE
CANTHARUS CANCELLARIA	SCRAPER	-CARNIVORE	-LIMITED DISPERS-EPIFAU(MOBILE)	
UROSALPINX TAMPAENSIS	SCRAPER	-CARNIVORE	-LIMITED DISPERS-EPIFAU(MOBILE)	
OLIVELLA SP.	SCRAPER	-OMNI/DETRIT	-LIMITED DISPERS-EPIFAU(MOBILE)	
PRUNUM APICINUM	SCRAPER	-OMNI/DETRIT	-LIMITED DISPERS-EPIFAU(MOBILE)	
PYRAMIDELLA SP.	SCRAPER	-OMNI/DETRIT	-LIMITED DISPERS-EPIFAU(MOBILE)	
APSEUDES SP.	SUSPENSION FEED-HERBIVORE		-LIMITED DISPERS-EPIFAU(MOBILE)	
CREPIDULA SP.	SUSPENSION FEED-HERBIVORE		-LIMITED DISPERS-EPIFAU(SESSILE)	
CHONE DUNERI	SUSPENSION FEED-HERBIVORE		-LIMITED DISPERS-TUBE(MOBILE)	
MEGALOMMA PIGMENTUM	SUSPENSION FEED-HERBIVORE		-LIMITED DISPERS-TUBE(SESSILE)	
SABELLIDAE	SUSPENSION FEED-HERBIVORE		-LIMITED DISPERS-TUBE(SESSILE)	
ABRA AEQUALIS	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
ANADARA SP.	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
ANOMALOCARDIA AUBERIANNA	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
CHIONE CANCELLATA	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
DENTALIUM LAQUEATUM	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
DOSINIA ELEGANS	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
ENSIS SP.	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
GLOTTIDIA PYRAMIDATA	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
MACTRA FRAGILIS	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
MULINIA LATERALIS	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
POLYMESODA CAROLINIANA	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
RANGIA CUNEATA	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
SEMELE PROLIFICA	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
TAGELUS SP.	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -BURROW(MOBILE)	
BRACHIDONTES SP.	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -EPIFAU(SESSILE)	
HYDROIDES UNCINATA	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -EPIFAU(SESSILE)	
LYONSIA HYALINA	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -EPIFAU(SESSILE)	
SERPULIDAE SP.	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -EPIFAU(SESSILE)	
TRACHYCARDIUM EGMONTIARUM	SUSPENSION FEED-HERBIVORE		-WIDE DISPERSAL -EPIFAU(SESSILE)	
SPIONIDAE POST-LARVA	SUSPENSION FEED-OMNI/DETRIT		-INVALID TO ASSI-TUBE(SESSILE)	
LEPIDACTYLUS SP.	SUSPENSION FEED-OMNI/DETRIT		LIMITED DISPERS-BURROW(MOBILE)	
MACOMA BALTHICA	SUSPENSION FEED-OMNI/DETRIT		-WIDE DISPERSAL -BURROW(MOBILE)	
MACOMA MITCHELLI	SUSPENSION FEED-OMNI/DETRIT		-WIDE DISPERSAL -BURROW(MOBILE)	
MACOMA TENTA	SUSPENSION FEED-OMNI/DETRIT		-WIDE DISPERSAL -BURROW(MOBILE)	
CHAETOPTERIDAE	SUSPENSION FEED-OMNI/DETRIT		-WIDE DISPERSAL -TUBE(SESSILE)	
SPIOCHAETOPTERUS COSTARUM	SUSPENSION FEED-OMNI/DETRIT		-WIDE DISPERSAL -TUBE(SESSILE)	
GASTROPOD SP. 2	UNKNOWN	-UNKNOWN	-LIMITED DISPERS-UNKNOWN	
ISOPODA	UNKNOWN	-UNKNOWN	-LIMITED DISPERS-UNKNOWN	
BIVALVE POST-LARVA 1	UNKNOWN	-UNKNOWN	-UNKNOWN	-UNKNOWN
BIVALVE SP. 2	UNKNOWN	-UNKNOWN	-UNKNOWN	-UNKNOWN
BIVALVE SP. 3	UNKNOWN	-UNKNOWN	-UNKNOWN	-UNKNOWN
BIVALVE SP. 5	UNKNOWN	-UNKNOWN	-UNKNOWN	-UNKNOWN
BIVALVE SP. 6	UNKNOWN	-UNKNOWN	-UNKNOWN	-UNKNOWN
GASTROPODA	UNKNOWN	-UNKNOWN	-UNKNOWN	-UNKNOWN

Table 3a (cont'd)

TAXON	TROPHIC MODE/ LEVEL		DISPERSAL MODE	MOBILITY MODE
INSECT LARVAE	UNKNOWN	-UNKNOWN	-UNKNOWN	-UNKNOWN
BRANCHIOSTOMA CARIBAEUM	UNKNOWN	-UNKNOWN	-WIDE DISPERSAL	-BURROW(MOBILE)
NUCULANA ACUTA	UNKNOWN	-UNKNOWN	-WIDE DISPERSAL	-BURROW(MOBILE)
POLYCHAETE (UNIDENT.)	UNKNOWN	-UNKNOWN	-WIDE DISPERSAL	-BURROW(MOBILE)

Table 3b - Functional Group Assignments for Taxa Collected in Virginia

TAXON	TROPHIC MODE	MOBILITY MODE	DISPERSAL MODE	TROPHIC LEVEL
PORIFERA	SUSPENSION	EPIFAUNAL-SESSILE	LIMITED DISPERSAL	HERBIVORE
HYDROZOA	SUSPENSION	EPIFAUNAL-SESSILE	LIMITED DISPERSAL	HERBIVORE
ANTHOZOA	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	HERBIVORE
TURBELLARIA	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
POLYCLADIA	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
RHYNCHOCOELA	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
TUBULANUS PELLUCIDUS	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
CARINOMIDAE	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
CEREBRATULUS LACTEUS	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
CEREBRATULUS LURIDUS	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
MICRURA	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
MICRURA LEIDYI	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
MICRURA RUBRA	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
MICRURA SP. 1	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
AMPHIPORUS	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
AMPHIPORUS SP 1	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
TETRASTEMMA VERMICULUS	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	CARNIVORE
ANNELIDA -(POLYCHAETA)	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN
POLYNOIDAE	PREDATOR	BURROWER-MOBILE	VARIABLE DISPERSAL	CARNIVORE
LEPIDAMETRIA COMMENSALIS	PREDATOR	BURROWER-MOBILE	VARIABLE DISPERSAL	CARNIVORE
HARMOTHOE EXTENUATA	PREDATOR	BURROWER-MOBILE	VARIABLE DISPERSAL	CARNIVORE
LEPIDONOTUS SUBLEVIS	PREDATOR	BURROWER-MOBILE	VARIABLE DISPERSAL	CARNIVORE
PHYLLODOCIDAE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
ETEONE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
ETEONE SP A	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
ETEONE LACTEA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
ETEONE HETEROPODA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
EUMIDA SANGUINEA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
PARANAITIS SPECIOSA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
PHYLLODOCE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
PHYLLODOCE ARENAE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
EULALIA SANGUINEA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
HESIONIDAE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
AMPHIDUROS	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
GYPTIS VITTATA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
GYPTIS BREVIPALPA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
PARAHESIONE LUTEOLA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
MICROPHTHALMUS SCZELKOWII	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
SIGAMBRA TENTACULATA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
SYLLIDAE	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
BRANIA CLAVATA	PREDATOR	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
NEREIDAE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
NEREIS SUCCINEA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
NEPHTYIDAE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
NEPHTYS PICTA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
GLYCERIDAE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
GLYCERA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
GLYCERA DIBRANCHIATA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
GLYCERA AMERICANA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
GONIADIDAE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
GLYCINDE SOLITARIA	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
CAPITELLIDAE	DEPOSIT-FEEDER	BURROWER-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
CAPITELLA CAPITATA	DEPOSIT-FEEDER	BURROWER-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
CAPITELLA JONESI	DEPOSIT-FEEDER	BURROWER-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
HETEROMASTUS FILIFORMIS	DEPOSIT-FEEDER	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
NOTOMASTUS HEMIPODUS	DEPOSIT-FEEDER	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
MEDIOMASTUS AMBISETA	DEPOSIT-FEEDER	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
MALDANIDAE	DEPOSIT-FEEDER	TUBE BUILDER-SESSILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CLYMENELLA	DEPOSIT-FEEDER	TUBE BUILDER-SESSILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CLYMENELLA TORQUATA	DEPOSIT-FEEDER	TUBE BUILDER-SESSILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CLYMENELLA ZONALIS	DEPOSIT-FEEDER	TUBE BUILDER-SESSILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
STERNASPIDA	DEPOSIT-FEEDER	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
PARAONIS SP A	DEPOSIT-FEEDER	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SPIONIDAE	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
POLYDORA LIGNI	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
PARAPRIONOSPIO	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
PARAPRIONOSPIO PINNATA	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SCOLECOLEPIDES VIRIDIS	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE

Table 3b (cont'd)

TAXON	TROPHIC MODE	MOBILITY MODE	DISPERSAL MODE	TROPHIC LEVEL
SCOLELEPIS SQUAMATA	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SCOLELEPIS TEXANA	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SPIO SETOSA	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SPIOPHANES BOMBYX	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
STREBLOSPIO BENEDICTI	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
DISPIO UNCINATA	INTERFACE	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SPIOCHAETOPTERUS OCULATUS	SUSPENSION	TUBE BUILDER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
DIOPATRA	PREDATOR	TUBE BUILDER-SESSILE	LIMITED DISPERSAL	CARNIVORE
DIOPATRA CUPREA	PREDATOR	TUBE BUILDER-SESSILE	LIMITED DISPERSAL	CARNIVORE
ARABELLIDAE	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
PSEUDEURYTHOE PAUCIBRANCHIAT	PREDATOR	BURROWER-MOBILE	WIDE DISPERSAL	CARNIVORE
ORBINIIDAE	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
SCOLOPLOS	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
ORBINIA ORNATA	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
SCOLOPLOS FRAGILIS	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
SCOLOPLOS ROBUSTUS	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
SCOLOPLOS RUBRA	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CIRRATULIDAE	INTERFACE	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CIRRATULUS	INTERFACE	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
THARYX	INTERFACE	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
THARYX SP A	INTERFACE	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CISTENA GOULDII	DEPOSIT-FEEDER	TUBE BUILDER-MOB	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
AMPHARETIDAE	INTERFACE	TUBE BUILDER-SESSILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
ASABELLIDES OCULATA	INTERFACE	TUBE BUILDER-SESSILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
MELINNA MACULATA	INTERFACE	TUBE BUILDER-SESSILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
TEREBELLIDAE	INTERFACE	TUBE BUILDER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
AMPHITRITE ORNATA	INTERFACE	TUBE BUILDER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
LOIMIA MEDUSA	INTERFACE	TUBE BUILDER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
PISTA PALMATA	INTERFACE	TUBE BUILDER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SABELLIDAE	SUSPENSION	TUBE BUILDER-SESSILE	VARIABLE DISPERSAL	HERBIVORE
POTAMILLA NEGLECTA	SUSPENSION	TUBE BUILDER-SESSILE	VARIABLE DISPERSAL	HERBIVORE
SABELLA MICROPHTHALMA	SUSPENSION	TUBE BUILDER-SESSILE	VARIABLE DISPERSAL	HERBIVORE
HYDROIDES DIANTHUS	SUSPENSION	TUBE BUILDER-SESSILE	VARIABLE DISPERSAL	HERBIVORE
TUBIFICIDAE	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
TUBIFICOIDES SP.1	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
PARANAIS LITTORALIS	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
GASTROPODA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	UNKNOWN
RISSOIDAE	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
SAYELLA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CREPIDULA FORNICATA	PREDATOR	EPIFAUNAL-SESSILE	VARIABLE DISPERSAL	CARNIVORE
CREPIDULA CONVEXA	PREDATOR	EPIFAUNAL-SESSILE	VARIABLE DISPERSAL	CARNIVORE
UROSALPINX CINEREA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	CARNIVORE
NASSARIUS VIBEX	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
ILYANASSA OBSOLETA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
MANGELIA PLICOSA	SCAVENGER	EPIFAUNAL-MOBILE	UNKNOWN	DETRITIVORE/OMNIVORE
PROPEBELA PYGMAEA	SCAVENGER	EPIFAUNAL-MOBILE	UNKNOWN	DETRITIVORE/OMNIVORE
ACTEON PUNCTOSTRIATUS	SCAVENGER	EPIFAUNAL-MOBILE	UNKNOWN	DETRITIVORE/OMNIVORE
CYLICHNA ALBA	SCAVENGER	EPIFAUNAL-MOBILE	UNKNOWN	DETRITIVORE/OMNIVORE
HAMINOEA SOLITARIA	SCAVENGER	EPIFAUNAL-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
ACTEOCINA CANALICULATA	SCAVENGER	EPIFAUNAL-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
RETUSA OBTUSA	SCAVENGER	EPIFAUNAL-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
ODOSTOMIA	SCAVENGER	EPIFAUNAL-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
ODOSTOMIA BISUTURALIS	SCAVENGER	EPIFAUNAL-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
TURBONILLA INTERRUPTA	SCAVENGER	EPIFAUNAL-MOBILE	VARIABLE DISPERSAL	DETRITIVORE/OMNIVORE
AEOLIDIIDAE	SCAVENGER	EPIFAUNAL-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
PELECYPODA	UNKNOWN	UNKNOWN	UNKNOWN	UNKNOWN
YOLDIA LIMATULA	INTERFACE	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
ANADARA TRANSVERSA	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
MYTILUS EDULIS	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	HERBIVORE
GEUKENSIA DEMISSA	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	HERBIVORE
LUCINA MULTILINEATA	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
ALIGENA ELEVATA	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
VENERIDAE	SUSPENSION	BURROWER-MOBILE	UNKNOWN	HERBIVORE
MERCENARIA MERCENARIA	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
GEMMA GEMMA	SUSPENSION	BURROWER-MOBILE	LIMITED DISPERSAL	HERBIVORE
TELLINIDAE	INTERFACE	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
TELLINA AGILIS	INTERFACE	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
MACOMA	INTERFACE	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
MACOMA BALTHICA	INTERFACE	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
MACOMA TENTA	INTERFACE	BURROWER-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
TAGELUS	SUSPENSION	BURROWER-SESSILE	WIDE DISPERSAL	HERBIVORE

Table 3b (cont'd)

TAXON	TROPHIC MODE	MOBILITY MODE	DISPERSAL MODE	TROPHIC LEVEL
TAGELUS PLEBEIUS	SUSPENSION	BURROWER-SESSILE	WIDE DISPERSAL	HERBIVORE
ENSIS DIRECTUS	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
SPISULA SOLIDISSIMA	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
MULINIA LATERALIS	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
MYA ARENARIA	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
CYRTOPLEURA COSTATA	SUSPENSION	BURROWER-MOBILE	WIDE DISPERSAL	HERBIVORE
LYONSIA HYALINA	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	HERBIVORE
LIMULUS POLYPHEMUS	SCAVENGER	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
ACARINA	PREDATOR	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	CARNIVORE
PYCNOGONIDA	PREDATOR	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	CARNIVORE
CRUSTACEA	UNKNOWN	UNKNOWN	UNKNOWN	CARNIVORE
CIRRIPEDIA	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	CARNIVORE
BALANUS IMPROVISUS	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	CARNIVORE
PERICARIDA MYSIDACEA MYSIDA	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
NEOMYSIS AMERICANA	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
MYSIDOPSIS BIGELOWI	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
CUMACEA	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
CYCLASPIS VARIANS	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
LEUCON AMERICANUS	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
OXYUROSTYLIS SMITHI	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
PERACARIDA ISOPODA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
ERICHSONELLA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
IDOTEA BALTICA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
EDOTEA TRILOBA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CYATHURA BURBANCKI	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
PTILANTHURA TENUIS	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
PERACARIDA AMPHIPODA	UNKNOWN	UNKNOWN	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
AMPELISCA	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
AMPELISCA ABDITA	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
AMPELISCA VADORUM	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
AMPELISCA VERRILLI	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
AMPITHOE VALIDA	UNKNOWN	UNKNOWN	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CYMADUSA COMPTA	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CERAPUS TUBULARIS	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CROPHIUM	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CROPHIUM ACHERUSICUM	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CROPHIUM TUBERCULATUM	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
ERICHTHONIUS BRASILIENSIS	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
ERICHTHONIUS RUBRICORNIS	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
UNCIOLA	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
UNCIOLA SERRATA	INTERFACE	TUBE BUILDER-MOB	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
GAMMARIDAE	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
GAMMARIDAE SP 1	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
ELASMOPUS LEVIS	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
GAMMARUS	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
GAMMARUS MUCRONATUS	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
MELITA NITIDA	DEPOSIT-FEEDER	BURROWER-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
IDUNELLA	UNKNOWN	UNKNOWN	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
LISTRIELLA BARNARDI	UNKNOWN	UNKNOWN	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
LISTRIELLA CLYMENELLAE	SCAVENGER	TUBE BUILDER-SESSILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
MONOCULODES EDWARDSI	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
PLEUSTIDAE	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
STENOTHOIDAE	PREDATOR	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
PARAMETOPELLA CYPRIS	PREDATOR	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
STENOTHOE	PREDATOR	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
STENOTHOE MINUTA	PREDATOR	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CAPRELLIDAE	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
AEGININA LONGICORNIS	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
CAPRELLA PENANTIS	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
PARACAPRELLA TENUIS	SCAVENGER	EPIFAUNAL-MOBILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
PALAEMONETES	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
PALAEMONETES PUGIO	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
CRANGON SEPTEMSPINOSA	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
UPOGEBIA AFFINIS	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
PORTUNIDAE	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
CALLINECTES SAPIDUS	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
XANTHIDAE	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
PINNOTHERIDAE	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
PINNIXA	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
PINNIXA SAYANA	PREDATOR	EPIFAUNAL-MOBILE	WIDE DISPERSAL	CARNIVORE
PHORONIS	INTERFACE	TUBE BUILDER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE

Table 3b (cont'd)

TAXON	TROPHIC MODE	MOBILITY MODE	DISPERSAL MODE	TROPHIC LEVEL
ECTOPROCTA	SUSPENSION	EPIFAUNAL-SESSILE	LIMITED DISPERSAL	DETRITIVORE/OMNIVORE
HOLOTHUROIDEA	DEPOSIT-FEEDER	EPIFAUNAL-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
LEPTOSYNAPTA TENUIS	DEPOSIT-FEEDER	EPIFAUNAL-MOBILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
HEMICHORDATA	DEPOSIT-FEEDER	BURROWER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
ENTEROPNEUSTA	DEPOSIT-FEEDER	BURROWER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SACCOGLOSSUS	DEPOSIT-FEEDER	BURROWER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
SACCOGLOSSUS KOWALEWSKII	DEPOSIT-FEEDER	BURROWER-SESSILE	WIDE DISPERSAL	DETRITIVORE/OMNIVORE
UROCHORDATA	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	HERBIVORE
MOLGULIDAE	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	HERBIVORE
MOLGULA MANHATTENSIS	SUSPENSION	EPIFAUNAL-SESSILE	WIDE DISPERSAL	HERBIVORE

TABLE 4. SPECIES COMPOSITION OF DOMINANT GUILDS

Interface feeders, detriv/omniv, mobile tube builders, wide dispersal

Virginia	Florida
Dispio uncinata	Apoprionospio pygmaea
Loimia medusa	Loimia medusa
Paraprionospio pinnata	Magelona pettiboneae
Pista palmata	Minuspio perkinsi
Polydora ligni	Paraprionospio pinnata
Scolecolepides viridis	Poecilochaetus johnstoni
Scolelepis (2 sp.)	Prionospio heterobranchia
Spio setosa	Scolelepis (2 sp.)
Spiophanes bombyx	Spiophanes bombyx
Streblospio benedicti	

Deposit feeders, detriv/omniv, mobile burrowers, limited dispersal

Virginia	Florida
Elasmopus levis	Adelodrilus sp.
Gammarus mucronatus	Arenicola cristata
Melita nitida	Aricidea (7 sp.)
Orbinia ornata	Ctenodrilus serratus
Orbiniidae	Dasybranchus sp.
Paranais littoralis	Enchytraeus (2 sp.)
Scoloplos (3 sp.)	Haemonais waldvogeli
Tubificidae	Haploscoloplos (3 sp.)
Tubificiodes sp.	Immature tubificid w/o cap setae
	Limnodriloides (2 sp.)
	Monoculoides sp.
	Monopylephorus (3 sp.)
	Naineris setosa
	Nais (2 sp.)
	Oligochaeta
	Orbinia riseri
	Paranais littoralis
	Paraonis fulgens
	Phallodrilus (3 sp.)
	Scoloplos rubra
	Smithsondrilus marinus
	Stylaria lacustris
	Tubifex littoralis
	Tubificiodes (6 sp.)

TABLE 4 (cont'd)

Deposit feeders, detriv/omniv, mobile burrower, wide dispersal

Virginia	Florida
Cistena gouldii	Armandia agilis
Heteromastus filiformis	Cossura soyeri
Mediomastus ambiseta	Holothuroidea
Notomastus hemipodus	Mediomastus ambiseta
Paraonis sp.	Notomastus (2 sp.)
Sternaspidae	Paranaitis speciosa
	Siphuncula

Interface feeder, detriv/omniv, mobile burrower, limited dispersal

Virginia	Florida
Cirratulus sp.	Chaetozone sp.
Tharyx (2 sp.)	Cirratulidae
	Tharyx sp.

Predator, carnivore, mobile burrower, wide dispersal

Virginia	Florida
Amphiduros sp.	Aglaophamus verrilli
Arabellidae	Ancistrsyllis (2 sp.)
Eteone (3 sp.)	Cabira incerta
Eulalia sanguinea	Eteone (2 sp.)
Eumida sanguinea	Eumida sanguinea
Glycera (2 sp.)	Glycera americana
Glycinde solitaria	Glycinde solitaria
Gyptis (2 sp.)	Goniadidae
Microphthalamus sczelkowii	Gyptis (2 sp.)
Nephtys picta	Nephtys (3 sp.)
Nephtyiidae	Parahesione luteola
Parahesione luteola	Parandalia americana
Paranaitis speciosa	Phyllodocidae (3 sp.)
Phyllodoce arenae	Sigambra (2 sp.)
Pseudeurythoe paucibranchiata	
Sigambra tentaculata	

TABLE 4 (cont'd)

Interface feeder, detriv/omniv, mobile tube builder, limited dispersal

Virginia	Florida
Ampilesca (3 sp.)	Ampilesca (2 sp.)
Cerapus tubularis	Ampharetidae
Corophium (2 sp.)	Carazziella hobsonae
Erichthonius (2 sp.)	Corophium (2 sp.)
Unciola serrata	Erichthonius brasiliensis
	Hobsonia florida
	Mellina maculata

Predator, carnivore, mobile burrower, limited dispersal

Virginia	Florida
Amphiporus bioculatus	Arabella sp.
Carinomidae	Autolytus sp.
Cerebratulus (2 sp.)	Dorvillea sp.
Micrura (3 sp.)	Ehlersia sp.
Polycladia sp.	Lumberneris latreilli
Rhyncocoela sp.	Marphysa sanguinea
Tetrastemma vermiculus	Microphthalamus sp.
Tubulanus pellucidus	Ophiodromus abscura
Turbellaria	Pettibonea sp.
	Pseudosyllides curacoensis
	Schistomeringos rudolphi
	Syllis cornuta

Scavenger, detriv/omniv, mobile epifaunal, limited dispersal

Virginia	Florida
Aeginina longicornis	Edotea sp.
Caprella penantis	Elasmopus levis
Caprellidae	Grandidierella bonnieroides
Cyathura burbanki	Lembos sp.
Cymadusa compta	Leucothoe spinicarpa
Edotea triloba	Lysianopsis alba
Erichsonella	Melita (3 sp.)
Idotea baltica	Microdeutopus (2 sp.)
	Nassarius vibex

TABLE 5 - PERCENT OF TOTAL INDIVIDUALS IN THE TOP 5 GUILDS IN EACH TEST

SPRING 1982

Florida

Guild	% of Total
Depos feeder, detriv/omniv, mobile burrower, wide dispersal	46.8
Depos feeder, detriv/omniv, mobile burrower, limited disper	10.6
Interface feeder, detriv/omniv, mobile tube bldr, wide disp	10.3
Scavenger, detriv/omniv, mobile burrower, limited dispersal	6.6
Interface feeder, detriv/omniv, mobl burrower, limited disp	5.0

Virginia

Guild	
Interface feeder, detriv/omniv, mobl tube bldr, wide disper	34.6
Depos feeder, detriv/omniv, mobile burrower, limited disper	30.8
Depos feeder, detriv/omniv, mobile burrower, wide dispersal	15.8
Interface feeder, detriv/omniv, mobl burrower, limited disp	11.3
Predator, carnivore, mobile burrower, wide dispersal	4.2

Table 5. (cont'd)

FALL 1982

Florida

Guild	% of Total
Depos feeder, detriv/omniv, mobile burrower, limited disper	72.5
Depos feeder, detriv/omniv, mobile burrower, wide dispersal	14.8
Interface feeder, detriv/omniv, mobl tube bldr, varibl disp	8.8
Predator, carnivore, mobile burrower, wide dispersal	2.6
Predator, carnivore, mobile epifaunal, wide dispersal	0.2

Virginia

Guild	% of Total
Interface feeder, detriv/omniv, mobl tube bldr, wide disper	28.9
Depos feeder, detriv/omniv, mobile burrower, limited disper	23.2
Depos feeder, detriv/omniv, mobile burrower, wide dispersal	17.2
Predator, carnivore, mobile burrower, wide dispersal	6.4
Interface feeder, detriv/omniv, sess tube bldr, limited disp	4.3

SPRING 1983

Florida

Guild	% of Total
Scavenger, detriv/omniv, mobile tube bldr, limited dispersal	26.6
Depos feeder, detriv/omniv, mobile burrower, wide dispersal	19.5
Interface feeder, detriv/omniv, mobl tube bldr, limited disp	16.8
Interface feeder, detriv/omniv, mobl tube bldr, variabl disp	14.4
Scavenger, detriv/omniv, mobile epifaunal, limited dispersal	9.2

Virginia

Guild	% of Total
Interface feeder, detriv/omniv, mobl tube bldr, wide disper	40.1
Depos feeder, detriv/omniv, mobile burrower, limited disper	26.1
Depos feeder, detriv/omniv, mobile burrower, wide dispersal	17.7
Predator, carnivore, mobile burrower, wide dispersal	5.2
Interface feeder, detriv/omniv, sess tube bldr, wide disper	3.4

Table 5. (cont'd)

FALL 1983

Florida

Guild	% of Total
Depos feeder, detriv/omniv, mobile burrower, limited disper	27.6
Depos feeder, detriv/omniv, mobile burrower, wide dispersal	25.8
Scavenger, detriv/omniv, mobile burrower, limited dispersal	10.2
Interface feeder, detriv/omniv, mobl tube bldr, wide disper	9.5
Interface feeder, detriv/omniv, mobl tube bldr, limited disp	6.4

Virginia

Guild	% of Total
Predator, carnivore, mobile burrower, wide dispersal	14.9
Scavenger, detriv/omniv, mobile epifaunal, limited dispersal	6.9
Interface feeder, detriv/omniv, mobl tube bldr, wide disper	6.8
Depos feeder, detriv/omniv, mobile burrower, limited disper	6.2
Predator, carnivore, mobile epifaunal, wide dispersal	5.8

SPRING 1985

Florida

Guild	% of Total
Deposit feeder, detriv/omniv, mobile burrower, limited disp	28.9
Deposit feeder, detriv/omniv, mobile burrower, wide dispersal	21.0
Scavenger, detriv/omniv, mobile burrower, limited dispersal	17.9
Depos feeder, detriv/omniv, mobile tube bldr, wide dispersal	11.0
Interface feeder, detriv/omniv, mobile burrower, limited disp	4.0

Virginia

Guild	% of Total
Predator, carnivore, mobile burrower, wide dispersal	11.0
Interface, detriv/omniv, sess tube bldr, wide dispersal	9.3
Depos feeder, detriv/omniv, mobile burrower, limited disper	8.5
Interface feeder, detriv/omniv, mobl tube bldr, limited disp	6.9
Predator, carnivore, mobile epifaunal, wide dispersal	5.2

Table 5. (cont'd)

FALL 1985

Florida

Guild	% of Total
Deposit feeder, detriv/omniv, mobile burrower, limited disp	43.8
Deposit feeder, detriv/omniv, mobile burrower, wide dispersal	21.8
Interface feeder, detriv/omniv, mobl tube bldr, wide dipersal	9.6
Scavenger, detriv/omniv, mobile burrower, limited dispersal	9.2
Interface feeder, detriv/omniv, mobl tube bldr, limited disper	4.4

Virginia

Guild	% of Total
Deposit feeder, detriv/omniv, mobile burrower, limited disp	36.6
Interface feeder, detriv/omniv, mobl tube bldr, wide disper	31.0
Deposit feeder, detriv/omniv, mobile burrower, wide dispersal	10.3
Predator, carnivore, mobile burrower, limited dispersal	4.4
Predator, carnivore, mobile burrower, wide dispersal	3.4

Table 6. Guilds which showed good agreement between temporal trends in the lab and field.

Interface-feeder, detritivore/ omnivore, mobile burrower, limited dispersal.

Interface-feeder, detritivore/omnivore, mobile tube-builder, limited dispersal.

Deposit-feeder, detritivore/omnivore, mobile burrower, wide dispersal.

Predator, carnivore, mobile burrower, limited dispersal.

Scavenger, detritivore/omnivore, mobile epifauna, limited dispersal.

Table 7. Evaluation of concordance between laboratory and field results PCP-dose experiments. Virginia Spring 1985 test is omitted since dose-equivalency was not achieved.

	Spring 1985		Fall 1985			
	Florida		Florida		Virginia	
Community Component	Response In Laboratory	Response In Field	Response In Laboratory	Response In Field	Response In Laboratory	Response In Field
Species Richness	Reduction by low and high doses	Reduction by high dose	Reduction by high dose	Reduction by high dose	Reduction by high dose	Reduction by high dose
Guild:						
INDOBMLD[1]	No effect of dose	No effect of dose	Recruitment depressed by high dose	Recruitment depressed by high dose	Too few to predict	Too few to predict
INDOTMLD[2]	Slight reduction at high dose	Slight reduction at high dose	Reduction by low and high doses	Reduction by high dose	Recruitment depressed by high dose	Recruitment depressed by high dose
DFDOMBWD[3]	Reduction by low and high doses	Reduction by low and high doses	Reduction by high dose	Reduction by high dose	No effect of dose	No effect of dose
PRCVBMLD[4]	Too few to predict	Too few to predict	No effect of dose	No effect of dose	Slight depression of recruitment	No effect of dose
SCDOEMLD[5]	Too few to predict	Too few to predict	Too few to predict	Too few to predict	Too few to predict	Too few to predict

[1] Interface-feeder, detritivore/omnivore, mobile burrower, limited dispersal.

[2] Interface-feeder, detritivore/omnivore, mobile tube-builder, limited dispersal.

[3] Deposit-feeder, detritivore/omnivore, mobile burrower, wide dispersal.

[4] Predator, carnivore, mobile burrower, limited dispersal.

[5] Scavenger, detritivore/omnivore, mobile epifauna, limited dispersal.

