THE BENTHIC COMMUNITY OF OFFSHORE SAND BANKS: A LITERATURE SYNOPSIS OF THE BENTHIC FAUNA RESOURCES IN POTENTIAL OUTER CONTINENTAL SHELF SAND MINING AREAS

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THE BENTHIC COMMUNITY OF OFFSHORE SAND BANKS: A LITERATURE SYNOPSIS OF THE BENTHIC FAUNA RESOURCES IN POTENTIAL OUTER CONTINENTAL SHELF SAND MINING AREAS

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Cover Photo:
A digital image of the asteroid of the family Goniasteridae taken on a sand bottom at 95 m depth on the North Florida continental shelf, Gulf of Mexico, photo #3188-001, USGS CEC Cruise TM-2002-01.

Project Cooperation

This study was undertaken to meet information needs identified by the Department of the Interior, U.S. Geological Survey (USGS), Outer Continental Shelf Ecosystem Program in concert with the Minerals Management Service (MMS). It was undertaken collaboratively by USGS and the University of South Florida.

Disclaimer

This report was prepared under the direction of, and in collaboration with, the Florida Integrated Science Center, Center for Aquatic Resource Studies, of the USGS. This report has been technically reviewed by USGS and MMS, and has been approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the USGS or MMS, nor does mention of trade names or commercial products constitute endorsement or recommendation for future use.

Report Availability

This report is also available as a downloadable Adobe© .pdf and .html formats from the Florida Integrated Science Center Website at http://cars.er.usgs.gov/coastaleco/

Copies of this report in CD format may also be obtained from:

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Literature Database

Information on study sites, collection methods, results, and overall conclusions were extracted from relevant literature sources and organized into a database program The database used was ProCite© 5 designed by Thomson ISI Researchsoft, a literature reference database creation program. The ProCite database was named "Benthos Database" and is organized by the author's last name. The main database screen displays the author(s) name, title, date, and key words upon opening. This main screen can be sorted and searched. The workform used for each record in the database was created specifically by the authors at USGS and is called MMS-Benthos. The MMS-Benthos workform contains a searchable "notes" field which contains summary information for each record in the database.

Benthos Database Availability

A complete copy of the database in Microsoft® Word 2002 format is provided in Appendix A of this report. The database is also available as a downloadable Adobe© .pdf and .html formats from the Florida Integrated Science Center Website at http://cars.er.usgs.gov/coastaleco/

Copies of the Benthos Database and MMS-Benthos workform are available in CD format and may be obtained from:

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PURPOSE

Benthic habitat on the United States continental shelf of the Atlantic coast and Gulf of Mexico is not a homogeneous region of flat mud habitat, but also contains natural bathymetric highs including ridge and shoal features. Many of these ridge/shoal features (e.g., Heald Bank, Sabine Bank, Ship Shoal) are sand banks which have already been identified as containing exploitable deposits. For example, it is estimated that Ship Shoal, located off of Louisiana, contains 1.6 billion cubic yards of sand appropriate for renourishment and stabilization projects (Research Planning, Baird Associates & Applied Marine Services, 2001). As nearshore reserves become depleted, offshore sand resources are becoming more important and proposed projects to use these sediments call for a range of a hundred thousand to several million cubic yards of sand to be taken (EMSAGG, 2003). In 2002, the Minerals Management Service (MMS) received requests for 15 million cubic meters of sand to be used for projects off of Florida, Louisiana, Maryland, South Carolina, and Virginia (EMSAGG, 2003). Sediments mined from offshore sources are being used to keep up with increased beach renourishment cycles, repair storm damage, prevent erosion, and prevent wetland loss due to anthropogenic alteration and sea level rise (Research Planning, Baird Associates & Applied Marine Services, 2001).

The Minerals Management Service (MMS) Leasing Division has the responsibility for determining the impact of mineral resource development excluding oil, gas, or sulfur. Before offshore sand resources are exploited, MMS is tasked with creating a synopsis which details not only what background information is known about potential sand mining areas but also what important information has not yet been collected. The U.S. Geological Survey (USGS), as part of a continuing long term policy to help address MMS information needs in the region, will undertake research to address those topics to provide an integrated basis of understanding of structure and function of key biological communities. This review serves as background information that MMS and others can utilize to estimate both the potential direct and indirect impacts of any proposed removal activities to natural sand banks on the Gulf of Mexico or U.S. Atlantic shelf. Direct impacts, potentially the most recognizable and easily detectable, include the actual removal of infauna and changes in sediment topography. Indirect impacts include those that affect both recolonization of the original benthic community (e.g., changes in sediment grain size) and higher trophic levels (e.g., fish response to changing prey) (Research Planning, Baird Associates & Applied Marine Services, 2001).

BACKGROUND

Sand areas on the outer continental shelf provide habitat for many benthic infaunal organisms (e.g., polychaetes, bivalves, amphipods) and epibenthic (e.g., crabs, gastropods) invertebrates (Hobbs, 2002; Posey et al., 1998). Species diversity and abundance are comparable to nearshore and intertidal areas (Posey et al., 1998). Along the continental shelf, the distribution of benthos may not be uniform, but rather patchily distributed. For example, Cutter and Diaz (2000) found the quality of benthic habitat to be higher in structured versus homogeneous sand areas. Part of this patchiness may be explained by microhabitat differences created by ridge and shoal structures (Sisson et al., 2002) which provide distinctive habitats in an otherwise structureless bottom. Raised sand banks provide unique microhabitat based upon a combination of sediment grain size and energy regime (Bergen et al. 2001). Thus differences in the resident benthic community may exist between areas on the bank, in the surrounding areas, and in the ecotone between the bank and surrounding areas. Previous work off of the U.S. East Coast supports this hypothesis (Hobbs, 2002). If differences in the spatial distribution of benthic biomass could be explained based upon microhabitat features, it has implications to predicting not only benthos distribution but the organisms that reply upon them as a food or structural resource as well.

Many finfish species settle out onto sand banks as juveniles and exploit sandy shoal areas for both habitat and feeding purposes. For example, juvenile red snapper have been found to utilize low-relief habitat (Szedlmayer and Conti, 1999) where their diet is dominated by small crustaceans common to sand sediments (Dr. William Patterson-University of West Florida, pers. comm.). Other resident fishes, such as flatfish (e.g., flounder, sole) reside in sandy areas for their entire life cycle. Flatfishes tend to undergo an ontogenetic shift in their diet. As juveniles, flatfish feed primarily upon annelids, switching to crustacean and bivalve prey as they increase in size (Rijnsdorp and Vingerhoed, 2001). The presence of benthic assemblages is important not only as food but also for the sediment stabilization and biogenic structure they provide. Tube, mound, and burrow construction by invertebrates provides a distinct habitat and many juvenile fish have been found to associate with such biogenic structures to avoid predation (Kaiser et al., 1999). Thus, any alterations to resident benthic or epibenthic invertebrate communities could have both trophic and habitat effects.

Benthic infaunal invertebrate communities can be broken down into macrofauna (>0.5 mm) and meiofauna (0.063 - 0.5 mm) components and generally have a relatively low mobility compared to nekton. Benthic infauna are directly tied to the substrate in which they live and thus, benthic communities are highly susceptible to anthropogenic activities such as sand mining which may either directly or indirectly alter the sediment environment. One direct effect of sand dredging is the actual removal all of the infaunal organisms within the immediate area. High recruitment back into the disturbed area can lessen the impact to higher trophic levels and restore a stable community. For this reason, it has been suggested that seasonal considerations are made before any dredging is performed. For example, Hobbs (2002) recommends that sand mining off of the coast of Maryland and Delaware take into account higher infaunal recruitment rates during spring and summer. Isolated disturbed areas have restricted recovery as only opportunists persist such as errant polychaetes, mobile amphipods, and scavenging isopods with recolonization by large sedentary fauna (e.g., bivalves) restricted (Hacking, 2003). Thus, a second suggestion in ameliorating the effects of dredging via increased recolonization is to leave undisturbed "islands" during sand removal activities (Byrnes et al., 1999, Hobbs, 2000, Hobbs, 2002). If islands are left they may serve as a colonizer source allowing rapid return of the original community. Other potential direct effects of sand dredging include changes in grain size, bathymetry (Drucker et al., 1995), and shear stress (Hobbs, 2002) which may alter the faunal community recruiting into the disturbed area, possibly preventing a return of the original community.

Dredging of sediment resources can also have indirect effects. Changes in sediment parameters (i.e., grain size, organic content) may create long term changes in sediment suitability leading to a change in species composition (Hacking, 2003). Sediment resuspension is another indirect effect that can impact not onlythe immediate benthic community but also the surrounding community structure due to differential susceptibility of fauna to either burial of adults/recruits (Miller et al., 2002), and/or prevention of effective suspension feeding (Rhoads and Young, 1970). A change in the resident benthic community may then have indirect impacts to higher trophic levels which are dependent upon benthos composition for its resource value (Kenny & Rees, 1996). Small changes in habitat quality or resource value that affect either the growth and/or survival of juvenile fishes may have eventual large impacts on fish population size (Diaz et al. 2003).

GOAL AND OBJECTIVES

GOAL

The goal of this synopsis was to synthesize the state of knowledge and identify gaps in the current understanding of the dominant benthic assemblages of natural sand bank areas on the U.S. East and Gulf Coast Continental Shelf.

OBJECTIVE A

Synthesize the existing scientific literature on the dominant offshore benthic assemblages residing along the U.S. East and Gulf of Mexico continental shelf. Additionally, highlight data deficiencies or questions that remain to be answered. Fulfillment of this objective provides a synthesis of biological information for assessing the complications and/or benefits of dredging in specific areas.

OBJECTIVE B

Synthesize existing literature which links the dominant offshore benthic assemblages identified in Objective A to particular sediment types and bathymetry. Knowledge of the sediment type and bathymetry of an area could be used to estimate the type of communities that are likely to be present if consistent relationships exist. One concern of MMS is the ability to prepare an adequate environmental assessment in areas where a site-specific study has not been conducted.

OBJECTIVE C

Examine existing literature which identifies the effects of sand dredge/mining activities on the dominant offshore benthic assemblages identified in Objective A. Special attention will be given to estimates of recovery time for benthic assemblages post anthropogenic impact.

OBJECTIVE D

Organize all of the scientific literature collected for Objectives A-C into a ProCite database. The assembled ProCite database provides scientists access to an easily searched database providing data for informed management decisions.

METHODS

The collection of information regarding benthos community structure, abundance, and biomass at potential offshore sand mining areas was carried out using standard Internet search engines, electronic databases, and individual library searches. Internet search engines were used to search for information available at the level of individual state agencies, and focused on information that was either unpublished or generally unknown outside of the specific agencies themselves.

That information was secured through personal contact with agencies whenever possible. In addition, thirteen electronic databases (Table 1) were searched with a series of key words used as search parameters. At least thirteen key words (Table 2) were used in an intensive search of each database, either alone or in combination with one another. Relevant sources were either obtained at specific libaries (i.e., University of South Florida, USGS FISC-CARS), or through interlibrary loan. The research library at Mote Marine Laboratory, Sarasota, Florida, USA, was also searched for pertinent reports. Additionally, the literature cited section of each acquired study was reviewed for any pertinent literature not found through the other search methods.

Table 1. A list of the electronic literature databases searched for pertinent records of benthic assemblages and dredging impacts.

Electronic Literature Databases
Aquatic Sciences
Aquatic Sciences & Fisheries Abstracts
BioOne
Cambridge Scientific Abstracts
Current Contents (ISI)
Dissertation Abstracts
Ecology Abstracts
First Search
GeoBase
National Technical Information Service (NTIS)
Ocean Abstracts
Web of Science (ISI)
Zoological Record

In deciding which papers were relevant to include in the review, emphasis was given to literature with a focused study area within federal waters (i.e., 3 nautical miles or greater offshore for all coastal states except 5 for Texas and Florida). Specifically, literature was selected which provided general benthic invertebrate community structure information in offshore areas in the Gulf of Mexico and western Atlantic Ocean (U.S. East Coast) as well as any impacts of dredging operations on offshore benthic communities. Some nearshore studies, and a few of estuarine nature, were included if their specific focus was on the impacts of dredging.

Relevant information on study sites, collection methods, results, and overall conclusions was extracted from each source and organized into the ProCite© 5 program designed by Thomson ISI Researchsoft, a literature reference database creation program. The ProCite database was organized by the author's last name, with the main database screen displaying the author(s) name, title, date, and key words upon opening. The main screen can be sorted and searched. Each entry also contains a searchable "notes" section. The first part of the notes section details what type of study it was (ecological survey, experimental, or literature review), the geographic area in which the study was conducted, the relative scale of the study (m-kms), the average depth range of the study, the benthos collection method (e.g., sample processing, sieve size) utilized, the environmental data (water parameters) collected, the habitat parameters (e.g., sediment particle size, habitat type) collected, and the sampling season of collection. The second part of the notes section details the major findings of each study. When available, the summary included information on dominant taxa in terms of abundance, dominant taxa in terms of biomass, spatial distribution patterns, environmental parameter correlations, habitat parameter correlations, indications of post-disturbance fauna recovery times, indications of any long-term differences between impacted versus non-impacted areas, details about dredging operations, and any general notes pertinent to the objectives of this review.

Table 2. A list of the key words used, either alone or in combinations, to search the electronic literature databases shown in Table 1.

Key Words
Benthic Assemblages
Benthos
Continental Shelf
Deposit Feeding
Dredging
Environmental Impact
Gulf of Mexico
Offshore
Prey Resources
Sand Banks
Sand Ridges
Suspension Feeding
Western Atlantic

The key words entered into the database were not extracted from published key words cited in the actual literature but were selected to standardize all records in the ProCite database. The chosen key words indicate the location of the study (northern East Coast, southern East Coast, eastern Gulf of Mexico, or western Gulf of Mexico), the state off of which the study was conducted, and type of study (experimental, survey, or review). Any study in which a manipulation was performed (e.g., sediment colonization boxes, planned sediment disposal) was designated as an experimental study. If the natural fauna within an area was sampled but no environmental manipulation was performed, the study was designated as a survey. Studies that synthesized the literature but did not provide any new data were designated as review papers. Additionally, if specific geographic coordinates were given for sample locations within the text then the key word "geographic coordinates" was selected for that entry into the database.

The information gathered was incorporated into data tables, in addition to ProCite, for final presentation, including spatially explicit information on distribution and comparison of dominant benthic assemblages within or near potential sand removal areas, correlations between benthic assemblages and sediment characteristics and/or bathymetry, post-dredging recovery times, and the resistance, resilience, or alternative states of dominant benthic assemblages in response to dredging impacts. Within the results section, the Gulf of Mexico and East Coast were divided into east-west and north-south regions to extract any regional differences. The Mississippi River marks the separation of regions in the Gulf, while on the East Coast, the northern region encompasses those states north of, and including, Delaware. Maryland and states to the south are considered the southern East Coast region. In addition, the numbers found in parentheses throughout the results text indicate a specific study, based upon the study reference numbers presented in Table 3. Lastly, current data gaps in information available on the impacts of sand/mining dredging to the benthic infaunal community are highlighted.

RESULTS

A. General Overview

One hundred and twenty-two annotated entries, spanning references from 1954-2003 and encompassing numerous peer reviewed journal articles and governmental reports, are included in the database (Table 3). Database entries emphasized the Gulf of Mexico and U.S. East Coast, although several papers were also included from locations outside these two areas (Appendix A). For the purpose of this report, only the results of those papers from the Gulf of Mexico and East Coast are analyzed, a total of 95 papers. Some papers are combinations of experimental type (Review/Survey, Survey/Experimental, etc.) or location (N/S East Coast or E/W Gulf of Mexico) (Table 3). The remaining papers were either studies which discussed general dredging effects and/or discussed dredging impacts from other countries.

Surveys were the most common type of study, representing over 50% of all of the papers in the database, and over 75% of the studies from the Gulf of Mexico and East Coast (Table 4). No survey studies included a comparison of fauna from the U.S. East Coast to the Gulf of Mexico. In the Atlantic, surveys were almost evenly divided between the northern and southern East regions. In the Gulf of Mexico, the majority of the surveys (64%) were exclusive to the area east of the Mississippi River. Additionally, five surveys spanned the review's pre-set geographical boundaries, with four of the surveys extending between the north and south East, and one survey conducted at sites in both the eastern and western Gulf of Mexico (Table 5).

Table 3. A listing of all studies included in the ProCite database, with an assigned reference number for each entry. These reference numbers will be used for annotation in the results section. When major taxa were discussed in the literature they were included in the table and if a taxon was cited as dominant, then it is underlined. More than one taxon was underlined if both a macrofaunal and meiofaunal component were discussed. The study type is listed for each study: Experimental (E), Review (R), or Survey (S). The location of each study along the United States East and Gulf Coast is listed: Northern East Coast (N), Southern East Coast (S), Eastern Gulf of Mexico (E), Western Gulf of Mexico (W), and Other (O). The depth of the study area is listed, when available. The sediment type is also listed, when available as: Boulder (B), Clay (Cl), Cobble (Co), Course (C), Fine (F), Gravel (G), Medium (Med), Mussels (Mus), Mud (M), Pebble (P), Quartz (Q), Sand (Snd), Shell (Sh), Silt (Slt), and Stone (St). An X indicates that the data were not available upon review.

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
1	Alexander et al.	1981	Annelids: <u>Polychaetes</u> Crustaceans: Copepods <u>Nematodes</u>	R	W	X	X
2	Applied Coastal Research & Engineering Inc.	2000	Annelids: <u>Archiannelids</u>, Polychaetes Crustaceans: Amphipods, Tanaids Molluscs: Bivalves	S	N	10-20	G Snd M/Slt
3	Auster et al.	1991	Crustaceans: Decapods	S	N	712	Slt Cl Snd
4	Barry A. Vittor & Associates Inc.	1985	Annelids: Archiannelids, Polychaetes Crustaceans: Amphipods, Decapods Echinoderms: Echinoids, Ophiuroids Molluscs: Bivalves Hemichordate	R	E	4-200	M Snd Snd/M

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
5	Bedinger	1981	Annelids: Polychaetes Crustaceans: Decapods Echinoderms: Asteroids Foraminifera Molluscs: Bivalves, Gastropods Nematodes Sipunculans	S	W	X	X
6	Bergen et al.	2001	Annelids: Polychaetes Brachiopods Crustaceans: Amphipods, Cumaceans, Ostracods Echinoderms: Ophiuroids Molluscs: Bivalves Phoronids	S	O	10-200	F C
7	Berryhill	1977	Polychaetes	S	W	18-134	Snd
8	Blake	1978	Molluscs	S	E	20-800	X
9	Blake et al.	1996	Annelids: Polychaetes Crustaceans: Decapods Echinoderms: Echinoids Molluscs	S	E	5-6	X
10	Boesch	1973	Annelids	S	S	3-13	Slt/Cl F Snd Med Snd C Snd
11	Boesch	1979	Annelids: Polychaetes Crustaceans: Percarids Echinoderms Molluscs	S/E	N/S	X	F Med C

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
12	Boesch et al.	1977	Anthozoans: Cerianthids, Zoantharians Crustaceans: Decapods Echinoderms: Asteroids, Echinoids Molluscs: Bivalves, Gastropods	S	N/S	X	F Slts C Snd
13	Bowen & Marsh	1988	Annelids: Polychaetes Bryozoans Crustaceans: Amphipods Molluscs: Bivalves	S	S	X	X
14	Bradshaw et al.	2001	X	E	O	1–40	X
15	Burlas et al.	2001	Annelids: Archiannelids, Polychaetes Crustaceans: Amphipods, Tanaids Nemerteans: Rhynochocoels	S	N	10–20	X
16	Byrnes et al.	1999	Annelids: Polychaetes Cephalochordates Molluscs: Gastropods	E	E	X	X
17	Byrnes et al.	2003	Annelids: Archiannelids, Polychaetes Crustaceans: Amphipods	S	S	10-20	Snd G
18	Caracciolo & Steimle	1983	X	R	N	9-45.6	X
19	Carney	1993	Annelids: Polychaetes	R	E/W	X	X
20	Cerame-Vivas & Gray	1966	Crustaceans: Amphipods, Decapods Echinoderms: Asteroids, Echinoids Molluscs: Bivalves	S	S	1.5-18	X
21	Chang et al.	1992	Annelids Anthozoans Crustaceans Molluscs	S	N	X	F Med C

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
22	Chicharo et al.	2002	Annelids: Polychaetes Crustaceans: Copepods Molluscs: Bivalves Nematodes	S	O	7–9	Snd
23	Collard & D'Asaro	1973	Anthozoans Annelids: Polychaetes Crustaceans: Decapods Echinoderms Molluscs: Bivalves, Gastropods	R	E	10-200	M
24	Collie et al.	1997	Annelids: Polychaetes Crustaceans: Decapods Echinoderms: Asteroids, Echinoids, Ophiuroids Molluscs: Bivalves, Gastropods	S	N	42-92	P/Co G B
25	Connor & Simon	1979	Annelids: Polychaetes	S	E	7	X
26	Continental Shelf Associates (CSA)	1987	Annelids: <u>Polychaetes</u> Crustaceans: Amphipods, Mysids, Tanaids Echinoderms Molluscs	S	E	20-25	X
27	CSA	1993	X	R	X	X	X
28	Cronin et al.	1998	Crustaceans: Ostracods Foraminiferans	S	S	X	X
29	Culter et al.	1992	Annelids: Oligochaetes, Polychaetes Cephalochordates Crustaceans: Amphipod, Copepod <u>Nematodes</u> Nemerteans	S	E	X	Slt F Snd C Snd

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
30	Culter & Mahadevan	1982	Annelids: Polychaetes Crustaceans: Amphipods, Decapods, Mysids Echinoderms: Echinoids Molluscs: Bivalves, Gastropods	S	E	X	F Snd Med Snd C Snd Q Snd
31	Culter	1988	Annelids: Polychaetes Crustaceans: Amphipods, Decapods Molluscs: Bivalves, Gastopods	S	E	X	X
32	Culter	1994a	Annelids: Polychaetes Crustaceans: Amphipods, Cumaceans Echinoderms Hemichordates Molluscs: Bivalves, Gastropods Nemerteans	S	E	X	F
33	Culter	1994b	Annelids: Oligochaetes, Polychaetes Crustaceans: Cumaceans Molluscs: Bivalves, Gastropods Nemerteans Turbellarians	S	S	10-17	X
34	Culter & Diaz	1998	Annelids: Polychaetes	S	S	X	X
35	Dauer	1980	Annelids: Polychaetes Crustaceans: Amphipods	S	S	18	X
36	De Grave &Whitaker	1999	Annelids: Polychaetes Crustaceans: Amphipods, Cumaceans Molluscs: Bivalves, Gastopods	S	O	1-3	Slt/Cl Snd Co
37	Defenbaugh	1976	X	S	E/W	18-183	X
38	Dolmer et al.	2001	Annelids: Polychaetes Crustaceans: Decapods Molluscs: Bivalves, Gastropods	E	O	7-7.4	M Mus

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
39	Emery & Uchupi	1972	Annelids: Polychaetes Crustaceans Echinoderms: Ophiuroids Molluscs: Pelecypods	R	N	X	Clay Sand
40	Emery et al.	1965	Annelids Bryozoans Crustaceans Echinoderms Molluscs	S	N	23-507	Slt Cl Snd G Bo
41	Environmental Science and Engineering Inc. et al.	1987	Annelids: <u>Polychaetes</u> Crustaceans: Amphipods, Cumaceans, Tanaids Molluscs: Bivalves	S	E	200	X
42	Escobar-Briones & Soto	1997	Annelids: Polychaetes Crustacans: Amphipods, Copepods, Decapods, Ostracods Echinoderms: Asteroids, Echinoids Foraminiferans Molluscs Nematodes	S	W	16-200	X
43	Finkl et al.	1997	X	S	E	5-14	X
44	Fitzhugh	1984	<u>Polychaetes</u>	S	W	10-40	X
45	Flint & Holland	1980	Annelids: <u>Polychaetes</u> Crustaceans: Copepods Molluscs: <u>Bivalves</u> Nematodes	S	W	22-131	Slt/Cl Snd/M
46	Flint & Rabalais	1981	Annelids: <u>Polychaetes</u> Crustaceans: Copepods <u>Nematodes</u>	S	W	10-182	

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
47	Giammona & Darnell	1990	Annelids: Polychaetes Molluscs: Bivalves	S	W	X	X
48	Hall-Spencer & Moore	2000	Molluscs: Bivalves	E	O	6-15	M Snd Mearl G
49	Harper	1990	Polychaetes	S	E	20-200	C Cl Sh Slt
50	Heard	1978	Crustaceans: Amphipods, Tanaids	S	E	20-800	X
51	Hildebrand	1954	Decapods	S	W	5-80	X
52	Hill et al.	1999	Annelids: Polychaetes Anthozoans Bryozoans Crustaceans: Amphipods, Cumaceans, Decapods, Isopods, Tanaids Echinoderms: Asteroids, Echinoids, Holothurians, Ophiuroids, Hydrozoans Molluscs: Bivalves, Cephalopods, Gastopods, Polyplacophorans, Scaphopods Urochordates: Ascidians	S	O	X	X
53	Hirsch et al.	1978	X	R	O/S	X	X

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
54	Hobbs	2000	Annelids: Oligochaetes, Polychaetes Arthropods Mollucs	S	N/S/	1–20	Slt F Snd C Snd G
55	Hobbs	2002	X	R	S	Shallow	X
56	Ivester	1978	Annelids: Polychaetes Crustaceans: Copepods Nematodes	S	E	20-800	X
57	Johnson & Nelson	1985	Annelids: Polychaetes Crustaceans: Amphipods, Cumaceans, Decapods, Isopods, Mysids Echinoderms Molluscs: Bivalves, Gastropods Nemerteans Sipunculans	S	S	7-10.5	Snd
58	Jones & Candy	1981	Annelids: Polychaetes Crustaceans: Amphipods Molluscs: Bivalves	S	O	2-21	M Snd
59	Jutte et al.	2002	Annelids: Oligochaetes, Polychaetes Crustaceans: Amphipods, Cumaceans Molluscs: Bivalves Nemerteans	S	S	Near-shore	Slt Cl Snd
60	Kaiser et al.	1999	Annelids: Polychaetes Crustaceans: Isopods Molluscs: Bivalves Sipunculans	E	O	26-34	Snd Sh G

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
61	Kenny & Rees	1996	Annelids: Polychaetes Crustaceans: Amphipods, Cumaceans, Decapods, Leptostracans, Cirripedia Echinoderms: Ophiuroids Molluscs: Bivalves, Gastropods, Polyplacophorans Nemerteans Urochordates: Ascidians	E	O	X	Snd G
62	Lewis et al.	2001	Annelids: Polychaetes Crustaceans: Dipteran Larvae	S	E	1-2	X
63	Lindegarth et al.	2000	Annelids: Polychaetes Echinoderms: Ophiuroids Molluscs: Bivalves	E	O	75-90	X
64	The Louis Berger Group Inc.	1999	Annelids: Polychaetes Crustaceans: Amphipods Molluscs: Bivalves, Gastropods	R	N	X	X
65	Lyons & Collard	1974	X	R	E	10-200	X
66	Mahadevan et al.	1976	Annelids: Polychaetes Crustaceans: <u>Amphipod</u> Molluscs: Bivalves	S	E	X	X
67	Mahadevan et al.	1984	X	R	E	X	X
68	Marsh et al.	1980	Annelids: Oligochaetes, <u>Polychaetes</u>	S	S	0.8-8	X
69	Maurer & Leathem	1981	Annelids: Polychaetes	S	N	38-185	Cl Slt/Snd F Snd Snd G

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
70	Maurer et al.	1976	Annelids: Archiannelids, Polychaetes Crustaceans: Amphipods, Decapods, Isopods, Mysids Echinoderms: Echinoids Molluscs: Bivalves	S	N/S	18-54	Snd
71	Maurer et al.	1982	Annelids: Polychaetes Crustaceans: Amphipods Echinoderms: Ophiuroids Molluscs: Bivalves	S	N	120	Slt Snd
72	McKinney & Harper	1980	X	S	W	X	X
73	McNulty et al.	1962	Annelids: Polychaetes Echinoderms: Echinoids, Ophiuroids	S	S	X	0-6.99 mm
74	Messieh et al.	1991	X	R	N	X	X
75	Miller et al.	2002	Annelids: Polychaetes Molluscs: Gastropods	E/R	N	Near-shore	Snd
76	Newell et al.	1999	X	S	O	2.9-21.9	X
77	Oakwood Environmental Ltd.	1999	X	R	O	X	X
78	Oliver et al.	1977	Annelids: Polychaetes Crustaceans: Amphipods, Cumaceans, Decapods, Ostracods	E/S	O	0-36	X
79	Parker	1960	Crustacean Gastropod Pelecypod	S	W	1-180	Cl Snd

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
80	Pearce	1970	Annelids: Polychaetes Anthozoans Crustaceans: Amphipods, Decapods Echinoderms: Echinoids Molluscs: Bivalves Nemerteans: Rhynchocoels	S	N	X	X
81	Pearce et al.	1981	X	R	N	X	X
82	Pequegnat	1978	X	R	X	X	X
83	Phillips & James	1988	Annelids: <u>Polychaetes</u> Nematodes	R	W	2-140	X
84	Phillips & Thompson	1990	Annelids: <u>Polychaetes</u> Crustaceans: Cumaceans, Tanaids Molluscs	R	E	X	X
85	Poiner & Kennedy	1984	Annelids: <u>Polychaetes</u> Anthozoans Bryozoans Cephalochordates Crustaceans: Amphipods, Cumaceans, Decapods, Isopods, Mysids, Tanaids Echinoderms: Echinoids, Holothurians, Ophiuroids Foraminifera Molluscs: Bivalves, Scaphopods Nemerteans Phoronids Sipunculids Urochordates: Ascidians	S	O	1-17	F Snd Med Snd

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
86	Posey et al.	1998	Annelids: Polychaetes Crustaceans: Amphipods Molluscs: Bivalves, Gastropods	S	E	13	F Snd
87	Posey & Alphin	2002	Annelids: Oligochaetes, Polychaetes Cephalochordates Crustaceans: Amphipods, Cumaceans Decapods Echinoderms: Ophiuroids Molluscs: Bivalves Nemerteans	S	S	12-15	Snd
88	Powers et al.	2001	Annelids: Polychaetes Crustaceans	S	W	4-20	F Snd
89	Pratt	1973	Annelids: Polychaetes Anthozoans Crustaceans: Amphipods, Cumaceans, Decapods, Isopods Echinoderms: Echinoids, Holothuroids, Ophiuroids Molluscs: Bivalves, Gastropods Urochordates: Ascidians		N/S	40-60	Slt/Cl Snd/Slt Snd
90	Quigley & Hall	1999	Annelids: Oligochaetes, Polychaetes Molluscs: Bivalves Nematodes	S	O	7-9	M
91	Rabalais et al.	2001	Annelids: Polychaetes Crustaceans Echinoderms: Ophiuroids Molluscs: Bivalves, Gastropods	S	W	20-21	X

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
92	Ranasinghe et al.	1985	X	S	S	X	X
93	Ray	2001	Annelids: Polychaetes Crustaceans: Amphipods, Tanaids	S	N	X	Med Snd
94	Renaud et al.	1999	Annelids: Polychaetes Crustaceans: Copepods Molluscs: Bivalves Nematodes Turbellarians	E	S	30	Snd
95	Rice & Culter	1984	Annelids: Polychaetes Nematodes Bryozoans	S	E	X	X
96	Rice et al.	1981	Echionderms	S	E	12-17	X
97	Rowe	1971	Annelids: Polychaetes Anthozoans Molluscs: Bivalves	S	N	1-80	M F Snd Co Snd
98	Saila et al.	1972	Annelids: Polychaetes Anthozoans Crustaceans: Amphipods, Cumaceans, Isopods Echinoderms: Echinoids Foraminifera Molluscs: Bivalves Urochordate: Ascidians	S	N	33-35	Slt Snd
99	Saloman	1974	Annelids: Polychaetes Molluscs: Pelecypods Nematodes	S	E	X	X
100	Saloman et al.	1982	Annelids: Polychaetes	S	E	9	X
101	Sanders	1968	Annelids: Polychaetes Molluscs: Bivalves	S	N/O	0.5-2500	M Snd

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
102	Schaffner & Boesch	1982	Crustaceans: Amphipods	S	N	50-100	F Snd Med Snd Co Snd
103	Schaffner et al.	1996	Annelids: Polychaetes Molluscs: Bivalves	S	S	5	X
104	Seiderer & Newell	1999	Annelids: Polychaetes Crustaceans	S	O	30	Slt Snd St
105	Shaw et al.	1982	Annelids: Polychaetes	S	E	30	M Snd
106	Sherk	1971	X	R	X	X	X
107	Sisson et al.	2002	Annelids: Polychaetes Echinoderms: Echinoids	S	N	8-12	M F Snd Co Snd
108	Snyder	1976	X	R	O	X	X
109	Somerfield et al.	1995	Annelids: Polychaetes Crustaceans: Copepods Nematodes	S	O	10	X
110	Steimle & Stone	1973	Annelids: Polychaetes Anthozoans Crustaceans: Amphipods, Decapods Echinoderms: Echinoids Molluscs: Bivalves	S	N	10-20	Slt/Snd Med Snd
111	Stern & Stickle	1978	X	R	X	X	X
112	Thistle et al.	1999	Crustaceans: Copepods, Ostracods Kinorhynchs Nematodes	S	O	580-1340	Cl Slt Snd G

Table 3 Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
113	Turbeville & Marsh	1982	Annelids: Polychaetes Crustaceans: Tanaids Molluscs: Bivalves	S	S	10-15	F Snd Co Snd
114	U.S. Environmental Protection Agency	1983	Annelids: Polychaete Crustaceans: Decapod Molluscs: Bivalves Echinoderms: Echinoid	R	E	10-200	X
115	Versar Inc.	1997	Annelids: Polychaetes Crustaceans: Amphipod, Tanaids Molluscs: Bivalves	S	N	Nearshore	X
116	Vittor	1978	Annelids: Polychaetes	S	E	20-800	X
117	Watling & Norse	1998	X	R	X	X	X
118	Weston et al.	1982	Annelids: Polychaetes Crustaceans: Barnacle, Cumacean Molluscs: Bivalve Phoronid	S	W	10	X
119	Wigley & McIntyre	1964	Annelids: Polychaetes Crustaceans: Amphipods Echinoderms Foraminifera Molluscs: Bivalves	S	N	40-567	X
120	Wigley & Theroux	1981	Annelids: Polychaetes Crustaceans: Amphipods, Cirripedia, Isopods Echinoderms: Echinoids Molluscs: Bivalves, Gastropods	S	N/S	X	X

Table 3. Continued

Ref. No.	Author	Date	Major Taxa	Study Type	Geographic Location	Depth (m)	Sediment Type
121	Woodward Clyde Consultants Inc.	1983	Annelids: Oligochaetes, <u>Polychaetes</u> Crustaceans Molluscs: Bivalves Nemerteans	S	E	20-90	X
122	Zajac & Whitlatch	2003	Annelids: Oligochaetes, <u>Polychaetes</u> Molluscs: Bivalves, Gastropods	E	N	Intertidal	F Co

Twenty-four review papers were included in the database. Of these, 17 were from the Gulf of Mexico or East Coast (Table 4). The majority of these review papers were from the eastern Gulf of Mexico and northern East Coast. Two of the 16 reviews spanned geographical boundaries, with one covering the eastern and western Gulf of Mexico and the other extending over the northern and southern East Coast (Table 5). Only one review paper was found which synthesized solely southern East Coast fauna. Of the review papers, one also had an experimental component, and was from the northern East Coast (Table 5).