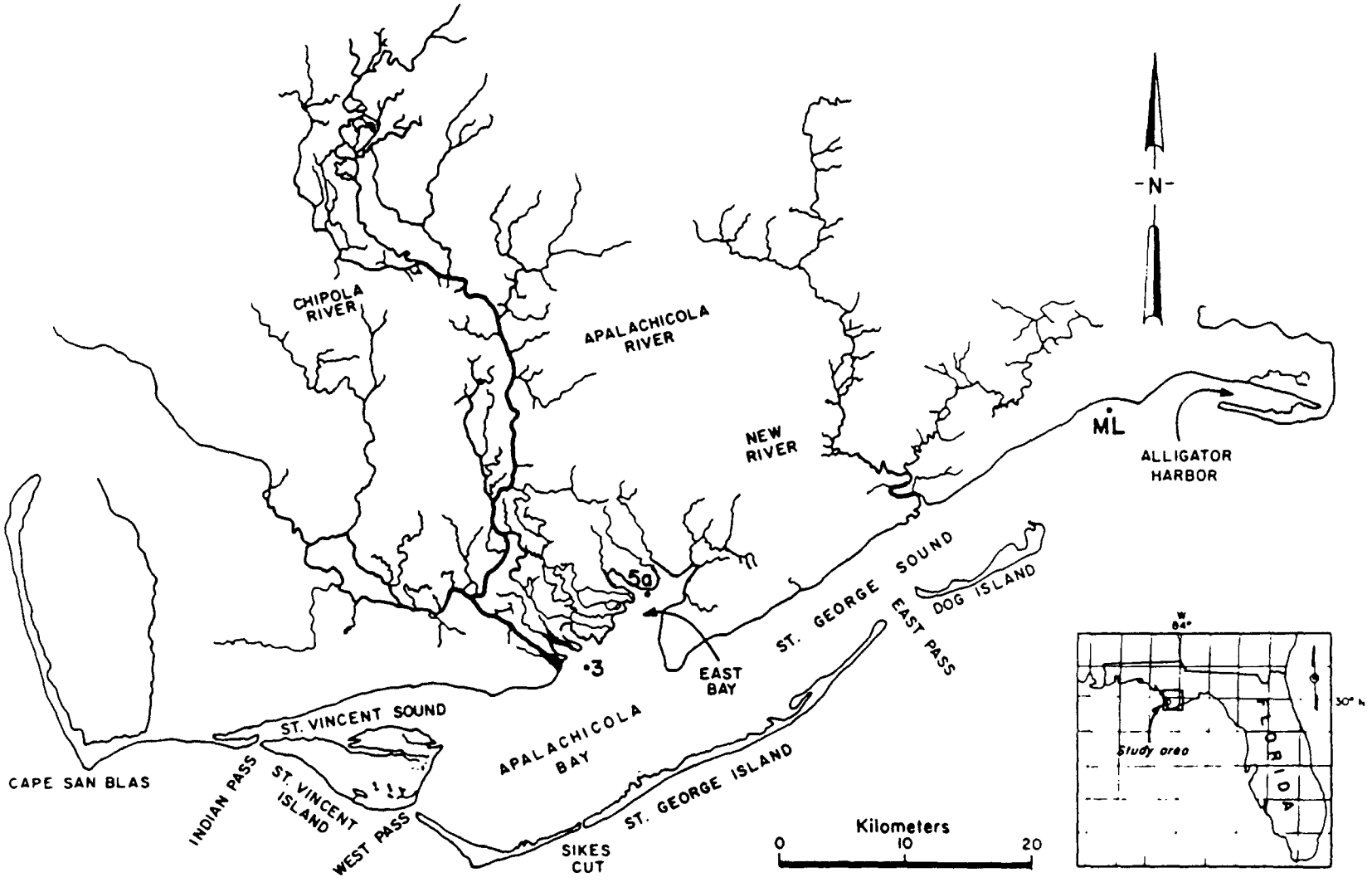


FIGURE 1-a Apalachicola Bay, Florida Study Site

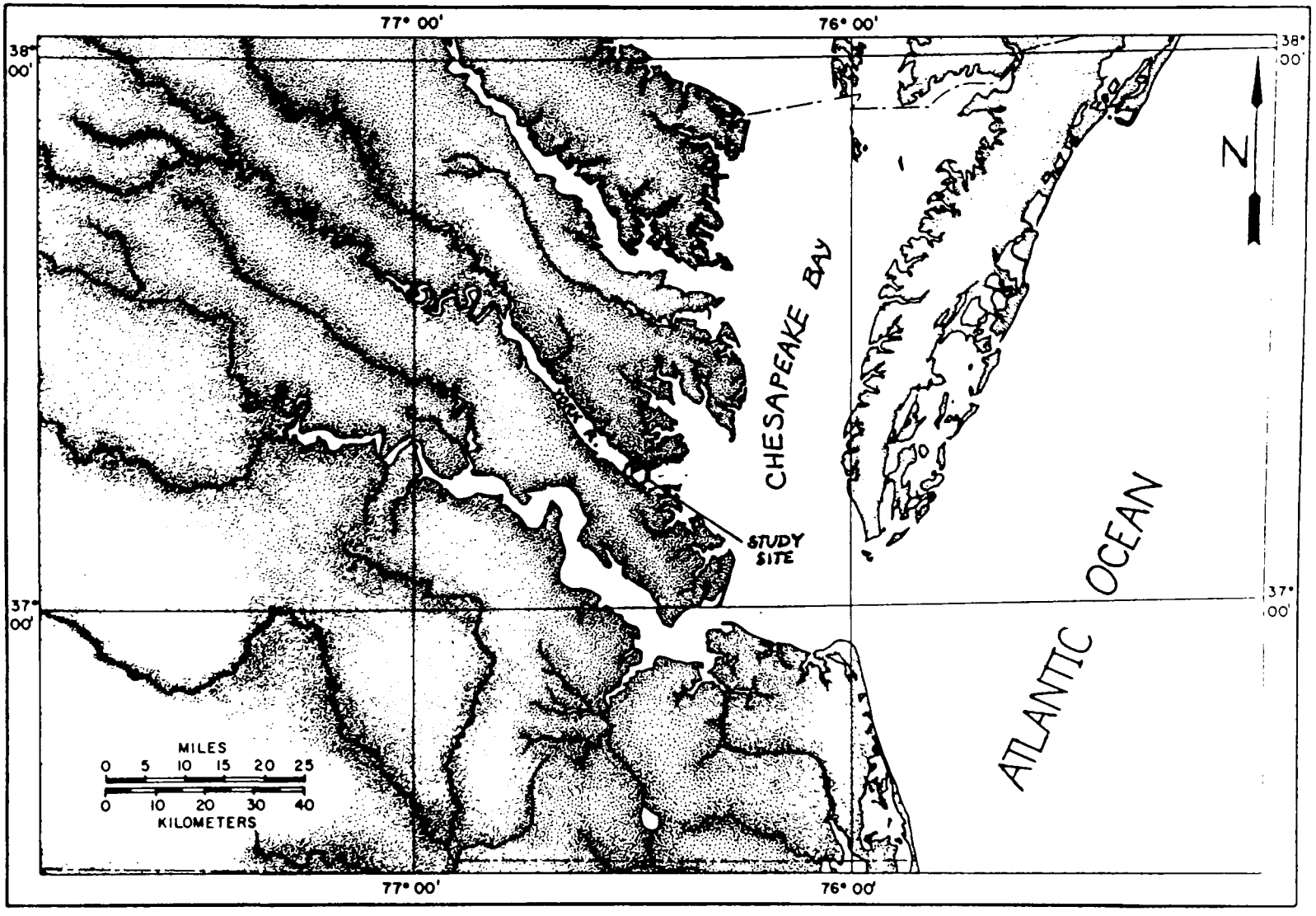


FIGURE 1-b York River, Virginia Study Site

FIGURE 2 - MEAN ABUNDANCE IN WEEKLY SAMPLES FROM 1981 - 1986. Vertical lines indicate test dates.

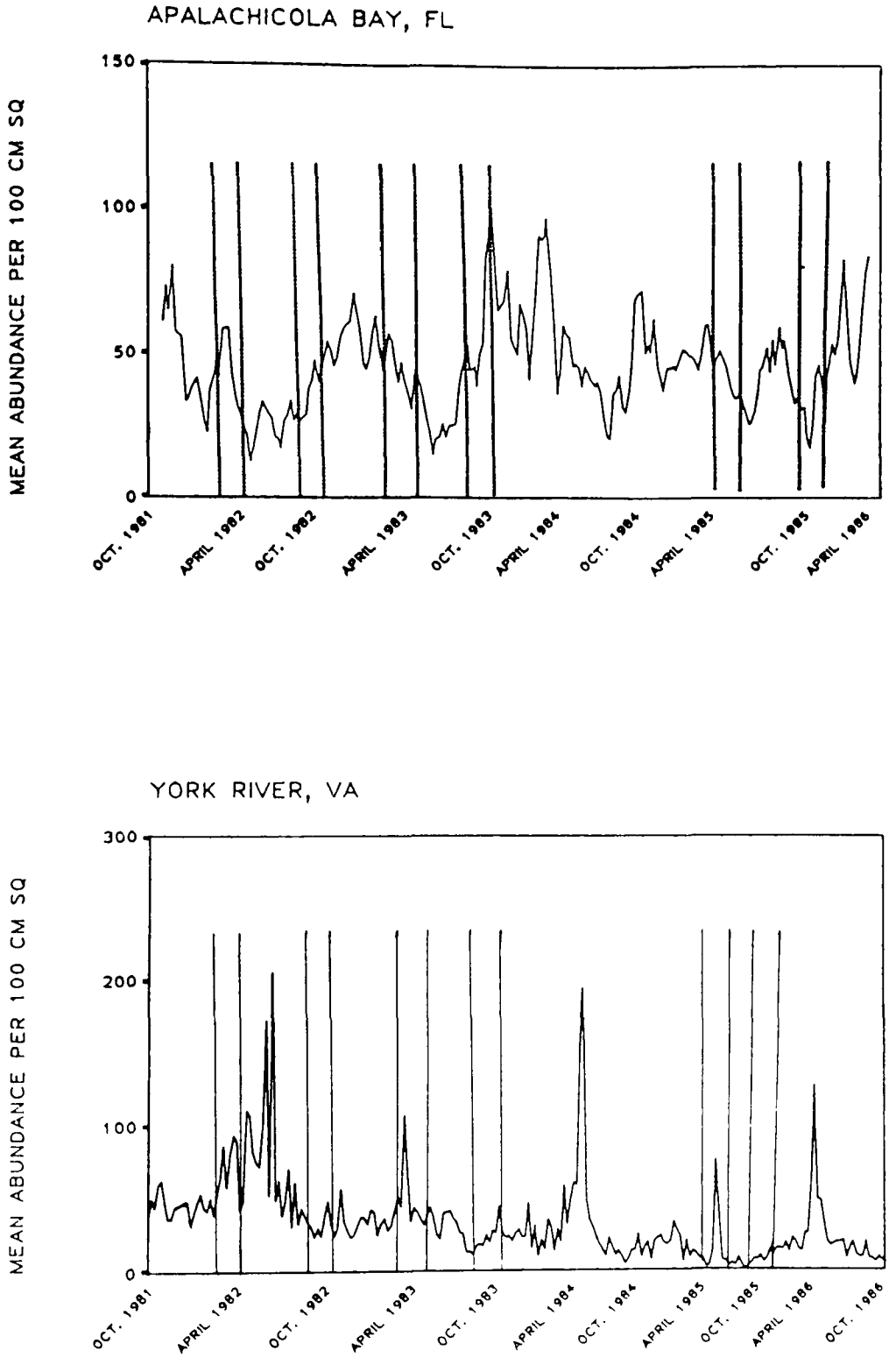
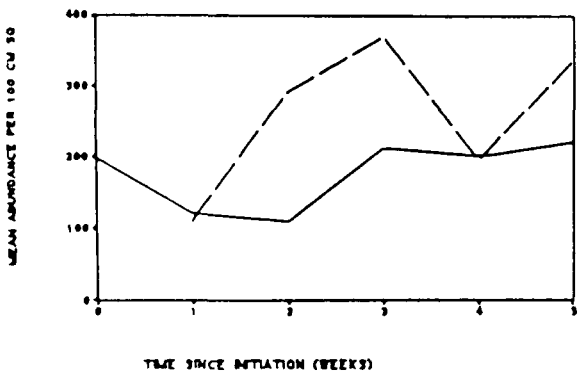


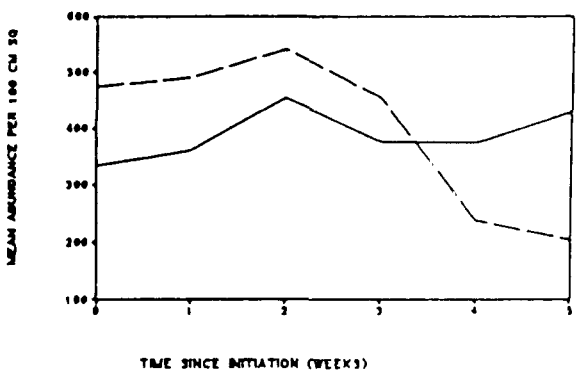
FIGURE 3 – TOTAL MACROFAUNA AND SPECIES RICHNESS SPRING 1982

LAB AND FIELD CONTROLS

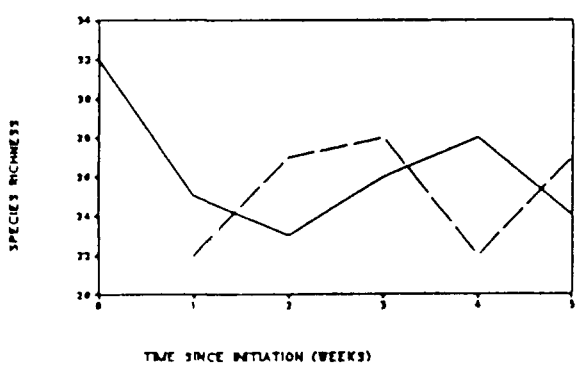
APALACHICOLA BAY, FL



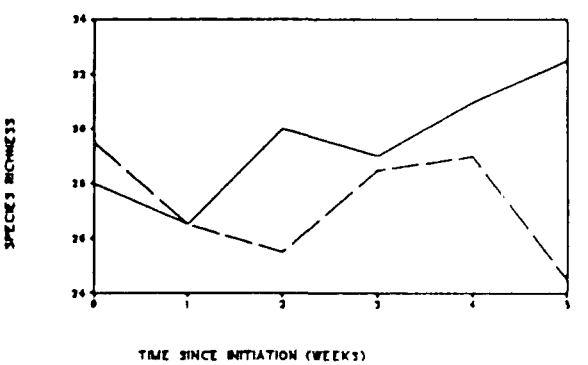
YORK RIVER, VA



APALACHICOLA BAY, FL



YORK RIVER, VA



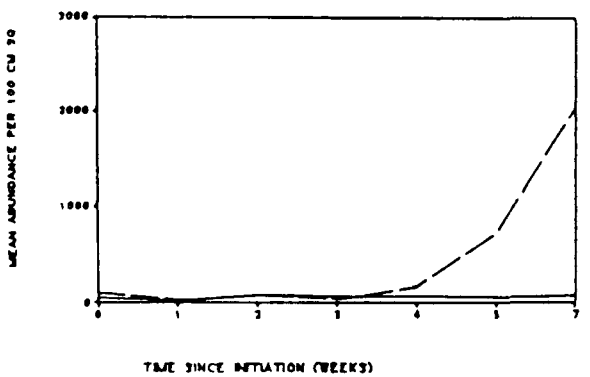
FIELD

LAB

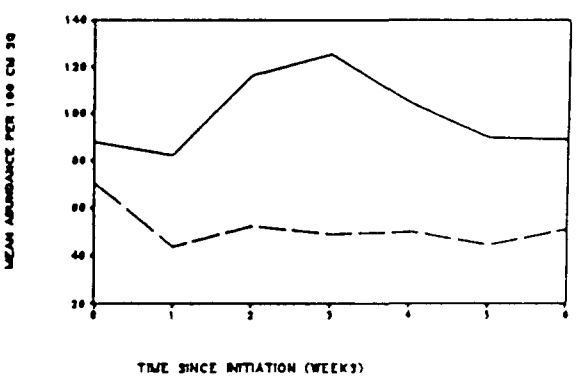
FIGURE 4 – TOTAL MACROFAUNA AND SPECIES RICHNESS FALL 1982

LAB AND FIELD CONTROLS

APALACHICOLA BAY, FL



YORK RIVER, VA



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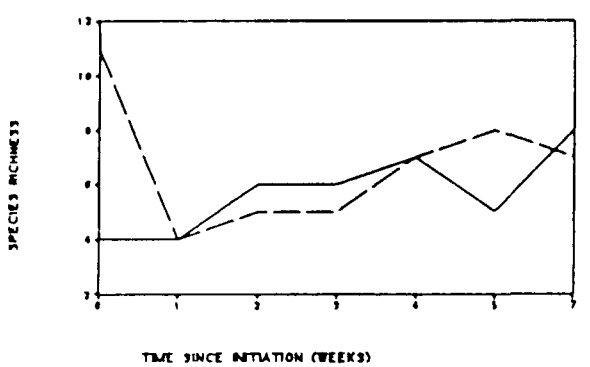
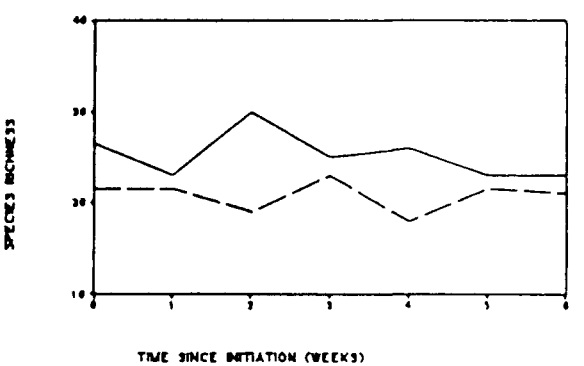


YORK RIVER, VA



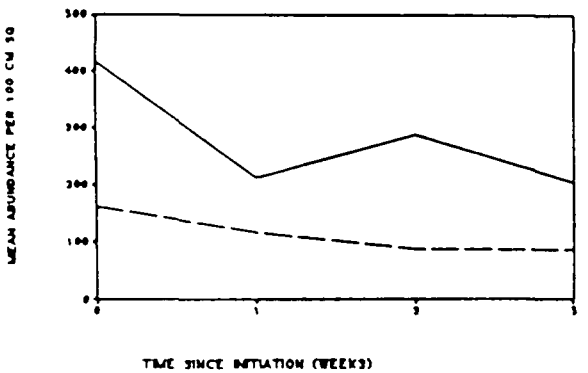
FIELD

LAB

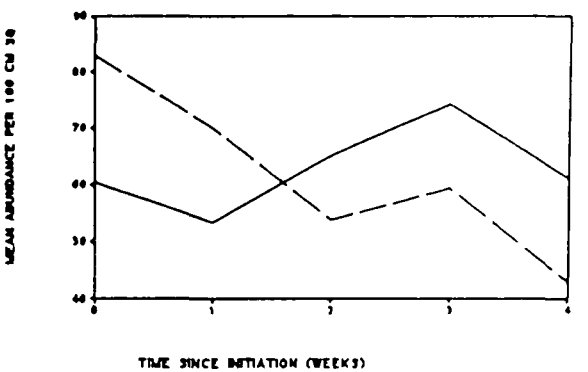
FIGURE 5 – TOTAL MACROFAUNA AND SPECIES RICHNESS SPRING 1983

LAB AND FIELD CONTROLS

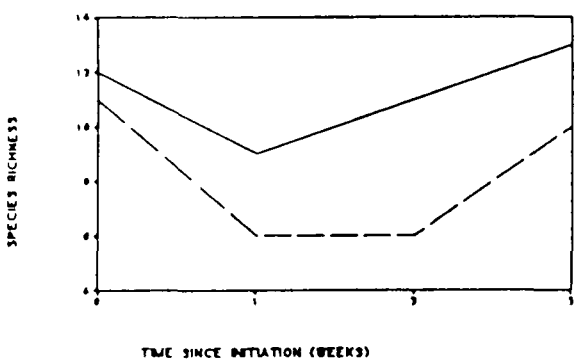
APALACHICOLA BAY, FL



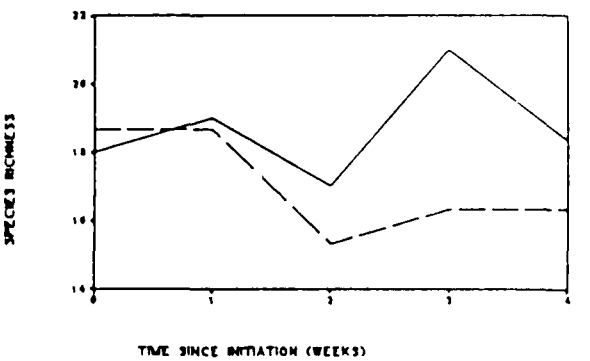
YORK RIVER, VA



APALACHICOLA BAY, FL



YORK RIVER, VA



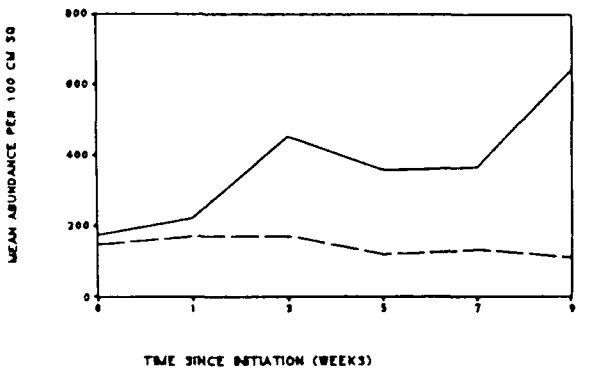
FIELD

LAB

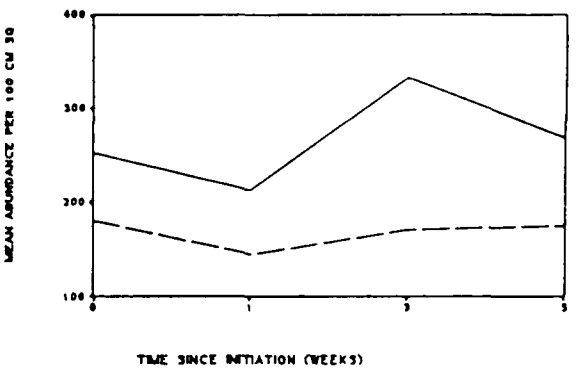
FIGURE 6 – TOTAL MACROFAUNA AND SPECIES RICHNESS FALL 1983

LAB AND FIELD CONTROLS

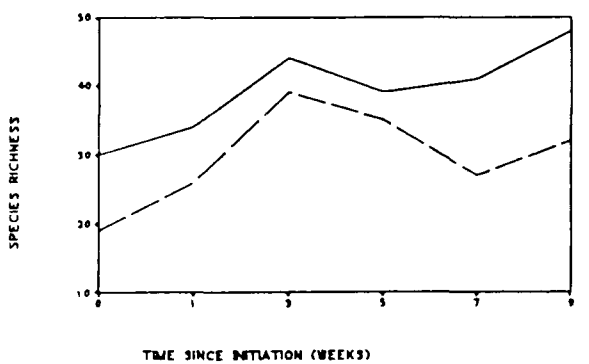
APALACHICOLA BAY, FL



YORK RIVER, VA



APALACHICOLA BAY, FL



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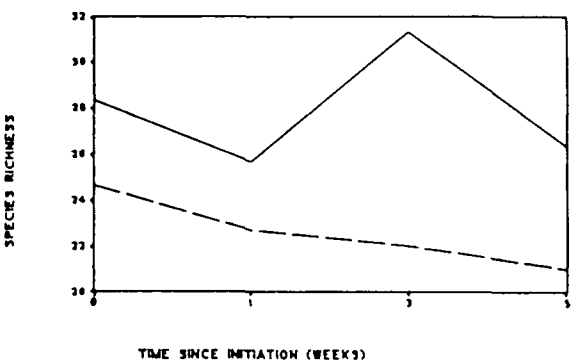