Table 4. A tabulation of each study type based upon geographic region. Studies which occurred in multiple regions or which were located in areas other than the East Coast or Gulf of Mexico are not included.

Study Type	East Coast	Gulf of Mexico	Total
Experimental	North – 1 South – 1	East – 1 West – 0	3
Review	North – 5 South – 1	East – 6 West – 2	14
Survey	North – 18 South – 16	East – 23 West – 13	70
Total	North - 23 South - 17	East - 29 West - 14	85

Twelve experimental studies are included in the database. Of these, only five were from our areas of interest, the Gulf of Mexico and East Coast (Table 4). Two experimental studies were conducted in the northern East Coast, although one of these was in combination with a review, and there was one experimental study performed in the southern East Coast. There was also one experimental study, combined with a survey, spanning both the northern and southern East Coast (Table 5). Within the Gulf of Mexico, there was one experimental study conducted in the eastern portion, but no experimental studies conducted in the western Gulf of Mexico (Table 5).

The depth of benthic surveys spanned 1-800 m in the Gulf of Mexico (Table 3). The depth range of surveys conducted in the East Coast ranged from 1-2,500 m. A survey conducted by Sanders (1968) contained a study site on the abyssal rise south of New England at 2,500 meters, which was the deepest location of all the studies examined. Twelve survey studies in the Gulf of Mexico and 16 on the East Coast examined the nearshore depth range of 5-15 meters, which is most appropriate to the depth range that natural sand banks, ridges, and shoals are found in.

Only survey and experimental papers were tabulated to examine patterns in the following sections of the results: taxonomic information, collection methods, depth relationships, sediment-animal relationships, feeding type communities, seasonality, dredging impacts, and recovery and recolonization. Review studies were not included as the information in the reviews contains results found in the survey entries, thus avoiding an uneven influence upon the results.

Table 5. A tabulation of the studies which occurred in multiple regions of the East Coast or Gulf of Mexico and were excluded from Table 4. The reference number of the specific studies are given in parentheses and can be found in Table 3.

Authors	Reference No.	Study Type	Location
Boesch (1979)	11	Survey/Experimental	East Coast
Boesch et al. (1977)	12	Survey	East Coast
Carney (1983)	18	Review	Gulf of Mexico
Defenbaugh (1976)	37	Survey	Gulf of Mexico
Hobbs (2000)	54	Survey	East Coast
Maurer et al. (1976)	70	Survey	Gulf of Mexico
Miller et al. (2002)	75	Experimental/Review	East Coast
Pratt (1973)	89	Review	East Coast
Wigley & Theroux (1981)	120	Survey	East Coast

B. Taxonomic Information

Of the studies that specifically stated a macrofaunal taxon was dominant, polychaetes were listed as the dominant taxon in 85% of the Gulf of Mexico surveys (Table 6). Amphipods were listed as the dominant taxon in 8% of the Gulf of Mexico studies, but were a dominant taxon only in the eastern region. While most papers only examined macrofauna, a few studies included meiofauna as well. In the Gulf of Mexico, nematodes were the dominant meiofauna found in the east, and foraminiferans in the west region.

Information on numerical dominance by individual species was also available from a limited number of studies. Four polychaete taxa were identified as predominant species in five or more surveys (>20% of the survey studies) from the Gulf of Mexico including *Paraprionospio pinnata*, *Mediomastus*, *Prionospio* and *Cossura* (Table 7). *Paraprionospio pinnata* was the most commonly cited dominant species (35%) in the Gulf of Mexico, which included surveys from both east and west of the Mississippi. *Cossura*, *Mediomastus, Nereis,* and *Prionospio* were all dominant polychaete genera commonly found from studies on both sides of the Gulf. *Sigambra tentaculata* and *Magelona phyllisae* were both common polychaete species, but only highlighted in surveys from west of the Mississippi River. In the Gulf of Mexico two of the three most common amphipod species, *Acanthohaustorius* and *Microdeutopus myersi*, along with the archiannelid, *Polygordius*, were only reported from the eastern Gulf of Mexico. *Ampelisca* was the predominant amphipod genera found in the Gulf (>10%) and was found both east and west of the Mississippi River. The bivalve, *Mulinia lateralis*, was the most commonly reported mollusc in the Gulf.

As was true for the Gulf of Mexico, polychaetes were most commonly recorded as the dominant macrofauna found in surveys from the East Coast (Table 6). Specifically, 50% of the East Coast surveys with taxa information listed polychaetes as the dominant macrofaunal component. Polychaetes dominated in four of seven surveys in the southern East Coast regions, with the remaining southern studies identifying asteroids, bivalves, and archiannelids as dominants. Archiannelids, polychaetes, and amphipods were all dominant taxa reported in surveys from the northern East Coast.

Spionidae polychaetes were the most frequently noted family within those East Coast surveys that specifically discussed numerically dominant species (47%) (Table 8). At the genus level, *Spiophanes* was noted as a dominant genus in 47% of East Coast surveys, and more specifically, the species *Spiophanes bombyx*, was listed in 44% of surveys from both northern and southern regions. The polychaete, *Prionospio,* was found in 22% of the East Coast surveys but generally only along the southern East Coast. Other common polychaete genera reported in at least four of the 32 East Coast studies (>10%) were *Chone, Clymenella*, *Lumbrineris*, *Nephtys*, *Nereis*, *Tharyx*, along with the families Aricidea, Sabellariidae, and Syllidae. *Ampelisca* and *Unicola* were the dominant amphipod genera, reported in 28% and 25% of the East Coast studies, respectively. The amphipod species, *Unicola irrorata,* was noted in 22% of the East Coast surveys. Other dominant amphipod species reported in East Coast surveys were *Byblis, Erichthonius*, *Protohaustorius*, and *Pseudunciola*. The dominant bivalve genera reported in East Coast surveys included *Ensis*, *Nucula*, *Tellina*, and *Astarte*. *Ensis directus* and *Nucula proxima* were commonly reported bivalve species. The predominant amphipod and bivalve taxa were similar to both the northern and southern East Coast regions. Other commonly encountered taxa (>10% of the East Coast surveys) included the archiannelid *Polygordius,* the echinoid *Echinarachnius parma,* the decapod *Cancer irroratus,* and the tanaid, *Tanaissus*.

Table 6. Taxa which were highlighted as the dominant infaunal component in a given survey study.

Taxa	East Coast	Gulf of Mexico	Total
Amphipods	North – 2 South – 0	East – 2 West – 0	4
Archiannellids	North – 2 South – 1	East – 0 West – 0	3
Asteroids	North – 1 South – 0	East – 0 West – 0	1
Bivalves	North – 0 South – 1	East – 0 West – 1	2
Foraminiferans	North - 0 South – 0	East – 0 West – 1	1
Gastropods	North – 0 South - 0	East – 1 West - 0	1
Nematodes	North – 0 South – 0	East - 3 West - 1	4
Polychaetes	North – 3 South – 4	East – 15 West - 7	29

Table 7. Dominant families, genera, and species which were highlighted as abundant in survey studies from the Gulf of Mexico. The reference number of the specific studies can be found in Table 3. The General area of each study within the Gulf is listed: Eastern Gulf (E), Western Gulf (W).

	REFERENCE NO.	4	7	8	15	24	25	28	29	31	40	43	44	45
TAXA	AREA	W	W	E	E	E	E	E	E	E	E	W	W	W
Acanthohaustorius	Amphipod	0	0	0	0	0	0	I	I	0	0	0	0	0
Acuminodeutopus	Amphipod	0	0	0	0	0	I	0	0	0	0	0	0	0
Ampelisca	Amphipod	0	I	0	0	0	0	0	0	0	I	0	0	0
Ampelisca agassizi	Amphipod	0	I	0	0	0	0	0	0	0	I	0	0	0
Ampelisca vadorum	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0
Anchialina typical	Amphipod	0	0	0	0	0	I	0	0	0	0	0	0	0
Haustoridae	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0
Listiella	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0
Melita nitida	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0
Microdeutopus myersi	Amphipod	0	0	0	0	0	I	0	0	0	I	0	0	0
Monoculodes	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0
Photis	Amphipod	0	0	0	0	0	0	0	0	0	I	0	0	0
Protohaustorius	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0
Pseudohaustorius	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0
Pseudunciola	Amphipod	0	0	0	0	0	0	I	0	0	0	0	0	0
Pseudunciola obliquua	Amphipod	0	0	0	0	0	0	I	0	0	0	0	0	0
Rhepoxyniu epistomus	Amphipod	0	0	0	0	0	0	I	0	0	0	0	0	0
Synchelidium	Amphipod	0	0	0	0	0	0	0	0	0	I	0	0	0
Calliactis tricolor	Anenome	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygordiidae	Archiannelid	0	0	0	0	0	0	I	0	0	0	0	0	0
Polygordius	Archiannelid	0	0	0	0	0	0	I	0	0	0	0	0	0
Astropecten	Asteroid	I	0	0	0	0	0	0	0	0	0	0	0	0
Astropecten duplicatus	Asteroid	I	0	0	0	0	0	0	0	0	0	0	0	0
Anadara baughmani	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	4	7	8	15	24	25	28	29	31	40	43	44	45
TAXA	**AREA**	**W**	**W**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**W**	**W**	**W**
Corbula contracta	Bivalve	I	0	0	0	0	0	0	0	0	0	0	0	0
Abra lioica	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Chione clenchi	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Donax	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0
Donax texasianus	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0
Ensis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinochama arcinella	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Ensis minor	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Gouldia cerina	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Lucina radians	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Lyonsia hyalina	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Macoma	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Macoma tageliformis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Macoma tentata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Mulinia lateralis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	I
Nuculana jamaicensis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Pecten papyraceus	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Pitar	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0
Pitar cordata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Pitar simpsoni	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0
Pitar texasiana	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Tagelus divisus	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Venus campechiensis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Varicorbula operculata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenaria	Bryozoan	0	0	0	0	0	0	0	0	0	0	0	0	0
Branchiostoma caribaeum	Cephalochordate	0	0	0	0	0	0	I	0	0	0	0	0	0
Ameira	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Apodopsyllus	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0

Table 7 Continued

	REFERENCE NO.	4	7	8	15	24	25	28	29	31	40	43	44	45
TAXA	AREA	W	W	E	E	E	E	E	E	E	E	W	W	W
Ectinosoma	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Enhydrosoma	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Halectinosoma	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Haloschizeropera	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Leptopsyllus	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Pseudobradya	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Robertgurneya	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Stenhelia	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Thompsonula	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Typhlamphiascus	Copepod	0	0	0	0	0	0	0	0	0	0	I	0	0
Apseudes	Cumacean	0	0	0	0	0	0	0	0	0	I	0	0	0
Cumella	Cumacean	0	0	0	0	0	0	0	0	0	I	0	0	0
Cyclaspis	Cumacean	0	0	0	0	0	0	0	0	0	I	0	0	0
Arenaeus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0
Cakaooa springeri	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0
Callinectes danae	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0
Portunus	Decapod	0	0	I	0	0	0	0	0	0	0	0	0	0
Portunus gibbesii	Decapod	0	0	I	0	0	0	0	0	0	0	0	0	0
Mellita	Echinoid	0	0	I	0	0	0	0	I	0	0	0	0	0
Mellita quinquiesperforata	Echinoid	0	0	0	0	0	0	0	I	0	0	0	0	0
Mellita tenuis	Echinoid	0	0	I	0	0	0	0	0	0	0	0	0	0
Ammonia becarii	Foraminiferan	I	0	0	0	0	0	0	0	0	0	0	0	0
Bolivina lowmani	Foraminiferan	I	0	0	0	0	0	0	0	0	0	0	0	0
Buliminella morgani	Foraminiferan	I	0	0	0	0	0	0	0	0	0	0	0	0
Nonionella basiloba	Foraminiferan	I	0	0	0	0	0	0	0	0	0	0	0	0
Acteon punctostriatus	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0
Anachis saintpairiana	Gasropod	0	0	0	0	0	0	0	0	0	0	0	0	0
Caecum	Gastropod	0	0	0	I	0	0	0	0	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	4	7	8	15	24	25	28	29	31	40	43	44	45
TAXA	AREA	W	W	E	E	E	E	E	E	E	E	W	W	W
Caecum cooperi	Gastropod	0	0	0	I	0	0	0	0	0	0	0	0	0
Caecum pulchellum	Gastropod	0	0	0	I	0	0	0	0	0	0	0	0	0
Crepidula	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepidula plana	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0
Murex fulvescens	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0
Polystria albida	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0
Prunum apicinum	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0
Strombus alatus	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0
Balanoglossus	Hemichordate	0	0	0	0	0	0	0	0	0	0	0	0	0
Balanoglossus aurantiacus	Hemichordate	0	0	0	0	0	0	0	0	I	0	0	0	0
Palpomyia	Insect Larvae	0	0	0	0	0	0	0	0	0	0	0	0	0
Edotea	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0
Edotea montosa	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0
Xenatnthura revitelson	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0
Bowmaniella	Mysid	0	0	0	0	0	I	0	I	0	0	0	0	0
Bowmaniella portoricensis	Mysid	0	0	0	0	0	I	0	0	0	0	0	0	0
Choniolaimidae	Nematode	I	0	0	0	0	0	0	0	0	0	0	0	0
Chromadoridae	Nematode	I	0	0	0	0	0	0	0	0	0	0	0	0
Cyatholaimidae	Nematode	I	0	0	0	0	0	0	0	0	0	0	0	0
Dorylaimopsis	Nematode	I	0	0	0	0	0	0	0	0	0	I	0	0
Halalaimus	Nematode	0	0	0	0	0	0	0	0	0	0	I	0	0
Laimella	Nematode	0	0	0	0	0	0	0	0	0	0	I	0	0
Linhomoeidae	Nematode	I	0	0	0	0	0	0	0	0	0	0	0	0
Neotonchus	Nematode	0	0	0	0	0	0	0	0	0	0	I	0	0
Ptycholaimellus	Nematode	0	0	0	0	0	0	0	0	0	0	I	0	0
Sabatiera	Nematode	I	0	0	0	0	0	0	0	0	0	I	0	0
Sphaerolaimus	Nematode	I	0	0	0	0	0	0	0	0	0	0	0	0
Synonchiella	Nematode	0	0	0	0	0	0	0	0	0	0	I	0	0

Table 7 Continued

	REFERENCE NO.	4	7	8	15	24	25	28	29	31	40	43	44	45
TAXA	**AREA**	**W**	**W**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**W**	**W**	**W**
Tershcellingia	Nematode	I	0	0	0	0	0	0	0	0	0	I	0	0
Theristus	Nematode	I	0	0	0	0	0	0	0	0	0	I	0	0
Tricoma	Nematode	I	0	0	0	0	0	0	0	0	0	0	0	0
Viscosia	Nematode	0	0	0	0	0	0	0	0	0	0	I	0	0
Haplocytherida setipunctata	Ostracod	0	0	0	0	0	0	0	0	0	0	0	0	0
Parasterope pollex	Ostracod	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoronis architecta	Phoronid	0	0	0	0	0	0	0	0	0	0	0	0	0
Euplana	Platyhelminthes	0	0	0	0	0	0	0	0	0	0	0	0	0
Stylochis	Platyhelminthes	0	0	0	0	0	0	0	0	0	0	0	0	0
Aedicira belgiacae	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0
Amastigos	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0
Amastigos caperatus	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0
Ampharete	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Ampharete acutifrons	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0
Aricidea cerruti	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0
Armandia	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0
Armandia maculata	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0
Brania	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Brania welfleetensis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitella capitata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceratocephale oculata	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Ceratoneries irritabilis	Polychaete	0	0	0	0	0	0	0	0	0	I	0	0	0
Chaetezone	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Chaetopterus variopedatus	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0
Cirratulidae	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0
Cirrophorus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirrophorus lyra	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	4	7	8	15	24	25	28	29	31	40	43	44	45
TAXA	AREA	W	W	E	E	E	E	E	E	E	E	W	W	W
Clymenella	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymenella torquata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Cossura	Polychaete	I	0	0	0	0	0	0	0	0	0	I	0	0
Cossura delta	Polychaete	I	0	0	0	0	0	0	0	0	0	I	0	0
Cossura soyeri	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Diopatra	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Diopatra cuprea	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Ecogone lourei	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Ehlersia cornuta	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Eunice	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Eunice vittata	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Fabricia	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Filograna implexa	Polychaete	0	0	0	0	0	0	0	0	0	I	0	0	0
Glycera	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycinde solitaria	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniadidae	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Goniadides carolinae	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Laeonereis culveri	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris	Polychaete	I	0	0	0	0	0	I	0	0	0	0	0	0
Lumbrineris tenuis	Polychaete	I	0	0	0	0	0	I	0	0	0	0	0	0
Magelona	Polychaete	I	0	0	0	0	0	0	0	0	0	0	I	I
Magelona phyllisae	Polychaete	I	0	0	0	0	0	0	0	0	0	0	I	I
Mediomastus	Polychaete	0	0	0	I	0	0	I	0	0	I	I	0	0
Mediomastus ambiseta	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0
Mediomastus californiensis	Polychaete	0	0	0	I	0	0	0	0	0	I	I	0	0
Mryiochele oculata	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0
Neanthes micromma	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Nephtys	Polychaete	I	0	0	0	0	0	0	I	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	4	7	8	15	24	25	28	29	31	40	43	44	45
TAXA	**AREA**	**W**	**W**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**W**	**W**	**W**
Nephthys incisa	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0
Nephtys picta	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0
Nereis	Polychaete	I	I	0	I	0	0	0	0	0	0	0	0	0
Nereis lamellosa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Nereis micromma	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0
Onuphis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Onuphis eremita	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Opheliidae	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0
Ophelia	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0
Oweniidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Owenia fusiformis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxyurostylis smithi	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Parahesione luteola	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraonidae	Polychaete	0	0	0	0	0	0	0	I	0	I	I	0	0
Paraonis fulgens	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0
Paraonis gracilis	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0
Parapionosyllis longicirrata	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Paraprionospio pinnata	Polychaete	I	I	0	I	0	0	0	0	0	I	0	I	I
Pionosyllis aesae	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0
Piromis roberti	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Prionospio	Polychaete	0	0	0	0	0	0	0	0	0	I	I	0	0
Prionospio cirrifera	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Prionospio cristata	Polychaete	0	0	0	0	0	0	0	0	0	I	I	0	0
Prionospio heterobranchia	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Protodorvillea kefersteini	Polychaete	0	0	0	0	0	I	0	0	0	0	I	0	0
Rhynchocoela	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0
Schistomeringos	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0
Schistomeringos caeca	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	4	7	8	15	24	25	28	29	31	40	43	44	45
TAXA	**AREA**	**W**	**W**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**E**	**W**	**W**	**W**
Scolelepis	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0
Scolelepsis squamata	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0
Sigambra tentaculata	Polychaete	I	0	0	0	0	0	0	0	0	0	I	0	0
Spionidae	Polychaete	0	0	0	0	0	0	I	I	0	0	0	0	0
Spiophanes	Polychaete	0	0	0	0	0	0	I	I	0	0	0	0	0
Spiophanes bombyx	Polychaete	0	0	0	0	0	0	I	I	0	0	0	0	0
Stenonineris martini	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Streblospio benedicti	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0
Synelmis albini	Polychaete	0	0	0	0	0	0	0	0	0	I	0	0	0
Tharyx	Polychaete	I	0	0	0	0	0	0	0	0	0	I	0	0
Tharyx marioni	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0
Tharyx setigera	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0
Gromiidae	Protist	I	0	0	0	0	0	0	0	0	0	0	0	0
Aspidosiphon	Sipunculan	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptocelia	Tanaid	0	0	0	0	0	I	0	0	0	I	0	0	0

Table 7 Continued

	REFERENCE NO.	51	60	64	79	85	86	89	93	103	118	120
TAXA	**AREA**	**W**	**E**	**E**	**E**	**E**	**W**	**W**	**E**	**E**	**W**	**E**
Acanthohaustorius	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Acuminodeutopus	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Ampelisca	Amphipod	0	0	I	0	0	0	0	0	0	0	0
Ampelisca agassizi	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Ampelisca vadorum	Amphipod	0	0	I	0	0	0	0	0	0	0	0
Anchialina typical	Amphipod	0	0	0	0	0	0	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	51	60	64	79	85	86	89	93	103	118	120
TAXA	**AREA**	**W**	**E**	**E**	**E**	**E**	**W**	**W**	**E**	**E**	**W**	**E**
Haustoridae	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Listiella	Amphipod	0	0	I	0	0	0	0	0	0	0	0
Melita nitida	Amphipod	0	0	I	0	0	0	0	0	0	0	0
Microdeutopus myersi	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Monoculodes	Amphipod	0	0	I	0	0	0	0	0	0	0	0
Photis	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Protohaustorius	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Pseudohaustorius	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Pseudunciola	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Pseudunciola obliquua	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Rhepoxynius epistomus	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Synchelidium	Amphipod	0	0	0	0	0	0	0	0	0	0	0
Calliactis tricolor	Anenome	I	0	0	0	0	0	0	0	0	0	0
Polygordiidae	Archiannelid	0	0	0	0	0	0	0	0	I	0	0
Polygordius	Archiannelid	0	0	0	0	0	0	0	0	I	0	0
Astropecten	Asteroid	0	0	0	0	0	0	0	0	0	0	0
Astropecten duplicatus	Asteroid	0	0	0	0	0	0	0	0	0	0	0
Anadara baughmani	Bivalve	0	0	0	I	0	0	0	0	0	0	0
Corbula contracta	Bivalve	0	0	0	0	0	0	0	0	0	0	0
Abra lioica	Bivalve	0	0	0	I	0	0	0	0	0	0	0
Chione clenchi	Bivalve	0	0	0	I	0	0	0	0	0	0	0
Donax	Bivalve	0	0	0	0	0	0	0	0	0	0	0
Donax texasianus	Bivalve	0	0	0	0	0	0	0	0	0	0	0
Ensis	Bivalve	0	0	I	0	0	0	0	0	0	0	0
Echinochama arcinella	Bivalve	I	0	0	0	0	0	0	0	0	0	0
Ensis minor	Bivalve	0	0	I	0	0	0	0	0	0	0	0
Gouldia cerina	Bivalve	0	0	0	I	0	0	0	0	0	0	0
Lucina radians	Bivalve	0	0	0	0	0	0	0	0	0	0	I

Table 7 Continued

	REFERENCE NO.	51	60	64	79	85	86	89	93	103	118	120
TAXA	**AREA**	**W**	**E**	**E**	**E**	**E**	**W**	**W**	**E**	**E**	**W**	**E**
Lyonsia hyalina	Bivalve	0	0	I	0	0	0	0	0	0	0	0
Macoma	Bivalve	I	0	I	0	0	0	0	0	0	0	0
Macoma tageliformis	Bivalve	I	0	0	0	0	0	0	0	0	0	0
Macoma tentata	Bivalve	0	0	I	0	0	0	0	0	0	0	0
Mulinia lateralis	Bivalve	0	0	I	0	0	0	0	0	0	I	0
Nuculana jamaicensis	Bivalve	0	0	0	I	0	0	0	0	0	0	0
Pecten papyraceus	Bivalve	I	0	0	I	0	0	0	0	0	0	0
Pitar	Bivalve	I	0	0	I	0	0	0	0	0	0	0
Pitar cordata	Bivalve	0	0	0	I	0	0	0	0	0	0	0
Pitar simpsoni	Bivalve	0	0	0	0	0	0	0	0	0	0	0
Pitar texasiana	Bivalve	I	0	0	0	0	0	0	0	0	0	0
Tagelus divisus	Bivalve	0	0	I	0	0	0	0	0	0	0	0
Venus campechiensis	Bivalve	I	0	0	0	0	0	0	0	0	0	0
Varicorbula operculata	Bivalve	0	0	0	I	0	0	0	0	0	0	0
Selenaria	Bryozoan	0	0	0	0	0	0	0	I	0	0	0
Branchiostoma caribaeum	Cephalochordate	0	0	0	0	0	0	0	0	I	0	0
Ameira	Copepod	0	0	0	0	0	0	0	0	0	0	0
Apodopsyllus	Copepod	0	0	0	0	0	0	0	0	0	0	0
Ectinosoma	Copepod	0	0	0	0	0	0	0	0	0	0	0
Enhydrosoma	Copepod	0	0	0	0	0	0	0	0	0	0	0
Halectinosoma	Copepod	0	0	0	0	0	0	0	0	0	0	0
Haloschizeropera	Copepod	0	0	0	0	0	0	0	0	0	0	0
Leptopsyllus	Copepod	0	0	0	0	0	0	0	0	0	0	0
Pseudobradya	Copepod	0	0	0	0	0	0	0	0	0	0	0
Robertgurneya	Copepod	0	0	0	0	0	0	0	0	0	0	0
Stenhelia	Copepod	0	0	0	0	0	0	0	0	0	0	0
Thompsonula	Copepod	0	0	0	0	0	0	0	0	0	0	0
Typhlamphiascus	Copepod	0	0	0	0	0	0	0	0	0	0	0

Table 7 Continued

TAXA	AREA	51	60	64	79	85	86	89	93	103	118	120
	REFERENCE NO. / AREA	W	E	E	E	E	W	W	E	E	W	E
Apseudes	Cumacean	0	0	0	0	0	0	0	0	0	0	0
Cumella	Cumacean	0	0	0	0	0	0	0	0	0	0	0
Cyclaspis	Cumacean	0	0	0	0	0	0	0	0	0	0	0
Oxyurostylis	Cumacean	0	0	0	0	0	0	0	0	0	I	0
Arenaeus	Decapod	I	0	0	0	0	0	0	0	0	0	0
Cakaooa springeri	Decapod	I	0	0	0	0	0	0	0	0	0	0
Callinectes danae	Decapod	I	0	0	0	0	0	0	0	0	0	0
Portunus	Decapod	0	0	0	0	0	0	0	0	0	0	0
Portunus gibbesii	Decapod	0	0	0	0	0	0	0	0	0	0	0
Mellita	Echinoid	0	0	0	0	0	0	0	0	0	0	0
Mellita quinquiesperforata	Echinoid	I	0	0	0	0	0	0	0	0	0	0
Mellita tenuis	Echinoid	0	0	0	0	0	0	0	0	0	0	0
Ammonia becarii	Foraminiferan	0	0	0	0	0	0	0	0	0	0	0
Bolivina lowmani	Foraminiferan	0	0	0	0	0	0	0	0	0	0	0
Buliminella morgani	Foraminiferan	0	0	0	0	0	0	0	0	0	0	0
Nonionella basiloba	Foraminiferan	0	0	0	0	0	0	0	0	0	0	0
Acteon punctostriatus	Gastropod	0	0	I	0	0	0	0	0	0	0	0
Anachis saintpairiana	Gasropod	0	0	0	I	0	0	0	0	0	0	0
Caecum	Gastropod	0	0	0	0	0	0	0	0	0	0	0
Caecum cooperi	Gastropod	0	0	0	0	0	0	0	0	0	0	0
Caecum pulchellum	Gastropod	0	0	0	0	0	0	0	0	0	0	0
Crepidula	Gastropod	0	0	I	0	0	0	0	0	0	0	0
Crepidula plana	Gastropod	I	0	I	0	0	0	0	0	0	0	0
Murex fulvescens	Gastropod	I	0	0	0	0	0	0	0	0	0	0
Polystria albida	Gastropod	I	0	0	0	0	0	0	0	0	0	0
Prunum apicinum	Gastropod	0	0	I	0	0	0	0	0	0	0	0
Strombus alatus	Gastropod	I	0	0	0	0	0	0	0	0	0	0
Balanoglossus	Hemichordate	0	0	0	0	0	I	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	51	60	64	79	85	86	89	93	103	118	120
TAXA	AREA	W	E	E	E	E	W	W	E	E	W	E
Balanoglossus aurantiacus	Hemichordate	0	0	0	0	0	0	0	0	0	0	0
Palpomyia	Insect Larvae	0	I	0	0	0	0	0	0	0	0	0
Edotea	Isopod	0	0	I	0	0	0	0	0	0	0	0
Edotea montosa	Isopod	0	0	I	0	0	0	0	0	0	0	0
Xenatnthura revitelson	Isopod	0	0	I	0	0	0	0	0	0	0	0
Bowmaniella	Mysid	0	0	0	0	0	0	0	0	0	0	0
Bowmaniella portoricensis	Mysid	0	0	0	0	0	0	0	0	0	0	0
Choniolaimidae	Nematode	0	0	0	0	0	0	0	0	0	0	0
Chromadoridae	Nematode	0	0	0	0	0	0	0	0	0	0	0
Cyatholaimidae	Nematode	0	0	0	0	0	0	0	0	0	0	0
Dorylaimopsis	Nematode	0	0	0	0	0	0	0	0	0	0	0
Halalaimus	Nematode	0	0	0	0	0	0	0	0	0	0	0
Laimella	Nematode	0	0	0	0	0	0	0	0	0	0	0
Linhomoeidae	Nematode	0	0	0	0	0	0	0	0	0	0	0
Neotonchus	Nematode	0	0	0	0	0	0	0	0	0	0	0
Ptycholaimellus	Nematode	0	0	0	0	0	0	0	0	0	0	0
Sabatiera	Nematode	0	0	0	0	0	0	0	0	0	0	0
Sphaerolaimus	Nematode	0	0	0	0	0	0	0	0	0	0	0
Synonchiella	Nematode	0	0	0	0	0	0	0	0	0	0	0
Tershcellingia	Nematode	0	0	0	0	0	0	0	0	0	0	0
Theristus	Nematode	0	0	0	0	0	0	0	0	0	0	0
Tricoma	Nematode	0	0	0	0	0	0	0	0	0	0	0
Viscosia	Nematode	0	0	0	0	0	0	0	0	0	0	0
Haplocytherida setipunctata	Ostracod	0	0	I	0	0	0	0	0	0	0	0
Parasterope pollex	Ostracod	0	0	I	0	0	0	0	0	0	0	0
Phoronis	Phoronid	0	0	I	0	0	0	0	0	0	I	0
Phoronis architecta	Phoronid	0	0	I	0	0	0	0	0	0	0	0
Euplana	Platyhelminthes	0	0	I	0	0	0	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	51	60	64	79	85	86	89	93	103	118	120
TAXA	**AREA**	**W**	**E**	**E**	**E**	**E**	**W**	**W**	**E**	**E**	**W**	**E**
Stylochis	Platyhelminthes	0	0	I	0	0	0	0	0	0	0	0
Aedicira belgiacae	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Amastigos	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Amastigos caperatus	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Ampharete	Polychaete	0	0	0	0	0	0	I	0	0	0	I
Ampharete acutifrons	Polychaete	0	0	0	0	0	0	0	0	0	0	I
Aricidea	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Aricidea cerruti	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Armandia	Polychaete	0	0	0	0	0	0	I	I	0	0	0
Armandia maculata	Polychaete	0	0	0	0	0	0	I	I	0	0	0
Brania	Polychaete	0	0	0	0	0	0	0	0	I	0	0
Brania welfleetensis	Polychaete	0	0	0	0	0	0	0	0	I	0	0
Capitella capitata	Polychaete	0	0	I	0	0	0	0	0	0	0	0
Ceratocephale oculata	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Ceratoneries irritabilis	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Chaetezone	Polychaete	0	0	0	0	0	I	0	0	0	0	0
Chaetopterus variopedatus	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Cirratulidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Cirrophorus	Polychaete	0	0	0	0	I	0	0	I	0	0	0
Cirrophorus lyra	Polychaete	0	0	0	0	0	0	0	I	0	0	0
Clymenella	Polychaete	0	0	0	0	0	0	I	0	I	0	0
Clymenella torquata	Polychaete	0	0	0	0	0	0	I	0	I	0	0
Cossura	Polychaete	0	0	0	0	0	0	I	0	I	I	0
Cossura delta	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Cossura soyeri	Polychaete	0	0	0	0	0	0	I	0	I	I	0
Diopatra	Polychaete	0	0	I	0	0	0	0	0	I	0	0
Diopatra cuprea	Polychaete	0	0	I	0	0	0	0	0	I	I	0
Ecogone lourei	Polychaete	0	0	0	0	0	0	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	51	60	64	79	85	86	89	93	103	118	120
TAXA	**AREA**	**W**	**E**	**E**	**E**	**E**	**W**	**W**	**E**	**E**	**W**	**E**
Ehlersia cornuta	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Eunice	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Eunice vittata	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Fabricia	Polychaete	0	0	0	0	0	0	0	0	0	0	I
Filograna implexa	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Glycera	Polychaete	0	0	0	0	I	0	0	0	0	0	0
Glycinde solitaria	Polychaete	0	0	I	0	0	0	0	0	0	0	0
Goniadidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Goniadides carolinae	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Laeonereis culveri	Polychaete	0	I	0	0	0	0	0	0	0	0	0
Lumbrineris	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris tenuis	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Magelona	Polychaete	0	0	0	0	0	0	I	0	0	I	0
Magelon pacifica	Polychaete	0	0	0	0	0	0	0	0	0	I	0
Magelona phyllisae	Polychaete	0	0	0	0	0	0	I	0	0	0	0
Mediomastus	Polychaete	0	0	I	0	0	0	I	0	0	0	0
Mediomastus ambiseta	Polychaete	0	0	0	0	0	0	I	0	0	0	0
Mediomastus californiensis	Polychaete	0	0	I	0	0	0	0	0	0	I	0
Mryiochele oculata	Polychaete	0	0	0	0	0	0	0	0	I	0	0
Neanthes micromma	Polychaete	0	0	0	0	0	I	0	0	0	0	0
Nephtys	Polychaete	0	0	0	0	0	0	I	0	0	0	0
Nephthys incisa	Polychaete	0	0	0	0	0	0	I	0	0	0	0
Nephtys picta	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Nereis	Polychaete	0	0	0	0	0	I	0	0	0	0	0
Nereis lamellosa	Polychaete	0	0	0	0	0	I	0	0	0	0	0
Nereis micromma	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Onuphis	Polychaete	0	0	I	0	0	0	0	0	0	0	0
Onuphis eremita	Polychaete	0	0	I	0	0	0	0	0	0	0	0