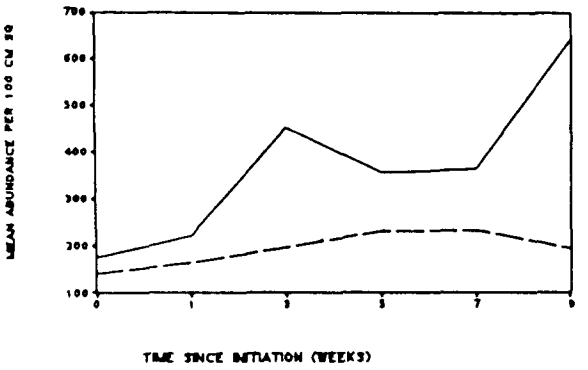
FIELD

LAB

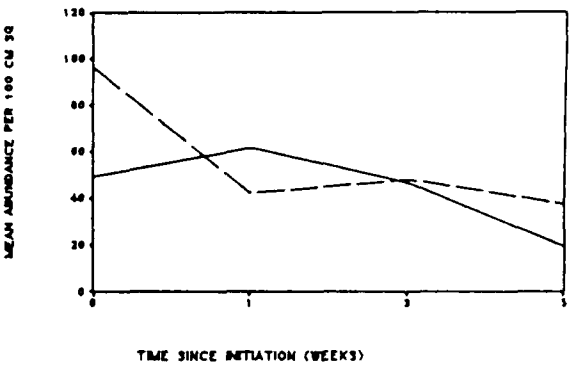
FIGURE 7 – TOTAL MACROFAUNA AND SPECIES RICHNESS SPRING 1985

LAB AND FIELD CONTROLS

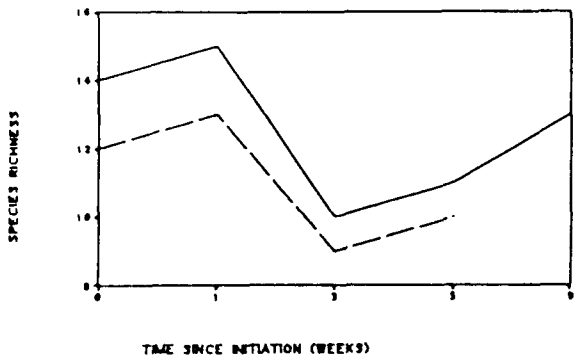
APALACHICOLA BAY, FL



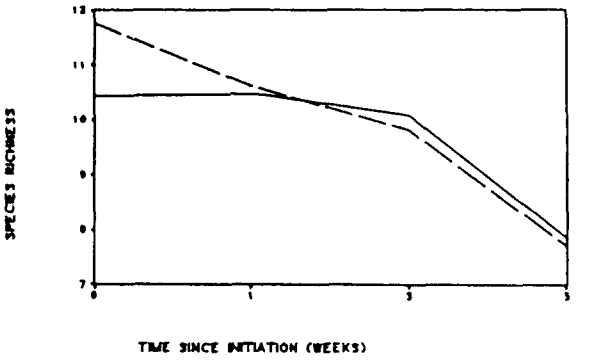
YORK RIVER, VA



APALACHICOLA BAY, FL



YORK RIVER, VA



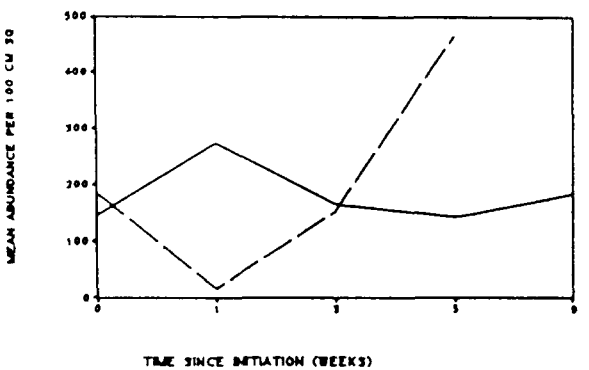
FIELD

LAB

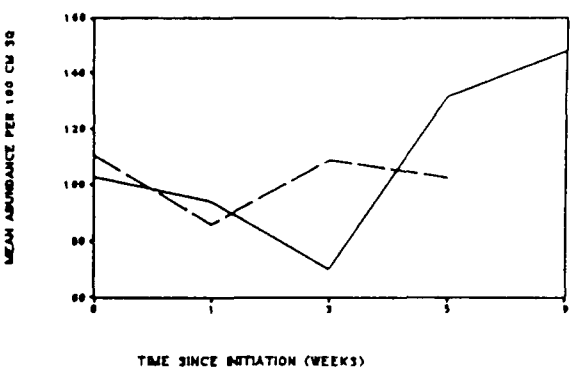
FIGURE 8 – TOTAL MACROFAUNA AND SPECIES RICHNESS FALL 1985

LAB AND FIELD CONTROLS

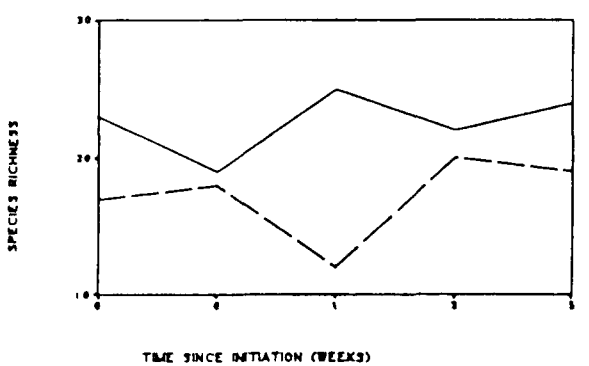
APALACHICOLA BAY, FL



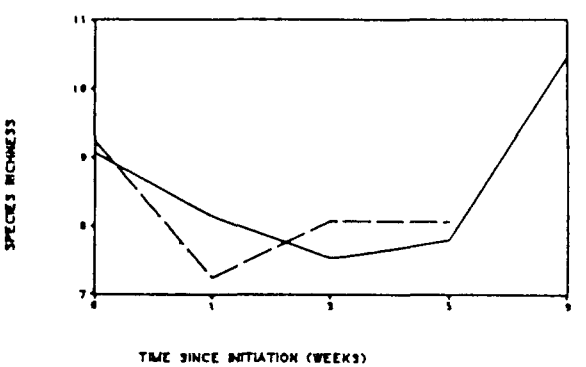
YORK RIVER, VA



APALACHICOLA BAY, FL



YORK RIVER, VA



FIELD

LAB

FIGURE 9

LAB–FIELD CONTROL COMPARISONS TESTS 1–7

GUILD: PREDATOR, CARVIVORE, MOBILE BORROWER, LIMITED DISPERSAL

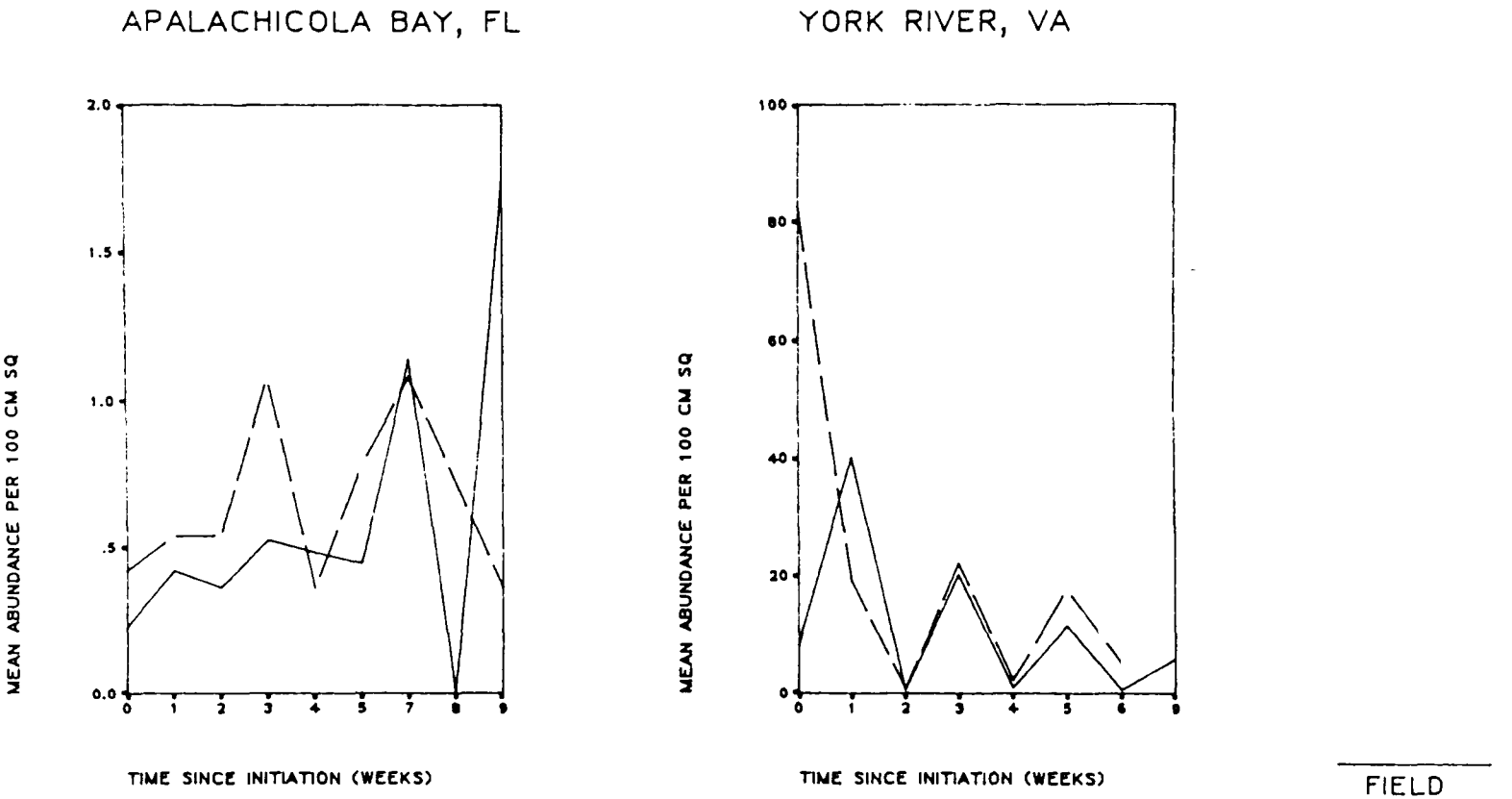
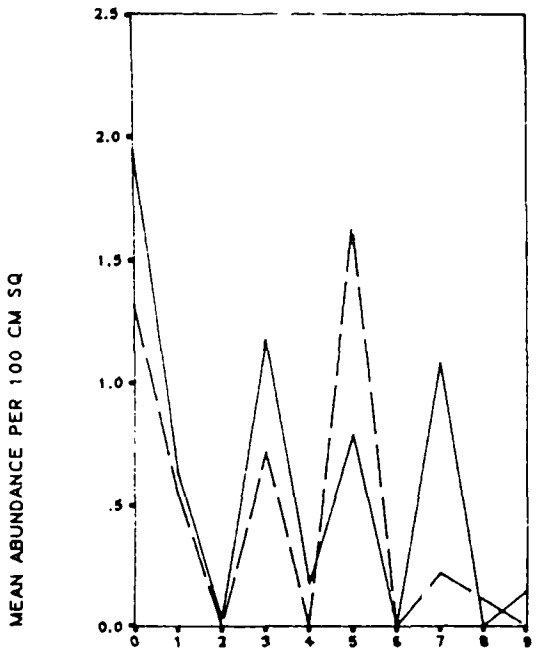


FIGURE 9 (Cont'd)

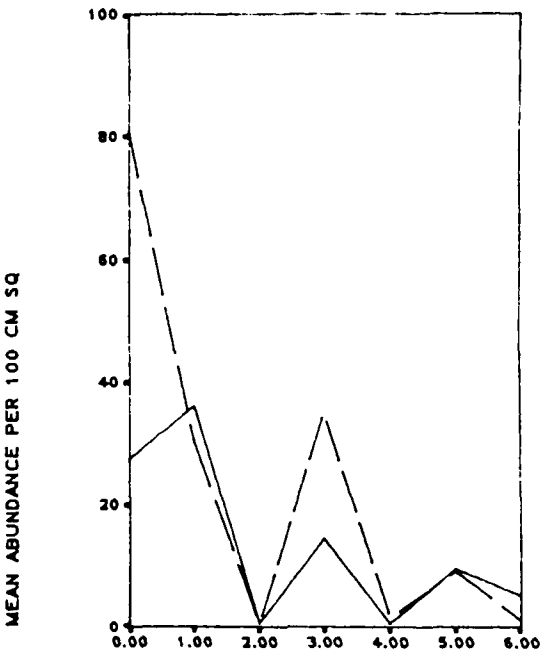
LAB–FIELD CONTROL COMPARISONS TESTS 1–7

GUILD: SCAVENGER, DETRIV/OMNIV, MOBILE EPIFAUNA, LIMITED DISPERSAL

APALACHICOLA BAY, FL



YORK RIVER, VA



FIELD

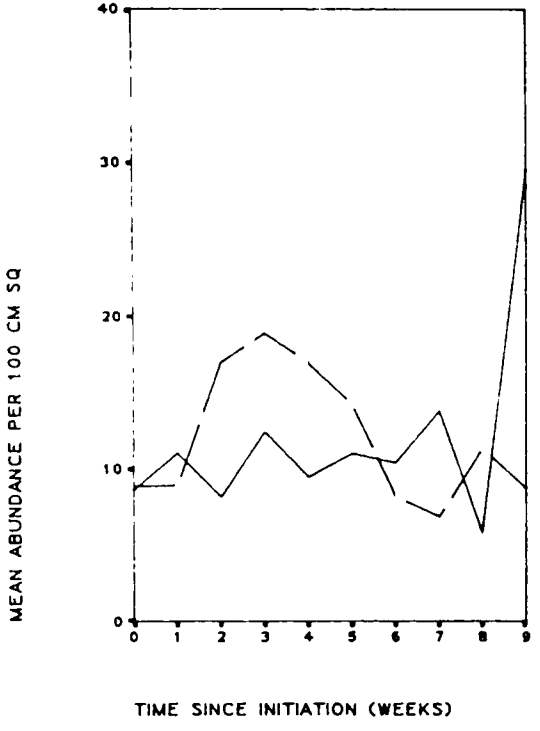
LAB

FIGURE 9 (Cont'd)