Table 7 Continued

	REFERENCE NO.	51	60	64	79	85	86	89	93	103	118	120
TAXA	AREA	W	E	E	E	E	W	W	E	E	W	E
Opheliidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Ophelia	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Oweniidae	Polychaete	0	0	0	0	0	0	I	0	0	0	0
Owenia fusiformis	Polychaete	0	0	0	0	0	0	I	0	0	0	0
Oxyurostylis smithi	Polychaete	0	0	0	0	0	0	0	0	I	0	0
Parahesione luteola	Polychaete	0	0	I	0	0	0	0	0	0	0	0
Paraonidae	Polychaete	0	0	0	0	0	0	0	0	0	0	I
Paraonis fulgens	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Paraonis gracilis	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Parapionosyllis longicirrata	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Paraprionospio pinnata	Polychaete	0	0	0	0	0	I	I	0	0	I	0
Pionosyllis aesae	Polychaete	0	0	0	0	0	0	0	I	0	0	0
Piromis roberti	Polychaete	0	0	0	0	0	I	0	0	0	0	0
Prionospio	Polychaete	0	0	I	0	0	0	0	0	I	0	I
Prionospio cirrifera	Polychaete	0	0	0	0	0	0	0	0	I	0	0
Prionospio cristata	Polychaete	0	0	0	0	0	0	0	0	0	0	I
Prionospio heterobranchia	Polychaete	0	0	I	0	0	0	0	0	0	0	0
Protodorvillea kefersteini	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Rhynchocoela	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Sabellides	Polychaete	0	0	0	0	0	0	0	0	0	I	0
Schistomeringos	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Schistomeringos caeca	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Scolelepis	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Scolelepsis squamata	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Sigambra tentaculata	Polychaete	0	0	0	0	0	I	I	0	0	0	0
Spionidae	Polychaete	0	0	0	0	0	0	0	0	I	0	0
Spiophanes	Polychaete	0	0	0	0	0	0	0	0	I	0	0
Spiophanes bombyx	Polychaete	0	0	0	0	0	0	0	0	I	0	0

Table 7 Continued

	REFERENCE NO.	51	60	64	79	85	86	89	93	103	118	120
TAXA	**AREA**	**W**	**E**	**E**	**E**	**E**	**W**	**W**	**E**	**E**	**W**	**E**
Stenonineris martini	Polychaete	0	0	I	0	0	0	0	0	0	0	0
Streblospio benedicti	Polychaete	0	I	I	0	0	0	0	0	0	0	0
Synelmis albini	Polychaete	0	0	0	0	0	0	0	0	0	0	I
Tharyx	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Tharyx marioni	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Tharyx setigera	Polychaete	0	0	0	0	0	0	0	0	0	0	0
Gromiidae	Protist	0	0	0	0	0	0	0	0	0	0	0
Aspidosiphon	Sipunculan	0	0	0	0	0	0	I	0	0	0	0
Leptocelia	Tanaid	0	0	0	0	0	0	0	0	0	0	0

Table 8. A list of the dominant families, genera, and species which were highlighted as abundant in studies from the United States East Coast. Only survey studies were tabulated. The reference number of the specific studies can be found in Table 3. The general area of each study is listed: Northern East Coast (N), Southern East Coast (S).

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Acanthohaustorius	Amphipod	0	0	0	0	0	0	I	0	0	0	0	0	0	I	0	0	0
Acanthohaustorius millsi	Amphipod	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Acanthohaustorius shoemakeri	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Aeginina longicornis	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Ampelisca	Amphipod	0	0	I	I	I	0	0	0	0	0	0	I	0	I	0	0	0
Ampelisca abdita	Amphipod	0	0	I	0	I	0	0	0	0	0	0	0	0	I	0	0	0
Ampelisca agassizi	Amphipod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Ampelisca vadorum	Amphipod	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Ampelisca verrilli	Amphipod	0	0	I	0	0	0	0	0	0	0	0	I	0	I	0	0	0
Atylus urocarinatus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Batea catharinensis	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bathyporeia	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Bathyporeia parkeri	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Byblis serrata	Amphipod	0	0	0	I	0	0	I	0	0	0	0	0	0	0	0	0	0
Caprella penantis	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Cerapus tubularis	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corophium acherusicum	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elasmopus laevis	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erichthonius	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erichthonius brasiliensis	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erichthonius rubricornis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eudevenopus honduranus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	I	0	0

Table 8 Continued

	REFERENCE NO.	**2**	**3**	**9**	**11**	**12**	**15**	**17**	**19**	**23**	**27**	**32**	**34**	**52**	**55**	**57**	**65**	**66**
TAXA	**AREA**	**N**	**N**	**S**	**N/S**	**S**	**N**	**S**	**S**	**N**	**S**	**S**	**S**	**N/S**	**S**	**S**	**S**	**N**
Gammarus mucronatus	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Haustoridae	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lembos websteri	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Leptocheiras pinguis	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Leptocheirus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Metharpina floridana	Amphipod	0	0	0	0	0	0	I	0	0	0	0	0	0	I	0	0	0
Monoculodes	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monoculodes edwardsii	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neohaustorius	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Orchomella pinguis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paracaprella tenuis	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraphoxus epistomus	Amphipod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoxocephalids	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoxocephalus holbolli	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phtisica marina	Amphipod	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Pontogeneia inermis	Amphipod	0	0	0	0	0	0	I	I	0	0	0	0	0	0	0	0	0
Protohaustorius	Amphipod	0	0	0	I	0	0	I	0	0	0	0	0	0	I	0	0	0
Protohaustorius wigleyi	Amphipod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Protohaustorius deichmannae	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protohaustorius wigleyi	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Pseudunciola	Amphipod	I	0	0	I	0	I	I	0	0	0	0	0	0	0	0	0	0
Pseudunciola obliquua	Amphipod	I	0	0	I	0	I	I	0	0	0	0	0	0	0	0	0	0
Rhepoxynius epistomus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Tiron tropakis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Trichophoxus	Amphipod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichophoxus epistomus	Amphipod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Unicola	Amphipod	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Unciola irrorata	Amphipod	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceriantheopsis americanus	Anemone	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerianthus	Anemone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerianthus americanus	Anemone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diadumene leucolena	Anemone	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edwardsia	Anemone	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edwardsia elegans	Anemone	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Metridium senile	Anemone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tealia felina	Anemone	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Zoantharians	Anemone	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Asabellides oculata	Archiannelid	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drilonereis filum	Archiannelid	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygordiidae	Archiannelid	I	0	0	I	0	I	I	0	0	0	0	I	0	0	I	0	0
Polygordius	Archiannelid	I	0	0	I	0	I	I	0	0	0	0	I	0	0	0	0	0
Bostrichobranchus pilularis	Ascidian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mogula	Ascidian	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molgula manhattensis	Ascidian	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asterias	Asteroid	0	0	0	I	0	0	0	I	I	0	0	0	0	0	0	0	0
Asterias forbesi	Asteroid	0	0	0	I	0	0	I	0	0	0	0	0	0	0	0	0	0
Asterias tenera	Asteroid	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Asterias vulgaris	Asteroid	0	0	0	I	0	0	0	0	I	0	0	0	0	0	0	0	0
Astropecten	Asteroid	0	0	0	I	0	0	0	I	0	0	0	0	0	0	0	0	0
Astropecten americanus	Asteroid	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Crossaster papposus	Asteroid	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Henrica sanguinolenta	Asteroid	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Amygdalum papyria	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anadara	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Anadara transversa	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctica islandica	Bivalve	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Astarte	Bivalve	0	0	0	I	0	0	0	I	I	0	0	0	0	0	0	0	0
Astarte borealis	Bivalve	0	0	0	0	0	0	0	I	I	0	0	0	0	0	0	0	0
Astarte castanea	Bivalve	0	0	0	I	0	0	0	I	0	0	0	0	0	0	0	0	0
Astarte elliptica	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Astarte montagui	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Astarte subaequilatera	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Astarte undata	Bivalve	0	0	0	0	0	0	0	I	I	0	0	0	0	0	0	0	0
Cardiomya costellata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Cardium	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Cerastoderma pinnulatum	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Chlamys	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Chlamys islandicus	BIvalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Crassinella martinicensis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	I	I	0	0
Crysinella lunata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclocardia	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Donax	Bivalve	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Donax variabilis	Bivalve	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Ensis	Bivalve	0	0	I	I	0	0	0	0	0	0	0	0	0	0	I	0	0
Ensis directus	Bivalve	0	0	I	I	0	0	0	0	0	0	0	0	0	0	I	0	0
Ervilia	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ervilia concentrica	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ervilia nitens	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lucinoma filosa	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lucuna multilineata	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lyonsia hyalina	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	**AREA**	**N**	**N**	**S**	**N/S**	**S**	**N**	**S**	**S**	**N**	**S**	**S**	**S**	**N/S**	**S**	**S**	**S**	**N**
Macoma tentata	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercenaria mercenaria	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiolus	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	I	0	0	0
Modiolus modiolus	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Mulinia lateralis	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Musculus discors	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Mya arenaria	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mytilus adulis	Bivalve	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nucula	Bivalve	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Nucula delphinodonta	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nucula proxima	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nucula tenuis	Bivalve	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Parvilucina multidentata	Bivalve	0	0	0	0	I	0	0	0	0	0	0	0	0	0	I	0	0
Pelecypoda	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Periploma papyratium	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pitar	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pitar morrhuana	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Placopecten magellanicus	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Pleuromeris tridentata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Semele proficua	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Solemya borealis	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Spisula	Bivalve	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spisula solidissima	Bivalve	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tellina	Bivalve	0	0	I	0	0	0	0	0	0	0	I	0	0	I	I	0	0
Tellina agilis	Bivalve	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thyasira	Bivalve	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Thyasira flexuosa	Bivalve	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

TAXA	AREA	2 N	3 N	9 S	11 N/S	12 S	15 N	17 S	19 S	23 N	27 S	32 S	34 S	52 N/S	55 S	57 S	65 S	66 N
Transenella stimpsoni	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Venericardia borealis	Bivalve	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Yoldia limatula	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Barbatia	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Barbatia cancellaria	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Barbatia candida	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Cupuladria	Bryozoan	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Branchiostoma caribaeum	Cephalochordate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Balanus	Cirripedia	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Balanus improvisus	Cirripedia	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclaspis	Cumacean	0	0	0	0	0	0	0	0	0	0	I	0	0	I	0	0	0
Cyclaspis varians	Cumacean	0	0	0	0	0	0	0	0	0	0	I	0	0	I	0	0	0
Diastylis	Cumacean	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Diastylus polita	Cumacean	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Oxyurostylis smithi	Cumacean	0	0	I	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Cancer irroratus	Decapod	0	0	0	I	0	0	0	I	I	0	0	0	0	0	0	0	0
Chaceon	Decapod	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crangon	Decapod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Crangon septemspinosa	Decapod	0	0	I	I	0	0	0	0	I	0	0	0	0	0	0	0	0
Dichelopandalus leptocerus	Decapod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Eualus pusiolus	Decapod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Euceramus praelongus	Decapod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Galatheids	Decapod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Hyas coarctatus	Decapod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Lebbeus groenlandicus	Decapod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Leptochela serratobita	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Lucifer faxoni	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

TAXA	AREA	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
	REFERENCE NO.	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Micropanope xanthiformis	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Munida	Decapod	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neopanope texana	Decapod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ogyrides limicola	Decapod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pagurus	Decapod	0	0	0	I	0	0	0	0	I	0	0	0	0	0	0	0	0
Pagurus acadianus	Decapod	0	0	0	I	0	0	0	0	I	0	0	0	0	0	0	0	0
Pagurus arcuatus	Decapod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Pagurus pubescens	Decapod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Pandalus montagui	Decapod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Spirontocaris lilljeborgii	Decapod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Peltaster planus	Echinoderm	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Poranimorpha insignis	Echinoderm	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Clypeaster	Echinoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Echinarachnius	Echinoid	0	0	0	I	0	0	0	I	0	0	0	0	0	0	0	0	0
Echinarachnius parma	Echinoid	0	0	0	I	0	0	0	I	0	0	0	0	0	0	0	0	0
Encope	Echinoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mellita	Echinoid	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Moira	Echinoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Strongylocentrotus droebachiensis	Echinoid	0	0	0	0	0	0	0	I	I	0	0	0	0	0	0	0	0
Jaculella obtuse	Foraminiferan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Alvania	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anachis translirata	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buccinum undatum	Gastropod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Caecum	Gastropod	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Caecum CF. johnsoni	Gastropod	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Calliostoma occidentale	Gastropod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Ceritheopsis greeni	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Colus	Gastropod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Coryphella	Gastropod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Crepidula	Gastropod	0	0	I	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Crepidula convexa	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepidula plana	Gastropod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Cylichna	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Epitonium rupicolum	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eupleura caudata	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haminoea solitaria	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mangelia plicosa	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mitrella lunata	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassarius	Gastropod	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassarius trivittatus	Gastropod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassarius vibex	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natica clausa	Gastropod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Neptunea decemcostata	Gastropod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Odostomia impressa	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olivella floralia	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Pyramidella fusca	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retusa canaliculata	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sinum perspectivum	Gastropod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Turbonilla interrupta	Gastropod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accalathura crenulata	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Ancinus depressus	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Chiridotea coeca	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Cirolana	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirolana concharum	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Cirolana polita	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyathura burbancki	Isopod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edotea	Isopod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edotea triloba	Isopod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurydice littoralis	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Ptilanthura tenuis	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acteocina canaliculata	Mollusc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadulus	Mollusc	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Dacrydeum vitreum	Mollusc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lasaea rubra	Mollusc	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Bowmaniella	Mysid	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Heteromysidopsis	Mysid	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Neomysis americana	Mysid	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carinomella lactea	Nemertean	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerebratulus lacteus	Nemertean	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrura leidyi	Nemertean	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ototyphlonemertes pellucida	Nemertean	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Rhynchocoels	Nemertean	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tubulanus pellucidus	Nemertean	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peloscolex	Oligochaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tubificidae	Oligochaete	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Tubificoides	Oligochaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Amphioplus	Ophiuroid	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphioplus macilentus	Ophiuroid	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophiopholis aculeata	Ophiuroid	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Harbansus	Ostracod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbansus bowenae	Ostracod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Harbansus dayi	Ostracod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarsiella zostericola	Ostracod	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoronis architecta	Phoronid	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amastigos	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	I	0	0
Amastigos caperatus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Amastigus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ampharete	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Ampharete americana	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Apoprionospio pygmaea	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Arenicolidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Aricidea	Polychaete	0	0	0	I	I	0	0	0	0	0	0	I	0	0	0	I	I
Aricidea catherinae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	I
Aricidea cerruti	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea neosuecia	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea philbinae	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea suecica	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea wassi	Polychaete	0	0	0	I	0	0	0	0	0	0	0	I	0	0	0	0	0
Armandia	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Armandia agilis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Armandia maculata	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Asabellides oculata	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Axiothella	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Brania	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Capitella capitata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Chone	Polychaete	0	0	0	I	I	0	0	0	I	0	0	0	0	0	0	0	I
Chone infundibuliformis	Polychaete	0	0	0	I	0	0	0	0	I	0	0	0	0	0	0	0	I
Cirratulidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	I	0	0	I

Table 8 Continued

TAXA	AREA	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
	REFERENCE NO. / AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Clymenella	Polychaete	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymenella torquata	Polychaete	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymenella zonalis	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cossura	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cossura longocirrata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diastylis bispinosa	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Diopatra	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diopatra cuprea	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eteone heteropoda	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchone incolor	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Euclymene collaris	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Eumida sanguinea	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunice	Polychaete	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Eunice norvegica	Polychaete	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Exogone	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	I
Exogone dispar	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Exogone hebes	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Exogone verugera	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Glycera	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Glycera americana	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycera dibranchiata	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycinde solitaria	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniada littorea	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Goniadella	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	I
Goniadella gracilis	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	I
Goniadidae	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0	I	0	0	0
Goniadides carolinae	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Haploscoloplos foliosus	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Harmothoe	Polychaete	0	0	I	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Harmothoe extenuate	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harmothoe imbricata	Polychaete	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Hemipodus roseus	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Heteromastus filiformis	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroides dianthus	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jasmineira filiformis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Lepidonatus	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidonatus squamatus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidonatus sublevis	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loimia medusa	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris	Polychaete	0	0	I	I	I	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris acuta	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris cruzensis	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris fragilis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris impatiens	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris latreilli	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris tenuis	Polychaete	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris testudinum	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Lumrinerides acuta	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Magelona	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	I	0	0
Magelonidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Maldane	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maldanidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	I
Mediomastus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mediomastus ambiseta	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Nephtys	Polychaete	0	0	I	0	0	0	0	0	0	0	0	I	0	I	0	0	I
Nephthys incisa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nephtys magellanica	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nephtys picta	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Nereis	Polychaete	0	0	I	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Nereis succinea	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nereis zonata	Polychaete	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Notomastus	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	I
Notomastus latericeus	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	I
Onuphis	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	I	0	0	0
Onuphis atlantisa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onuphis pallidula	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Opheliidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Orbiniidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Oweniidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	I	I	0	0
Owenia fusiformis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Paleanotus heteroseta	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paramphinome	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Paramphinome pulchella	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Paranaitis speciosa	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraonidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraonides lyra	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapionosyllis longicirrata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Paraprionospio pinnata	Polychaete	0	0	I	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Pectinariidae	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Pectinaria gouldii	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pherusa affinis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

TAXA	AREA	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
	REFERENCE NO. / AREA	N	N	S	N/S	S	N	S	S	N	S	S	S	N/S	S	S	S	N
Phyllodoce	Polychaete	0	0	I	0	0	0	0	0	I	0	0	0	0	0	0	0	I
Phyllodoce arenae	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodoce groenlandica	Polychaete	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Phyllodoce mucosa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Podarke obscura	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polycirrus	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polycirrus eximius	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polydora ligni	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polynoidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Potamilla reniformis	Polychaete	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Prionospio	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	I	I	0
Prionospio cristata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Prionospio dayi	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prionospio fallax	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Prionospio malmgreni	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protodorvillea kefersteini	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Protodrilus	Polychaete	0	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Protula tubularia	Polychaete	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Pseudoeurythoe paucibranchiata	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabellidae	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Sabella	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabella microphthalma	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabellariidae	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	I	I	0	0
Sabellaria	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabellaria vulgaris	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Samytha sexcirrata	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Scalibregma	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	**AREA**	**N**	**N**	**S**	**N/S**	**S**	**N**	**S**	**S**	**N**	**S**	**S**	**S**	**N/S**	**S**	**S**	**S**	**N**
Scalibregma iflatum	Polychaete	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Schistomeringos	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	I
Schistomeringos caeca	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Schistomeringos rudolphi	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Scolelepis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scoloplos	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scoloplos fragilis	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scoloplos robustus	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaerosyllis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Sphaerosyllis erinaceus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Spio	Polychaete	0	0	I	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Spio setosa	Polychaete	0	0	I	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Spionidae	Polychaete	I	0	I	I	0	I	0	0	0	0	0	I	I	I	I	0	I
Spionidae	Polychaete	I	0	I	I	0	I	0	0	0	0	0	I	I	0	I	0	I
Spiophanes	Polychaete	I	0	I	I	0	I	0	0	0	0	0	I	I	0	I	0	I
Spiophanes bombyx	Polychaete	I	0	I	I	0	I	0	0	0	0	0	I	I	0	I	0	I
Spiophanes kroyeri	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Spiophanes wigleyi	Polychaete	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Sternaspis scutata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Streblospio benedicti	Polychaete	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Syllidae	Polychaete	0	0	0	1	0	0	0	0	0	0	0	0	0	I	0	I	0
Syllis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Tharyx	Polychaete	0	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0	I
Tharyx acutus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tharyx setigera	Polychaete	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sipincula	Sipuncula	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Apseudes	Tanaid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	2	3	9	11	12	15	17	19	23	27	32	34	52	55	57	65	66
TAXA	**AREA**	**N**	**N**	**S**	**N/S**	**S**	**N**	**S**	**S**	**N**	**S**	**S**	**S**	**N/S**	**S**	**S**	**S**	**N**
Tanaissus	Tanaid	I	0	0	I	0	I	0	0	0	0	0	0	0	0	0	0	0
Tanaissus psammophilus	Tanaid	I	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0
Tanaissus liljeborgi	Tanais	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Acanthohaustorius	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acanthohaustorius millsi	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Acanthohaustorius shoemakeri	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aeginina longicornis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ampelisca	Amphipod	0	I	0	0	0	0	0	I	I	0	0	0	0	0	I
Ampelisca abdita	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Ampelisca agassizi	Amphipod	0	I	0	0	0	0	0	I	I	0	0	0	0	0	0
Ampelisca vadorum	Amphipod	0	0	0	0	0	0	0	I	I	0	0	0	0	0	0
Ampelisca verrilli	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atylus urocarinatus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Batea catharinensis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bathyporeia	Amphipod	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Bathyporeia parkeri	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Byblis serrata	Amphipod	I	0	0	0	0	0	0	I	I	0	0	0	0	0	0
Caprella penantis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerapus tubularis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Corophium acherusicum	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Elasmopus laevis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	AREA	N/S	N	S	N	S	N	N	N	N	S	N	N	S	N	N/S
Erichthonius	Amphipod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Erichthonius brasiliensis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Erichthonius rubricornis	Amphipod	0	0	0	0	0	0	0	0	I	0	0	0	0	0	0
Eudevenopus honduranus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gammarus mucronatus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haustoridae	Amphipod	0	0	0	0	I	0	0	I	0	0	0	0	0	0	0
Lembos websteri	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptocheiras pinguis	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Leptocheirus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Metharpina floridana	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monoculodes	Amphipod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0
Monoculodes edwardsii	Amphipod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0
Neohaustorius	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchomella pinguis	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Paracaprella tenuis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraphoxus epistomus	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoxocephalids	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Phoxocephalus holbolli	Amphipod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Phtisica marina	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pontogeneia inermis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protohaustorius	Amphipod	I	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Protohaustorius wigleyi	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protohaustorius deichmannae	Amphipod	0	0	0	0	0	0	0	0	0	0	0	I	0	I	0
Protohaustorius wigleyi	Amphipod	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pseudunciola	Amphipod	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Pseudunciola obliquua	Amphipod	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Rhepoxynius epistomus	Amphipod	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Tiron tropakis	Amphipod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trichophoxus	Amphipod	I	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Trichophoxus epistomus	Amphipod	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unicola	Amphipod	I	0	0	I	0	0	0	I	I	0	0	I	0	0	I
Unciola irrorata	Amphipod	I	0	0	I	0	0	0	I	I	0	0	I	0	0	0
Ceriantheopsis americanus	Anemone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerianthus	Anemone	0	0	0	I	0	0	I	I	0	0	0	0	0	0	0
Cerianthus americanus	Anemone	0	0	0	I	0	0	0	I	0	0	0	0	0	0	0
Diadumene leucolena	Anemone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edwardsia	Anemone	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Edwardsia elegans	Anemone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Metridium senile	Anemone	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Tealia felina	Anemone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zoantharians	Anemone	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asabellides oculata	Archiannelid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drilonereis filum	Archiannelid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygordiidae	Archiannelid	I	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Polygordius	Archiannelid	I	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Bostrichobranchus pilularis	Ascidian	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Mogula	Ascidian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molgula manhattensis	Ascidian	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asterias	Asteroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asterias forbesi	Asteroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asterias tenera	Asteroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asterias vulgaris	Asteroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astropecten	Asteroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astropecten americanus	Asteroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Crossaster papposus	Asteroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Henrica sanguinolenta	Asteroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amygdalum papyria	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anadara	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Anadara transversa	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arctica islandica	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astarte	Bivalve	0	0	0	0	I	0	0	0	0	0	0	0	0	0	I
Astarte borealis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astarte castanea	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astarte elliptica	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astarte montagui	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astarte subaequilatera	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Astarte undata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardiomya costellata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cardium	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerastoderma pinnulatum	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlamys	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chlamys islandicus	BIvalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassinella martinicensis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crysinella lunata	Bivalve	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Cyclocardia	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Donax	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Donax variabilis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ensis	Bivalve	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Ensis directus	Bivalve	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Ervilia	Bivalve	0	0	0	0	I	0	0	0	0	0	0	0	I	0	0
Ervilia concentrica	Bivalve	0	0	0	0	I	0	0	0	0	0	0	0	I	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	AREA	N/S	N	S	N	S	N	N	N	N	S	N	N	S	N	N/S
Ervilia nitens	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Lucinoma filosa	Bivalve	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Lucuna multilineata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lyonsia hyalina	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Macoma tentata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercenaria mercenaria	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiolus	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Modiolus modiolus	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mulinia lateralis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Musculus discors	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mya arenaria	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mytilus adulis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Nucula	Bivalve	0	0	0	I	0	0	I	I	0	0	0	I	0	I	I
Nucula annulata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Nucula delphinodonta	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Nucula proxima	Bivalve	0	0	0	I	0	0	I	I	0	0	0	I	0	0	0
Nucula tenuis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Parvilucina multidentata	Bivalve	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Pelecypoda	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Periploma papyratium	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Pitar	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Pitar morrhuana	Bivalve	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Placopecten magellanicus	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pleuromeris tridentata	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Semele proficua	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solemya borealis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spisula	Bivalve	0	0	0	I	0	0	0	0	0	0	0	I	0	0	0

Table 8 Continued

REFERENCE NO.		68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	AREA	N/S	N	S	N	S	N	N	N	N	S	N	N	S	N	N/S
Spisula solidissima	Bivalve	0	0	0	I	0	0	0	0	0	0	0	I	0	0	0
Tellina	Bivalve	0	0	0	I	I	0	0	0	0	0	0	I	0	0	0
Tellina agilis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Thyasira	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Thyasira flexuosa	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Transenella stimpsoni	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Venericardia borealis	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Yoldia limatula	Bivalve	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0
Barbatia	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barbatia cancellaria	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barbatia candida	Bivalve	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cupuladria	Bryozoan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Branchiostoma caribaeum	Cephalochordate	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Balanus	Cirripedia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Balanus improvisus	Cirripedia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclaspis	Cumacean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyclaspis varians	Cumacean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diastylis	Cumacean	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Diastylus polita	Cumacean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxyurostylis smithi	Cumacean	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Cancer irroratus	Decapod	0	0	0	I	0	0	0	0	0	0	0	0	0	0	0
Chaceon	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crangon	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crangon septemspinosa	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dichelopandalus leptocerus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eualus pusiolus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euceramus praelongus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	AREA	N/S	N	S	N	S	N	N	N	N	S	N	N	S	N	N/S
Galatheids	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hyas coarctatus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lebbeus groenlandicus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leptochela serratobita	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lucifer faxoni	Decapod	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Micropanope xanthiformis	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Munida	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neopanope texana	Decapod	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Ogyrides limicola	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pagurus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pagurus acadianus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pagurus arcuatus	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pagurus pubescens	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pandalus montagui	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spirontocaris lilljeborgii	Decapod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peltaster planus	Echinoderm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poranimorpha insignis	Echinoderm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clypeaster	Echinoid	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Echinarachnius	Echinoid	I	0	0	I	0	0	0	I	0	0	I	I	0	0	I
Echinarachnius parma	Echinoid	I	0	0	I	0	0	0	I	0	0	I	I	0	0	0
Encope	Echinoid	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Mellita	Echinoid	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Moira	Echinoid	0	0	I	0	0	0	0	0	0	0	0	0	0	0	0
Strongylocentrotus droebachiensis	Echinoid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jaculella obtuse	Foraminiferan	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Alvania	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	AREA	N/S	N	S	N	S	N	N	N	N	S	N	N	S	N	N/S
Anachis translirata	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Buccinum undatum	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caecum	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caecum CF. johnsoni	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calliostoma occidentale	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ceritheopsis greeni	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Colus	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coryphella	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepidula	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepidula convexa	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crepidula plana	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cylichna	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Epitonium rupicolum	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eupleura caudata	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haminoea solitaria	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mangelia plicosa	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mitrella lunata	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassarius	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Nassarius trivittatus	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nassarius vibex	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Natica clausa	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neptunea decemcostata	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Odostomia impressa	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Olivella floralia	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pyramidella fusca	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Retusa canaliculata	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sinum perspectivum	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Turbonilla interrupta	Gastropod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Accalathura crenulata	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ancinus depressus	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chiridotea coeca	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirolana	Isopod	I	0	0	0	0	0	0	I	0	0	0	0	0	0	I
Cirolana concharum	Isopod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Cirolana polita	Isopod	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyathura burbancki	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edotea	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Edotea triloba	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eurydice littoralis	Isopod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ptilanthura tenuis	Isopod	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Acteocina canaliculata	Mollusc	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Cadulus	Mollusc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dacrydeum vitreum	Mollusc	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Lasaea rubra	Mollusc	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bowmaniella	Mysid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heteromysidopsis	Mysid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Neomysis americana	Mysid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Carinomella lactea	Nemertean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cerebratulus lacteus	Nemertean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Micrura leidyi	Nemertean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ototyphlonemertes pellucida	Nemertean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rhynchocoels	Nemertean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tubulanus pellucidus	Nemertean	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Peloscolex	Oligochaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tubificidae	Oligochaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Tubificoides	Oligochaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amphioplus	Ophiuroid	0	I	I	0	0	0	0	0	0	0	0	0	0	0	0
Amphioplus macilentus	Ophiuroid	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Ophiopholis aculeata	Ophiuroid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbansus	Ostracod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbansus bowenae	Ostracod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbansus dayi	Ostracod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sarsiella zostericola	Ostracod	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phoronis architecta	Phoronid	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amastigos	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amastigos caperatus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Amastigus	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Ampharete	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ampharete americana	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apoprionospio pygmaea	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Arenicolidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea	Polychaete	I	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea catherinae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea cerruti	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Aricidea neosuecia	Polychaete	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea philbinae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea suecica	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aricidea wassi	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Armandia	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Armandia agilis	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Armandia maculata	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Asabellides oculata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Axiothella	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Brania	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Capitella capitata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chone	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chone infundibuliformis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cirratulidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymenella	Polychaete	I	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Clymenella torquata	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Clymenella zonalis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cossura	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Cossura longocirrata	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Diastylis bispinosa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diopatra	Polychaete	0	0	I	0	0	0	0	0	0	0	I	0	0	0	0
Diopatra cuprea	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eteone heteropoda	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euchone incolor	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euclymene collaris	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eumida sanguinea	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunice	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Eunice norvegica	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exogone	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exogone dispar	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exogone hebes	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exogone verugera	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycera	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Glycera americana	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glycera dibranchiata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Glycinde solitaria	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniada littorea	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniadella	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniadella gracilis	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Goniadidae	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Goniadides carolinae	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Haploscoloplos foliosus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harmothoe	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Harmothoe extenuate	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Harmothoe imbricata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Hemipodus roseus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Heteromastus filiformis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hydroides dianthus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jasmineira filiformis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lepidonatus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Lepidonatus squamatus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Lepidonatus sublevis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loimia medusa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris	Polychaete	I	I	0	0	0	0	0	I	0	0	0	0	I	0	0
Lumbrineris acuta	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris cruzensis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris fragilis	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Lumbrineris impatiens	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris latreilli	Polychaete	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumbrineris tenuis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Lumbrineris testudinum	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lumrinerides acuta	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	AREA	N/S	N	S	N	S	N	N	N	N	S	N	N	S	N	N/S
Magelona	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magelonidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Maldane	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Maldanidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mediomastus	Polychaete	0	0	0	0	I	0	0	0	0	I	0	0	0	0	0
Mediomastus ambiseta	Polychaete	0	0	0	0	I	0	0	0	0	I	0	0	0	I	0
Nephtys	Polychaete	I	0	0	0	0	0	I	0	0	0	0	I	0	0	I
Nephthys incisa	Polychaete	0	0	0	0	0	0	I	0	0	0	0	I	0	0	0
Nephtys magellanica	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nephtys picta	Polychaete	I	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nereis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Nereis succinea	Polychaete	0	0	0	0	0	0	0	0	0	0	0	I	0	0	0
Nereis zonata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Notomastus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Notomastus latericeus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Onuphis	Polychaete	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Onuphis atlantisa	Polychaete	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Onuphis pallidula	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Opheliidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orbiniidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oweniidae	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Owenia fusiformis	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Paleanotus heteroseta	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paramphinome	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paramphinome pulchella	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paranaitis speciosa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraonidae	Polychaete	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Paraonides lyra	Polychaete	0	I	0	0	0	0	0	0	0	0	0	0	0	0	0
Parapionosyllis longicirrata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paraprionospio pinnata	Polychaete	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Pectinariidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pectinaria gouldii	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pherusa affinis	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Phyllodoce	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodoce arenae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodoce groenlandica	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Phyllodoce mucosa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Podarke obscura	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polycirrus	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Polycirrus eximius	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polydora ligni	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygoridus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Polynoidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potamilla reniformis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prionospio	Polychaete	0	0	0	I	I	0	I	0	0	0	0	0	0	I	0
Prionospio cristata	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Prionospio dayi	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Prionospio fallax	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Prionospio malmgreni	Polychaete	0	0	0	I	0	0	I	0	0	0	0	0	0	0	0
Prionospio steenstrupi	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	I	0
Protodorvillea kefersteini	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Protodrilus	Polychaete	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Protula tubularia	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Pseudoeurythoe paucibranchiata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabellidae	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Sabella	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Sabella microphthalma	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabellariidae	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Sabellaria	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sabellaria vulgaris	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Samytha sexcirrata	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scalibregma	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	I
Scalibregma iflatum	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schistomeringos	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schistomeringos caeca	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Schistomeringos rudolphi	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scolelepis	Polychaete	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Scoloplos	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scoloplos fragilis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scoloplos robustus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaerosyllis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sphaerosyllis erinaceus	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spio	Polychaete	0	0	0	0	0	0	0	0	0	I	0	0	0	0	0
Spio setosa	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spionidae	Polychaete	I	0	0	I	I	0	0	0	0	I	I	0	0	0	I
Spionidae	Polychaete	I	0	0	I	I	0	0	0	0	I	I	0	0	0	I
Spiophanes	Polychaete	I	0	0	I	I	0	0	0	0	I	I	0	0	0	I
Spiophanes bombyx	Polychaete	I	0	0	I	I	0	0	0	0	I	I	0	0	0	0
Spiophanes kroyeri	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 8 Continued

	REFERENCE NO.	68	69	71	77	84	91	95	96	100	101	105	108	111	115	117
TAXA	**AREA**	**N/S**	**N**	**S**	**N**	**S**	**N**	**N**	**N**	**N**	**S**	**N**	**N**	**S**	**N**	**N/S**
Spiophanes wigleyi	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sternaspis scutata	Polychaete	0	0	0	0	0	0	0	I	0	0	0	0	0	0	0
Streblospio benedicti	Polychaete	0	0	0	0	0	0	0	0	0	I	0	0	0	I	0
Syllidae	Polychaete	0	0	0	0	I	0	0	0	0	0	0	0	0	0	0
Syllis	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tharyx	Polychaete	0	I	0	0	0	0	I	0	0	0	0	0	0	0	0
Tharyx acutus	Polychaete	0	0	0	0	0	0	I	0	0	0	0	0	0	0	0
Tharyx setigera	Polychaete	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sipincula	Sipuncula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apseudes	Tanaid	0	0	0	0	0	0	0	0	0	0	0	0	I	0	0
Tanaissus	Tanaid	0	0	0	0	0	I	0	0	0	0	0	0	0	I	0
Tanaissus psammophilus	Tanaid	0	0	0	0	0	I	0	0	0	0	0	0	0	0	0
Tanaissus liljeborgi	Tanais	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Reported as dominant for both the East Coast and Gulf of Mexico, the only commonality between the two were the polychaetes *Prionospio*, *Nephtys*, and *Spiophanes bombyx*. Several dominant taxa from the East Coast were not reported in any surveys from the Gulf of Mexico including the amphipods *Byblis serrata* and *Unicola*, the bivalves *Astarte*, *Ensis directus*, *Nucula, Tellina,* the decapod *Cancer irroratus,* the echinoid *Echinarachnius,* the polychaetes *Aricidea*, *Chone, Lumbrineris,* Syllidae, Sabellariidae, and tanaid *Tanaissus*. In the Gulf of Mexico, the polychaetes *Magelona phyllisae*, *Mediomastus californiensis*, and *Sigambra tentaculata* were reported as dominants. None of these same taxa were reported as dominants in East Coast surveys.

C. Collection Methods

Sieve or mesh size used for faunal collections was recorded in 77 surveys and experiments. Literature reviews were excluded from the comparison of collection methods. In the Gulf of Mexico and East Coast, 60 surveys and experimental studies provided sieve sizes, and in some cases, multiple sizes were used to separate megabenthos, macrofauna, or meiofauna. Standard sieve size for macrofaunal and meiofauanal separation in the published literature is 0.5 mm and 0.063 mm, respectively. Within the Gulf of Mexico, 33 studies reported mesh sizes, and of these, 22 utilized 0.5 mm sieves. There were also three studies where a sieve size of 0.063 mm was recorded. The smallest mesh size used in the Gulf of Mexico was 0.030 mm (62). Within the East Coast, a total of 40 studies reported mesh sizes. Of these sizes, 19 used 0.5 mm, and three used 0.063 mm mesh.

D. Depth Relationships

In the Gulf of Mexico surveys that discussed depth relationships, the majority indicated a decrease in faunal density with depth (1, 7, 8, 41, 45, 49, 56, 79, 83, 84). One study, however, noted that both macrofaunal density and diversity were greater offshore (20 km) than nearshore (8 km), indicating a positive association of density with depth (72). Additionally, there were several surveys in which there was either no trend with macrofaunal density and depth (29), or situations in which the direction of the relationship was taxon or species-specific (5, 105). Of the studies that discuss diversity or species richness in relation to depth, four noted a negative relationship (7, 8, 79, 114), three indicated a positive relationship (30, 45, 72), and three other papers indicated no clear trend (5, 29, 105). Thus, there appears to be no clear relationship between macrofuanal diversity and depth. Finally, only one study in the Gulf of Mexico investigated the relationship between benthic biomass and depth. A decrease of carbon biomass with increasing depth was reported (23).

As with Gulf of Mexico surveys, East Coast surveys reported inconsistent trends concerning the relationship between macrofaunal density and depth. Three surveys indicated an increase in density with depth, either in polychaetes (69), sand assemblages (110), or in total macrofauna (24), but two other surveys reported a decrease in macrofaunal density with depth, on the continental slope (11) and continental shelf (119). Four surveys discussing the relationship of macrofaunal diversity and depth reported a positive relationship, with one study finding greater diversity on the continental slope than shelf (39), one showing an increase of polychaete diversity with depth down to 80 m (69), and two others being more general in the nature of the link (24, 110). Additionally, it was found that there was an increased diversity and species richness associated with the outer shelf and shelf-break (11). Two surveys on the East Coast discussed the relationship between biomass and depth, reporting a negative relationship between the two (39, 117). Community composition divisions, or changes, were indicated at depths of 32 and 115 meters in one study (6), but this was the only survey which attempted to characterize communities with depth.

E. Sediment-Animal Relationships

Overall, there was limited information on sediment properties (i.e., grain size, organic content) in relation to faunal community parameters, such as diversity or abundance. Within the Gulf of Mexico surveys, there were four relationships found between sediment type or grain size and community composition (1, 4, 16, 79), and four relationships between sediment type and abundance and diversity measurements (5, 7, 49, 118). One of these surveys, however, only one found a local-scale relationship between community structure and sediment type (79). The majority of Gulf of Mexico studies indicated a lack of any strong relationship between sediment grain size and macrofaunal abundance (41), density (44, 84), or community structure (29, 84, 118). Inconsistencies across taxa or species were also noted on two occasions (5, 105).

Contrary to the Gulf of Mexico surveys, several relationships between grain size and fauna were observed in East Coast surveys. The use of discrete habitats, such as gravel (17, 40), boulders (41), shell hash (40), coarse sands (17, 107), and fine sands (107), was noted for macrofauna (12, 17), megafauna (3), polychaetes (2, 11, 17), amphipods (11), bivalves (17), tanaids (17), sand dollars (107), and tubeworms (107). In yet another study, however, temperature and salinity were found to influence the meiofauna community to a greater extent than sediments (39). Faunal abundance and sediment size were found to be related in three surveys (40, 91, 120). No correlation was found between sediment carbon or nitrogen and faunal abundance (39). A connection between sediment and macrofaunal diversity was noticed in two instances (12, 92). Only one study related biomass to sediment characteristics finding a relatively low biomass in shell hash habitat (40). No mention was made in East Coast studies of inconsistencies across taxa or species with respect to sediment-animal relationships.

F. Feeding Type Communities

Among the four surveys in the Gulf of Mexico that emphasized feeding types, two noted deposit feeders (polychaetes) as dominant (1, 118), another indicated suspension feeders as dominant, at least in the Louisianna and Texas areas (83), and yet another reported suspension feeders dominanting in the summer, shifting to deposit feeders in winter (87).

The East Coast also had relatively few surveys (six) which identified macrofauna to specific feeding types, with inconsistent results as to which group dominated. Two surveys listed either carnivores and deposit feeders (15), or carnivores and suspension feeders (54) as the dominant feeding types. One survey provided more detailed information, stating that deposit feeders were dominant in mud or silt sites (2). In contrast, it was reported that surface feeding polychaetes were dominant (13), or that location on the continental shelf, shelf-break, or slope determined dominant feeding types (11). Only one study examined any changes in feeding type which occur post-dredging, stating that filter feeders and surface deposit feeders increased, while subsurface deposit feeders declined, after dredging (15). Overall, most surveys from both areas highlighted the dominant feeding types as deposit or suspension feeders.

G. Seasonality

Review of the 18 surveys that included information on seasonality of benthic fauna in the Gulf of Mexico indicated spring (1, 7, 8, 9, 16, 44, 49, 84, 105, 118) and/or summer (1, 8, 9, 41, 99, 100, 116) as peak seasons for spawning, abundance, biomass, and diversity values. The focus of the surveys varied across taxa, with some studies relating seasonality to abundance of specific phyla, such as polychaetes (44, 116), molluscs (8, 84) or arthropods (50), while others categorized infauna (9), meiofauna (1, 83), or macrofauna (32, 41, 83) with seasonality. Most results, using taxonomic categories (i.e. molluscs, arthropods, infauna, meiofauna, etc.) were consistent. Of the three surveys examining the seasonality of overall macrofaunal abundance two studies indicated the summer (41), or warmer months (83) supported higher densities, while the third stated that the winter months (32) supported the greatest densities.

Late spring and summer were found as seasons of highest abundance for macrofauna in several East Coast surveys, as well. Three surveys identified late spring or early summer as months of peak abundance or density (34, 86, 113). Alternatively, one survey reported highest abundances during a winter month (35) and three reported higher densities in the fall compared to either summer (12), summer and spring (70), or spring (17). In contrast, two surveys found a lack of seasonal trends in either megabenthos density (12) or macrofaunal biomass (69). Taxon-specific patterns in seasonal abundance were common (2, 86, 102).

H. Dredging Impacts

Seven papers from the Gulf of Mexico specifically addressed the impacts of dredging and/or sediment disposal on benthic fauna (Table 9). Two studies found no change in infaunal density with dredging (9, 31), and five studies detected reduced densities in impact areas (30, 66, 83, 96, 99). When infaunal species richness was considered, two studies found no change after dredging (9, 31), but four observed reduced infaunal species richness in the impact area (30, 66, 83, 99). Impacts do not appear to extend seaward of the dredged area (62).

Within the East Coast, infaunal density (24, 93) and species richness (24, 93, 97) declined in areas impacted by dredging (Table 9). However, three studies reported an increase in polychaete abundance post-dredging (57, 93, 103). One East Coast study found a higher density of infauna adjacent to an impact area (97). In addition, one East Coast study found communities with a different species composition and higher productivity on swales versus ridges due to sediment differences as a result of dredging (12). In summary, there is no consistent pattern of faunal response to dredging in the reviewed literature.

Table 9. A summary table which highlights the conclusion of studies which examined resultant changes in benthos density, benthos species richness, or both due to dredging disturbance. The reference number of the specific studies are given in parentheses and can be found inTable 3.

Metric	Impact	East Coast	Gulf of Mexico	Total Number of Studies
Infaunal Denisty				
	No Change		(9) (31) (66)	3
	Reduced in Impact Area	(24) (93)	(30) (66) (83) (96) (99)	7
	Greater in Impact Area	(97)		1
Infaunal Species Richness				
	No Change		(9) (31) (66)	3
	Reduced in Impact Area	(24) (93) (97)	(30) (66) (83) (99)	7
	Greater in Impact Area			0

I. Recovery and Recolonization

Thirteen surveys are available to provide estimates on the time period for recovery or recolonization of benthos in dredge or disposal areas (Table 10). Four of the studies were from the Gulf of Mexico and focused on dredging recovery. Two of the Gulf of Mexico studies showed that recovery takes place in less than one year (66, 100, 114). The most rapid recovery times were recorded in a study of an accidental dredge material spill which showed recovery to occur between 45 and 156 days (66). In this study, the method of spill containment, whether the area is dredged for clean-up, or left undredged, was found to affect species composition and density, with higher densities in the undredged area. Another survey, however, stated that three years post-dredging, complete recovery in terms of mollusc size frequency, species abundance, or species diversity was not present (99). Opportunistic polychaetes (114, 116) and mobile crustaceans (114), were shown to colonize disturbed areas first.

Studies of recovery and/or recolonization time were more numerous on the East Coast, (Table 10) with most studies showing recovery to take from three months to 2.5 years (11, 57, 59, 86, 93, 122). Specifically, the recovery periods reported were 3-4 months (122), 3-6 months (59), 43 weeks (11), 9-12 months (57, 86), and one year (infaunal densities) to 2.5 years (total recovery) (93). Recovery of the original community composition has been suggested to potentially take a substantial amount of time to recover, especially in sand mining areas that are repetitively used (16).

Table 10. Highlighted conclusion of studies which indicated recovery times post-dredging disturbance. The reference number of the specific studies can be found in Table 3.

Reference No.	Location	Study Type	Conclusion
11	East Coast	Survey/ Experimental	Densities recovered in 43 weeks but the resultant species composition was different.
15	East Coast	Survey	Overall, abundance, species richness, and taxonomic structure recovered within 1 year. Most taxa recover within 1 year with deep burrowers taking up to 3 years. Species composition will change in a mining area which is repetitively used.
57	East Coast	Survey	Densities and species diversity recovered in 9-12 months. The species composition was not identical within 1 year.
59	East Coast	Survey	Faunal densities were not significantly altered after 3-6 months. Species composition was still different after 30 months.
66	East Coast	Survey	Impact effects are not observed after 5 to 10 years.
68	Gulf of Mexico	Survey	A spill area recovered in terms of species diversity and species within 156 days. A dredged area had not recovered in density, biomass, species richness, or species composition within 45 days.
87	East Coast	Survey	Infauna are similar 9-12 months post dredging. A few compositional changes remained post 1 year.
93	East Coast	Survey	Infaunal densities recovered by the next season with total recovery within 2-2.5 years.
99	Gulf of Mexico	Survey	Abundance, species diversity, and mollusc size were all reduced within a sand mining pit three years post dredging.

Table 10 Continued

Reference No.	Location	Study Type	Conclusion
100	Gulf of Mexico	Survey	Recovery after dredging takes 3-12 months for species richness and infaunal densities. Species composition was not identical after 1 year.
113	East Coast	Survey	Infaunal density and species richness was greater in mined pits 5 years post dredging.
114	Gulf of Mexico	Review	Recovery from disposal is expected to occur within 7-12 months in shallow high energy areas.
122	East Coast	Experimental	Infaunal densities recovered within 3 months. Community structure recovered within 4 months.

For example, deep burrowers may take up to three years to recover (15). Two surveys followed faunal recovery over relatively long time periods (5-10 years), one indicating a lack of impact after five to 10 years (68), and another showing increased faunal density and species richness in sand removal pits five years post-dredging (113). As in the Gulf of Mexico, polychaetes and crustaceans recolonized impact areas more quickly than other taxa (11, 13). Molluscs, however, were slow to colonize impact areas (13).

J. Dredging Recommendations

Dredging recommendations for the Gulf of Mexico were given in numerous papers. Two papers recommended leaving small undredged areas, or islands, between dredged areas in order to facilitate recolonization of original communities (16, 100). Fall and spring were identified, in one paper, as optimal times for dredging, and recommended that less than 3-4 cm of sediment should be taken (16). Currents of the area, because they affect sediment movements and disturbances, may also play a role in recovery following dredging, and these were suggested to be considered in design of dredging projects (17, 83, 100). One paper recommended sediment disposal to occur in naturally disturbed areas, since these organisms are more adept to changing conditions (114).

Recommendations from studies from the East Coast were similar to those from the Gulf of Mexico studies. Researchers recommended that dredging be restricted to shallow pits (2, 17), with resource islands left to facilitate recolonization (54). The type of dredging may need to be considered as well, with some more desirable than others (17, 59). On the East Coast, hopper dredges have been shown to make shallow furrows, of about one meter, separated by undisturbed areas. Sediment from the undisturbed areas after hopper dredging may slump into dredge furrows, allowing for fast sediment re-fill of dredged areas (59).

DISCUSSION & RECOMMENDATIONS

A. Study Types

The majority of studies included in the database were surveys of benthos, either conducted in relation to dredging and disposal activities, or a general assessments of benthos on the U.S. East Coast and Gulf of Mexico. While Continental Shelf surveys have targeted both northern and southern East Coast regions, there has been a lack of survey work conducted in the western Gulf of Mexico, as most Gulf of Mexico surveys were conducted east of the Mississippi River. As was true for surveys, literature reviews were more frequent than experimental studies, but generally lacking from both the southern East Coast and western Gulf of Mexico. Thus, the western Gulf of Mexico and southern East Coast stand as areas in need of additional study if sand mining activities are likely to be conducted there.

There were only five experimental studies reported from the literature search, and, of these, only three were in our regions of interest. We found no experimental studies conducted in the western Gulf of Mexico. It should be noted, however, that in most instances, studies conducted before and after dredging operations were considered to be surveys, unless it was specifically stated in the paper that the dredging was designed as an experiment. If dredging occurred as a part of some larger operation (e.g. sand mining, harbor dredging, etc.), and not specifically for the purposes of experimentation, then that study was also considered a survey. The general lack of experimental work makes assessment of dredging impacts tenuous.

B. Depth Relationships

Depth ranges of surveys from the East Coast and Gulf of Mexico spanned a range of 1 - 2500 m, but most were conducted at depths of 200 m or less. Thus, these studies extend into depths unlikely to be exploited for sand mining activities. In order to be more useful for sand resource management, studies should be focused in shallower waters in the range of 5-15 m, since these are the areas most likely to contain natural sand banks, ridges, and shoals, and therefore, to be considered for sediment borrow activities. Additional studies targeting the effects of sand borrowing should place more effort into replication within this narrow depth range versus spreading out sampling effort to cover a large scale of depths.

Our survey of faunal relationships with depth indicated that they varied widely, and no definitive associations were identified. Studies over narrower depth ranges would be beneficial for demarcating faunal relationships with depth, especially if fauna were identified to the species level, since associations may be species-specific. Several studies related species richness, abundance, and/or biomass to depth, but the studies arrived at various conclusions, making generalizations difficult. Standardization of measurements and level of analysis across studies would improve the ability to discern faunal relationships with depth.

C. Dominant Taxa

Dominant taxa were reported across a range of taxonomic categories. While most studies listed dominant taxa to phyla or to the class level, several other surveys reported dominance to the family, genus, or species levels. A higher level of taxonomic resolution strengthens comparisons within and across regions, and allows for evaluations to be made between the Gulf of Mexico and East Coast, as patterns of abundance for individual species may not mirror that of others and some species may be especially susceptible to dredging impacts. Such species level of analysis is also important to accurately assess dredging impacts on species richness.

In common between the Gulf of Mexico and East Coast are several dominant polychaetes, Spionidae (i.e., *Prionospio, Spiophanes bombyx*) and Nephtyidae (*Nephtys*) which are listed as mobile taxa. Spionidae polychaetes are tube-building surface deposit feeders while Nephtyidae are free-living predators consuming molluscs, crustaceans, and other polychaetes (Fauchald and Jumars, 1979). Surveys from the East Coast indicated a greater diversity of dominant taxa not reported for the Gulf of Mexico including, for example, filter-feeding polychaetes (Sabellidae and Sabellariidae), carnivorous polychaetes (Syllidae) (Fauchald and Jumars, 1979), tube-dwelling amphipods (*Unicola* and *Byblis*) (Bousfield, 1973), and a bioturbating echinoderm (Echinarachnius). The species composition of dominant taxa was found to be relatively similar in the north and south East, with a few exceptions (e.g., *Prionospio*, polychaete). In the Gulf of Mexico, several polychaete species (*Sigambra tentaculata, Magelona phyllisae*) were found to be predominant only west of the Missisippi River while the opposite pattern was true for dominant amphipod species. The amphipods, *Acanthohaustorius* and *Microdeutopus,* both free-living and tube-building genera (Bousfield, 1973), respectively, were common, but only east of the Mississippi River.

While the majority of surveys gave dominance information in terms of abundance, many either lacked dominance by biomass, or were inconsistent in parameters assessed. Many of the studies used wet weights instead of dry weights for biomass measurements, and several even measured mollusc biomass with shells included. Discrepancies in such measurements either make comparisons impossible, or strongly biased.

Among the literature examined, some examined patterns of dominance by feeding type, with examples of deposit and suspension feeders, as well as carnivores, all reported to be dominant in various studies. Increased information on feeding type is needed, as preliminary studies suggested that subsurface deposit feeders declined after dredging. However, too few studies are available to evaluate trends. This "functional" classification may be a useful approach for providing information on trophic structure of the benthos. Such information could be easily gleaned from species-specific data or even if taxa were identified to specific families. For example, in the Gulf of Mexico, while mobile deposit feeding polychaetes dominated (e.g., *Mediomastus*, Spionidae) a diversity of polychaete feeding types was present including surface deposit feeders (e.g., *Tharyx*), suspension feeders (e.g., Sabellidae, Sabellariidae), and carnivores (Nephtyidae, Lumbrineridae, Syllidae) (Fauchald and Jumars, 1979).

Not only were there wide discrepancies in faunal measurements and level of analysis, but techniques of faunal collections were also variable across studies. Mesh sizes, although most were reported to be 0.5 mm, were highly variable. This makes comparisons among studies problematic. Less problematic, but still an issue, are differences in gear type. The use of different collection devices may influence the fauna gathered. Smith-McIntyre grabs were often used to collect fauna, more so on the East Coast than in the Gulf, while box corers were used mostly in the Gulf of Mexico. With over nine different collection mechanisms used throughout the East Coast and Gulf of Mexico studies, additional unknown sampling bias may be introduced into evaluation of benthic composition and abundance.

D. Sediments

Overall, the information on animal-sediment relationships was poor. Although numerous studies indicated in the methods that sediments were collected to describe the sedimentary habitat very little statistical analyses were done which provide useful information to predict fauna distributions based upon sediment type. Most of the sediment analyses results were on a gross scale and results were inconsistent across studies. Inconsistencies among taxa were also apparent, at least in the Gulf of Mexico. Some studies indicated a lack of relationship, while others pointed to direct relationships, where fauna utilize specific sediment size category (shell hash, gravel, etc.). Sediment characteristics were not considered as important as temperature and salinity to meiofauna. Generally, direct associations between sediment grain sizes and communities were difficult to extract from the available information.

E. Recovery & Recolonization

Presently, it is difficult to draw conclusions about approximate recovery times from dredging and/or disposal operations because of the paucity of studies. From the few studies available, it appears that general “recovery” of assemblages to background levels is within three months to 2.5 years. However, this information is very specific to taxa, dredging operation, and environmental conditions, such as background disturbances, currents, etc. In most cases, polychaetes were the first to recolonize dredged or disposal sites, with crustaceans, specifically amphipods, also recolonizing relatively quickly. Some studies noted that carnivores recolonized dredged areas in a short amount of time, speculating that this response may be tied to the food resources available in dredged areas due to dead and injured organisms resulting from the dredging process itself. Measurements of recovery, however, were varied, with some studies looking at general abundance of organisms, and others evaluating community structure. Those evaluating entire communities often indicated that while abundances of organisms may increase to background levels relatively quickly, community structure may remain altered for some time, and, in repetitively dredged areas, may have difficulty ever recovering to the original state. Many studies reported that community structure differences still existed after one year. There were not enough studies to make any conclusions concerning recovery rates based upon differences in dredge extent or intervals.

Although there were few papers that gave distinct recommendations concerning dredging operations, a few suggested leaving small “resource islands” for recovery purposes. Such resource islands may be important for two reasons: First, the ridges of islands are a source of sediment, which can slump down into furrows, allowing for a quick rate of sediment replenishment. Island sediments should also retain the original sediment characteristics of the area. Second, original communities may still exist within resource islands, so communities in the dredged areas may recover quickly if their source pool lies within the island. The resource island concept, although appealing, needs to be experimentally tested with proper controls before its benefits can be evaluated fully.

CONCLUSIONS

Based on the available information on the impacts of dredging in offshore areas, specifically sand mining areas, the following research needs have been identified:

A. Needs:

1. Better sampling of borrow areas: consider a preplanned study with monitoring before dredging and long term monitoring afterwards.
2. Use of dredging as part of preplanned experimental studies, where recovery can be charted over short and long term and where "control" areas are included.
3. Improvement of standardization of sampling techniques - sieve size, taxonomic resolution, biomass determinations, season of sampling.
4. Trophic level analysis-either by isotope analyses or categorization of feeding types. This will add to informational content.
5. Laboratory experiments which not only examine the potential effects of sand mining (e.g.,sediment resuspension, burial) upon individual species survival but also changes in species composition and trophic transfer.
6. A biological or large-scale geographical context needs to be applied to interpret group similarities based upon cluster analysis results. Cluster analysis is commonly used to group "similar" sampling stations however the resulting dendograms are of limited value without this information.
7. *A-priori* group categories should be assigned prior to the use of discriminant analysis.

In addition, several data gaps have been noted after compilation of the database, and should be considered important areas for future research focus:

B. Data Gaps:

1. Spatial Information: The use of GPS allows for reporting of spatial coordinates of all sampling locations. This information was sorely lacking in the studies reviewed here and should be a requirement of all additional studies.
2. Area of Study: Adequate assessment of benthos at depths where sand mining is likely to occur is limited.
3. Sediment Characteristics: Description of detailed sediment characteristics at each sample location is often unavailable.
4. Large Scale Description of Sediment Surface Features: These features (ridges, swales, etc.) are of interest, especially areas where sand mining is to be conducted.

5. Long Term Studies: Little evidence is available to determine if seasonal patterns are repeated annually or to assess adequate recovery of dredged sites.
6. Habitat Resource Island Concept: Description of adequate sizes and efficiency of habitat islands is only discussed in a few papers and is largely unexplored.

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Appendix A

Benthos ProCite Database

ProCite Database

Database Entry #1

Alexander, S. K., P. N. Boothe, R. W. Flint, C. S. Giam, J. S. Holland, G. Neff, W. E. Pequegnat, P. Powell, N. N. Rabalais, J. R. Schwarz, P. J. Szaniszlo, C. Venn, D. E. Wohlschlag, and R. Yoshiyama. 1981. Benthic biota in W. R. Flint and N. N. Rabalais, editors. Environmental studies of a marine ecosystem South Texas outer continental shelf. University of Texas Press, Austin.

Keywords: Texas/Gulf of Mexico.

Notes:

Collection Method and Sample Processing

A sieve size of 0.5 mm was used to define macrofauna and 0.1 mm for meiofauna.

MAJOR FINDINGS

Dominant Abundant Taxa

The most abundant meiofauna was Nematodes. The second most abundant was Harpacticoids.
The most abundant shallow water species were *Prionospio steenstrupi, Ceratocephaleo oculata, Magelona phyllisae, Paraprionospio pinnata,* and *Lumbrineris verrilli*.
Species diversity was higher in shallow water.
The most common taxa were deposit feeding polychaetes.
Many of the species on the shallow shelf are typical of inlets, bays, and shoals.

Spatial Distribution

Meiofauna and macrofauna populations decreased in abundance with depth.
Sediment grain size was also found to be important in defining community type.
Spatial patterns of infaunal density appear to be correlated with Cholorphyll a concentration.

Environmental Correlations

Meiofauna abundance peaks in March, July-August, and November.

Database Entry #2

Applied Coastal Research and Engineering Inc. 2000. Environmental survey of potential sand resource sites: offshore New Jersey: U.S. Department of Interior Minerals Management Service. OCS Study MMS 2000-052.

Keywords: New Jersey/East Coast/Continental Shelf.

Notes:

Geographic Area

The study site is the Federal-State OCS boundary within the New Jersey Exclusive Economic Zone (between the 10-20 m depth contours).
The study area includes many natural sand ridges (2-5 m high and 0.5-1.5 km apart).

Depth Range

The depth range is from 10-20 m.

Collection Method and Sample Processing

Samples were collected inside of and adjacent to 8 sand borrow areas.
A Sediment Profiling Camera was used.
A Smith-McIntyre Grab was used.
A 0.5 mm mesh sieve was used for faunal analysis.

Statistics

Shannon Weaver, Evenness, Margalef's (species richness), Canonical Discriminant Analysis and Cluster Analysis were used for statistical purposes.

Environmental Data Collected

The water quality parameters of temperature, salinity, and DO were measured.

Habitat Parameters Collected

Sediment grain size was analyzed.

Date of Sampling

Sampling was performed during May and September.

Entry #2 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Over both seasons, *Polygordius* (archiannelid) was the most dominant (18% of all infauna sampled).

May:

Spiophanes bombyx (polychaete) 16.4% of all infauna sampled.
Tunicates 16.1%
Polygordius (archiannelid) 16.1%
Mytilus edulis (bivalve) 11.6%
Spisula solidissima (surf clam) 2.2%

September:

Polygordius 19.5% of all infauna sampled
Asabellides oculata (polychaete) 6.4%
Rhynchocoels 5.9%
Tanaissus psammophilus (tanaid) 5.9%
Pseudunciola obliquua (amphipod) 4.5%

Spatial Distribution

Northern areas were dominated by gravel. The assemblage of species associated with gravel consisted of: Bivalves - *Astarte castanea, Crenella decussata, Mytilusedulis,* Juvenile surf clams; Gastropods - *Crepidula fornicata, Mitrella lunata;* and Polychaetes - *Harmothoe imbricata, Hemipodus roseus, Pisione remota.*

Southern areas had some sites dominated by sand. The assemblage of species associated with sand were: Polychaetes - *Caulleriella, Spiophanes bombyx,* Archiannelid – *Polygordius,* Bivalve - *Tellina agillis,* Amphipods – *Acanthohautorius millsi, Pseudunicola obliquua, Protohaustorius wigleyi, Rhepoxynius hudsoni,* and Tanaid - *Tanaissus psammophilus.*

High mud or silt sites contained deposit feeders: Polychaetes - *Asabellides oculata, Capitella capitata* and the Nut Clam - *Nucula proxima*.

Trough sites tended to have a high abundances including polychaetes and amphipods.