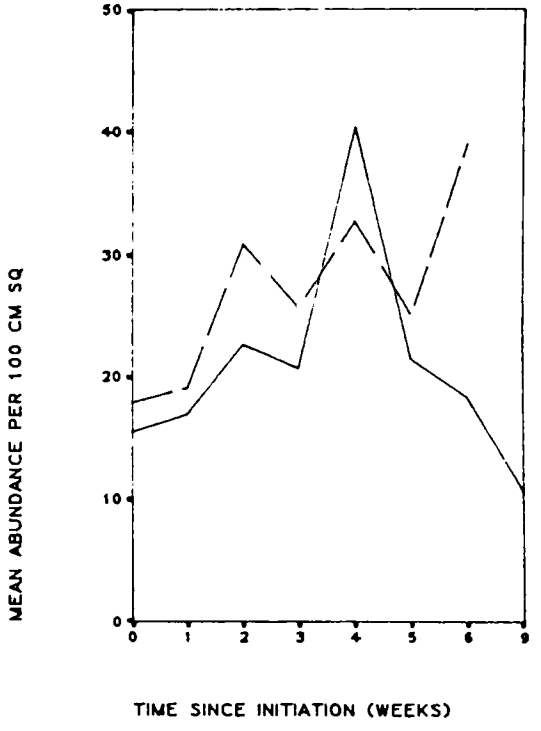
LAB–FIELD CONTROL COMPARISONS TESTS 1–7

GUILD:DEPOSIT–FEEDER, DETRIV/OMNIV, MOBILE BURROWER, WIDE DISPERSAL

APALACHICOLA BAY, FL



YORK RIVER, VA



FIELD

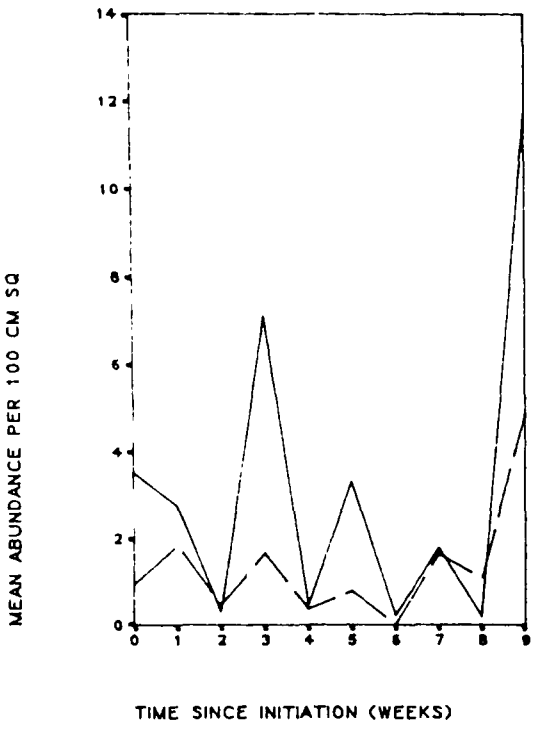
LAB

FIGURE 9 (Cont'd)

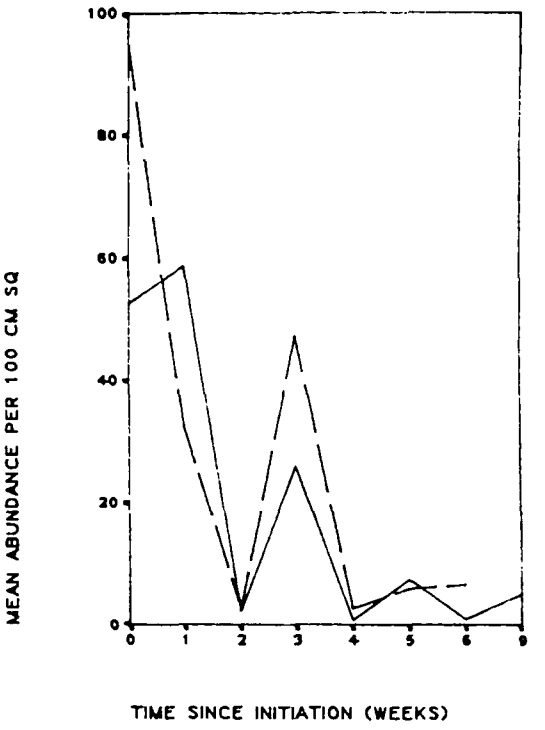
LAB–FIELD CONTROL COMPARISONS TESTS 1–7

GUILD: INTERFACE–FEEDER, DETRIV/OMNIV, MOBILE TUBE–BLD, LIMITED DISPERS

APALACHICOLA BAY, FL



YORK RIVER, VA



FIELD

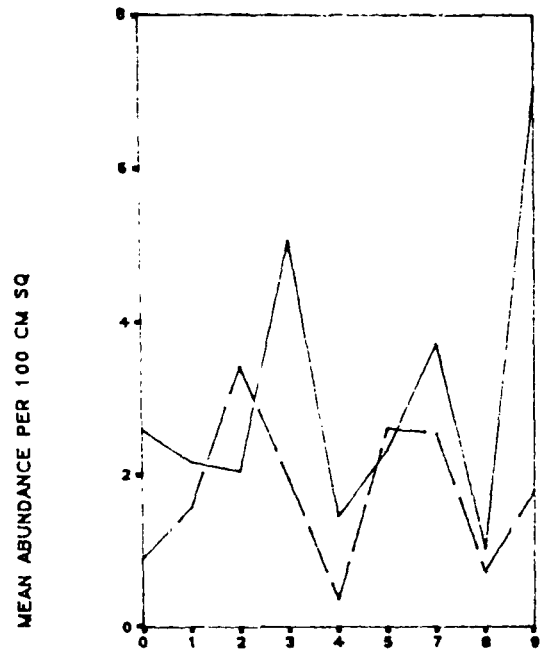
LAB

FIGURE 9 (Cont'd)

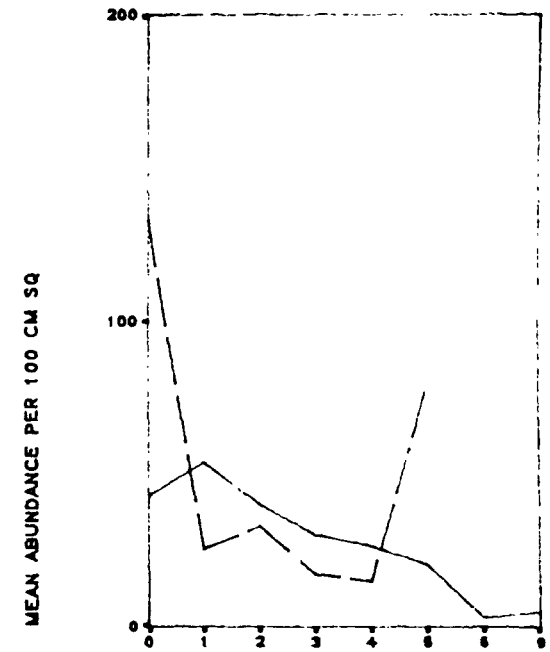
LAB—FIELD CONTROL COMPARISONS TESTS 1—7

GUILD: INTERFACE FEEDER, DETRIV/OMNIV, MOBILE BURROWER, LIMITED DISPERS

APALACHICOLA BAY, FL



YORK RIVER, VA



FIELD

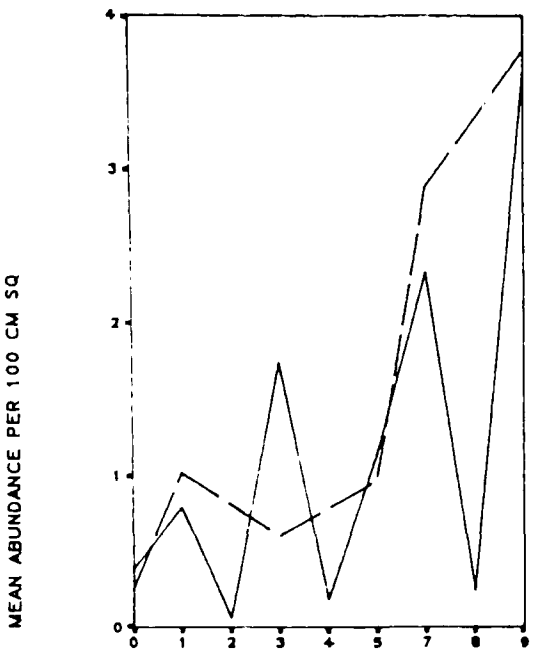
LAB

FIGURE 9 (Cont'd)

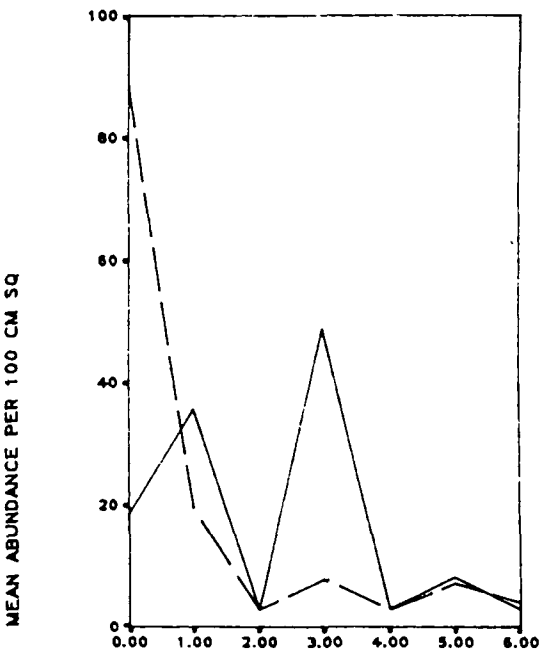
LAB–FIELD CONTROL COMPARISONS TESTS 1–7

GUILD: SUSPENSION–FEEDER, HERBIVORE, MOBILE BURROWER, WIDE DISPERSAL

APALACHICOLA BAY, FL



YORK RIVER, VA



FIELD

LAB

FIGURE 9 (Cont'd)

LAB–FIELD CONTROL COMPARISONS TESTS 1–7

GUILD: DEPOSIT–FEEDER, DETRIV/OMNIV, MOBILE BURROWER, LIMITED DISPERS

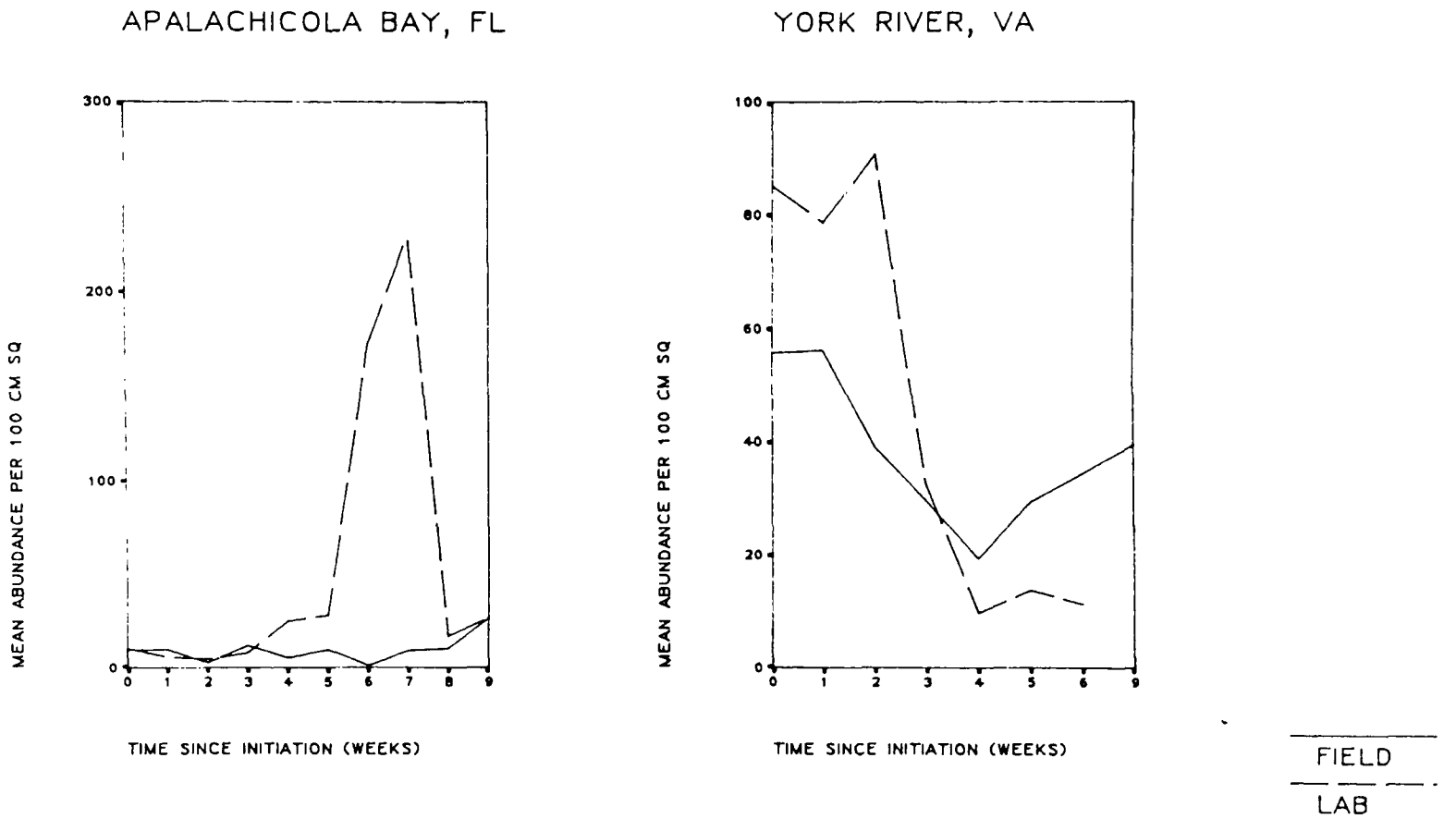


FIGURE 9 (Cont'd)

LAB–FIELD CONTROL COMPARISONS TESTS 1–7

GUILD: INTERFACE FEEDER, DETRIV/OMNIV, MOBILE TUBE–BLD, WIDE DISPERSAL

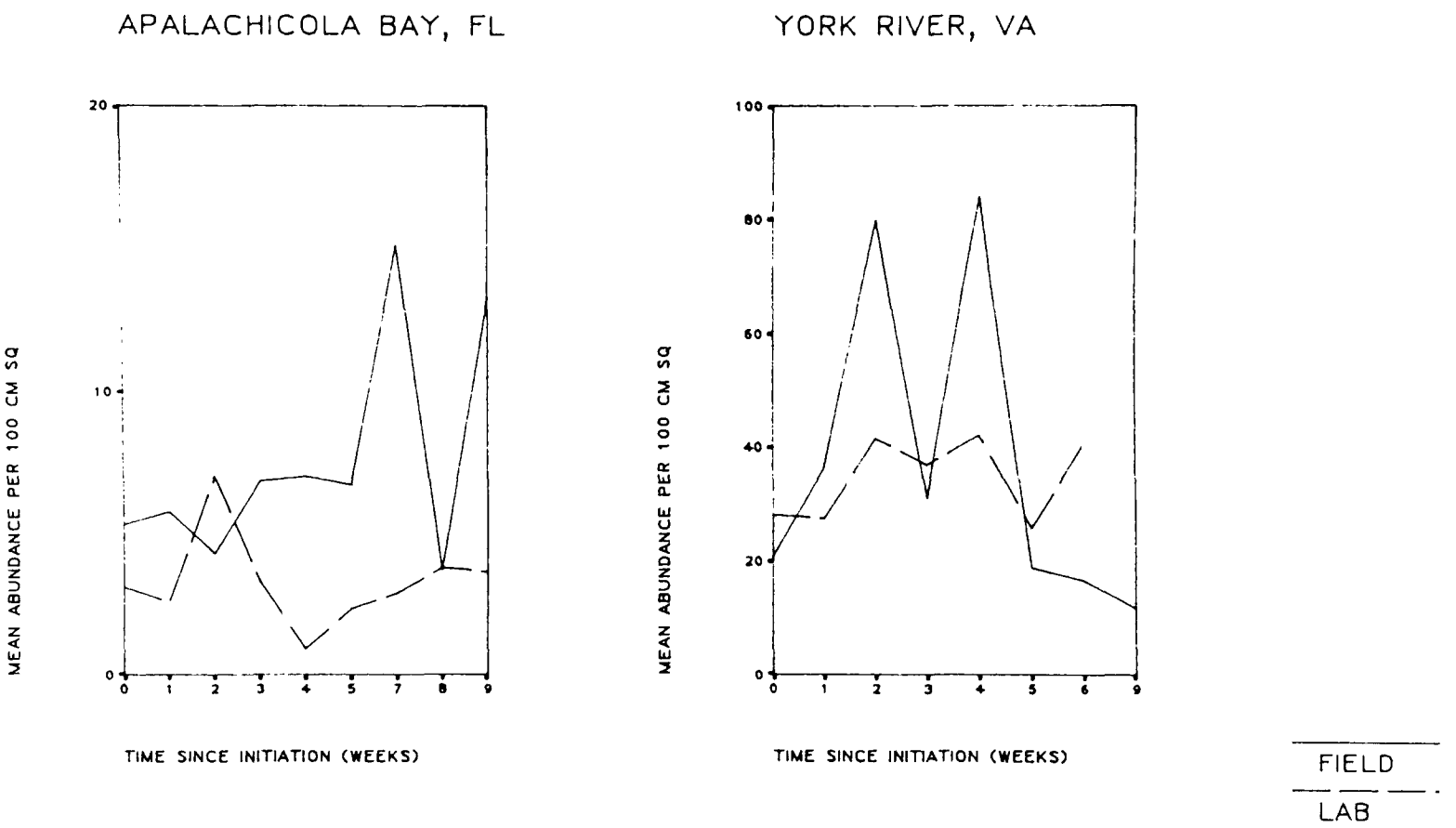
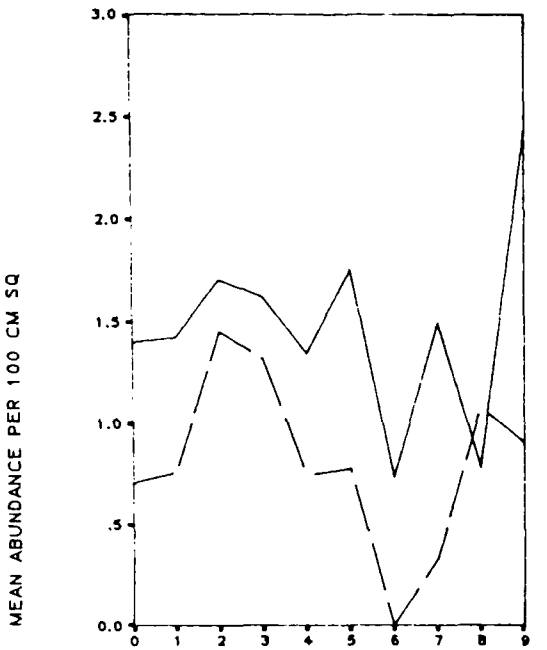


FIGURE 9 (Cont'd)