Environmental Correlations

Infauna were more abundant in during May (772 individuals/grab) compared to September (566 individuals/grab) on average.

Species diversity and richness was highest in September.

Entry #2 Continued

Other Pertinent Comments

Based upon Centre for Cold Ocean Resources Engineering (1995):
Fine grained sediments may recover in one year.
Medium grained deposits may recover in 1-3 years.
Coarse grained deposits may recover in five years.
Removal of sediment during mining would have minimal impact by reducing the spatial extent ("alter spatial balance") of some habitats but the whole area is heterogeneous.
Excavations would be less detrimental if they were shallow versus creating deep pits.
Mining should have little impact upon sediment structure as most of the area is uniform therefore sediment grain size shouldn't change when replacement sediments are deposited.

Database Entry #3

Auster, P. J., R. J. Malatesta, and S. C. LaRosa. 1991. Microhabitat use by continental slope megafauna. American Zoologist, Abstracts: Annual Meeting 1991. 31:127A.

Keywords: Continental slope/Geographic coordinates.

Notes:

Geographic Area

The survey took place on the continental slope (39° 50' N, 70° 30'W)

Depth Range

The depth of the study site was approximately 712 m.

Collection Method

This survey just used direct observation of benthos and habitats from a submersible.

MAJOR FINDINGS

Megafauna were found to utilize four microhabitats:

1) Burrow
2) Biogenic Depression
3) Biogenic Depression with an Adjacent Burrow
4) Boulder

Only one species studied, *Chaceon quinquedens*, had a random distribution.
The other species mentioned were associated with the above microhabitats (*Munida* spp., *Glyptocephalus cynoglossus, Synaphobranchus kaupi, Urophycis chesteri*, *Nezumia bairdii, Coryphaenoides rupestris*).

Database Entry #4

Barry A. Vittor & Associates Inc. 1985. Tuscaloosa trend regional data search and synthesis study (Volume 1 - Synthesis Report): U.S. Department of Interior, Minerals Management Service. OCS Contract No. 14-12-0001-30048.

Keywords: Mississippi /Alabama /Florida /Gulf of Mexico.

Notes:

Geographic Area

Trend area is bounded by South Pass on the west (i.e. southeast corner of the Mississippi River Delta) and by a line from the head of DeSoto Canyon and the boundary between Alabama and Florida to the east. The offshore portion extends to the 200 m isobath with the landward limit in the coastal areas.

MAJOR FINDINGS

Dominant Abundant Taxa

Inner shelf habitat (4-20 m):
- Mud (<20% sand)
  - Hemichordate - *Balanoglossus cf. aurantiacus*
  - Polychaete - *Paramphinome*
  - Mollusc - *Utriculastra canaliculata, Nassarius acutus*
- Sandy Mud (20-50% sand)
  - Ophiuroid - *Hemipholis elongata, Micropholis atra*
  - Mollusc - *Nuculana concentrica*
  - Pinnixid Crab - *Pinnixa pearsei*
- Sand (>90% sand)
  - Polychaetes - *Nephtys picta, Brania wellfleetensis*
  - Amphipod - *Acanthohaustorius, Protohaustorius, Lepidactylus*
  - Cephalocordate - *Branchiostoma carribeum*
  - Archiannelid - *Polygordius*
- Transitional Species
  - Polychaetes - *Magelona cf. phyllisae, Paraprionospio pinnata, Mediomastus californiensis, Sigambra tentaculata, Spiophanes bombyx*

Intermediate shelf habitat (20-60 m):
- Mud (<20% sand)
  - Polychaetes - *Cirrophorus lyriformis, Nephtys incisa, Notomastus daueri*
- Sand (>90%)

Polychaetes -*Aricidea wassi*

Entry #4 Continued

Crustaceans - *Metharpinia floridana, Kalliapseudes, Ampelisca agassizi*

Transitional

Polychaetes - *Cossura soyeri, Nereis micromma, Sigambra tentaculata, Aglaophamus verrilli*

Outer shelf habitat (60-120 m) distributions are influenced by a compination of salinity, depth, and distance from shore:

Mud (<20% sand)

Polychaetes - *Notomastus latriceus, Nereis grayi, Cirrophorus lyriformis, Nephtys incisa*

Sandy Mud (20-50% sand)

Polychaetes - *Sphaerosyllis pirifera, Mooreonuphis pallidula, Synelmis albini*

Macroepifauna:

Depths of 4-20 m by the Mississippi Delta Fan:

Sea pansy - *Renilla mulleri*

Molluscs - *Nassarius acutus, Nuculana concentrica*

Shrimp - *Panaeus aztecus, Penaeus setiferus, Trachypeneus similes*

Crab - *Portunus, Callinectes similes*

Intermediate shelf

Gastropods - *Strombus, Murex, Busycon, Fasciolaria*

Bivalve - *Argopecten, Tellina, Pitar*

Shrimp - *Penaeus, Sicyonia*

Crabs - *Calappa, Portunus, Anasimus, Libinia, Parthenope*

Echinoids - *Encope, Stylocidaris*

Starfish - *Luidia, Astropecten*

Outer shelf

Gastropod - *Turritella exoleta, Polystira albida*

Bivalves - *Anadara, Verticordia ornate*

Crabs - *Munida, Raninoides, Myropsis*

Echinoids - *Echinocardium, Brissopsis*

Starfish - *Astropecten, Cheiraster*

Spatial Distribution

Inner shelf habitat (4-20 m) is represented by euryhaline species assemblages especially close to the Mississippi River influence.

Entry #4 Continued

Other Pertinent Comments

Few studies look at east to west trends. Most studies look at north to south trends with changing depth. However, there is a change in sediment type as one moves from east to west approaching the Mississippi River, with an increase of silt and clay content.

Database Entry #5

Bedinger Jr., C. A. 1981. Ecological investigations of petroleum production platforms in the central Gulf of Mexico: U.S. Department of Interior Bureau of Land Management. SWRI Project 01-5245, OCS Contract AA551-CT8-17.

Keywords: Gulf of Mexico/Louisiana/Platforms.

Notes:

Geographic Area

The study area was 5 km off Louisiana.

Collection Method and Sample Processing

Twenty platforms and four control areas were sampled for benthos.
A Smith-McIntyre grab was used which was subsampled using a 5 cm diameter x 5 cm deep core for meiofauna and macrofauna.
A 0.062 mm mesh was used to sample meiofauna and a 0.5 mm mesh for macrofauna.
Forty trawls were performed to examine macroepifauna.

Statistical Analysis

Cluster analysis and various community indices were calculated.

MAJOR FINDINGS

Dominant Abundant Taxa

Meiofauna:

The major taxa recovered were Foraminifera, Turbellaria, Rhynchocoela, Kinorhyncha, Nematodes, Polychaetes, and Harpacticoids.
Foraminifera followed by Nematodes were the most abundant taxa.
The top ten species were *Sabatieria* (Nematode), *Bolivina lowmani* (Foram), Gromiidae (Protist), *Dorylaimopsis* (Nematode), Cyatholaimidae (Nematode), *Theristus* (Nematode), *Buliminella morgani* (Foram), Linhomoeidae (Nematode), *Nonionella basiloba* (Foram), Choniolaimidae (Nematode), *Terschellingia* (Nematode), *Ammonia beccarii* (Nematode), Chromadoridae (Nematode), *Tricoma* (Nematode), *Sphaerolaimus* (Nematode).

Macrofauna:

The major taxa recovered were Anthozoans, Rhynchocoela, Polychaeta, Gastropoda, Bivalvia, Decapoda, Crustacea, Sipunculida, and Echinoderms.

Entry #5 Continued

Polychaetes were the dominant taka representing around 70% of the total number of individuals.
Bivalves were the second most abundant infauna.
The top ten species were *Paraprionospio pinnata* (polychaete), Rhynchocoela, *Sigambra tentaculata* (polychaete), *Cossura delta* (polychaete), *Magelona phyllisae* (polychaete), *Nephtys incise* (polychaete), *Corbula contracta* (Bivalve), *Lumbrineris tenuis* (polychaete), *Tharyx marioni* (polychaete), *Nereis* (polychaete).
The asteroid, *Astropecten duplicatus*, was very common.

Environmental Correlations

Distance from the mouth of the Mississippi River, depth, temperature, salinity, dissolved oxygen, and sediment characteristics were all correlated with faunal diversity and abundance.
Correlations were not consistent for all taxa.

Other Pertinent Comments

The following families have been noted to contain opportunistic species, Capitellidae and Spionidae.
The benthic fauna of Louisiana is a stressed community (anthropogenic and natural disturbance).
The presence of platforms did not appear to affect benthic diversity most likely due to the creation of multiple microhabitats.

Database Entry #6

Bergen, M., S. B. Weisberg, R. W. Smith, D. B. Cadien, A. Dalkey, D. E. Montagne, J. K. Stull, R. G. Velarde, and J. A. Ranasinghe. 2001. Relationship between depth, sediment, latitude, and the structure of benthic infaunal assemblages on the mainland shelf of southern California: Marine Biology. 138:637-647.

Keywords: California/Continental shelf.

Notes:

Geographic Area

Point Conception, California to the U.S.-Mexico international border, on the continental shelf

Scale of Study

There were initially 251 sample sites, but after elimination of potentially contaminated sites, there was a total of 175 sites sampled for this study.

Depth Range

The depth range of the study was 10-200 m

Collection Method and Sample Processing

A 0.1 m^2 van Veen grab was used
A sieve size of 1 mm was used.

Environmental Parameters Collected

Total organic carbon was measured.

Habitat Parameters Collected

Analyses of sediment grain size and sediment chemistry (for contamination) were done.

Date of Sampling

Sampling was performed from July 13 - August 22, 1994.

<u>Entry #6 Continued</u>

MAJOR FINDINGS

Dominant Abundant Taxa

Annelids made up 42-64% of the abundance of organisms in all habitats.

<u>Shallow:</u>
Amphideutopus oculatus (amphipod), *Glottidia albida* (brachiopod), *Spiophanes bombyx* (polychaete), *Ampelisca cristata* (amphipod), *Macoma yoldiformis* (bivalve), *Tellina modesta* (bivalve)

<u>Mid-Depth:</u>
Sthenelanella uniformis (polychaete), *Phoronis* spp. (phoronids), *Prionospio* sp. A (polychaete), *Paramage scutata* (polychaete), *Euphilomedes carcharodonta* (ostracod)

<u>Deep Fine:</u>
Maldane sarsi, Levisenia spp., *Cossura* spp., *Laonice appelloefi* (all polychaetes)

<u>Deep Coarse:</u>
Amphiodia digitata (brittlestar), *Euphilomedes producta* (ostracod), *Chloeia pinnata* (polychaete), *Decamastus gracilis* (polycaete), *Photis lacia* (amphipod), *Eudorella pacifica* (cumacean)

<u>Both Deep Sites:</u>
Spiophanes fimbriata (polychaete), *Ampelisca careyi* (amphipod)

<u>Middle Depth & Deep:</u>
Amphiodia urtica (ophiuroid), *Pectinaria californiensis* (polychaete)

<u>Middle Depth & Deep Coarse:</u>
Rhepoxynius bicuspidatus (amphipod), Euclymeninae sp. A (polychaete)

<u>Common in All Four Assemblages:</u>
Spiophanes missionensis, Paraprionospio pinnata, Mediomastus spp., Lumbrineris spp, Maldanidae (all polychaetes)

Spatial Distribution

70% of the most common/abundant species were only prevalent in the shallow habitats. Community splits were determined to occur at 32 m and 115 m, so shallow was 32 m,

Entry #6 Continued

middle depth was 32-115 m, and deep was 115 m or greater.

Latitude did not appear to play a significant role in community structure (maybe because the study area only contained 2° latitude, and the whole study area was in the Southern California Bight, which is a single biogeographic zone)

Habitat Parameter Correlations

The number of taxa and total abundance of organisms was lowest in deep fine sediments and highest at middle depths.

While depth appeared to be the primary factor in distribution of organisms/communities, sediment was the secondary factor.

Database Entry #7

Berryhill, H. L. 1977. Environmental studies, South Texas Outer Continental Shelf, 1975: An atlas and integrated study. Bureau of Land Management, Gulf of Mexico.

Keywords: Gulf of Mexico/Texas/Geographic Coordinates.

Notes:

Depth Range

The sampling stations depths ranged from 18-134 m.

Collection Method and Sample Processing

Four transects were established with three sampling stations per transect.
Epifaunal invertebrates were sampled during both the day and night using a 10.7 m otter trawl.
Infauna were sampled using a Smith-Macintyre grab with a volume of 0.0125 m^3.
A 0.5 mm mesh sieve was used.

Environmental Data Collected

Salinity, temperature, and subsurface drift measurements were taken during sampling.

Habitat Parameters Collected

Sediment grain size was determined at each sampling location.

Date of Sampling

Sampling was repeated three times: December-January, April-May, and August-September.

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes were the dominant infaunal component.
The most dominant and widespread infauna were the polychaetes, *Paraprionospio pinnata* and *Nereis*, along with the amphipod *Ampelisca agassizi*.

The dominant epifaunal species were *Solenocera vioscai, Penaeus aztecus Trachypenaeus similes, Sicyonia dorsalis* , and *Callinectes similes*.

Entry #7 Continued

Spatial Distribution

The abundance and diversity of infauna decreases with distance from shore.
The spatial distribution of infauna appears to be most strongly driven by grain size with higher abundances in sandy sediments.
The spatial distribution of epifauna both appear to be most strongly driven by food (i.e., plankton) and secondly by depth.

Environmental Correlations

Both infaunal and epifaunal abundance was higher in the spring than either winter or summer.
Epifaunal abundance was higher at nighttime than daytime.
Both infaunal and epifaunal species composition appears to be influenced by depth.
The infaunal polychaete, *Paralacydonia paradoxa,* was only collected at the deeper stations.

Database Entry #8

Blake, N. 1978. Infaunal macromolluscs of the Eastern Gulf of Mexico in N. Blake, editor. The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey: U.S. Department of Interior Bureau of Land Management. AA550-CT7-34.

Keywords: Mississippi/Alabama/Florida/Gulf of Mexico/Continental Shelf/Geographic Coordinates.

Notes:

Geographic Area

The study site consisted of 30 Stations ranging from Sarasota, FL, to Mississippi and ranged across the shelf.

Depth Range

A depth range of 20-800 m was examined in the study.
Macrofauna specifically were looked at from 11-171 m

Collection Method and Sample Processing

Macrofauna were sampled with a box core 21.3 x 30.5 cm.
Nine replicate box coers were taken per station
Indentification was made to taxanomic guild

Statistics

Species Richness, Shannon-Weaver, and Evenness indices along with Cluster Analysis was performed on the macrofaunal samples.

MAJOR FINDINGS

Spatial Distribution

Mollusc species richness and diversity decreased from south to north and with increasing depth.

Environmental Correlations

Mollusc abundance was greatest in the fall (so a summer or spring spawning occurs).

Database Entry #9

Blake, N. J., L. J. Doyle, and J. J. Culter. 1996. Impacts and direct effects of sand dredging for beach renourishment on the benthic organisms and geology of the West Florida shelf. Final Report: U.S. Department of Interior Minerals Management Service. OCS Report MMS 95-0005.

Keywords: Gulf of Mexico/Florida/Geographic Coordinates.

Notes:

Depth Range

Water depth was between 5-6 m at most sites with a maximum of 15 m.

Collection Method and Sample Processing

Four study sites were established:
1) Egmont Key (27°37'N, 82°49'W) 1 pre and 3 post-dredging samples were taken.
2) Sarasota (27°15'N, 82°35'W) 3 pre-dredging samples were taken.
3) Manasota (26°29'N, 82°27'W) 1 pre-dredging sample was taken.
4) Longboat (27°14'N, 82°36'W) 1 post-dredging sample was taken.

At each site two dredge stations and one control station (1 mile away) were set up.
A box corer was used 21.3 cm x 30.5 cm.
A 0.5 mm sieve was used.
Wet weights were determined for each taxa.
Trawls and ROV Video were collected to examine epifauna as well.

Statistical Analysis

The Shannon-Weaver, Equitability, and Margalef's indices were calculated.
Cluster analysis was performed.

Environmental Data Collected

Particle size and carbonate content was determined for sediment samples.

MAJOR FINDINGS

Dominant Abundant Taxa

Epifauna:
The crab, *Portunus gibbesii*, and sand dollar, *Mellita tenuis*, were the two dominant species.

Entry #9 Continued

Infauna:
The samples were dominated by polychaetes 44 and 49% of the total number of taxa and individuals.
The molluscs were the second most abundant representing 22 and 29% of the total number of taxa and individuals.
The arthropods were the third most abundant representing 27 and 11% of the total number of taxa and individuals.

Spatial Distribution

Species diversity and abundance was highest at Manasota Key followed by Sarasota and Egmont Key.

Environmental Correlations

The infaunal community density and diversity peaks in spring and early summer but the pattern is variable.

Comparison to Outside Areas

At Egmont Key were dredging took place and both pre versus post samples (along with separate outside control areas) were available. There were no detectable significant differences in either faunal abundance or species richness.
There was a high amount of variability in dredge areas and controls making any temporal patterns hard to decipher.

Other Pertinent Comments

Reviewed from Saila et al. (1972):
Polychaete, *Nephtys incise*, can burrow through 21 cm of sediment deposit.
Bivalve, *Mulinia lateralis*, can burrow through 21 cm of sediment deposit.
Polychaete, *Streblospio benedicti*, can burrow through 6 cm of sediment.
Bivalves, *Macoma, Yoldia*, and *Nucula* can burrow horizontal to move away after sediment deposit.
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Database Entry #10

Boesch, D. F. 1973. Classification and Community Structure of Macrobenthos in the Hampton Roads Area, Virginia: Marine Biology. 21:226-244.

Keywords: Virginia/Chesapeake Bay/James River/Elizabeth River.

Notes:

Geographic Area:

The study areas were in the Hampton Roads port area (between Norfolk and Newport News); confluence of James River and Chesapeake Bay; also Elizabeth River

Depth Range:

The depth range across sites was 3 -12.3 m.

Collection Method and Sample Processing

In February, a 0.06 m^2 Foerst-Petersen grab was used.
In May and August, a 0.07 m^2 modified van Veen grab was used.
Sieve size was 1 mm.

Habitat Parameters Collected:

Sediment particle size distribution was measured.

Date of Sampling:

Sampling took place in February, May, & August 1969.

MAJOR FINDINGS

Dominant Abundant Taxa:

Spiochaetopterus oculatus dominated the samples.
Numerically dominant species were ubiquitous or seasonal, except *Mya arenaria* (Elizabeth River) and some sand dominants (habitat specific)

Spatial Distribution:

Species diversity was higher at sand and muddy-sand than Elizabeth River and mud sites.

Entry #10 Continued

Environmental Correlations:

Few species in Elizabeth River due to pollution.
Definite Seasonal Patterns: in Elizabeth River and muddy areas, the evenness increased from February to August; in sand and muddy-sand, species richness and evenness peaked in May.

Habitat Parameter Correlation:

Sediments varied from silty clay (fine) to medium to fine sands (coarse); coarse dominated northern and eastern shoals and fine dominated shoals to south and lower James and Elizabeth River.
Substrate was primary factor responsible for spatial distribution and diversity (silt & clay content/availability of hard substrate-shell, gravel, etc).
Epifauna of sand bottoms more diverse (b/c of suitable hard substrate).

Other Pertinent Comments

This area is influenced by shipping (overboard disposal, oil pollution, & dredging), waste disposal, and land reclamation
Important Genera in Hampton Roads:

Ampelisca spp
Spiophanes
Retusa
Mya
Nephtys

Database Entry #11

Boesch, D. F. 1979. Benthic ecological studies: Macrobenthos: U.S. Department of Interior Bureau of Land Management Contract AA550-CT6-62. Special report in Applied Marine Science and Ocean Engineering No. 194.

Keywords: East Coast/New Jersey/Maryland/Delaware/Virginia/Continental Shelf

Notes:

Geographic Area

The study was located on the continental shelf off New Jersey, Maryland, Delaware, and Virginia.

Collection Method and Sample Processing

Survey:
Six replicate grabs were taken at twenty different stations over a period of two years.
A 0.1 m^2 Smith-McIntyre grab was used along with a 35 mm camera.
Megabenthos were sampled at nine locations using a Menzies trawl and modified anchor dredge.
A 0.5 mm sieve was used.
Wet weights were determined for the major taxa.
Sediment temperature, depth, and appearance of redox potential discontinuity layer were measured.
Samples were taken for grain size, organic carbon, and nitrogen analysis.

Recolonization Study:
Defaunated sediment boxes (50 cm^2 by 15 cm high)were placed out in the field for recolonization. Some boxes had either oil added to them or were screened to prevent epibenthic predator access. The boxes were left out for either 3 or 8 months.

Statistics

Cluster analysis, ordination, Shannon Index, and Evenness were used for analysis.

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes dominated the collections representing 40-90 % of the individuals. Percarids, molluscs, and echinoderms were the second, third, and fourth most abundant taxa, respectively.

Entry #11 Continued

Denisities ranged from 250-18,00 individuals/m^2.

Species richness and diversity increased across the shelf and was highest on the outer shelf and shelf-break. Paucity of species on the inner shelf may be due to previous hypoxic conditions.

Dominance peaked in the swale stations.

Dominant Biomass Taxa

Polychaete biomass was greater on the inner shelf and reduced on the slope.
Mollusc biomass was giher on the outer and central shelf and reduced on the slope.
Percarid biomass decreased proceeding from the shelf to the continental slope.

Spatial Distribution

The density of individuals decreased with depth on the slope.
Summer hypoxia caused the elimination of crustaceans on the inner shelf in 1976.
Classifications revealed macrobenthos groupings based upon bathymetry and topographic position inner/central shelf, inner/central shelf swales, outer shelf depression/shelf break, and upper/middle continental slope.
No consistent latitudinal trend was found.

Environmental Correlations

Temporal trends in abundance were specific to taxa.
Temperature maybe a major cause for the faunal shift found between the continental shelf break and the slope. However, sediments play a dominant role as well.

Habitat Parameter Correlation

The inner shelf habitat was dominated by interstitial-burrowers and burrowing deposit feeders.
The importance of tubicolous amphiods increased on the outer shelf where sediments were finer.
Outer shelf depressions were dominated by deposit feeders (surface and subsurface).
On the shelf break tubicolous surface deposit feeders, burrowing subsurface deposit feeders and suspension feeders dominated.
Molluscs became more important on the continental slpe with suspension feeding and subsurface deposit feeders increasing.
The polychaetes *Goniadella gracilis, Lumbrinerides acuta,* and *Aricidea cerruti* are indicators of coarse-medium sediments.

Entry #11 Continued

The amphipods, *Ampelisa agassizi* and *Eudorella pusilla*, and the polychaetes, *Clymenella torquata* and *Notomastus latericeus,* are indicators of medium-fine sands.

Indication of Turnover Times

Polychaetes and crustaceans dominated the recolonization of the defaunated sediment boxes.
Crustaceans were more dominant in the predator excluded boxes.
Ericthonius, an amphipod, was one of the dominant colonizers.
After 43 weeks, the boxes contained a similar number of fauna but the species composition was different when compared to the surrounding area. The authors concluded therefore that this did not constitute recovery.
One of the first colonizers after hypoxia was the polychaete *Spiophanes bombyx*.

Other Pertinent Comments

Where hypoxia occurred it did cause death to the benthos. The returning communities was often different (composition and abundance) from the pre-existing one.
Crustaceans and echinoderms are more susceptible to hypoxia than molluscs and polychaetes.

Database Entry #12

Boesch, D. F., J. N. Kraeuter, and D. K. Serafy. 1977. Benthic ecological studies: megabenthos and macrobenthos, Chapter 6: Middle Atlantic Outer Continental Shelf Environmental Studies, Volume II. Chemical and biological benchmark studies in D. F. Boesch, J. N. Kraeuter, and D. K. Serafy, editors. Distribution and structure of communities of macrobenthos on the outer continental shelf of The Middle Atlantic Bight: 1975-1973 investigations: U.S. Department of Interior Bureau of Land Management. Contract No. 08550-CT-5-42.

Keywords: New Jersey/Virginia/Delaware/Maryland/Atlantic Coast.

Notes:

Geographic Area

The study looks at the continental shelf and upper slope between New Jersey and Virginia.

Collection Method and Sample Processing

Megabenthos are identified in this study as greater than 4 mm while macrobenthos are greater than 0.5 mm.
A small trawl and anchor dredge were used to sample megabenthos.
A 0.1 m^2 Smith-McIntyre grab was used to sample 24 stations quarterly and 27 stations biannually. The grab was used for macrofauna.
A wet weight was taken for major taxonomic groups.
A grab mounted camera was used to take bottom photographs.

Statistical Analysis

Cluster analysis, Shannon Index, rarefraction, and Peilou evenness were calculated.

MAJOR FINDINGS

Dominant Abundant Taxa

Megabenthos:
In the photographs, asteroids (*Asterias* sp.) are common from the central and outer shelf.
Burrowing anemones (cerianthids, zoantharians) are common on the shelf edge based upon photographs.
Ensis directus, Arctica islandica, Astarte castanea, and *Nassarius trivittatus* were common megabenthic molluscs found.
The dominant species on the inner shelf were *Echinarachnius parma, Asterias forbesi, Crangon septemspinosa, Astarte castanea, Nassarius trivittatus,* and *Pagurus acadianus*.

Entry #12 Continued

The central and outer shelf was dominated *Echinarachnius, Crangon, Cancer irroratus, Asterias vulgaris,* and *P. acadianus*.
The dominant continental shelf fauna was *Astropecten*.

Macrobenthos:
Total density ranged from 393-37,835 individuals/m^2.
Density was highest on the outer continental shelf.
Densities were lowest on the continental slope.
Polychaetes dominated representing (40-90%) of the total number of individuals.
Peracarideans were the second most common taxa.
There were no latitudinal trends within the study area.

The dominant species on the inner shelf were *Polygordius* (archiannelid), *Goniadella gracilis* (polychaete), *Lumrinerides acuta* (polychaete), *Aricidea* (polychaete), syllids (polychaete), *Tanaissus liljeborgi* (percarid), *Pseudunciola obliquua* (percarid), and *Echinarachnius parma* (echinoderm).

The dominant species on the central shelf were *Spiophanes bombyx* (polychaete), *Aricidea suecica* (polychaete), *Aricidea wassi* (polychaete), syllids (polychaete), *Trichophoxus epistomus* (percarid), *Pseudunciola* (percarid), *Tanaissus* (percarid), *Prothaustorius wigleyi* (percarid).

The dominant species on the central and inner shelf were *Tharyx* (polychaete), *Clymenella torquata* (polychaete), *Lumbrineris impatiens* (polychaete), *Pherusa affinis* (polychaete), *Nucula proxima* (bivalve), and *Ampelisca vadorum* (amphipod).

The dominant outer shelf taxa were *Lumbrineris impatiens* (polychaete), *Spiophane bombyx* (polychaete), *Scalibregma inflatum* (polychaete), *Tharyx* (polychaete), *Chone infundibuliformis* (polychaete), syllids, *Ampelisca variorum* (percarid), *Byblis serrata* (percarid), *Unciola irrorata* (percarid), *Trichophoxus epistomus* (polychaete), and *Diastylis bispinosa* (polychaete).

The dominat shelf break species were *Onuphis pallidula* (polychaete), *Aricidea neosuecia* (polychaete), *Tharyx* (polychaete), *Spiophanes wigleyi* (polychaete), *Lumbrineris cruzensis* (polychaete), *Thyasira flexuosa* (bivalve), *Harbansus bowenae* (ostracod), *Harbansus dayi* (ostracod), *Ampelisca agassizi* (amphipod), and *Amphipolus macilentus* (ophiuroid).

The dominant slope species were *Lumbrineris cruzensis* (polychaete), *Notomastus latericeus* (polychaete), *Tharyx* (polychaete), *Thyasira flexuosa, Lumbrineristenuis, Paramphinome pulchella* (polychaete), *Samytha sexcirrata* (polychaete),*Cadulus* (mollusc), *Lasaea rubra* (mollusc), and *Nucula tenuis* (mollusc).

Entry #12 Continued

Dominant Biomass Taxa

Macrobenthos:
Annelid biomass was highest in topographic lows with most estimates of 10-30 g/m^2.
Mollusc biomass typically ranged from 500-100 g/m^2.
Crustacean biomass on the shelf was < 10 g/m^2 with higher values in depressions.

Spatial Distribution

Sediments on ridges contain coarser sandy sediments while swales have generally finer silts and clays. This leads to a different macrobenthic community on ridges versus swales.

Environmental Correlations

Seasonality of megabenthos was not clear.
Macrobenthos in general had higher densities in the fall compared to summer. This seems to indicate a summer recruitment.

Habitat Parameter Correlation

There was a strong relationship between macrofauna and sediments as illustrated by the differences between ridge and swale communities.
Swale habitats appear to be the most productive.

Other Pertinent Comments

Hypoxia conditions did not affect the megabenthos *Astarte castanea* and *Nassaruis trivittatus*. However, the other fauna was greatly reduced including crustaceans and echinoderms.

<u>Database Entry #13</u>

Bowen, P. R., and G. A. Marsh. 1988. Benthic faunal colonization of an offshore borrow pit in southeastern Florida: U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Miscellaneous Paper D-88-5.

Keywords: Florida/Continental Shelf/Gulf of Mexico.

Notes:

Geographic Area

The study site is 1200 m offshore of Delray Beach, Florida.

Collection Method and Sample Processing

A new borrow pit was sampled 21, 98, 170, 246, 296, and 395 days post dredging.
An old borrow pit was sampled 395 days post dredging.
A PVC core 15 cm in length with a diameter of 7.9 cm was usedto sample fauna.
Thirty random cores were taken for faunal analysis.
Sediment was sieved over a 1 mm screen.

Statistics

Shannon Weaver and evenness were used for statistical purposes.

Environmental Data Collected

Sediment samples were taken along with the faunal cores.
Sediment was examined for grain size and organic content.

Date of Sampling

Dredging was completed on 25 May 1978.

MAJOR FINDINGS

Dominant Abundant Taxa

Ten species made up 50% of all individuals collected:
Polychaetes - *Aricidea philbinae, Lumbrineris testudinum, Haploscoloplos foliosus, Chone, Prionospio fallax,* and *Paraprionospio pinnata*
Amphipods - *Phtisica marina, Ampelisca abdita*
Bryozoan - *Cupuladria*
Bivalve - *Parvilucina multidentata*

Entry #13 Continued

Habitat Parameter Correlation

Organic content decreased over time.

Indication of Turnover Times

Numbers were high on the first sampling date (35 species and 1081 individuals/m^2) and increased over time. Species richness peaked at 206 days and abundance at 98 days. The lowest density was found after a year with 870 individuals/m^2.

Polychaetes and amphipods were rapid to colonize with mollucs being considerably slower.
No adult molluscs were found.
Surface feeding polychaetes dominated at first and remained dominate throughout the study.
Infaunal feeders and omnivores increased in abundance over time.

Comparison to Outside Areas

Both pits (regardless of age) were similar in species composition and abundance.

Database Entry 14

Bradshaw, C., L. O. Veale, A. S. Hill, and A. R. Brand. 2001. The effect of scallop dredging on Irish Sea benthos: experiments using a closed area: Hydrobiologia. 465:129-138.

Keywords: Dredging/Irish Sea/*Pecten maximus*.

Notes:

Depth Range

The study was done in various areas, up to 40 m.

Scale of Study

Four plots (500 m x 100 m) were formed in the closed area; two were dredged and two were left undredged.
Three plots (same size) were located outside this closed area, and were still commercially dredged for scallops.

Collection Method and Sample Processing

Collections were made with Newhaven-type scallop dredges and 0.1 m^2 day grab samplers.
Samples were sieved through 1 mm mesh.
Divers also ran 2 m x 50 m belt transects for scallop density studies.

Date of Sampling

The "closed" areas were closed in 1989.
Experimental dredging began around January 1995 and ran every 2 months.
Sampling of closed undredged, closed dredged, and open areas was done in the spring and autumn each year, starting in 1995

Habitat Parameters Collected

Sediment grain size and organic carbon content were measured.
Scallop densities measured, as well as age structure.

MAJOR FINDINGS

Spatial Distribution

Encrusting species are more abundant in dredged plots.
Scallop densities were greater in closed areas, but not significantly.

Entry #14 Continued

Sessile, upright species (which likely increase structural complexity, habitat heterogeneity, and diversity) are less abundant in dredged plots

Results

High variability in numbers between treatments
No significant differences,based on Kruskal;-Wallis one-way ANOVA on ranks,in total species number or species richness between treatments.
Shannon-Weaver diversity index higher in closed experimentally dredged than undredged plots.
Pielou's evenness and Simpson's Dominance higher in commercially dredged than closed experimentally dredged and undredged plots.
Results of Index of Multivariate Dispersion imply that dredging reduces heterogeneity of communities (highest values for undredged plots).
Scallops: mean age in closed area=6.5 yrs; outside area=5.3 yrs; large old individuals (>9 yrs) in closed area, but 4-5 yr olds outside.

Database Entry #15

Burlas, M., G. Ray, and D. Clarke. 2001. The New York district's biological monitoring program for the Atlantic coast of New Jersey, Asbury Park to Manasquan section beach erosion control project: US Army Corps of Engineers, Engineer Reserach and Development Center, Waterways Experiment Station.

Keywords: New York/East Coast/Continental Shelf.

Notes:

Geographic Area

The study area was the Belmar Borrow Areas located off New York between the Shark River Inlet and Manasquan Inlet.

Depth Range

The depth range of the study sites was 10-20 m.

Dredge Details

No details were given on the dredging depth, dredging spatial extent, or number of times it was dredged.

Collection Method and Sample Processing

Three borrow pits were examined with 20 sampling stations per pit.
One of the pits was unmined (i.e. control) for the first year.
A Smith McIntyre grab ($0.1m^2$) was used to sample the pits.
A 0.5 mm mesh sieve was used for faunal sorting.
Fauna were identified to species and feeding guild.

Statistical Analysis

NMDS was used in the statistical analysis.

Environmental Data Collected

Temperature, salinity, and DO were collected.

Habitat Parameters Collected

Sediment grain size and depth were collected.

Entry #15 Continued

Date of Sampling

Sampling was performed in both the spring and fall.

MAJOR FINDINGS

Dominant Abundant Taxa

Total abundance was dominated by the archiannelid, *Polygordius* (35.5%); amphipod, *Pseuodunicola obliquua* (9.6%); and tanaid *Tanaissus psammophilus* (6.0%).
Spiophanes bombyx was present in high numbers only after the dredging.
Spiophanes bombyx abundance returned to normal within one year.
Rhynchocoela was found in lower abundance after dredging.

Dominant Biomass Taxa

Echinoderms (up to 95% at some times) represented the most biomass followed by molluscs and annelids. After dredging echinoderm biomass was greatly reduced. The reduction was generally due to a reduced size of sand dollar (*Echinarachnius parma*) which took 2.5 yrs to recover.

Environmental Correlations

There was no change in water chemistry related to dredging.

Habitat Parameter Correlation

There was little change in grain size composition related to dredging.

Other Pertinent Comments

It appears that there are two main responses for infauna in borrow areas:
The first response is rapid recovery of the same community. Recovery is usually within one year for most fauna but up to three yrs for deep burrowing taxa.
The second response is the formation of a different community which they term a "depauperate soft-sediment community".
The first response is generally found for first time use borrow areas while the second response appears to occur in older, deeper pits which are repetitively used.
Likewise if the pit becomes too restrictive of water movement it can lead to poor water quality and periodic disturbance to the benthic community.

The borrow areas here are unusual in that they are from bathymetric peaks rather than depressions and occur in an area of strong current and sand movement.

Entry #15 Continued

At most times carnivores and deposit feeders dominated.
Filter feeders/surface deposit feeders showed a spike in abundance right after dredging (probably due to an increase in *Spiophanes bombyx*).

Subsurface deposit feeder (generally shallow feeding species) abundance declined after dredging.

Taxa with planktonic larvae increased in abundance from 40% of the total fauna to more than 75% of the total fauna after dredging (probably due to an increase in *Spiophanes bombyx*).

Database Entry #16

Byrnes, M. R., R. M. Hammer, B. A. Vittor, J. S. Ramsey, D. B. Snyder, K. F. Bosma, J. D. Wood, T. D. Thibaut, and N. W. Phillips. 1999. Environmental survey of identified sand resource areas offshore Alabama: Volume I: Main Text, Volume II: Appendices: U.S. Department of Interior Minerals Management Service. OCS Report MMS 99-0052.

Keywords: Alabama/Gulf of Mexico/Continental Shelf/Geographic Coordinates.

Notes:

Geographic Area

The study involves five areas offshore of Alabama.

Collection Method and Sample Processing

Sixteen samples were collected inside and four samples outside of each sand resource area.
A Smith-McIntyre grab was used.
A 0.5 mm mesh sieve was used for faunal analysis.

Statistics

Shannon-Weaver, Evenness, Margalef's (d), Cluster Analysis, and Canonical Discriminant Analysis were all calculated.

Environmental Data Collected

The following water quality parameters were measured -temperature, salinity, DO, and depth.

Habitat Parameters Collected

Sediment grain size was analyzed.

Date of Sampling

Sampling was performed in May and December

MAJOR FINDINGS

Dominant Abundant Taxa

Mean species diversity (H') and evenness (J') were similar across all areas. Species richness was higher during May.

Entry #16 Continued

MAY: values given are total % of individuals sampled in May
Areas 1-3 were dominated by gastropods (*Caecum pulchellum* - 25%, *Caecum cooperi* - 10%).
Areas 4-5 were dominated by polychaetes (*Paraprionospio pinnata* 4.5%, *Mediomastus*)

DECEMBER: values given are total % of individuals sampled in December.
Areas 1-3 were dominated by (*C. pulchellum* 21%, *C. cooperi* 7%).
Area 4 was dominated by the lancelet (*Branchiostoma*) and polychaetes (*Armandia maculata, Mediomastus, Nereis micromma*).
Area 5 was dominated by the polychaetes found in Area 4.

Spatial Distribution

Infaunal abundance increases from west to east regardless of season. This is mostly due to a high number of the gastropod Caecum in the west.
Areas 1-3 clustered similarly to each other while Areas 4 & 5 were different from Areas 1-3 and each other.
The west was dominated by gastropods, arthropods, and bivalves. The east was dominated by polychaetes.

Environmental Correlations

The density of infauna was greater in May than December.
A trend was found for reduced infaunal abundance with lower oxygen levels (Area 4 had the lowest faunal density and DO level).

Indication of Turnover Times -

Predictions were made about the recovery time for the individual areas:
Predict that impacts would be of minimal scale and of short duration. This is based upon islands of undisturbed area left within the dredged area due to undesirable sediment content. These islands should function as a source population for recolonization.
Removal would be best done during late fall to early spring.
Predators would most likely just switch their foraging spot or preferred prey lessening the impact of infaunal loss.
Loss would be less if removal depth is 3-4 m or less.
Area 4 is expected to recover more quickly because the fauna are disturbed species already due to
the dynamic outflow from the Mississippi.

Entry #16 Continued

Other Pertinent Comments

The following comments are based upon a review of what they call the inner-shelf (4-20 deep). This is the approximate area of sand resources:

- Four main sediment habitat types exist mud, sandy-mud, muddy sand, and sand. Of these categories muddy sand tends to have an indiscrete faunal assemblage.
- Additionally there are several "transitional assemblages" that span all habitat types including the bivalve (*Mulinia lateralis*) and the polychaete (*Armandia maculata*) (Barry Vittor and Associates, Inc., 1985).

The following are typical fauna found for the three remaining habitat types based upon mostly the work by Barry Vittor & Associates, Inc., 1985. They suggest the area is highly dynamic and probably never in a late successional stage but always turning over.

Mud
- Hemichordate (*Balanoglossus aurantiacus*)
- Polychaete (*Paramphinome*)
- Mollusc (*Nassarius acutus, Utriculastra canaliculata*)

Sandy-Mud
- Ophiuroid (*Hemipholis elongata, Micropholis atra*)
- Bivalve (*Nuculana concentrica*)
- Crab (*Pinnixa pearsei*)

Sand
- Amphipoda (*Acanthohaustorius, Protohaustorius, Lepidactylus*)
- Lancelet (*Brachiostoma caribaeum*)
- Polychaete (*Apoprionospio pygmaea, Aricidea wassi, Mooreonuphis nebulosa, Nephytys picta*)

Specific Area Information

Areas 1&4 (Harper, 1991)
- Amphipods (*Ampelisca abdita, Ampelisca verrilli*)
- Bivalve (*Parvilucina multilineata, Tellina versicolor*)
- Decapod (*Euceramus praelongus, Spinocarcinus lobatus*)
- Polychaete (*Aglaophamus verrilli, Mediomastus californiensis*)

Area 4 (Hummell & Smith, 1995)
- Polychaete (*Nereis micromma, Spiophanes bombyx, Diopatra*)

There are many euryhaline species present that are in high numbers when the river flow peaks ex. Polycheates (*P. pinnata, Heteromastus filiformis, Streblospiobenedicti*) (Stickle et al. 1989)

Entry #16 Continued

Coarser sediments have a higher density of fauna (Harper, 1991).

Impacts of dredging;

1) Sediment removal will result in faunal removal. This may impact food availability disrupting benthic-pelagic coupling mechanisms (i.e., diel migration, larval transport) (Hammer & Zimmerman, 1979; Hammer, 1981).
2) Sediment composition may change resulting in a change of habitat type. This may impact recolonization.
3) Deep borrow pits can take up to 12 years to refill to pre-dredge profiles unless in highly depositional areas (Van Dolah et al., 1998).
4) Suspended sediments may provide a food resource (Centre for Cold Ocean Resources Engineering, 1995), cause hypoxia (LaSalle et al., 1991), clog filter feeding, and reduce photosynthetic capabilities.
5) Sediment deposition may occur near the dredge site resulting in organism burial or an increased number of organisms due to nutrient enrichment (Stephenson et al., 1978; Jones & Candy, 1981; Poiner & Kennedy, 1984).

Factors affecting recolonization rates:

1) Time of year may influence the larvae pool available to colonize.
2) Sediment types can impact recovery times Coastal Surveys Limited (1988) and Newell et al. (1998) suggest that estuarine muds require 6-8 months, sand and gravel requires 2-3 years, and coarser deposits require 5-10 years.

Database Entry #17

Byrnes, M. R., R. M. Hammer, B. A. Vittor, S. W. Kelley, D. B. Snyder, J. M. Cote, J. S. Ramsey, T. D. Thibaut, N. W. Phillips, and J. D. Wood. 2003. Collection of environmental data within sand rsource areas offshore North Carolina and the environmental implications of sand removal for coastal and beach restoration. Volume I: Main Text, Volume II: Appendices: U.S. Department of Interior Minerals Management Service. OCS Report MMS 2000-056.

Keywords: North Carolina/Atlantic Coast/Continental Shelf/Geographic Coordinates

Notes:

Geographic Area

The study was conducted off of North Carolina.

Depth Range

The study sites are 10-20 m in depth.

Collection Method and Sample Processing

Four potential sand resource areas were identified off of North Carolina.
The sand ridges of target provide on average 2-3 m of relief.
Twenty Grab stations were performed in May and 50 stations in September using a Smith -McIntyre grab.
Fifty stations in May and 25 stations in September were surveyed using a sediment profiling camera.
Trawl samples were conducted as well to sample epifauna.
A 0.5 mm sieve size was used for infaunal samples.

Statistical Analysis

Shannon's Index, Evenness and Species Richness were calculated.
Cluster analysis was performed.

Habitat Parameters Collected

They collected sediment grain size information.

Date of Sampling

The field studies were conducted in May and September.

Entry #17 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

In September there was an average of 321 individuals per grab compared to 106 in May.

Polygordius, an archiannelid, was dominant (14% of all infauna) in the grabs followed by the amphipods *Acanthohaustorius millsi*, *Metharpinia floridana*, *Protohaustorius wigleyi*, and *Pseudunicola obliquua*.

In May, the amphipods *P. wigleyi, M. floridana*, and haustorids along with the polychaete, *Spiophanes bombyx*, dominated.

In September, *Polygordius* dominated followed by the amphipods *P. wigleyi, Byblis serrata,* and *P. obliquua.*

Trawl surveys also indicated a high abundance of the sea star *Asterias forbesi*.

Environmental Correlations

A higher number of infauna were collected in September compared to May.

Habitat Parameter Correlation

A correlation with sediment grain size was found for some infauna based upon percent sand and gravel:

Ubiquitous Speciess:

- Archiannelid - *Polygordius*
- Amphipods *Byblis serrata, Metharpinia*
- Bivalve *Tellina agilis*
- Polychaetes *Caulleriella, Nephtys picta, Paraprionospio pinnata, and Spiophanes bombyx*

Gravel Associated Community

- Gastropod *Crepidula fornicate*
- Polychaetes *Aricidea catherinae, Brania wellfleetensis, Exogone rolani, Hesionura elongate, Parapionosyllis longicirrata, Parougia caeca, Pisione remota,* and *Polycirrus*

Sand Associated Community

- Amphipod *Protohaustorius wigleyi*
- Polychaete *Apoprionospio pygmaea*
- Tanaid *Tanaissus psammophilus*

Other Pertinent Comments

Several of the areas showed indications of high bioturbation activity levels based upon the sediment profiling camera.

Entry #17 Continued

Several sites displayed polychaete tubes protruding from the sediment surface.
Potential impacts of sand mining include organismal removal, changes in sediment grain size and topography, sediment suspension, and sediment burial.
Because of the hydrological and sedimentary environment of the North Carolina Shelf, the factor most likely to alter recovery times is the depth of sediment removal. This is compounded by surface area, but sediment depth is still believed to be the most important.

Database Entry #18

Caracciolo, J. V., and F. W. Steimle Jr. 1983. An atlas of the distribution and abundance of dominant benthic invertebrates in the New York Bight apex with reviews of their life histories: U.S. Department of Commerce, NOAA, National Marine Fisheries Service. NOAA Technical Report NMFS SSRF-766.

Keywords: Atlas/Atlantic.

Notes:

This report provides a description of the common taxa from the New York Bight area.
Each spcies description includes a species discription, distribution, habitat, feeding ecology, and reproduction/growth.
The taxa described in this survey were obtained in 500 grabs in 1973-1974 using a 0.1 m^2 Smith -McIntyre grab.
A mesh size of 1.0 mm was used for sample processing.
The depth of sampling ranged from 9-45.6 m.

Database Entry #19

Carney, R. S. 1993. Review and reexamination of OCS saptial-temporal variability as determined by MMS studies in the Gulf of Mexico: U.S. Department of Interior Minerals Management Service. OCS Study MMS 93-0041.

Keywords: Gulf of Mexico.

Notes:

Dominant Abundant Taxa

The ten most common Gulf of Mexico species are:
Polychaetes *Paraprionospio pinnata, Tauberia gracilis, Mediomastus californiensis, Tharyx marioni, Sigambra tentaculata, Armandia maculata, Notomastus laterkeus, Prionospio cristata, Aglaophamus verrilli, Sthenelais boa*, and *Aricidea fragilis*.

Other Pertinent Comments

States that studies to detect impacts have failed due to:
1) Failure to have a prior definition of the impact being sought
2) Failure to adopt a valid sampling and analysis design
3) Failure to employ appropriate analysis of the data

The main information needs for benthic studies:
1) What is the impact that is being tested.
2) What are the study organisms and how might they exhibit an impact.
3) What is the natural variation of the measured parameters
4) What is the cause of the natural variation

Using a suite of species instead of single species analysis might be the most effective if no one species makes up a substantial proportion of the total.

Sampling periods should be twice the frequency of the event being sought to pick up temporal patterns. If the period is unknown then at least three seasonal cycles should be sampled with roughly six samplings per year.

The most easily detected impact is one in which there is a local alteration in the rate of recruitment.

Species richness appears to be a better metric than more elaborate species diversit indices.

Should look at different levels of taxanomic grouping above the species level. If gouping is done and the species groups contain congeners that respond differently to stress, then the conclusions can be altered.

Database Entry #20

Cerame-Vivas, M. J., and I. E. Gray. 1966. The distributional pattern of benthic invertebrates of the continental shelf off North Carolina: Ecology. 47:260-270.

Keywords: Atlantic Coast/North Carolina.

Notes:

Collection Method and Sample Processing

Four transects starting at the continental shelf inward to 10 fathoms were established.
A bottom dredge was towed for 15 minutes at each station.
No mention of sieve size was made.

MAJOR FINDINGS

Dominant Abundant Taxa

Seastars were abundant (*Astropecten americanus*).
Rock crabs (*Cancer*), galatheid shrimp, and sea anemones were also common.
Most of the species were of tropical origin.

Inner North Carolina Shelf (north):
Cold water (boreal) origin species prevailed:

Bivalves: *Astarte borealis, Astarte castanea, Astarte undata, Solemya borealis*, and *Yoldia limatula*
Amphipods: *Leptocheiras pinguis, Aeginia longicornis, Pontogeneia inermis*
Echinoderms: *Strongylocentrotus drobachiensis, Echinarachnius parma, Peltaster planus, Poranimorpha insignis, Asterias tenera*

Inner North Carolina Shelf (south):
Warm subtropical species dominate is this region.

Outer North Carolina Shelf:
Warm species from the Gulf of Mexico and Caribbean.

Other Pertinent Comments

The authors advocate the division of biological provinces based upon water mass temperatures.
They predict there is a cold water wedge that splits the fauna of northern versus southern North Carolina. Storms may kill fauna if it shifts the wedge location.

Database Entry #21

Chang, S., F. W. Steimle, R. N. Reid, S. A. Fromm, V. S. Zdanowicz, and R. A. Pikanowski. 1992. Association of benthic macrofauna with habitat types and quality in the New York Bight: Marine Ecology Progress Series. 89: 237-251.

Keywords: Atlantic/New York Bight/Contamination.

Notes:

Geographic Area

The study took place in the New York Bight.

Collection Method and Sample Processing

A 0.1 m^2 Smith McIntyre grab was used to collect fauna.
Macrofauna was sieved over a 0.5 mm mesh.

Environmental Data Collected

Mean sediment grain size and % of finer grain size were measured.
Concentration of three trace metals (chromium, lead, zinc) was determined.
Percent total organic carbin (TOC) and total Kjeldahl nitrogen were also measured.

Date of Sampling

Samples were taken in the summers of 1980-1982.

MAJOR FINDINGS

Dominant Abundant Taxa:

The dominant abundant taxa in each location depended on the contamination of that habitat.
Communities varied from "Most contaminant sensitive species" to "Most contaminant insensitive species".

Spatial Distribution

Fewer total species were found in areas with high trace metal concentrations.
Density and biomass of *Ceriantheopsis americanus, Nephthys incisa*, and *Nucula proxima* were high in fine grain sizes and higher contaminant levels (*C. americanus* and *N. proxima* also high in coarser grain size)

Entry #21 Continued

Capitella species were high in TOC and CR (tolerance for high contaminants, fine grain, and hypoxic/reducing conditions).

Ampelisca agassizi was only abundant at deeper medium to fine grain sites and never in high trace metal concentrations.

Environmental Correlations

C. americanus, N. incisa, and *N. proxima* are indicators of fine sediment and high TOC (not sensitive to trace metals).
Capitella species are indicators of high TOC and trace metal contamination.
Crustaceans (amphipods, *A. agassizi*) and overall spp. density are indicators of minimally contaminated habitats.
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Database Entry #22

Chicharo, L., A. Chicharo, M. Gaspar, F. Alves, and J. Regala. 2002. Ecological characterization of dredged and non-dredged bivalve fishing areas off south Portugal: Journal of the Marine Biological Association of the United Kingdom. 82:41-50.

Keywords: Portugal/Survey/Dredging.

Notes:

Geographic Area

Two areas in Portugal were surveyed:
  Lagos was non-fished for 4 years before the study (stopped in 1995).
  Vilamoura has been continuously fished.
These locations were first fished about 40 years ago.

Scale of Study:

There were three 50x50 m areas at each site.

Depth Range:

The depth range was 7-9 m

Collection Method and Sample Processing

Quadrats (0.0625 m^2 x 0.15 m) were used for collection of macrofauna.
Meiofauna was collected with corers (0.001 m^2 x 0.15 m).
Macrorauna samples were sieved over 1mm mesh.
Meiofauna samples were sieved over 150 um mesh.

Date of Sampling:

Surveys were conducted in September 1999.

MAJOR FINDINGS

Dominant Abundant Taxa:

Spisula solida abundant in fished area
Meiofauna dominanted by nematoda, copepoda, & polychaeta

Entry #22 Continued

Spatial Distribution:

Mean abundances of macrofauna and meiofauna were higher in non-fished areas, but not significant.

Meiofaunal diversity was higher in the fished area, but macrofaunal diversity was higher in the non-fished area

Macrofauna:

- Suspension feeder macrofauna were the most abundant trophic group in the fished area and deposit feeders were the least.
- Herbivores were most abundant in non-fished in deposit feeders were least abundant.
- There was a significant difference between the abundance of herbivores at both sites.

Meiofauna:

- Deposit feeders were the most abundant meiofauna, but there was no significant difference between sites.
- Deposit feeders had the greatest biomass at the non-fished site and carnivores had the greatest biomass at the fished site
- Significant differences were found between biomass of deposit feeders and carnivores at both sites.

Indication of Turnover Times:

There is an estimate given of approximately 6 yrs.

Other Comments:

This study indicates that fished areas are dominated by r-selection

Continuous fishing decreases herbivores because algae could not grow, and increases suspension feeders and scavengers due to the input of dead organic material and increased turbidity from dredges.

Database Entry #23

Collard, S. B. and C. N. D'Asaro. 1973. Benthic invertebrates of the Eastern Gulf of Mexico in J.I. Jones, editor. A summary of knowledge of the eastern Gulf of Mexico: State University at Florida Institute of Oceanography, St. Petersburg, FL.

Keywords: Gulf of Mexico.

Notes:

Spatial Distribution

Offshore muddy bottom shelf communities (10-50 m) are dominated by a variety of fauna including:

Shrimp - *Penaeus setiferus*
Onuphid tube worm - *Renilla mulleri*
Crabs- *Hepatas, Calappa, Persephona, Petrochirus diogenes* (hermit crab)
Anenome - *Paranthus rapiformis*
Gastropod - *Murex, Busycon*

If the community is dominated by *Penaeus aztecus* instead of *P. setiferus,* then *Renilla* is replaced by *Astropecten* and the clams *Pitar chordata* and *Chione* become more abundant.

Carolinian offshore shallow shelf community (10-50 m) from Louisiana to Cedar Key, Florida contains the following species: *Argopecten gibbus, Scaphella kieneri,Cerianthiopsis americanus, Fious commonis, Tonna galea, Cassis madagascariensis, Renilla mulleri, Cardiomya gemma, Clypeaster subdepressus, Plagiobrissus grandis,* and *Amphipolis gracillima*.

West Indian communities dominate in deep water (30-200 m) on the shelf. These communities contain the following soft bottom species: *Portunus spinicarpus,Ranilia muricata, Pitar cordata, Fusinus covei, Polystira albida, Scaphella junonia, Clypeaster subdepressus, Plagiobrissus grandis*, and *Amphipolis gracillima*.

Slope communities residing in mud below 130 m contain the following species: *Solenocera vioscai, Hymenopenaeus tropicalis, Hymenopenaeus robustus, Benthesicymus cereus, Benthesicymus bartletti, Acanthocarpus alexandri, Raninoides constricta, Bathyplax typhla*, and *Callapa angusta*.

Other Pertinent Comments

There are two faunal zones distinguished by temperature in the Gulf.
The first zone is the Carolinian Province in the north.
The southern province is termed the Caribbean or West Indian.
The zone appears to be separated by a minimum temperature of 20°C and is not clear cut.
It is debated that the Carolinian Province is actually a transition zone.

Entry #23 Continued

Salinity appears to only be an important factor defining communities in bays, estuaries, and sounds.
Substrate is the most important factor influencing the distribution of benthos.
The carbon biomass of infauna decreases logarithmically with depth.

Database Entry #24

Collie, J. S., G. A. Escanero, and P. C. Valentine. 1997. Effects of bottom fishing on the benthic megafauna of Georges Bank: Marine Ecology Progress Series. 155:159-172.

Keywords: Atlantic/Georges Bank.

Notes:

Geographic Area

The study took place on Georges Bank.

Scale of Study

For this survey, six study sites (5 x 10 km) were located: four undisturbed and two disturbed. The study sites each had 1-3 sampling stations.

Depth Range

Depth ranged from 42 to 90 m.

Collection Method and Sample Processing

A 1 m dredge fitted with a 6.4 mm mesh liner was used to catch megafauna.
Samples were resieved over a 0.5 mm mesh.
In addition, observations of sediment properties and disturbance were made with side -scan sonar, video transects, and scallop dredging records.

Date of Sampling

Sampling was done on two cruises: April 6-15, 1994 and November 8-18, 1994.

MAJOR FINDINGS

Spatial Distribution

Numerical abundance was significantly greater at deep and undisturbed sites.
Biomass was significantly greater at deep and undisturbed sites.
Species diversity was significantly greater at deep and undisturbed sites.
Evenness was significantly greater at disturbed sites.
Species richness was significantly greater at deep and undisturbed sites.

Entry #24 Continued

Results of Clustering Analysis

Deep sites (regardless of disturbance) were characterized by:
- Hard-shelled molluscs (*Natica clausa, Astarte spp*.)
- Crabs (*Pagurus pubescens, Hyas coarctatus*)

Deep undisturbed sites were characterized by:
- Polychaetes (*Thelephus cincinnatus, Eunice norvegica, Chone infundibuliformis, Protula tubularia*)
- Shrimps (*Lebbeus groenlandicus, Spirontocaris lilljeborgii*)
- Brittlestar (*Ophiopholis aculeata*); these were found between tubes of *Filograna implexa*
- Molluscs (*Musculus discors, Calliostoma occidentale, Chlamys islandicus, Sinum perspectivum, Cerastoderma pinnulatum*)

The following were abundant at undisturbed and rare or absent from disturbed:
- Shrimp (*Eualus pusiolus, Pandalus montagui*)
- Horse mussel (*Modiolus modiolus*)
- Bloodstar (*Henricia sanguinolenta*)

Ubiquitous species were:
- Sea scallop (*Placopecten magellanicus*)
- Whelk (*Buccinum undatum*)
- Sea urchin (*Strongylocentrotus droebachiensis*)

Other Pertinent Comments

Individual mean weight or organisms was greater at deep disturbed sites, possibly because these organisms have migrated here to feed on damaged animals.

Important Prey of Georges Bank groundfish are:
- *S. droebachiensis*
- *Cancer irroratus*
- *Dichelopandalus leptocerus*
- *H. coarctatus*
- *P. magellanicus*
- *Pagurus acadianus*
- *Crangon septemspinosa*
- *P. montagui*
- *Ophiopholis aculeata*
- *Myoxocephalus octodecemspinosus*

Database Entry #25

Conner, W. G., and J. L. Simon. 1979. The effects of oyster shell dredging on an estuarine benthic community: Estuarine and Coastal Marine Science. 9:749-758.

Keywords: Dredging/Florida/Tampa Bay.

Notes:

Geographic Area

The study was conducted in Tampa Bay, Florida.

Scale of Study

Two dredged areas and a control area were sampled before dredging and monitored for one year post-dredging.
The experimental (dredged) plots were 50 x 50 m and 100 x 300 m.

Depth Range

The depth of the study areas was approximately 7 m.

Collection Method and Sample Processing

A 0.0045 m^2 PVC corer (to a depth of 22 cm) were used for collection of samples for faunal analysis.
Samples were sieved through 0.5 mm mesh.
For sediment analysis cores were also taken (1.75 cm diameter x 15 cm depth).

Environmental Data Collected

Bottom water salinity and sediment temperature were measured.

Habitat Parameters Collected

Sediment grain size distribution was examined.
Sediment organic content was also measured.

Date of Sampling

Dredging took place in April 1975.
Exact dates for pre-dredging samples are not stated, but based on Figure 3, February 1975, is the probable time for pre-dredging sampling.

Entry #25 Continued

Post-dredging sampling took place from May - August 1975, at two-week intervals, and monthly samples were taken from August 1975 to April 1976.

MAJOR FINDINGS

Initial Results

Immediate observations after dredging revealed dislodged *Chaetopterus variopedatus* tubes laying on sediment surface.
Large errant polychaetes were seen in the water column and on the sediment surface.
The area was, therefore, not totally defaunated.
Troughs with 1-2 meters relief were measured.
Faunal samples initally revealed:
- 40% decrease in the number of species.
- 66% decrease in the number of individuals.
- 87% decrease in biomass.

Indication of Turnover Times

There was a significant decrease in the number of species, densities, and biomass during the first six months after dredging.
During the second 6 months after dredging, the dredged communities had returned to control levels in terms of quantitative aspects.
There was an immediate decrease of 15% similarity in experimental versus pre-dredged areas, but by November 1975, pre-dredging levels of similarity wre reached.
A 6-month period for recovery of infaunal density and species composition at experimental sites was observed.
Overall, this study indicates recovery within about 12 months.

Other Pertinent Comments

The two experimentally dredged sites differed in their methods of dredging:
- Site 1: No dredge hopper was present, dredging took place over 4 hours, and a 50 x 50 m area was dredged
- Site 2: A hopper was present, dredging took place over 10 hours, and a 100 x 300 m area was dredged.

The study indicated no significant differences between dredging methods on fauna.

Database Entry #26

Continental Shelf Associates Inc. 1987. Tampa Harbor dredged material disposal site monitoring study: U. S. Environmental Protection Agency Criteria and Standards Division.

Keywords: Florida/Continental Shelf/Gulf of Mexico.

Notes:

Geographic Area

The study site was located on the west Florida Shelf 33 km WSW of Tampa Bay.
A control site was established 9.3 km away.

Scale of Study

From May 1984 to November 1985, the study site received 2.63 million m^3 of dredge material.

Depth Range

The depth of the study site was 20-25 m.

Collection Method and Sample Processing

Seventeen monitoring stations were established (6 within the area, 8 at the perimeter, and 3 at the control site). Ten samples were collected at each station using a 12.5 x 12.5 cm corer to a depth of 23 cm.
Photograph stations were set up in hard bottom areas.
Wet biomass was determined for faunal samples.
A 0.5 mm mesh was used to sieve fauna.

Statistics

Shannon-Weaver, Pielou’s Equitability, and Margalef’s d were calculated.
Discriminant Analysis and classifications were also done.

Habitat Data Collected

The following environmental data was collected: currents, sediment samples, sediment traps.

Date of Sampling

Sampling was conducted 1 month prior to the disposal and then at 3-4 month intervals for the next year and a half during disposal.

Entry #26 Continued

Post disposal a survey was conducted 1.5 years after disposal ceased

MAJOR FINDINGS

Dominant Abundant Taxa

Mean abundance ranged from 2,176-17,472 individuals/m^2.
Annelids averaged 60% of all organisms. Arthropods were also common (15-30% of the total).

The dominant polychaetes were carnivorous or omnivorous scavengers (*Dorveillidae Protodorvillea kefersteini, Eunicidae Eunice vittata, Goniadidae Goniadides carolinae, Nereidae Ceratocephale oculata, Syllidae Ehlersia cornuta, Exogone lourei, Parapionosyllis longicirrata*, and *Pionosyllis gesae*).
The dominant arthropods were the amphipods (*Acuminodeutopus, Microdeutopus myersi*), mysids (*Anchialina typical, Bowmaniella portoricensis*), tanaids (*Leptochelia*).

Dominant Biomass Taxa

Mean biomass ranged from 1.1-16.9 g wet wt/m^2.
Annelids represented the majority of the biomass followed by arthropods, molluscs, and echinoderms.

Environmental Correlations

Abundances were higher in July-August compared to December-March-April.

Habitat Parameter Correlation

Grain size and water depth do appear to lead to different infaunal assemblages.

Comparison to Outside Areas -

In comparison to the control area, some of the disposal site stations had higher abundances and biomass after disposal began.
The conclusion of the study was that there was no effect of disposal material on the infauna.

Database Entry #27

Continental Shelf Associates. 1993. Synthesis and analysis of existing information regarding environmental effects of marine mining: U.S. Department of Interior Minerals Management Service. OCS Study MMS 93-0006.

Keywords: Mining Impacts.

Notes:

Indication of Turnover Times

Recovery time can occur rapidly and within a year.
The recovery of biomass appears to be slower and there is the possibility of a different species composition.
Recovery time appears to be less when the substrate type is relatively the same post as it was pre -mining.

Other Pertinent Comments

Organisms most likely to be impacted are filter feeders, surface dwellers, tube dwellers, or sensitive life stages. The effect will only be great if the sediment redeposition thickness and rate of deposition is too great. Impacts are expected to be greater to organisms which normally live in low turbidity areas.

Mitigation (or minimizing effects) options:
- Control the sediment plume of sediment suspension.
- Leave undisturbed patches in the landscape.

Database Entry #28

Cronin, T. M., S. Ishman, R. Wagner, and G. R. Cutter Jr. 1998. Benthic Formanifera and Ostracoda from Virginia Continental Shelf. in C. H. Hobbs III, editor. Environmental studies relative to potential sand mining in the vicinity of the city of Virginia Beach, Virginia: U.S. Department of Interior Minerals Management Service. Agreement 14-35-0001-3087.

Keywords: Virginia/Continental Shelf/East Coast.

Notes:

Geographic Area

The survey took place in the Western North Atlantic Ocean between 36.7-37.91°N and 75.85 -75.92°W, off the coast of Virginia.

Collection Method and Sample Processing

A Smith/McIntyre grab was taken and then an area was subsampled (10 x 10 cm area 2 cm deep).
300 Forams and any Ostracods were selected from each sample.
A 0.063 mm sieve was used.

MAJOR FINDINGS

Dominant Abundant Taxa

20 Foraminifera species were found.
31 Ostracod species were found.

Database Entry #29

Culter, J. K., S. Mahadevan, R. Yarbrough, and M. Gallo. 1992. Benthic macroinfauna and sediment studies in S. Mahadevan, editor. Marine sampling and measurement program off northern Pinellas county Florida 1982: U. S. Environmental Protection Agency. EPA 904/9-82-102.

Keywords: Florida/Gulf of Mexico/Continental Shelf.

Notes:

Geographic Area

The study site was off of Pinellas, Florida, with a northern border of Anclote Key and a southern border of Belleair Causeway.
The area extends to 16 km offshore.