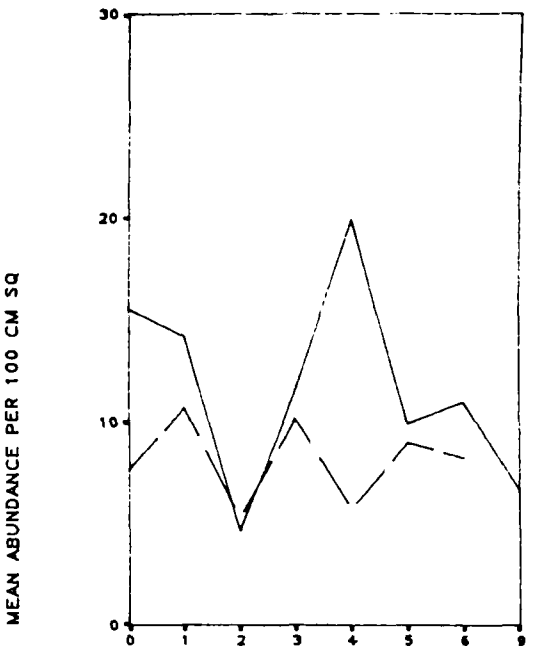
LAB–FIELD CONTROL COMPARISONS TESTS 1–7

GUILD: PREDATOR, CARNIVORE, MOBILE BURROWER, WIDE DISPERSAL

APALACHICOLA BAY, FL



YORK RIVER, VA



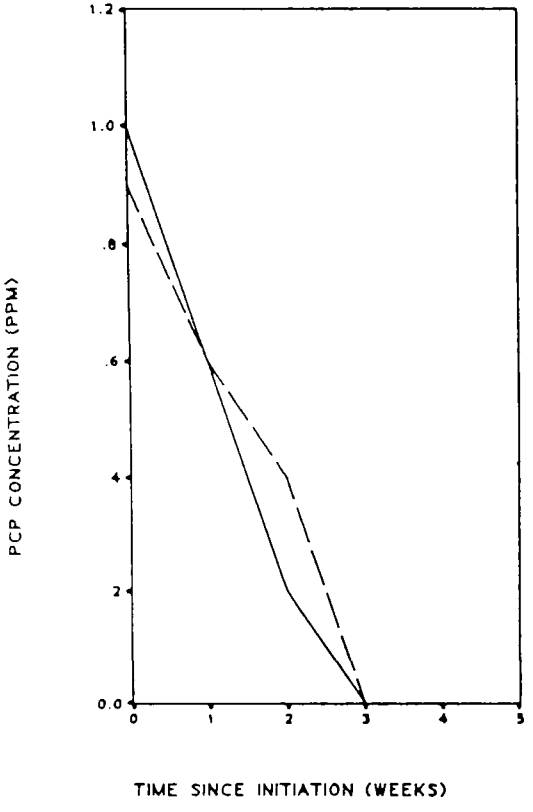
FIELD

LAB

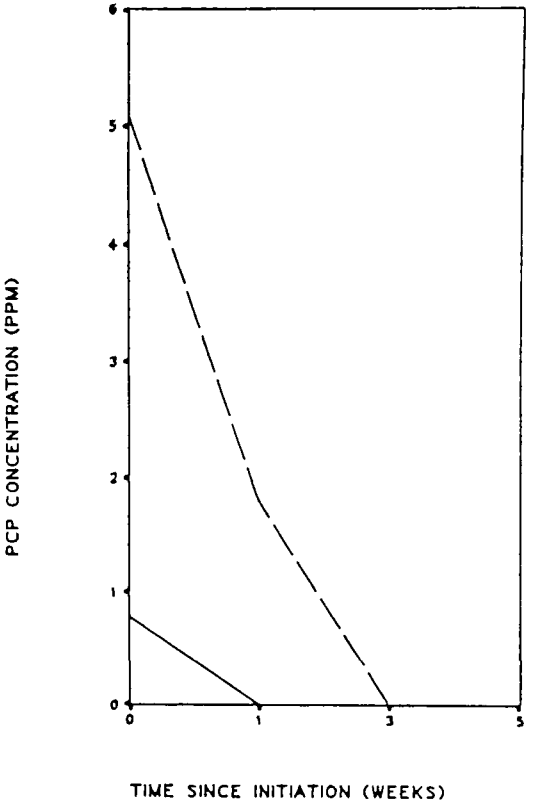
FIGURE 10A – LAB AND FIELD PCP LEVELS LOW DOSE

SPRING 1985

APALACHICOLA BAY, FL



YORK RIVER, VA



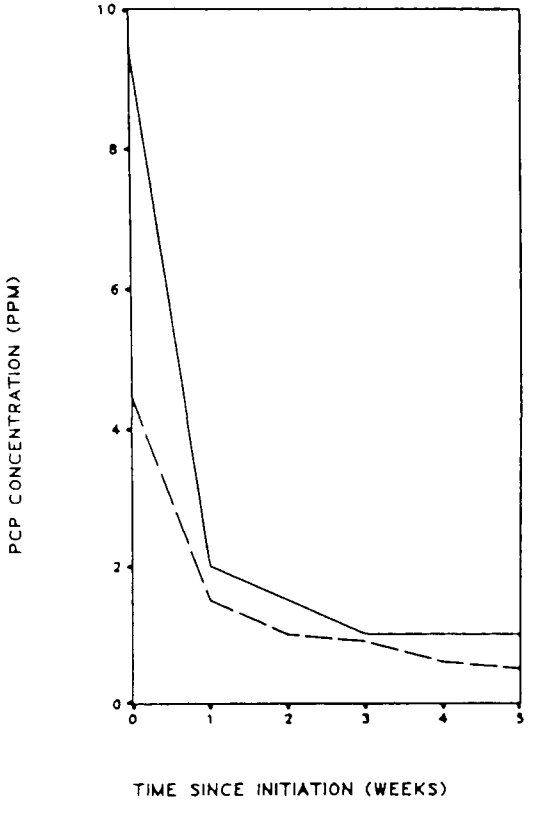
FIELD

LAB

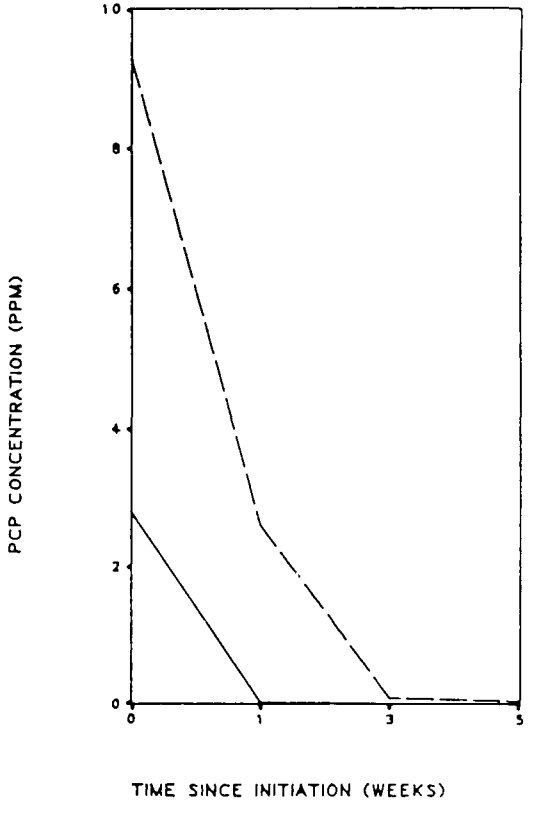
FIGURE 10B – LAB AND FIELD PCP LEVELS HIGH DOSE

SPRING 1985

APALACHICOLA BAY, FL



YORK RIVER, VA



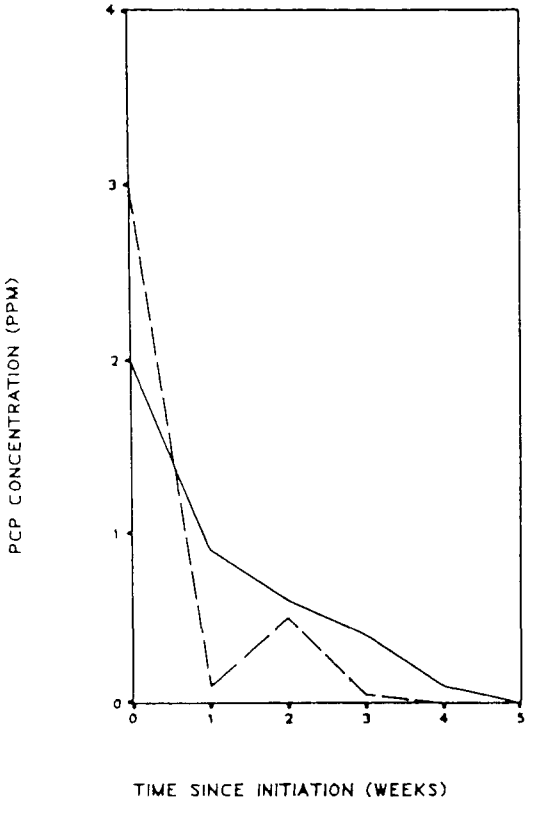
FIELD

LAB

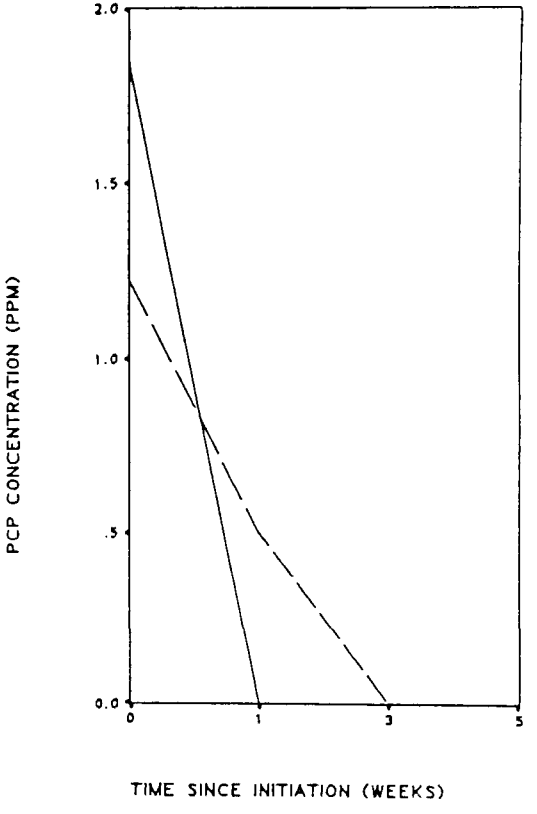
FIGURE 11A – LAB AND FIELD PCP LEVELS LOW DOSE

FALL 1985

APALACHICOLA BAY, FL



YORK RIVER, VA



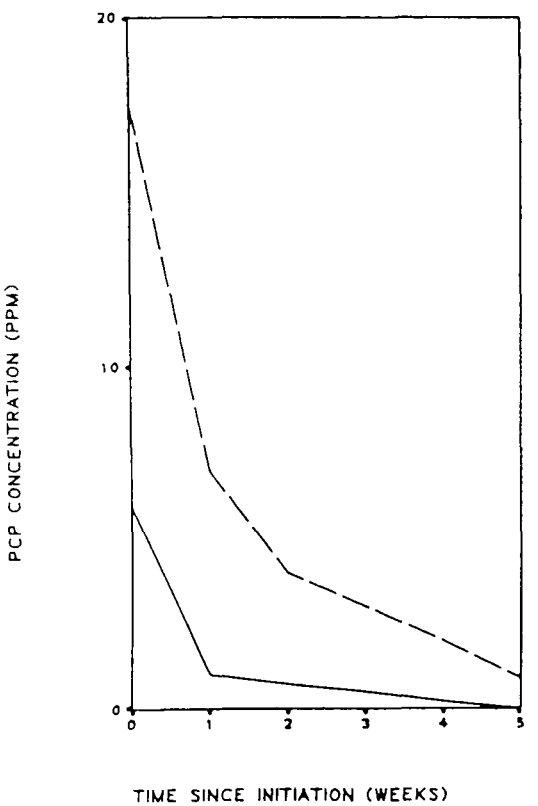
FIELD

LAB

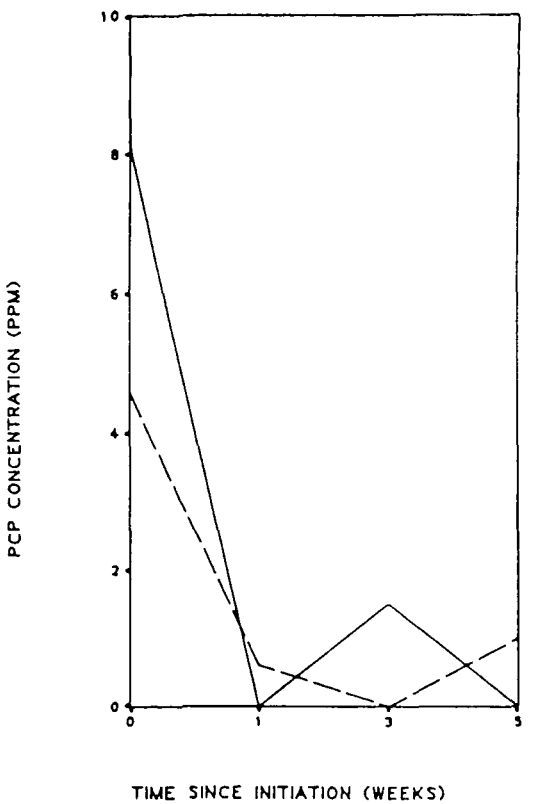
FIGURE 11B – LAB AND FIELD PCP LEVELS HIGH DOSE

FALL 1985

APALACHICOLA BAY, FL



YORK RIVER, VA



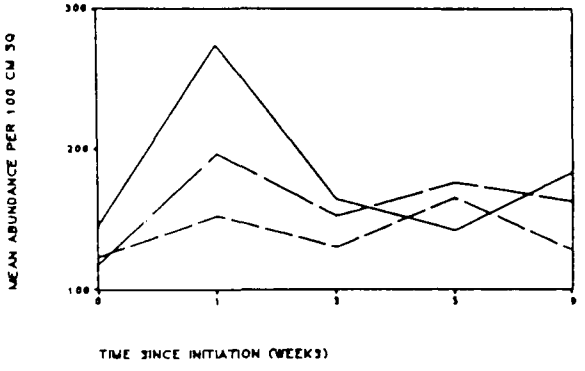
FIELD

LAB

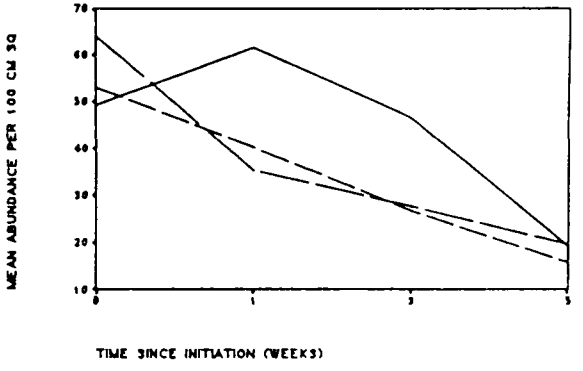
FIGURE 12 – RESPONSE TO PCP TOTAL MACROFAUNA·

SPRING 1985

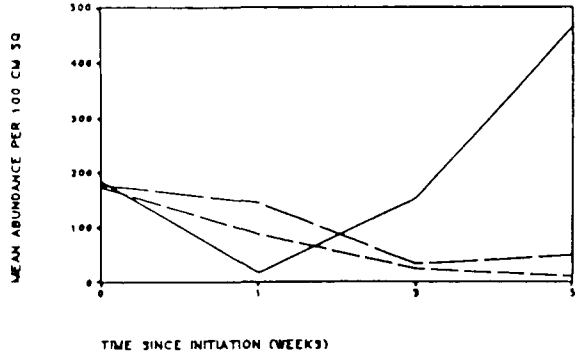
APALACHICOLA BAY, FL – FIELD



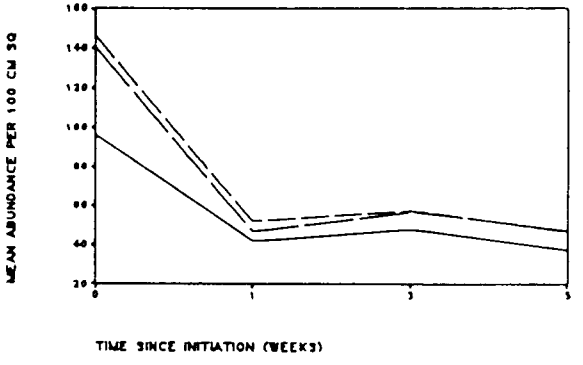
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

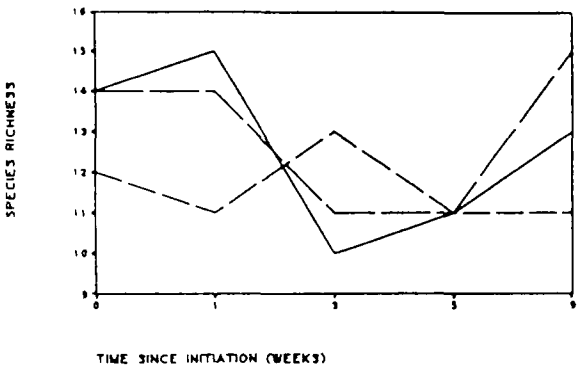
LOW DOSE

HIGH DOSE

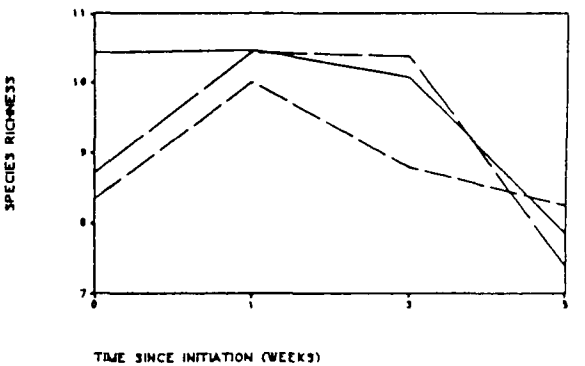
FIGURE 13 – RESPONSE TO PCP SPECIES RICHNESS