Scale of Study

The study area was 512 km^2.

Collection Method and Sample Processing

A total of 21 stations were sampled.
Sampling was done using a stainless steel plug core (12.5 cm x 12.5 cm x 23 cm (0.016 m^2).
Subsamples were taken using a 4 cm diameter PVC corer.
Seven to eight core samples were taken per station.
A 0.5 mm sieve size was used for fauna separation.

Statistics

Shannon-Weaver, species richness, Margalef's Index, equibility, and Morisitas were used in the statistical analysis.

Environmental Data Collected

Temperature, salinity, and dissolved oxygen were measured.

Habitat Parameters Collected

Sediment grain size was determined.

Entry #29 Continued

Date of Sampling

Sampling was conducted in May and October.

MAJOR FINDINGS

Dominant Abundant Taxa

Faunal density ranged from 1,277-24,321 individuals m^{-2}.
The dominant species in May were nematodes (17.3%), *Acanthohaustorius* (amphipod 9.7%), *Branchiostoma caribaeum* (cephalochordate 4.4%), an unknown copepod (3.8%), and a nemertean (3.8%).
The dominant species in October were nematodes (22.1%), *Branchiostoma caribaeum* (14.4%), *Ophelia* (polychaete 5.8%), Oligochaetes (3.6%), and *Acanthohaustorius* (3.1%).
Overall, there is a relatively high faunal diversity in this area compared to Tampa Bay.

Spatial Distribution

Densities fluctuated going from onshore to offshore.
Species richness displayed no nearshore-offshore trend.
There is no clear nearshore versus offshore grouping of species.

At the Dam Neck station 70% of the community was made up of *Amastigos caperatus*, *Spiophanes bombyx*, *Mediomastus ambiseta*, Cirratulidae, *Polygordius*, Oligochaetes, and Nemerteans.

Offshore coarser sands contained *Pseudunciola obliquua, Lumbrineris tenuis*, and *Schistomeringos caeca* which were absent inshore.
These species prefer coarse sands.

Inshore stations contained *Rhepoxynius epistomus* which was absent from offshore.
This species prefers fine to medium substrate.

Environmental Correlations

Dissolved oxygen, salinity, and temperature do not appear to control the distribution of fauna in the study area.
Species diversity was higher in May.

Entry #29 Continued

Habitat Parameter Correlation

There were few faunal-sediment type relationships found.
The polychaete, *Capitella capitata*, occurs in silty areas.
The amphipod (*Acanthohaustorius*) and bivalve (*Anodontia alba*) occurred in fine sands.
The bivalve (*Tellina*) was abundant in very fine sand.

Database Entry #30

Cutler, J. K., and S. Mahadevan. 1982. Long-term effects of beach nourishment on the benthic fauna of Panama City Beach, Florida: Controlling Office: Department of Army, Coastal Engineering Research Ctr. Misc. Report #82-2.

Keywords: Gulf of Mexico/Florida/Swash Zone/Shallow/Survey.

Notes:

Geographic Area

The area studied was off Panama City Beach, Florida, between St. Andrew Bay and Philips Inlet. There are two offshore sand bars in this study area.

Scale of Study

There were 49 sampling stations; 47 of these were on nine transects surveyed at an earlier time by Saloman (1976).

Depth Range

The survey took place from the swash zone to about 10 m.

Collection Method and Sample Processing

For sediment collection, a 5.08 cm diameter PVC core was used.
For faunal collections, a plug sampler was used with 0.016 m^2 and 23 cm depth.
Fauna were rinsed through a 0.701 mm^2 sieve mesh size.

Environmental Data Collected

Temperature, conductivity, dissolved oxygen, and topography were examined.

Habitat Parameters Collected

Sediment analysis was done for grain size, organic content, and carbonates.
Sediments were mostly fine, medium, and coarse quartz sand.

Date of Sampling

Sampling took place from November-December 1979 and in May 1980. Saloman's (1976) previous collections were used as a source for baseline information.

Entry #30 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant taxa, in terms of abundance, were:

Polychaetes (*Paraonis fulgens, Mryiochele oculata, Scolelepis squamata, Spiophanes bombyx, Nephtys picta*)
Bivalves (*Donax texasianus, Pitar simpsoni*)
Gastropods
Amphipods (*Haustorius n. sp., Acanthohaustorius sp., Protohaustorius n. sp., Pseudohaustorius n. sp.*)
Brachyurans
Mysid (*Bowmaniella sp.*)
Echinoderm (*Mellita quinquiesperforata*)

Spatial Distribution

The number of species increased with distance from shore.
Control stations had the greater number of species.
Borrow sites had fewer species and lower densities than control sites on most dates.

Rare & Absent Fauna

There were no species present that required a permanent attachment site and few tube dwellers in borrow site.

Other Pertinent Comments

Dominant species had changed between the 1974/75 sampling of Saloman and the 1979/80 samplings
Diversity was higher in 1979/80 than 1974/75.
Equitability was somewhat higher in 1979/80 than 1974/75
Evenness was comparable in both years.
Fourteen of the species that were dominant in 1974/75 were also dominant in 1979/80.

Database Entry #31

Cutler, J. K. 1988. Evaluation of hard bottom and adjacent soft bottom macrofaunal communities in the vicinity of the Tampa Bay material ocean disposal site 4: U. S. Ecological Protection Agency Contract no 68-03-3319. Mote Marine Laboratory Technical Report No. 125.

Keywords: Florida /Continental Shelf /Gulf of Mexico/Geographic Coordinates.

Notes:

Geographic Area

The study area was 18 nautical miles west-southwest of Egmont Key
A sampling box was placed around the disposal site with the following 4 corners:

Northwest	27°32’27”N	83°06’02”W
Southwest	27°30’27”N	83°06’02”W
Northeast	27°32’27”N	83°03’46”W
Southeast	27°30’27”N	83°03’46”W

The coordinates for each sampling station within the box are given as well in Table 1.
A control site was established 9.3 km away. (27°25’85”N, 83°02’42”W)

Scale of Study

The area studied was 4 nautical miles square.

Collection Method and Sample Processing

A collection was made of the sediment veneer overlying a living hard bottom area.
In comparison, samples were also taken in nearby adjacent soft bottom areas.
A suction sampler was used (sampled area 0.375 m^2) on live hard bottom and a core sampler (10.2 cm diameter x 15 cm deep) on soft bottom.
A 0.5 mm screen was used for sieving and fauna were identified to species.

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes (28-44%), crustaceans (26-42%), gastopods (10.5%), and bivalves (9.3%) were the most abundant fanua found.
The crustaceans were made up of mostly amphipods and decapods.
The diversity and abundance of crustaceans, gastropods, and bivalves was greater on living hard bottom than adjacent soft bottom.
The diversity, but not abundance, of polychaetes was greater on living hard bottom than adjacent soft bottom.

Entry #31 Continued

Spatial Distribution

Soft bottom areas are highly heterogeneous (and more so than living hard bottom).

Comparison to Outside Areas

No obvious conclusions were drawn about areas near versus away from the Ocean Disposal Site.

Other Pertinent Comments

This report is designed to look at the difference in the two sampling methodologies.
Additionally, it deals with the problem of making actual comparisons when there are the two methods.

Database Entry #32

Culter, J. K. 1994(a). Benthic macrofauna community and response characterization, thin-layer disposal national demonstration project, Gulfport, Mississippi: Mote Environmental Services, Inc. Technical Report #274, Contract # DACW01-91-C-0092.

Keywords: Gulf of Mexico/Survey.

Notes:

Background

This study is a summary of the first year of activity for pre-disposal or baseline surveys of the thin-layer disposal method.
The west side of the shipping channel was a thin-layer repository in 1974.
A portion of one site on the east side of the channel received thin-layer material in December 1986, and, as a part of this study, received more thin-layer material in July 1992.

Date of Sampling:

Sampling was conducted monthy, from July 1991 to June 1992.

Collection Method and Sample Processing

A 0.0625 m^2 surface area stainless steel box corer was used for faunal collections.
A petite Ponar grab was also used when this corer couldn't penetrate hard substratum in some locations.
Samples were sieved over a 0.5 mm mesh.

Environmental Parameters:

Temperature, conductivity, salinity and dissolved oxygen were measured.
The above parameters were measured at surface, mid-depth, and bottom.

Habitat Parameters

Sediment grain characteristics of percent solids and silt/clay fraction were measured.
Sediment subsamples were usually fine-grained (80% of samples had clay 45-60%).

MAJOR FINDINGS

Dominant abundant taxa:

Annelids (mostly polychaetes) accounted for most taxa (40%).

Entry #32 Continued

The following taxa were also numerically abundant:
Arthropods (mostly crustaceans)(31%) and molluscs (16%) were numerically abundant.
Annelids also accounted for largest proportion of individuals (54%) and hemichordates followed (18%). Polychaete: *Mediomastus* spp. (22% of the fauna); Hemichordate: *Balanoglossus cr. aurantiacus* (18% of fauna)
34 species represented 90% of fauna:
13 polychaetes, 5 gastropods, 4 echinoderms, 4 bivalves, 4 nemerteans, 2 cumaceans,1 amphipod, and 1 hemichordate

Dominant Biomass Taxa:

Based on wet weights , the following taxa were dominant (in order of decreasing biomass):
Hemichordata, Echinodermata, Annelida, Bivalvia, Gastropoda, and Arthropoda.

Spatial Distribution

Seasonal differences in number of taxa were greatest for areas on the east side of the channel, and
were mostly between fall/winter and summer/fall.
December through June had greatest numbers of taxa
Greatest numbers individuals were from winter months (December through February).

Other Pertinent Comments

Ten core samples appeared to adequately sample the area, based on the species/area analysis.

Database Entry #33

Culter, J. K. 1994(b). Summary of benthic infaunal analysis for May/June 1990 collections off south Hutchinson Island, Martin County, Florida: A technical data summary: Mote Marine Laboratory. Submitted to Applied Technology and Management, Inc.

Keywords: Atlantic Ocean/Florida.

Notes:

Date of Sampling:

Sampling was conducted from May to June 1990.

Depth Range:

Depths ranged from 11-16 m.

Collection Method and Sample Processing:

Diver operated stainless steel cores (0.0156 m^2 surface area) were used for sample collections. The sieve size used was 0.5 mm.

Statistics:

Shannon's index of diversity, Pielou's index of equitability, Margalef's index of species richness, and Simpson's and Gini's indices of diversity were used for statistical purposes.

MAJOR FINDINGS

Dominant Abundant Species:

In the planned borrow area, the following species were dominant:
Tellina, Nemertea sp. B, Cyclaspis varians, Lumbrineris sp. D, Goniada littorea, Lucinidae sp. B
In the borrow site control area, the following species were dominant:
Caecum CF. johnsoni, Tubificidae, *Hemipodus roseus, Protodorvillea kefersteini, Tellina, Armandia maculata, Goniadides carolinae*
In the proposed restoration area, the following species were dominant: *Protodrilus*, Turbellaria, *Donax variabilis*,
In the beach transect control, the following species were dominant: Turbellaria, *Donax variabilis*,
Nemertea

Entry #33 Continued

Spatial Distribution

For beach transects, the number of taxa increased from the swash zone to 600 ft offshore.
Gastropods and echinoderms were only present at offshore borrow and control stations; they were absent from all beach transect stations.
Greatest numbers of individuals were at borrow site control stations, followed by 600 ft beach transects, swash zone stations, borrow site stations, and the 400 ft. beach transect station.
Species diversity was lowest at beach transect swash zone sites and highest at borrow site control stations.
Equitability was low in swash zone stations.
Annelids dominated borrow sites and borrow site control stations.
Arthropods (mostly crustacea) dominated all other sites.
Amphipods showed relatively large faunal abundance at all but one station.
Sand dollars (*Melita tenuis*) and portunid crabs were present at offshore locations, but absent from beach transect stations.

Database Entry #34

Cutler, G. R. Jr., and R.J. Diaz. 1998. Benthic habitats and biological resources off the VIrginia coast 1996 and 1997. in C. H. Hobbs III, editor. Environmental studies relative to potential sand mining in the vicinity of the city of Virginia Beach, Virginia: U.S. Department of Interior Minerals Management Service. Agreement 14-35-0001-3087.

Keywords: Virginia/East Coast/Continental Shelf/Geographic Coordinates.

Notes:

Geographic Area

The study area is composed of offshore Virginia from three miles out to approximately ten miles out.
Coordinates for the proposed borrow areas and part of the study area are given in the text.

Collection Method and Sample Processing

Sediment profile imaging and bottom photography were both used.
A Smith-MacIntyre grab was taken and then subsampled with a 10 cm diameter and 10-15 cm deep core.
All samples were sived through a 0.5 mm sieve.
Wet weight biomass was determined in the study.

MAJOR FINDINGS

Dominant Abundant Taxa

Infaunal densities ranged from <100 to >2000 indivduals m^{-2}.
Polychaetes were the most abundant taxa.

Dominant Biomass Taxa

Estimates of secondary production were calculated.
Low to moderate production (5-25 g m^{-2} y^{-1}) was found in the Northeast and areas near proposed borrow areas.
Low to high (>25 g m^{-2} y^{-1}) production was found in the northwest.
High production was due mostly to molluscs and annelids.

Crustacean, cnidarian, and echinoderm production was low throughout.

In the vicinity of the borrow areas production was low to moderate with molluscs, polychaetes, and crustaceans having a low to very low (<1 g m^{-2} y^{-1}) production rate.

Entry #34 Continued

Spatial Distribution

Crustacean densities were relatively high in borrow area B (>1000 m^{-2}) and low to moderate elsewhere.
Polychaete densities were highest inshore.

Environmental Correlations

Biomass and abundance was greater in June than November.

Database Entry #35

Dauer, D. M. 1980. Benthic monitoring of the Norfolk disposal site. in R.W. Alden III, D.M. Dauer, and J.H. Rule, editors. Appendix A, An assessment of the ecological impact of open ocean disposal of materials dredged from a highly industrialized estuary: Norfolk District COE. Final EIS Norfolk Disposal Site.

Keywords: Virginia/East Coast/Geographic Coordinates.

Notes:

Geographic Area

The study area is the Norfolk open ocean disposal site.
The site is centered at 36º59'N, 75º39'W.

Scale of Study -

The site has a radius of 7.4 km.

Depth Range

The depth in the study area is approximately 10 fathoms.

Collection Method and Sample Processing

The goal of the study was to collect baseline data prior to disposal.
Five study sites were established.
Four sites outside of the future disposal area and one site in the center.
The outside sites were located in the four cardinal directions at 9.26 km away.
A box core was used (10 x 25 x 30 cm) during the February cruise.
Subsequent cruises used a Shipek grab device.
A 0.5 mm mesh was used for faunal separation.

Statistics

Shannon Index, evenness, Margelef's Index, and cluster analysis were the statistics used.

Habitat Parameters Collected

Sediment grain size and organic content were collected as well.

Date of Sampling

Sampling was performed in February, May, June, and August 1979.

Entry #35 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Density at the study site ranged from 834-27,544 individuals per m^2.

Polychaetes dominated the taxa found at all sites representing 51.95 of all of the species.
Capitella capitata (68.8% of the total fauna - February), *Aricidea wassi* (23.0% of the total fauna May), and *Spio setosa* (21.3% of the total fauna June) dominated at the center site community.
Nephtys picta was ranked in the top ten species of abundance during all dates.

Apoprionospio pygmaea (41.6% of the total fauna February) and *Ampelisca verrilli* (52.8% of the total fauna August) dominated at the site north of the disposal area. *Magelona*, Cirratulid, *Aricidea wassi, Spiophanes bombyx*, and *Aricidea catherinae* were ranked in the top ten species of abundance during all dates.

Amastigos (70.2% of the total fauna) dominated the infaunal community at the site south of the disposal area in February.
Apoprionospio pygmaea, Spiophanes bombyx, Nephtys picta, and *Amastigos* ranked in the top ten species of abundance during all dates.

Spio setosa (83.4% of the total abundance) dominated at the site east of the disposal area.
Spio setosa, Polygordius, Cirratulid, and *Tubificoides* were ranked in the top 10 species of abundance during all dates.

Apoprionospio pygmaea and *Amastigos* dominated the collections on the site west of the disposal
area on most dates.
Spiophanes bombyx, Magelona, Nephtys picta, and Cirratulid were ranked in the top ten species of abundance during all dates.

Environmental Correlations

Abundances were generally highest in February.

Other Pertinent Comments

A wide degree of variability was evident in the community structure from areas only 9 km away.

Database Entry #36

De Grave, S., and A. Whitaker. 1999. Benthic community re-adjustment following dredging of a muddy-maerl matrix: Marine Pollution Bulletin. 38:102-108.

Keywords: Ireland/Suction Dredging.

Notes:

Depth range:

The depth range for the study was from 1-3 m.

Collection Method & Sample Processing

A 0.025m^2 Van-Veen grab was used for sampling fauna.
Organisms were sieved through 0.5mm mesh.
Organisms were sorted to family (except Nemertea) and categorized into: omnivores/predators, filter feeders, grazers, or deposit feeders.

Habitat Parameters Collected

Particle size distribution was measured via wet sieving methods: % Coarse (>2 mm), % Sand (2 mm<>62 um), & % Silt (<62 um).
Marl debris and other material was separated out.

MAJOR FINDINGS

Dominant Abundant Taxa

Only 9/60 taxa showed a significant difference in density across the two sites:
Fallowed: Leuconidae, Scalibregmatidae, Philinidae, Scrobiculariidae
Dredged: Melitidae, Nereidae, Phoxocephalidae, Polyonidae, Sigalionidae

Spatial Distribution

No significant differences were seen in total numbers of individuals or total numbers of species, but derived diversity indices and evenness indices showed elevated levels in dredged sites.
Dredged stations were more scattered in Detrended Correspondence Analysis (DCA) than fallowed (indicates more stress).

Entry #36 Continued

Habitat Parameter Correlation

No significant difference was found in the sediment particle size distribution, but fallowed sites showed an increase of fine sediments and a decrease of coarse sediments.

Database Entry #37

Defenbaugh, R. E. 1976. A study of the benthic macroinvertebrates of the continental shelf of the northern Gulf of Mexico: Texas A&M University. Dissertation.

Keywords: Gulf of Mexico/Texas/Louisianna/Alabama/Mississippi/Florida /Continental Shelf.

Notes:

Geographic Area

The study examines the northern Gulf of Mexico between Corpus Christi, Texas, and Pensacola, Florida.

A small sample was taken from the continental shelf of Mexico.

Depth Range

The depth range examined in this study was from 18-183 m.

Collection Method and Sample Processing

One hundred and thiry-one trawl samples were taken in the northern Gulf of Mexico.

Fifteen trawl samples were taken off of Mexico.

Trawls were for 20 minutes using 1.25” stretch mesh.

Other Pertinent Comments

The study included specimens outside the scope of this research and included many hard bottom species.

Database Entry #38

Dolmer, P., T. Kristensen, M. L. Christiansen, M. F. Petersen, P. S. Kristensen, and E. Hoffmann. 2001. Short-term impact of blue mussel dredging (Mytilus edulis L.) on a benthic community: Hydrobiologia. 465:115-127.

Keywords: Limfjorden/Mussels/Dredging.

Notes:

Geographic Area:

The sampling took place in the Danish Sound Limfjorden.

Scale of Study:

There were 4 study sites, each being 20 x 20 m.

Depth Range:

Depth ranged from 7 m-7.4 m.

Collection Method and Sample Processing:

Surveys of fauna were taken with a 0.1 m^2 van Veen grab.
For experimental portions of the study, a 0.1 m^2 van Veen grab and photographs were used.
A 0.28 m2 frame was used to determine mussel density and size distribution.

Sieve/Mesh Size: 1.0 mm

Habitat Parameters Collected:

Distribution of mussel beds and sediment texture were analyzed.

Date of Sampling:

A survey took place in June 1996.
For experimental studies, sites were established in June 1996 and dredged (12 times per area) in September 1996.
Sampling took place 20 days before dredging, and 0, 7, and 40 days after dredging.
Control sites were sampled 20 days before, 0, and 40 days after dredging had occurred at the dredged site.

Entry #38 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Inside mussel beds, dominant taxa were the polychaetes, *Harmothoe imbricate, Scoloplos armiger*, and *Polydora cornuta*, capitellids, nereids, nepthyids, and the prosobranch, *Rissoa albella.*

Outside mussel beds, dominant taxa were the opisthobranch, *Philine aperta,* and the bivalves *Arctica islandica, Corbula gibba*, and *Cerastoderma edule.*

Spatial Distribution

The following taxa had reduced densities in dredged areas: polychaetes Capitellidae, *Harmothoe imbricata* and *Scoloplos armiger*; prosobranch *Rissoa albella,* bivalve *Mysella bidentata*; polychaetes *H. imbricata, P. cornuta, Polydora ciliata, S. armiger, Nepthys hombergi, N. punctata* showed reduced reduced densities in dredged compared to boundary (undredged).

The following species had increased densities in dredged areas: opisthobranch *P. aperta,* bivalve *Arctica islandica.*

The density of brown shrimp, *Crangon crangon,* increased in dredged and boundary areas after dredging.

Indication of Turnover TImes

There was a decrease in the number of species and individuals in the dredged area 40 days after dredging, coincident with an increase in numbers in boundary areas and constant numbers in the control areas.

Other Pertinent Comments

Commercial dredged tracks were compared to adjacent control areas, experimental dredge tracks were created and compared to control and undredged adjacent boundary areas, and mussel bed fauna were compared to outside-bed fauna.

Database Entry #39

Emery, K. O., and E. Uchupi. 1972. Western North Atlantic Ocean: Topography, rocks, structure, water, life, and sediments. Memoir 17: The American Association of Petroleum Geologists, Tulsa, Oklahoma, USA.

Keywords: Atlantic/Literature Review.

Notes:

MAJOR FINDINGS

Dominant Abundant Taxa

In areas of high sand movement the community is dominated by agile crustaceans and deep burrowing, thick shelled Pelecypods.
With less sand movement echinoderms become more important.
In areas with low water movement there is more organic matter which supports feeding and burrowing of worms, crustaceans, and molluscs.
In areas of very low current a sediment-clay fraction is found.
The dominant fauna are worms and echinoderms.
The slope is dominated by the polychaete, *Hyalinoecia tubicola,* and the brittle star, *Ophiomusium lymani*.

Spatial Distribution

Meiofauna appear to be more influenced by salinity and temperature than sediment characteristics.
Polychaetes tend to decrease in abundance while crustaceans increase with distance from shore.
Diversity is greater on the slope than the shelf due to greater environmental stability.
Benthic biomass decreases with increasing depth and is about 0.1 g/m^2 on deeper bottoms.
On the shelf biomass averages 10 g/m^2.
No mention is made if this is a wet weight or dry wt.
Benthic biomass increases going from the south to the north due to highly productive cold water.

Environmental Correlations

There appears to be little correlation between sediment total carbon or total nitrogen content and faunal abundance.

Indication of Turnover Times

The average life span of shallow water infauna is 2.4 generations per year.

Life span is expected to be between 1-5 years in deeper waters.

Entry #39 Continued

Other Pertinent Comments

The source of food is plankton fall out, sargassum fall out, and marine algae and grasses (from nearshore).

Database Entry #40

Emery, K. O., A. S. Merrill, and J. V. A. Trumbull. 1965. Geology and biology of the sea floor as deduced from simultaneous photographs and samples: Limnology and Oceanography. 10:1-21.

Keywords: Continental Shelf/Photography

Notes:

Location

The study took place in the Continental shelf of the northeastern U.S.

Collection Method and Sample Processing

A 250 kg clam-shell bottom sampler, jaws spanning 0.56 m^2 and capable of recovering up to 0.2 m^3 of bottom material, with an attached 35 mm Robot "Star" camera was used for collection and survey purposes.
Samples were passed through a 1 mm sieve.

Habitat Parameters Collected

Sediment grain sizes were determined and used to construct chart of bottom sediments.
Sediment characteristics, along with faunal characteristics, were also used to determine currents in some areas.

Date of Sampling

The study was done in 1963.

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant taxa varied by station, but at most stations, crustaceans and annelids dominated At others, however, echinoderms, molluscs, and bryozoans were dominant.

Spatial Distribution

Total fauna, surface fauna, and subsurface fauna abundances were greatest in gravel or boulder and sand, but least in shell hash.
Total and surface fauna biomass were greatest in gravel or boulder and sand, but least in shell hash. Subsurface fauna biomass was greatest in shelly sand, but least in shell hash.

Entry #40 Continued

Other Comments

Photographs alone failed to provide accurate information on biomass and identification of fauna, but do provide information on relationships between fauna and bottom sediments.
Photographs are necessary when boulders or other large bottom materials don't allow adequate bottom sampling.

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Database Entry #41

Environmental Science and Engineering, INC., LGL Ecological Research Associates, INC, and Continental Shelf Associates, INC. 1987. Florida Shelf Ecosystems Study Data Synthesis Report: U.S. Department of Interior Minerals Management Service. Contract No. 14-12-0001-30276.

Keywords: Gulf of Mexico/Florida/Continental Shelf.

Notes:

Geographic Area

The study was conducted on the Florida Shelf.

Scale of Study

The study area encompassed 27^0 latitude southward to the Florida Keys and Dry Tortugas to a depth of 200 m.

Depth Range

The sampling stations ranged down to the 200 m isobath.

Collection Method and Sample Processing

Samples were taken at thirty different stations over eight different cruises.
Samples were taken using both a 0.057 m^2 box corer and a diver held 0.016 m^2 corer.
All samples were washed through a 0.5 mm mesh.
Biomass was determined.

Statistics

Cluster analysis was performed.
An Equibility Index was also calculated.

Habitat Parameters Collected

Sediment grain size, silt/clay percentage, carbonate content, and organic carbon content were collected from each site.

Date of Sampling

Sampling was performed over 4 years.

Entry #41 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

The abundance of macroinfauna ranged from 1,280-14,202 individuals m^2.
Polychaetes (64%), crustaceans (17%) , and molluscs (10%) dominated the abundance.
The polychates *Prionospio cristata, Paraprionospio pinnata, Mediomastus californiensis, Synelmis albini, Filograna implexa,* and *Ceratonereis irritabilis* were very abundant.
Most polychaetes were of the family Paraonidae, which are burrowing subsurface deposit feeders or Spionidae, which are tubicolous surface deposit/suspension feeders.
Other than polychaetes, a few bivalves and peracarid crustaceans were common.
Of the percarids the cumaceans *Apseudes, Cumella,* and *Cyclaspis* were abundant along with the amphipods *Ampelisca agassizi, Microdeutopus myersi, Photis,* and *Synchelidium*.
The tanaid *Leptochelia* was also abundant.

Dominant Biomass Taxa

Biomass ranged from 0.3-212 g/m^2 with most samples having less than 20 g/m^2.

Spatial Distribution

Macroinfaunal density decreased with depth with a peak at 20-30 m.
The polychaete *Prionospio cristata* and the syllid *Haplosyllis spongicola* peaked at this depth.

Environmental Correlations

The density of macroinfauna was higher in the summer in general.

Habitat Parameter Correlation

There was no overall relationship between total infaunal density and the measuredsediment parameters.
Prionospio cristata was dominant in sediments of very fine sand or silt.

Comparison to Outside Areas -

The southwest Florida shelf has a comparable polychaete abundance and biomass compared to the south Texas continental shelf, the South Atlantic Bight, and the mid-Atlantic coast.

Other Pertinent Comments

Food availability may be the most important factor controlling abundance and biomass.

Entry #41 Continued

Most benthic species are dependent upon phytoplankton production due to their deposition of particulate organic material which decreases with increasing depth.

Database Entry #42

Escobar-Briones, E. G., and L.A. Soto. 1997. Continental shelf benthic biomass in the western Gulf of Mexico: Continental Shelf Research. 17:585-604.

Keywords: Gulf of Mexico/Survey.

Notes:

Geographic Area

The area surveyed was in the western Gulf of Mexico on continental shelf and upper slope, south of the Grande River and north of the Tamiahua Lagoon.

Depth Range

Depths ranged from 16-200 m.

Collection Method and Sample Processing

A 0.2 m2 Smith-McIntyre grab was used and subsamples of meiofauna were taken with a handcorer (4 cm diameter x 10 cm depth).
A top mesh of 250um was used to exclude macrofauna and 63 um bottom was used to retain meiofauna. Macrobenthos were then sieved through 0.25, 0.5, and 1.0 mm mesh.

Environmental Data Collected

Conductivity, temperature, and pressure were measured.
Organic carbon and nitrogen measurements were also made of sediments.

Date of Sampling

Three survey cruises were taked during 1988 and 1989.

MAJOR FINDINGS

Dominant Abundant Taxa

The following were the dominant infauna:
Meiofauna: harpacticoid copepods, nematodes, foraminiferans, ostracods, and juvenile amphipods
Macrofauna: polychaetes, crustaceans, molluscs, echinoderms, Brachyuran crabs and paneid shrimps were the dominant fauna of the shelf epibenthic macrofauna.

Entry #42 Continued

Also frequently collected, but not dominant were the bivalves, gastropods, echinoids, and asteroids.

Spatial Distribution

Highest biomass was found on the innershelf and decreased to the outer shelf.
Nematodes and forams were significantly more abundant on the outer shelf.

Environmental Correlations

Infaunal biomass decreased with increasing depth and distance from coast.
Highest biomass was in April 1989 and decreased into November 1989, which was the onset of the winter storm season.
Epibenthic biomass decreased as depth increased.
Highest biomass was found in stratified conditions, which were at locations of river outflow.
Peak biomass was during late spring and early summer.

Database Entry #43

Finkl, Jr., C. W., S. M. Khalil, and J. L. Andrews. 1997. Offshore sand sources for beach replenishment: Potential borrows on the continental shelf of the eastern Gulf of Mexico: Marine georesources and Geotechnology. 15:155-173.

Keywords: Gulf of Mexico/Borrow Sites.

Notes:

Scale of Study

Total area surveyed was about 215 km^2.

Depth Range

Depth was about 5-14 m.

Environmental Data Collected

Bathymetric and seismic surveys were done for topology and substrate thickness.
Sand grain size and percent silt (want silt <13%) were measured.

MAJOR FINDINGS

General Results

The seafloor in the study site was gently sloping with hummocks.
The average thickness of unconsolidated sediments is 1.5-2.5 m.
Sediment size ranged from 0.13 mm to 0.53 mm.
Silt ranged from 4.14% to 19.58%.
Several potential donor sites were found in the study area, based on the set parameters.
Sites close to shore had abundant fine-grained sands, but silt contents were too high.
Of six main potential sites, three were found to be suitable, and in a large enough quantity for project; these are farthest offshore

Other Pertinent Comments

The general purpose of this study was to identify potential sand borrow sites.

Database Entry #44

Fitzhugh, K. 1984. Temporal and spatial patterns of the polychaete fauna on the central Northern Gulf of Mexico continental shelf. Proceedings of the First International Polychaete Conference, Sydney, 1983.

Keywords: Gulf of Mexico/Louisiana.

Notes:

Scale of Study

The study site existed from the Mississippi River west to the Texas border on the Continental shelf.

Depth Range

The depth range of the sampling stations was from slightly greater than 10 to almost 40 m deep.

Collection Method and Sample Processing

Twenty stations were established along transects at 500 and 2000 m away from petroleum platforms.
A 5 cm x 5 cm subsample core was taken from ten replicate Smith-McIntyre grabs (0.09 m^2).
A 0.05 mm size mesh was used to sieve samples.

Statistical Analysis

Cluster analysis and discriminant analysis were both performed on the data.

Environmental Data Collected

Bottom temperature, salinity, and dissolved oxygen measurements were taken.

Habitat Parameters Collected

Sediment grain size and sediment organic content were both determined for each station.

MAJOR FINDINGS

Dominant Abundant Taxa

Disturbed sites were commonly populated by opportunists such as *Paraprionospio pinnata* and *Magelona phyllisae*.

Entry #44 Continued

Environmental Correlations

Polychaete abundance and species richness was highest in the spring and lowest in the summer. Winter samples fell in-between in terms of abundance and richness.
Temporal changes in species abundance and richness were dampened with depth.
Variation in salinity, temperature, and dissolved oxygen are also dampened with depth.

Habitat Parameter Correlation

Depth was more important than sediment grain size at determining the polychaete assemblage which was present. The reason for the depth relationship is due to the increased environmental stability it provides.

Other Pertinent Comments

Hypoxia was found during the spring and summer cruises but not during the winter.
Variability in abundance measurements was reduced with increasing depth.

Database Entry #45

Flint, R. W., and J.S. Holland. 1980. Benthic infaunal variability on a transect in the Gulf of Mexico: Estuarine and Coastal Marine Science. 10:1-14.

Keywords: Outer Continental Shelf/Gulf of Mexico/Survey.

Notes:

Geographic Area

The sample stations were in the south Texas outer continental shelf (Gulf of Mexico).

Scale of Study

A transect with six sampling stations was sampled on 12 cruises.

Depth Range

Depths on the transect ranged from 22 - 131 m.

Collection Method and Sample Processing

A 0.1 m^2 Smith-McIntyre bottom sampler was used.
From those samples, a 5 cm diameter plexiglass corer was used for subsamples for sediment texture analyses.
Sieve size was 0.5 mm.

Environmental Data Collected

Depth, bottom water temperature, and salinity were measured.