SPRING 1985

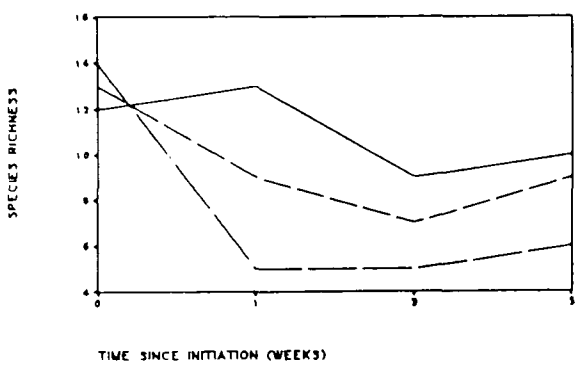
APALACHICOLA BAY, FL – FIELD



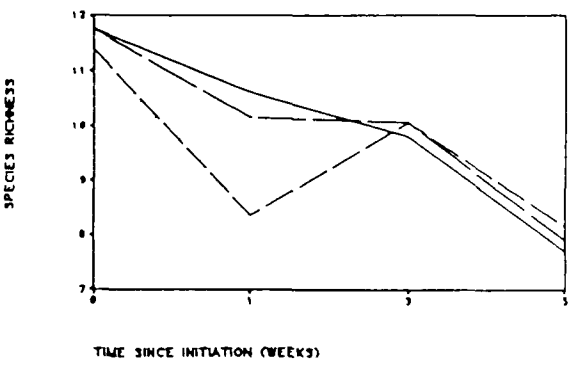
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

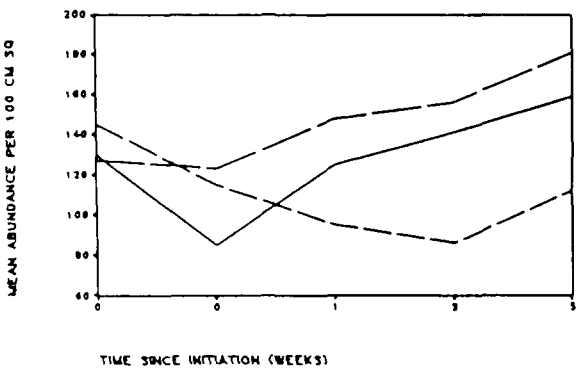
LOW DOSE

HIGH DOSE

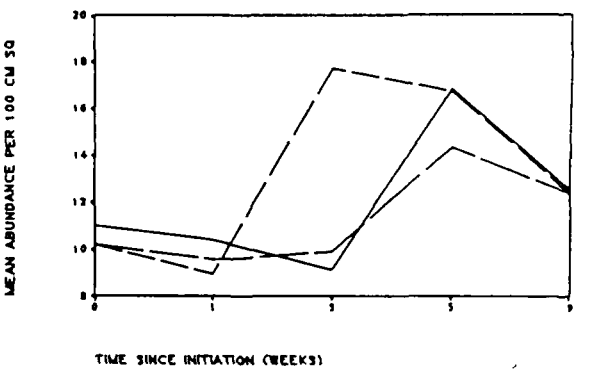
FIGURE 14 – RESPONSE TO PCP TOTAL MACROFAUNA

FALL 1985

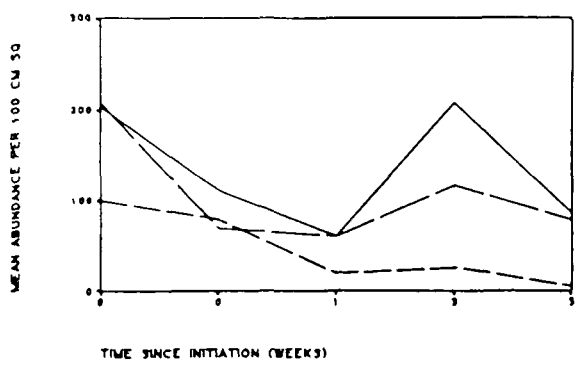
APALACHICOLA BAY, FL – FIELD



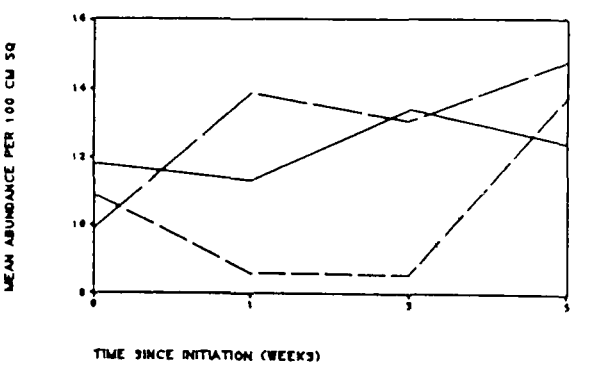
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

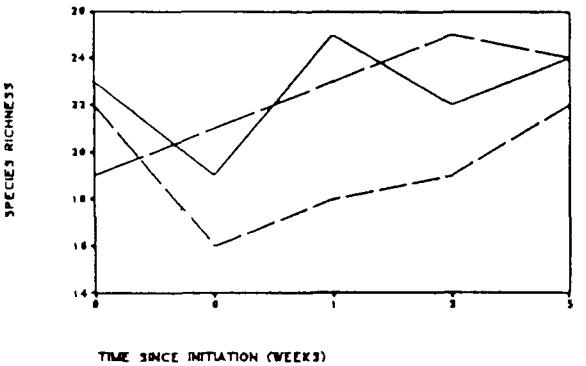
LOW DOSE

HIGH DOSE

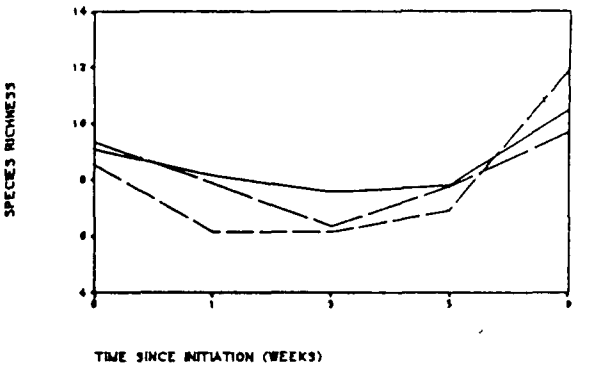
FIGURE 15 – RESPONSE TO PCP SPECIES RICHNESS

FALL 1985

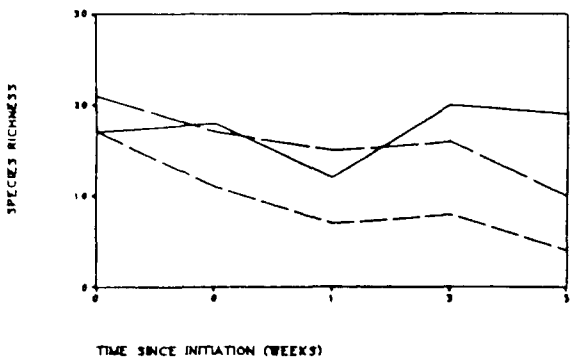
APALACHICOLA BAY, FL – FIELD



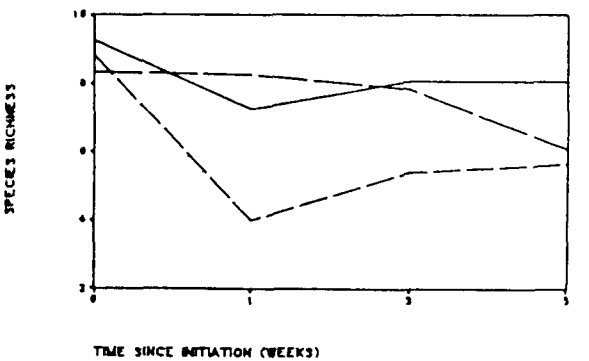
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

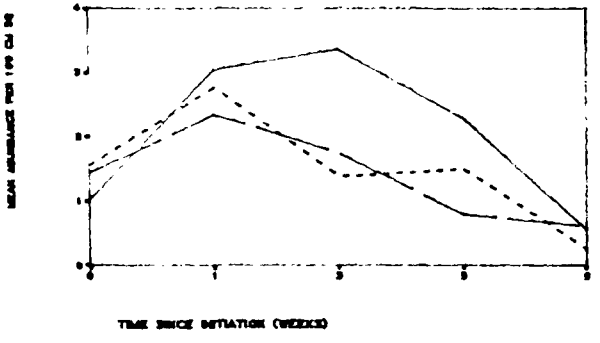
LOW DOSE

HIGH DOSE

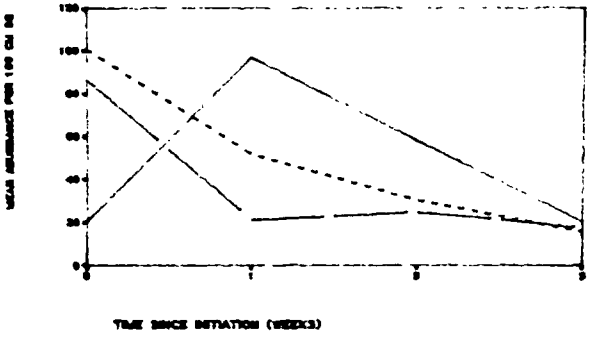
FIGURE 16 – RESPONSE TO PCP SPRING 1985

GUILD: PREDATOR, CARNIVORE, MOBILE BURROWER, LIMITED DISPERSAL

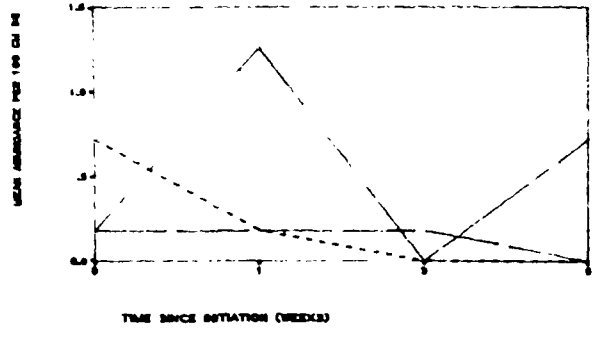
APALACHICOLA BAY, FL – FIELD



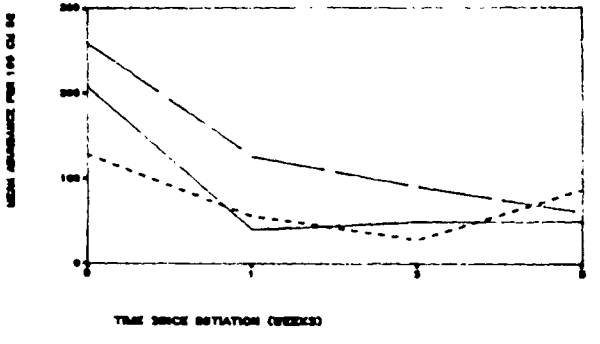
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

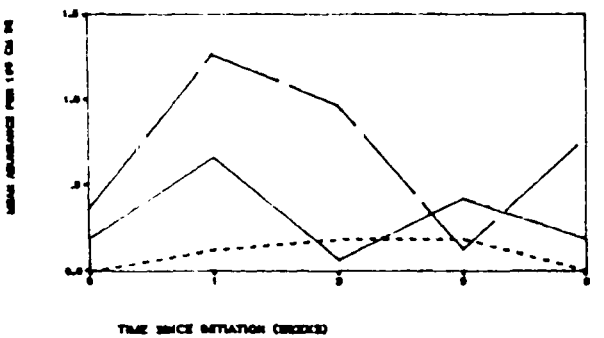
LOW DOSE

HIGH DOSE

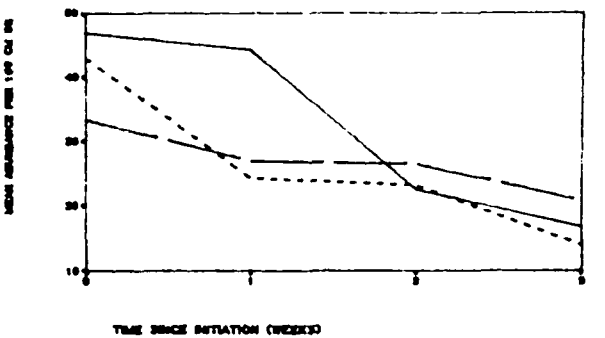
FIGURE 16 – RESPONSE TO PCP SPRING 1985

GUILD: SCAVENGER, DETRITIV/OMNIV, MOBILE EPIFAUNA, LIMITED DISPERSAL

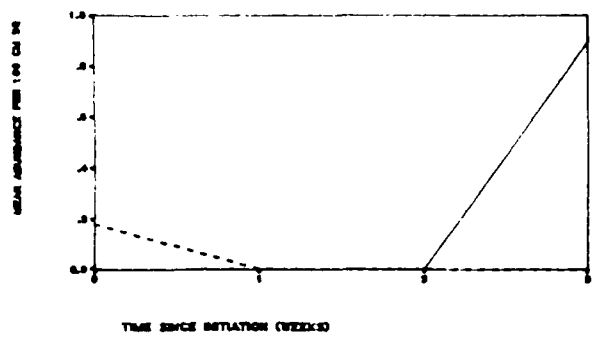
APALACHICOLA BAY, FL – FIELD



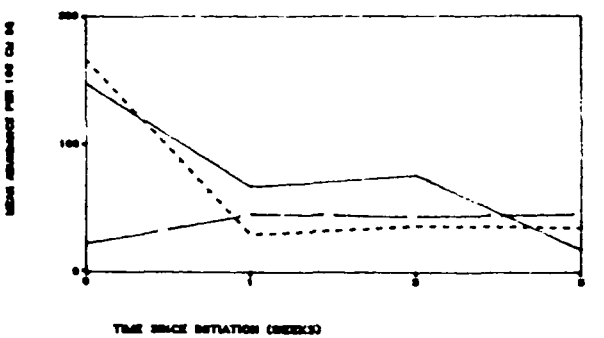
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

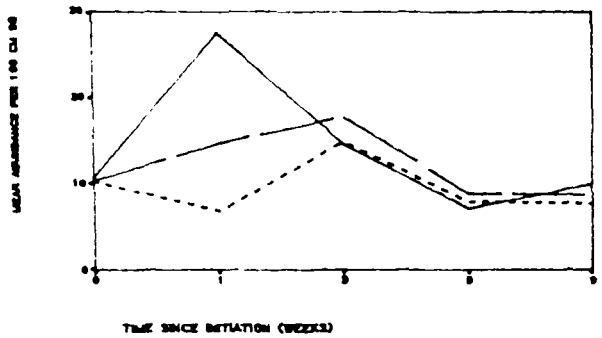
LOW DOSE

HIGH DOSE

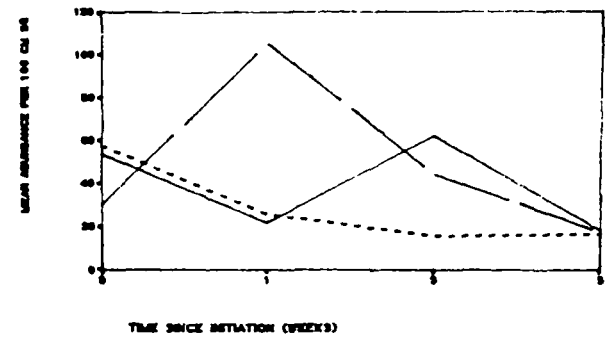
FIGURE 16 – RESPONSE TO PCP SPRING 1985

GUILD: DEPOSIT–FEEDER, DETRIV/OMNIV, MOBILE BURROWER, WIDE DISPERS

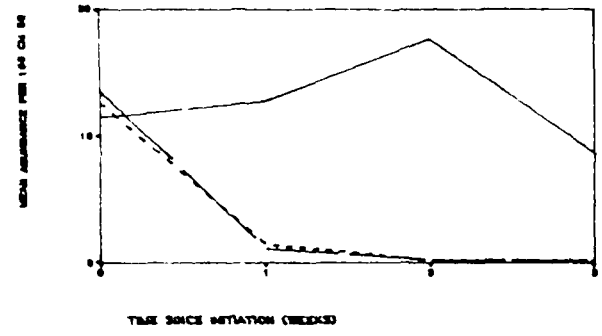
APALACHICOLA BAY, FL – FIELD



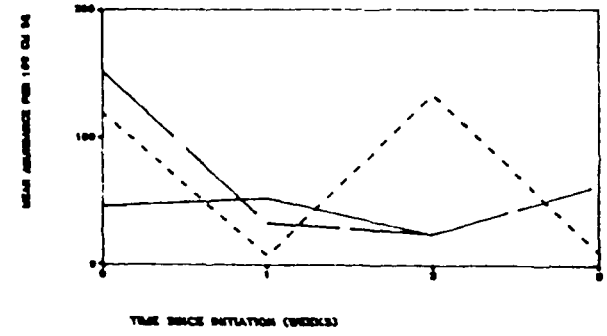
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

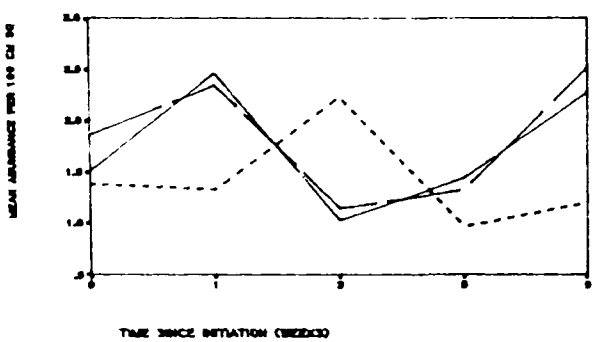
LOW DOSE

HIGH DOSE

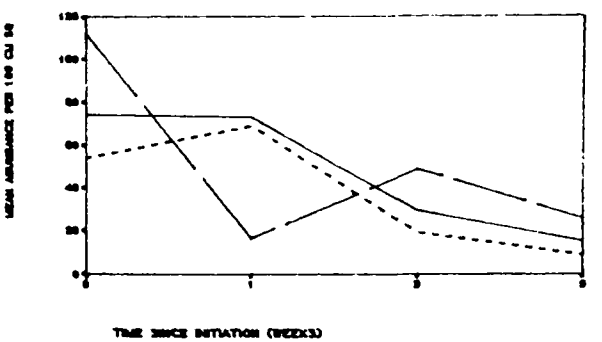
FIGURE 16 – RESPONSE TO PCP SPRING 1985

GUILD: INTERFACE–FEEDER, DETRIV/OMNIV, MOBILE TUBE–BLD, LIMITED DISPERS

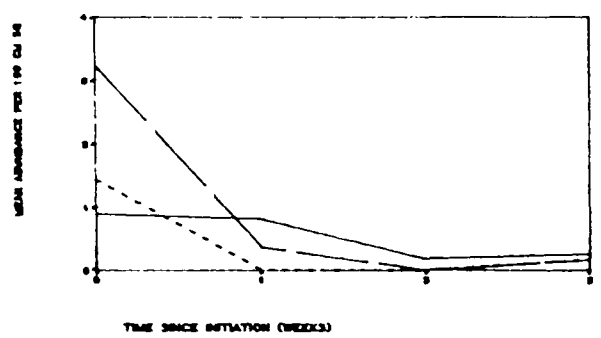
APALACHICOLA BAY, FL – FIELD



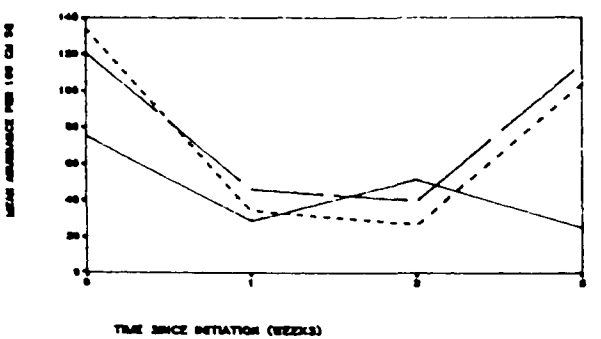
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

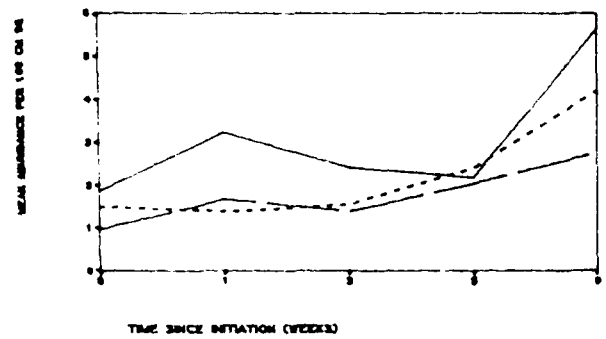
LOW DOSE

HIGH DOSE

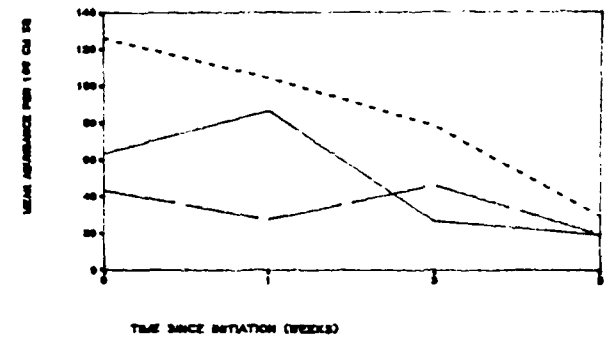
FIGURE 16 – RESPONSE TO PCP
SPRING 1985

GUILD: INTERFACE–FEEDER, DETRIV/OMNIV, MOBILE BURROWER, LIMITED DISPERS

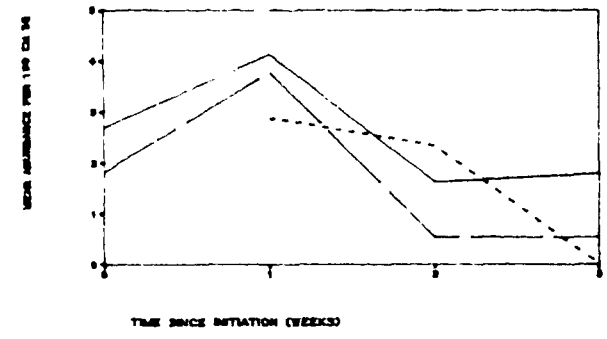
APALACHICOLA BAY, FL – FIELD



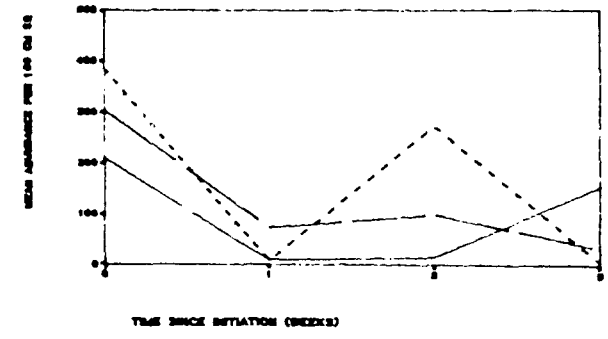
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

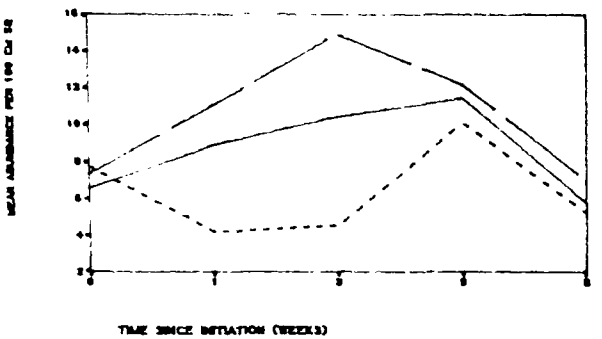
LOW DOSE

HIGH DOSE

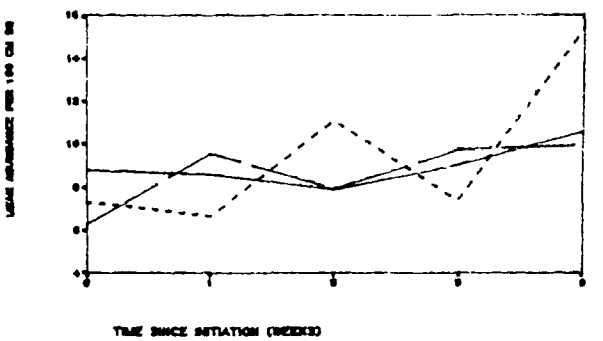
FIGURE 17 – RESPONSE TO PCP
FALL 1985

GUILD: DEPOSIT–FEEDER, DETRIV/OMNIV, MOBILE BURROWER, WIDE DISPERS

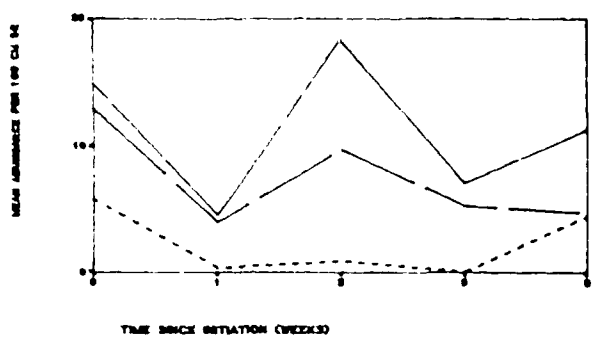
APALACHICOLA BAY, FL – FIELD



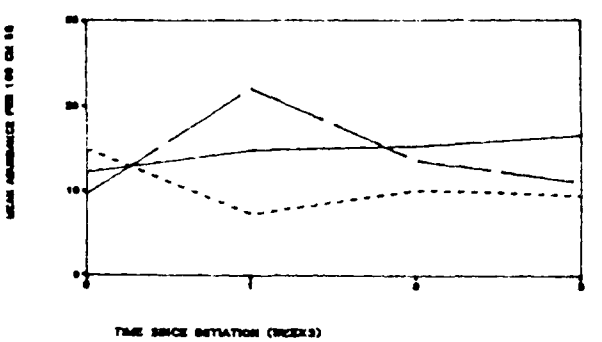
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

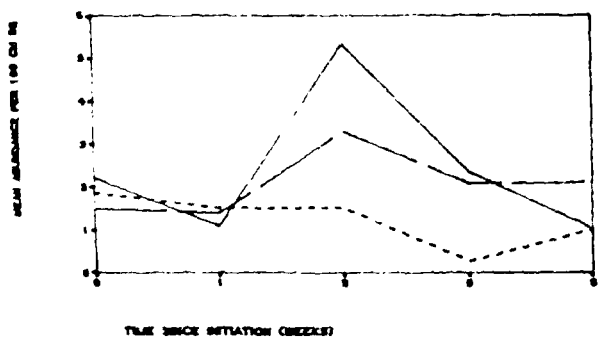
LOW DOSE

HIGH DOSE

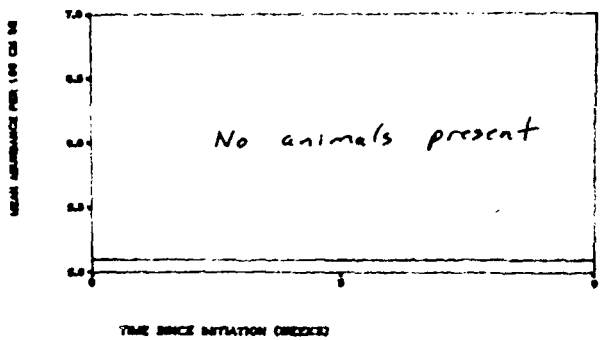
FIGURE 17 – RESPONSE TO PCP
FALL 1985

GUILD: INTERFACE–FEEDER, DETRIV/OMNIV, MOBILE BURROWER, LIMITED DISPERS

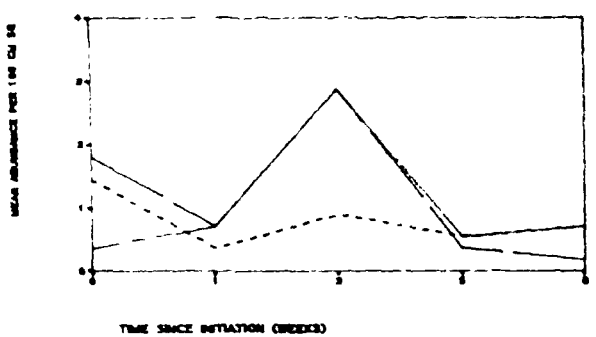
APALACHICOLA BAY, FL – FIELD



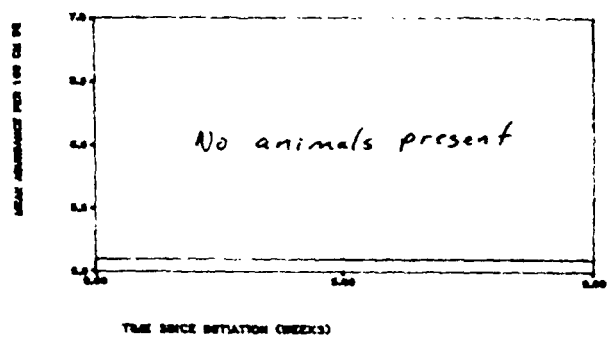
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

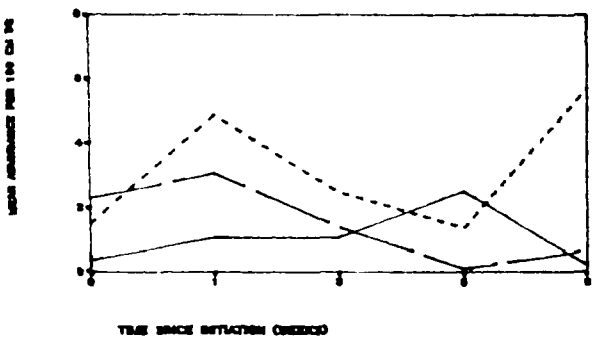
LOW DOSE

HIGH DOSE

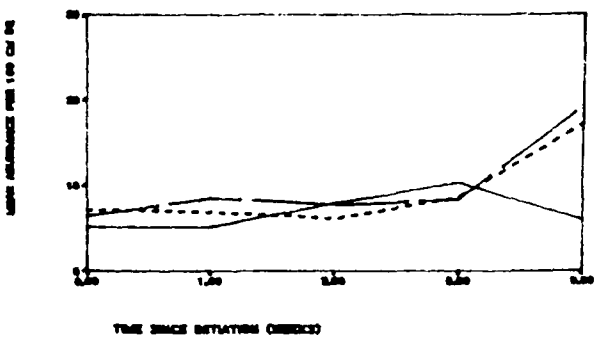
FIGURE 17 – RESPONSE TO PCP
FALL 1985

GUILD: PREDATOR, CARNIVORE, MOBILE BURROWER, LIMITED DISPERSAL

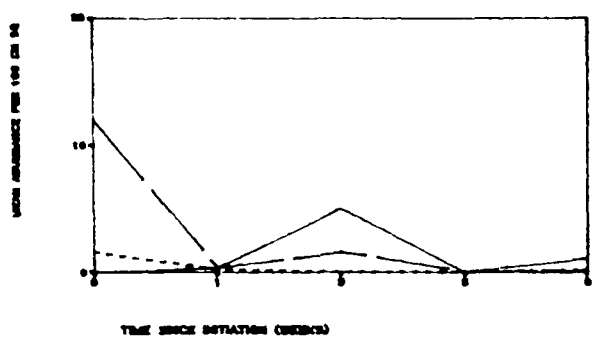
APALACHICOLA BAY, FL – FIELD



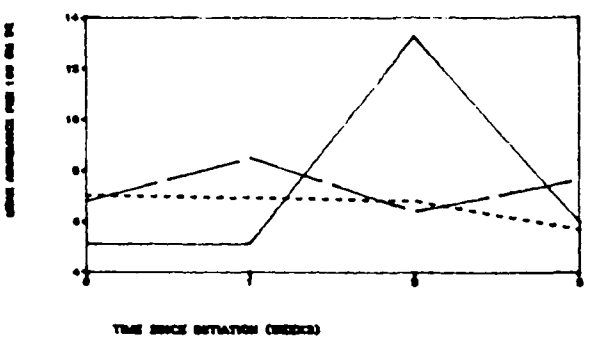
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

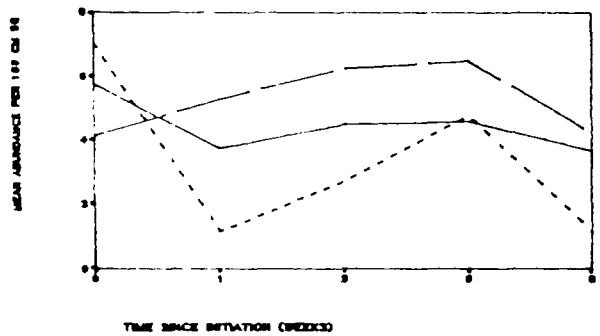
LOW DOSE

HIGH DOSE

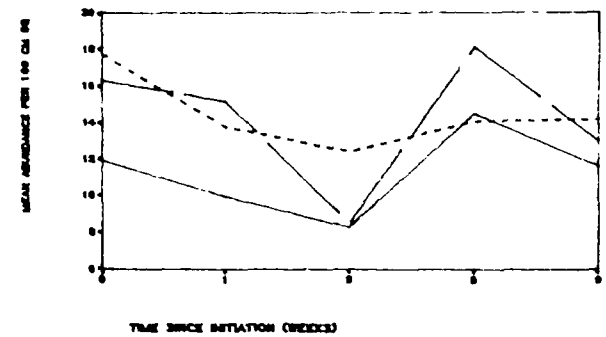
FIGURE 17 – RESPONSE TO PCP
FALL 1985

GUILD: INTERFACE–FEEDER, DETRIV/OMNIV, MOBILE TUBE–BLD, LIMITED DISPERS

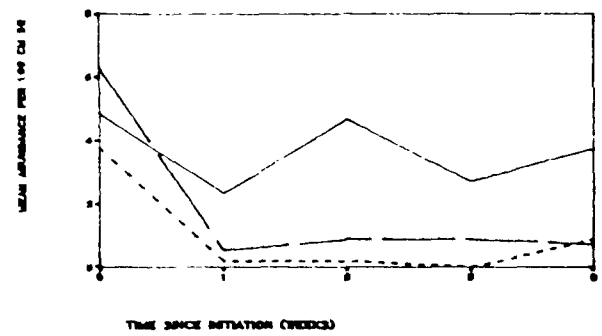
APALACHICOLA BAY, FL – FIELD



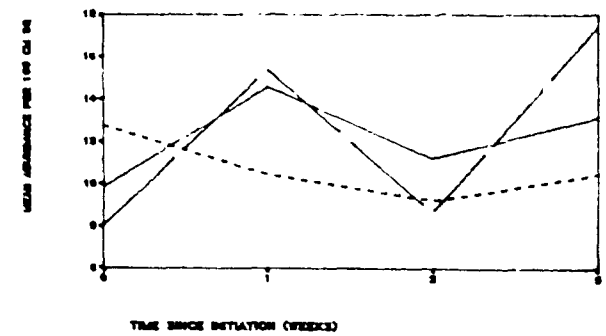
YORK RIVER, VA – FIELD



APALACHICOLA BAY, FL – LAB



YORK RIVER, VA – LAB



CONTROL

LOW DOSE

HIGH DOSE