Habitat Parameters Collected

Sediment texture was measured with subsamples taken with a corer.

Date of Sampling

The twelve sampling cruises were between January 1976 and September 1977.

Entry #45 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

In shallow stations, polychaetes were most abundant: *Paraprionospio pinnata, Mediomastus californiensis, Magelona phyllisae*

In deep stations, bivalves and crustaceans were most abundant.

Spatial Distribution

There were higher species numbers at deeper sites.
Densities were greater at shallower sites.
The shallow site showed the greatest separation from the other sites, and there was also a distinct mid-depth group at less than 50 meters.
Gastropods were evenly distributed across stations.
Pelecypods were denser at deeper sites.
Ostracods and isopods were most abundant at deepest sites.
Amphipods had greater percent compositions at shallower sites.
Evenness decreased from deep water to mid-shelf stations.

Environmental Correlations

Bottom water temperature only accounted for 9% of the spatial variation in specie number.
Salinity accounted for 57% of the infaunal density variation.
Silt content of sediments accounted for 2% of the infaunal density variation.
Species diversity and equitability were highly correlated with bottom water temperature, and depth was also an important factor, although not to as great of an extent as temperature.

Database Entry #46

Flint, R. W., and N. N. Rabalais. 1981. Environmental studies of a marine ecosystem: South Texas outer continental shelf, 1st ed.

Keywords: Marine Ecology/Continental Shelf/Gulf of Mexico.

Notes:

Geographic Area

This survey took place on the south Texas continental shelf.

Scale of Study

There were typically four transects in study area, with 6 or 7 stations distributed 10-130 m offshore.
The numbers of stations, however, varied by year.
The total area of study area is 19,250 km^2.

Depth Range

Depth was from about 10 m (transect I, station 4) to 182 m (transect II, station 7).

Environmental and Habitat Data Collected

The following environmental parameters were measured:
Hydrography: Temperature, Salinity, Depth, Currents, Secchi Depth, Transmission
Nutrients: Silicate, Phosphate, Nitrate, Dissolved Oxygen
Hydrocarbons: Methane, Ethane, Ethene, Propene, Propane, Hexane/Benzene Fractions, Retention index with concentrations
Chlorophyll (biomass), 14C productivity

Habitat Parameters

Sediment texture and chemistry were measured.
Topography was also recorded.

Date of Sampling

Sampling was done from December 1974 to December 1977.

Entry #46 Continued

MAJOR FINDINGS

Dominant Abundant Taxa:

The dominant fungi from the survey were: *Cladosporium cladosporioides, Penicillium citrinum, Aspergillus flavus* var. *columnaris, Aspergillus sydowi, Fusarium ventricosum, F. moniliforme* var. *subglutanans*

Nematodes were the most abundant meiofaunal taxa (92.6% of total abundance of permanent meiofauna). Dominants were *Sabatieria* (sandy silts & muds, regardless of depth), *Theristus, Halalaimus, Dorylaimopsis, Neotonchus, Terschellingia, Synonchiella, Viscosia, Laimella* (sandier sediments), and *Ptycholaimellus* (in order of highest to lowest abundance).

Polychaetea was the second most abundant taxon on transects I-IV (4.3 % of total meiofauna, excluding Forams and Protozoans). Dominants were *Paraonis gracilis, Tharyx setigera, Mediomastus californiensis, Aedicira belgiacae ,Protodorvillea* sp. A, *Cossura delta, Aricidea cerruti, Sigambra tentaculata,* and *Prionospio cristata.*

Harpacticoida was the second most abundant taxon in STOCS area(3.6% of total abundance of permanent meiofauna). Dominants were *Haloschizopera,Enhydrosoma, Pseudobradya, Ameira, Ectinosoma, Typhlamphiascus,Robertgurneya, Halectinosoma, Thompsonula, Apodopsyllus, Leptopsyllus,* & *Stenhelia* (in order of highest to lowest abundance).

Polychaetes were the dominant macrofaunal taxa.

There were large numbers of species of epifauna with low abundances.

Spatial Distribution

In 1976 and 1977, meiofaunal populations diminished with increasing depth.

Population peaks of Nematodes (March, July-August, & November) greater inshore than offshore.

Highest abundances of polychaetes were in shallow zone (0-30 m) and decreased offshore.

Number of species and organism density of infauna was consistently highest at shallow stations.

Equitability of infauna increased offshore.

Depth was the most apparent factor controlling epifaunal distribution.

Numbers of epifaunal organisms peaked at mid depth or shallow-intermediate depths and decreased shoreward and offshore.

Zonation of the demersal fish is primarily depth related, but temperature and seasonal migration patterns also playhed a role.

Entry #46 Continued

Habitat Parameter Correlation

Deposit feeding was the dominant feeding mode due to the silty unstable bottom sediments, whereas on the Atlantic shelf, which is sandier, suspension feeders dominate (ie: Amphipods).
Epifauna had high equitability and species richness due to stable environmental conditions.

Other Pertinent Comments

Marine fungi were isolated from sediments and were found in lowest concentrations in late -winter and steadily increased to highest levels in fall (paralleled increase in generic richness).
Fungi found in shallow stations were capable of degrading crude oil, but this characteristic decreased in species further offshre in deeper waters.
Fungal abundance was limited by organic carbon in this system.
Benthic bacteria was in highest numbers during spring and lowest during winter.
Populations of bacteria decreased along transects with increasing depth.

Database Entry #47

Giammona, C. P., and R. N. Darnell. 1990. Environmental effects of the strategic petroleum reserve program on Louisiana continental shelf communities: American Zoologist. 30:37-43.

Keywords: Louisiana/Inner shelf/Gulf of Mexico.

Notes:

Geographic Area

The study site is at the West Hackberry brine disposal site, 11.2 km offshore southwest of Cameron, Louisiana.
The effects of brine disposal on marine organisms is being tested.

Collection Method and Sample Processing

To collect nekton, standard shrimp trawls were used.
For benthos collections, a Smith-McIntyre grab was used.
Samples were sieved through a 0.5 mm mesh.

Date of Sampling

Brine discharge was initiated in mid-May 1981.
Studies were done four months prior to initial discharge and continued through November 1984.

MAJOR FINDINGS

Dominant Abundant Taxa

Dominant taxa were:
Zooplankton: calanoid copepods (especially *Acartia tonsa*)
Benthos: polychaetes (*Magelona phyllisae, Paraprionospio pinnata*) and bivalves (*Mulinia lateralis*)
Nekton: Atlantic croaker (*Micropogonias undulatus*), Gulf Butterfish (*Peprilus burti*), and Silver seatrout (*Cynoscion nothus*)

Impacts of Brine Disposal

Increased salinity near the bottom increased stratification, which could provoke the onset of hypoxia, but due to vertical mixing near the diffuser, waters never became completely hypoxic.
There were no impacts on phytoplankton.

Entry #47 Continued

Local populations of zooplankton, benthos, and nekton were enhanced during otherwise hypoxic periods because of the moderate bottom oxygen levels maintained by the diffuser.

There was long-term cumulative change in species composition and diversity of the benthos in the plume area.

Recommendations for Other Studies of This Type

Don't study phytoplankton (too variable, reproduction too high/fast, etc).

Zooplankton studies should focus on meroplankton, which vary on short timescales.

Sampling should be conducted throughout the impact period and at least for a year following the impact period.

Lab studies could be included to determine effects of several parameters (increased salinity, decreased oxygen, etc.) on organisms.

Field studies on hypoxia should be included.

In order to determine how the food chain between benthos and nekton is altered, nekton food consumption studies should be done.

Benthos should be the main focus, since the most dramatic effects are expected to be seen here.

Database Entry #48

Hall-Spencer, J. M., and P. G. Moore. 2000. Scallop dredging has profound, long-term impacts on maerl habitats: ICES Journal of Marine Science. 57:1407-1415.

Keywords: Scallop Dredging/Scottland/Dredging.

Notes:

Geographic Area

The study site was in the Firth of Clyde, SW Scottland.

Scale of Study:

There were three sites:
- Site 1: Creag Gobhainn, Loch Fyne = 17.5 ha (not previously fished)
- Site 2: Stravanan Bay = 6.75 ha (fished over past 40 yrs)
- Site 3: Tan Buoy = 4.0 ha (fished over past 40 yrs)

Depth Range

The depth ranged from 6-15 m, depending on location.

Collection Method and Sample Processing

A Sprint ROV, Rox Ann, and Van Veen grab sampler were used for collections.
SCUBA observations were also made.
Samples were sieved over 5 mm mesh.

Date of Sampling

Sampling was conducted from 1994 to 1998.

MAJOR FINDINGS

Spatial Distribution

There was a lack of vertical stratification of sediments in test plots, with less interstitial space and more find particles at surface.
A gradual return to original stratification was seen over 4 years.

Rare & Absent Fauna

The scallop, *Aequipecten opercularis,* was absent from site 2.

Entry #48 Continued

No individuals older than 7 years of the scallop *Pecten maximus* were found at site 2, but mature ones dominated site 1

Limaria hians was absent (but shells still present) from site 2, but present in byssus nests at site 1.

Indication of Turnover Times

At five months after dredging, there were 70-80% fewer live thalli in test cores than in cores taken prior to fishing.

No sign of recovery was seen in the number or area covered by thalli over 4 years following dredging.

Comparison to Outside Areas

At site 3, only 16 live *Phymatolithon calcareum* thalli were found at the time of the study (all under 20 mm), whereas, in 1885, over 100 (up to 58 mm) were found, and in 1891, at three different sites, over 100 (up to 38 mm), 65 (up to 50 mm), and 18 (up to 43 mm) were found.

Database Entry #49

Harper, D. E. Jr. 1990. Macroinfana and macroepifauna. In J. M. Brooks and C. P. Giammona, editors. Mississippi-Alabama Continental Shelf Ecosystem Study Annual Report, Year 2. Volume I: Technical Narrative: Department of Interior, Minerals Management Service. OCS Study MMS 89-0095.

Keywords: Gulf of Mexico/Mississippi/Alabama/Geographic Coordinates.

Notes:

Depth Range

The following depths were sampled: 20, 40, 100, and 200 m.

Collection Method and Sample Processing

Three transects were established along the depth gradient.
They used a 0.1 m^2 box core or 0.1 m^2 Smith-McIntyre grab to take nine infaunal samples per site.
The grab was found to be more effective than the box core.
A 0.5 mm mesh size sieve was used for sample processing.
Infaunal biomass was determined but it was unspecified as to wet or dry weight.
Macroepifauna were sampled using a 6.6 m otter trawl towed for 15 minutes.

Environmental Data Collected

They measured temperature, salinity, and dissolved oxygen.

Habitat Parameters Collected

Samples were collected to determine sediment grain size.

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes were the dominant infauna (>60%) in both number of species and individuals.
No one species of polychaete dominated the infauna.
Macroepifauna were dominated by crustaceans.

Spatial Distribution

Neither infaunal or macroepifaunal biomass displayed a detectable pattern with depth.

Entry #49 Continued

Environmental Correlations

Deeper waters were more stable in their infaunal numbers but had a lower abundance.
Infaunal abundance and biomass was greater in the summer than winter.

Other Pertinent Comments

The following notes were taken from the executive summary of this study:

Brooks, J.M. ed. 1991. Mississippi-Alabama Continental Shelf Ecosystem Study: Data Summary and Synthesis. Volume I: Executive Summary. OCS Study MMS 91-0062. U.S. Dept. of the Interior, Minerals Mgmt. Service, Gulf of Mexico OCS Regional Office, New Orleans, LA. 43 pp.

Greatest infaunal densities are found in coarse sand and shell.
Relatively lower infaunal densities are found in silts and clay.
Infaunal density is lower in the winter compared to spring/summer
Storms may impact the bottom up to depths of at least 80 m.
No known hypoxic conditions have been reported on the MS/AL shelf.
Middle shelf bottom water generally flows SW
Deep shelf water (200m) generally flows to the NE
The Loop Current does have intrusions (not seasonally dependent) which brings nutrient poor water up onto the shelf.
Sediments are organic poor (<1%) from 60-100m but rich > 100m.

Database Entry #50

Heard, R. W. 1978. Macroarthropods from the MAFLA box core program in N. Blake, editor. The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey: U.S. Department of Interior Bureau of Land Management. AA550-CT7-34.

Keywords: Mississippi/Alabama/Florida/Gulf of Mexico/Continental Shelf/Geographic Coordinates.

Notes:

Geographic Area

The study site consisted of 30 Stations ranging from Sarasota, FL to Mississippi and ranged across the shelf.

Depth Range

A depth range of 20-800 m was sampled.
Macrofauna specifically were looked at from 11-171 m

Collection Method and Sample Processing

Macrofauna were sampled using a box core 21.3 x 30.5 cm.
Nine replicate box coers were taken per station.
Indentification was to taxanomic guild

Statistics

Species Richness, Shannon-Weaver, and evenness were performed on macrofaunal samples.
Cluster Analysis was also done.

MAJOR FINDINGS

Dominant Abundant Taxa

Amphipods made up almost 50% of the total arthropod fauna.
Tanaids were the next most abundant taxa.

Environmental Correlations

There was a dramatic decrease in arthropods in the winter.

Database Entry #51

Hildebrand, H. H. 1954. A study of the fauna of the Brown Shrimp (Penaeus aztecus Ives) grounds in the western Gulf of Mexico: Publications of the Institute of Marine Science, University of Texas. 3:233-366.

Keywords: Gulf of Mexico/Texas/ Louisianna.

Notes:

Depth Range

Trawls were examined from 3-45 fathoms deep with most concentrated in the 10-24 fathom zone.

Collection Method and Sample Processing

The bycatch of 164 shrimp trawls was examined.

MAJOR FINDINGS

Dominant Abundant Taxa

Herein we report the common benthic/epibenthic fauna which were described:
Sea Anenome - *Calliactis tricolor*
Bivalves - *Echinochama arcinella, Pitar texasiana, Pecten papyraceus, Venus campechiensis, Macoma tageliformis*
Gastropods *Crepidula plana, Strombus alatus, Murex fulvescens, Polystria albida*
Decapod Crustaceans *Callinectes danae, Arenaeus, Cakaooa springeri*
Echinoid *Mellita quinquiesperforata*

Spatial Distribution

Detail is made to list what general depth range each fauna was found in.

Other Pertinent Comments

Distributional maps were made for *Penaeus setiferus* (white shrimp), *Penaeus aztecus* (brown shrimp), and *Penaeus duorarum* (pink shrimp).

Database Entry #52

Hill, A. S., L. O. Veale, D. Pennington, S. G. Whyte, A. R. Brand, and R. G. Hartnoll. 1999. Changes in Irish Sea benthos: Possible effects of 40 years of dredging: Estuarine, Coastal, & Shelf Science. 48:739-750.

Keywords: Dredging/Irish Sea/ Survey.

Notes:

Geographic Area

The three areas surveyed were south of the Isle of Man.
Two of the sites are fished every year, and one is relatively unaffected by the local scallop fishery.

Collection Method and Sample Processing

Van Veen grabs (0.1 m^2) and unspecified dredge types were used in historical samplings.
Day grabs (0.1 m^2) were used in present samplings.
At one of the fished sites, scallop dredges adapted with short queen teeth and a 1 cm mesh liner were also used in recent surveys.

Date of Sampling

Samples from 1946 to 1952 were used as "pre-dredege:.
Additional sampling of a muddy site was done in 1992.
"Recent" dates of sampling of the two fished sites were not given, but are assumed to be mid -1990s.

MAJOR FINDINGS

Findings are separated by site:

Chickens (fished heavily since 1982):

Species number, richness, and diversity were all greater in the recent survey than historical surveys.

Dominance was greater in the historical survey.

There were also some differences in species composition between recent and historical surveys:

Brissopsis lyrifera and *Echinocardium flavescens* were present in historical, but not recent surveys.

The bivalve *Corbula gibba* was present in high numbers in the historical survey, but not the recent one.

Entry #52 Continued

The tube-dwelling polychaetes *Chone fauveli, Euchone rubrocincta,* and *Ampharete lindstroemi* were more abundant in recent samples.
Lepidochiton asellus and *Timoclea ovata* were also more abundant in recent samples.
There was a higher polychaete to mollusc ratio in the recent survey.

Bradda (fished heavily since 1982):

The amphopids *Sunchelidium haplocheles, Urothoe marina*, and *Bathyporeia gracilis*, the isopod *Microjassa cumbrensis*, and a tube-dwelling polychaete *Anothrobus gracilis* were in historical samples, but absent from recent samples.
Most epifauna scavenger species frequently found in recent surveys were absent from historical surveys(e.g. *Asterias rubens, Neptunea antiqua, Buccinum undatum,* and *Cancer pagurus*).

Muddy Sand (relatively unaffected by the scallop fishery):

There was a significant decrease in the number of individuals per grab.
Pielous evenness increased and simpsons dominance decreased sinificantly from 1952 to 1992.
The brittlestars *Amphiura chiajei* and *Amphipholis squamata,* the bivalve *Nucula sulcata,* and the worm *Lumbrineris* sp. were more abundant in recent samples.
The amphipod *Ampelisca* spp., urchins *Echinocardium flavescens*, and *Brissopsis lyrifera* were in historical but not recent samples (many species in historical, but not recent, but these were among the most significant).

There was a highly significant difference between polychaete to mollusc ratio with a greater number of polychaetes in recent samples.

Other Pertinent Comments

Even the undredged area (muddy sand) changed dramatically, so there were probably other factors influencing the change other than just dredging effects.

Database Entry #53

Hirsch, N. D. D. L. H. P. R. 1978. Effects of dredging and disposal on aquatic organisms: Office, Chief of Engineers, U.S. Army, Washington, D.C. Technical Report DS-78-5.

Keywords: Dredged material disposal/Dredging/Review.

Notes:

Type of Study

This paper is a review of the various experiments carried out to assess the impacts of dredging and disposal on benthos.
The field experiments were carried out in Monterey Bay, California, and the James River, Virginia, and various laboratory studies are also included.

MAJOR FINDINGS

Physical Disruption of Bottom Environment

Minimal disruption will be at sites that are naturally unstable (high energy), since organisms are adapted.
Thin layer disposal poses the fewest problems, as the overburden is less; However, if potentially hazardous materials (biologically or chemically) materials are to be released, maybe it is better to release them all in one small, low energy area to minimize the area of impact.
Disposal material should be of the same physical characteristics as the substrate to minimize destruction.
Dredging and disposal should be done to avoid spawning periods; recovery is most rapid if operations are completed before the seasonal increase in biological activity/larval abundance.
Disposal should be in the least sensitive or critical habitats.

Sediment Suspensions

In most cases, suspended sediment does not appear to be a big problem, unless it is persistent and concentrated.
Turbidity may affect photosynthesis, but effects are transitory.
Turbidity may permanently affect coralline reefs.
Turbidity would have the most adverse impacts in normally clear water areas.
Fluid mud presents extreme stress due to low dissolved ozygen and long persistence.
Pipeline considerations, unique to each site, should be taken to either minimize fluid mud layer thickness, which would maximize areal extent, or to maximize fluid mud layer in a small area.
Dredging/disposal should be done in seasons with low productivity or reproduction

Entry #53 Continued

Indirect Effects of Sediment Contaminants

Sediment contamination assays are difficult to perform and evaluate; several methods are discussed (ie bulk analysis).
New contaminants are not introduced by dredging/disposal, but they may be redistributed via sediments.
Heavy metal uptake from sediments was not evident for many metals.
Accumulation of metals depends on many factors (ie exposure duration, concentration, organism, etc.).
Uptake of hydrocarbons from sediments is relatively minor.
Conclusions were made that toxicity of dredged material is not as great as once thought, although some sedimenta are toxic.
Alot of the hydrocarbons in sediments does not become available to organisms for uptake.
Uptake of many materials depends on species, sediment, contaminant properties, salinity, etc.

Other Conclusions

Recolonization occurs within months in the cases studied, but may be by opportunistic species.
Indirect effects (long-term and sublethal) will be minimal.

Database Entry #54

Hobbs, C. H. III. 2000. Environmental survey of potential sand resource sites offshore Delaware and Maryland: U.S. Department of Interior Minerals Management Service. OCS Study 2000-055.

Keywords: Maryland/Delaware/East Coast/Continental Shelf.

Notes:

Geographic Area

The study site was on the inner continental shelf out to 20 m between Cape Henlopen, DE and Ocean City Inlet, MD.
This includes the offshore ridges Fenwick, Weaver, and the Isle of Wight Shoals and areas offshore of the Indian River Inlet

Scale of Study

Large scale point sampling was performed, and complimented by small scale transect sampling as well.

Collection Method and Sample Processing

A Young grab (0.044 m^2) was used.
A Hulcher model Minnie Sediment profile camera and VIMS Standard Bottom Imaging Sled was used.
The camera systems determine what biogenic structures are present.
A 0.5 mm mesh sieve was used for faunal analysis.

Statistics

Calculation of secondary production was done using a published model.
Shanon-Weaver, Margalef's Index (d), evenness, and cluster analysis were also done.
The Scaled Benthic Habitat Quality Index was calculated based upon prism penetration, sediment type, sediment compaction, and the presence of surface/subsurface biogenic features.

Habitat Parameters Collected

The depth of the RPD layer was determined based upon color change

Date of Sampling

Sampling was performed in May and June.

Entry #54 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

There was a great variance in the abundance collected with a mean of 204 individuals in May and
307 individuals/0.04 m^2 in June.
Annelids were by far the dominant infaunal taxon followed by molluscs and arthropods.
Lower abundances were found off of the Indian River Inlet.
The polychaete *Spiophanes bombyx* accounted for 35% of all individuals collected.

Dominant Biomass Taxa

There was a great variance in the biomass collected with a mean biomass of 4.1 g wet/0.04 m^2.
Molluscs accounted for 87% in May and 64% in June of the total biomass.
A lower biomass was found off of the Indian River Inlet.
The bivalve *Spisula solidissima* (surf clam) accounted fro 65% of the total biomass.

Spatial Distribution

Oligochaetes (Tubificidae and Enchytraeidae) were widely distributed and found at 80% of the stations.

Habitat Parameter Correlation

Cluster analysis appeared to break out in accordance with animal-sediment relationships.
Nemertina, Astarte, Crenella glandula, Mytilus edulis, and *Byblis serrata* were characteristic of coarse grained sediments, including coarse sands and gravel.
Asabellides oculata, Spio setosa, Spipophanes bombyx, Tellina, and *Unicola irrorata* were associated with fine sand and silts.

The SBHQ index values were low and less variable in the Indian River Lagoon Inlet region.
On the offshore ridges, the SBHQ index values were lower on the shoals than on the deep valleys
between ridges.

Other Pertinent Comments

Most speices were either suspension feeders or carnivorous.
Most of the species represent mobile fauna.
The anemonies were the only taxonomic group considered to have poor recolonization potential.
The other taxa were classified as potential year round, spring/summer, and fall/winter colonizers.

Entry #54 Continued

Larval recruitment would be better after spring/summer than fall/winter (ex. Amphipods),but this Is not true of all taxa.

A prediction is made that any increase in the silt-clay content of surface sediments would increase infaunal secondary production (i.e. bivalves and annelids). However, on the long-term, this would decrease the resource value for demersal fishes (which prefer small crustaceans).

When mining to minimize impacts, small resource islands should be left to facilitate recolonization.

Database Entry #55

Hobbs, C. H. 2002. An investigation of potential consequences of marine mining in shallow water: An example from the mid-Atlantic coast of the United States: Journal of Coastal Research. 18(1):94-101.

Keywords: Atlantic/Sand-mining/Maryland/Delaware.

Notes:

Geographic Area

Large ridges of Fenwick, Isle of Wight, and Weaver Shoals southeast of the Delaware-Maryland border.

Collection Method and Sample Processing

A Young grab (0.044 m2 surface area) for collection of samples, and a 2.4 m beam trawl was also used..
A sediment profile camera and bottom imaging sled were also used.

Effects on Transitory Vertebrate Fauna

Dredging areas are typically small compared to the large geographic ranges of transitory fishes, so little impact is expected.
Minimize threat to turtles by mining mid-November to mid-April when they aren't in the area.
No threat to migratory/transitory marine mammals is expected.

Effects on Reproductive FIsh and Ichthyoplankton in the Study Area

At anytime, there are spawning, egg, and larval stages, but the fewest numbers are from January to March.
A window of low reproductive species is from December to about mid-April.

Benthic Habitats & Recolonization

Larval/juvenile recruitment is quicker in spring and summer.
Adult recruitment is regulated by other factors that affect passive transport.
It would be beneficial to avoid totally stripping a surface to ensure that the biological assemblage that recolonizes resembles that prior to mining (small islands and refuge patches allow easier recolonization).
Recovery of biological community (benthic) is dependent on waves, currents, and bottom stresses.

Entry #55 Continued

Model Study by Maa and Kim (2000) on Physical Oceanography and Changes after Mining:

Comparing two mining surface areas, 2 x 10^6 m from each shoal and 2.4 x 10^7 m in total area:

- The impact on the wave environment would change little with a smaller area dredged from each shoal, but would increase wave height between the dredged area and shore if the larger area was dredged.
- With a storm surge, there would be negligible differences between pre- and post-dredging outputs, even with the larger dredging scenario.
- The cumulative dredging scenario results in a 10% increase in bottom currents, and is therefore only an increase of about 1 cm/second.
- The impacts of dredging on wave and current generated bottom disturbing forces were minimal.

Overall

Consequences to sand mining this area are not substantial and can be minimized based on the above study conclusions.

Database Entry #56

Ivester, M. S. 1978. Analysis of benthic meiofana from the MAFLA/Eastern Gulf of Mexico. in N. Blake, editor. The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey: U.S. Department of Interior Bureau of Land Management. Contract AA550-CT7-34.

Keywords: Mississippi/Alabama/Florida/Gulf of Mexico/Continental Shelf/Geographic Coordinates/Meiofauna.

Notes:

Geographic Area

The overall study involved 30 Stations ranging from Sarasota, FL to Mississippi and all across the shelf.

Depth Range

A depth range of 20- 800 m was used in this study.

Collection Method and Sample Processing

Meiofauna were sampled using a 3.5cm diameter corer to subsample a box corer.
Two subsaples were taken per box core and 3 box cores per station.
Indentification was to taxanomic guild

MAJOR FINDINGS

Dominant Abundant Taxa

Meiofauna were dominated by nematodes followed by copepods and polychaetes (possibly temporary meiofauna).
Meiofauna densities (65-3752 individuals 10 cm^{-2}) were similar to those found other continental shelf ecosystems.

Spatial Distribution

Decreased meiofauna with depth and increasing freshwater influence.
Highest densities were found in inner to mid-shelf areas.

Environmental Correlations

Meiofauna densities were not correlated with temperature or salinity.

Entry #56 Continued

Habitat Parameter Correlation

Meiofauna densities peak in high carbonate (30-85%) medium to fine sands.

Database Entry #57

Johnson, R. O., and W. G. Nelson. 1985. Biological effects of dredging in an offshore borrow area: Florida Scientist. 48:166-188.

Keywords: Atlantic/Dredging/Florida.

Notes:

Geographic Area

The study took place on the Atlantic coast of Florida in the vicinity of the Fort Pierce inlet.

Scale of Study

The dredged area was 130 m x 0.8 km.
There were 5 stations on each transect, and 2 transects running through the dredged area (each transect with some stations in the trench and some outside)
There were also control sites.

Depth Range

The control areas and areas on the transects that were outside the trench were 7 m, and the trench was about 10.5 m.

Dredge Details

285,000 m^3 of sand was removed.

Collection Method and Sample Processing

A 0.1 m^2 Smith-McIntyre grab was used.
Samples were sieved through 505 micron mesh and then resieved through .6 mm mesh.

Habitat Parameters Collected

Sediment analysis for grain size was conducted.

Date of Sampling

Samples were taken at the time of dredging, August 15, 1980, and at 3-month intervals following dredging: November 18, 1980, February 20, 1981, May 21, 1981, and August 4, 1981.
No pre-dredging samples were taken due to a last minute contract, but nearby samples were taken

for comparison purposes.

Entry #57 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Bivalves and amphipods were abundant, and some polychaetes were found.

Indication of Turnover TImes

The dredged (trench) area initially had decreased grain size, but had returned to normal within 12 months.
Abundances were low through February, increased in May and August, and by August, densities had returned to approximate levels at the time of dredging.
Abundance of fauna had returned to initial levels within 12 months on Transect I and 9 months on Transect II.
Number of taxa had returned to initial levels within 9 months on Transects I and II.
One year after dredging, Transects I and II remained dominated by polychaetes.

Comparison to Outside Areas

The effects of dredging were also seen on non-trench stations on both transects, as these areas also had decreased abundance and numbers of taxa.
Abundance in dredged areas (trenches-Transects I & II) decreased 72% after dredging, compared to outside comparison (control) sites.
While the number of taxa decreased after dredging in trenches, a decrease was also seen at one of
the outside areas as well as the non-trench stations on Transect I
Organisms present at outside comparison areas, but not in trenches were: *Crassinella martinicensis* (bivalve), *Melita* sp. (sand dollar), and *Bathyporeia parkeri* (amphipod).

Other Pertinent Comments

Polychaetes increased in trenches while bivalves decreased in trenches.
Dredging had little impact on evenness.

Database Entry #58

Jones, G., and S. Candy. 1981. Effects of dredging on the macrobenthic infauna of Botany Bay: Australian Journal of Marine and Freshwater Research. 32:379-398.

Keywords: Australia/Botany Bay.

Notes:

Geographic Area

The study took place in Botany Bay, Australia.

Scale of Study

The study consisted of 4 dredged, 4 undredged, and one additional undredged area.
There were 10 sites per area, for a total of 90 sites.

Depth Range

The depth ranged from 2 - 21 meters.

Collection Method and Sample Processing

Collections were made with a cylindrical corer (19 cm diameter x 15 cm depth).
Samples were sieved through a 1mm mesh.

Habitat Parameters Collected

Sediment particle size and organic content was measured.

Date of Sampling

Sampling occurred from November 1976 - January 1977.

MAJOR FINDINGS

Dominant Abundant Organisms

The dominant abundance organisms were polychates (55%)(*Caullierella* sp. 2, *Chone* sp., *Mediomastus californiensis),* crustaceans (27%)(*Corophium ascherusicum)*, and mollusks (18%):(*Notospisula trigonella*).

Entry #58 Continued

Environmental Correlations

Depth didn't play a large role in faunal groups.

Habitat Parameter Correlations

Sediment type was strongly linked to species groups.
Species density was similar in sandy and muddy areas.
Species richness was lower in muddy sediments (dredged), except for the channel
The channel had diverse and abundant fauna, possibly because:

- the configuration of the channel protects it from wave and current disturbances
- the topography indicates that it may act as a drainage channel for ebb flows, which may increase food sources to benthos because of the delivery of organic matter
- continued dredging disrupts underlying materials from the sediments, and frees detritus

Indication of Turnover Times

Turnover times were "fairly rapid".
Even the most recently dredged area, which was dredged from 1972-1974 supported a rich benthic fauna by the time of the sutvey (1976 & 1977).

Other Pertinent Comments

No survey was done of fauna before dredging.

Database Entry #59

Jutte, P. C., R. F. Van Dolah, and P. T. Gayes. 2002. Recovery of benthic communities following offshore dredging, Myrtle Beach, South Carolina: Shore and Beach. 70:25-30.

Keywords: South Carolina/Atlantic.

Notes:

Geographic Area

The survey was done in the Cherry Grove borrow area, Myrtle Beach, South Carolina.

Scale of Study

2.6 million cubic yards of sandy sediment were removed to about 1 meter below grade.
10 sample stations were located in the borrow and reference areas (20 total).
The locations of these stations were randomly selected on all sample dates.

Dredge Details

The area was dredged once using a hopper dredge.
The area of dredging was approximately 4 $miles^2$.
The depth of dredging was a little over 1 m.

Collection Method and Sample Processing

A 0.043 m^2 Young grab sampler was used.
Samples were sieved over a 0.5 mm mesh.

Habitat Parameters Collected

Sediment composition, sand grain size, and total organic matter were measured.

Date of Sampling

Dredging was done in three phases, but this study is only concerned with the first phase, in which dredging occurred from mid-September through mid-November 1996.
Infaunal and sediment sampling was done from November 1995 through February 1998 (but not in Nov. 1996) on a quarterly basis. A final sampling was done in February 1999.

Entry #59 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant faunal groups were the annelids and molluscs.

Habitat Parameter Correlations

The borrow area filled with shell hash after dredging, instead of fine sediments, as shown in other studies.

The use of the hopper dredge resulted in shallow furrows (about 1 m), separated by undisturbed areas.

Indication of Turnover Times

No significant differences in faunal densities or numbers of species were found within 3-6 months after dredging.
Organic matter was significantly different between borrow and reference sites even 27-30 months after dredging.
The mean sand grain size at the reference site was significantly smaller than the borrow site throughout the study.
After dredging, the borrow area had lower sand and higher silt/clay content than the reference, but at 15-18 months, there was no significant difference.
At 27-30 months, there was lower sand and higher calcium carbonate at the borrow site compared to the reference site.
The authors indicated that a quick turnover rate could have been due to several factors:
- Because shell hash filled in furrows instead of fine sediments, recovery may be quicker than other studies.
- Because furrows are separated by undisturbed areas (ridges), these ridges may slump into furrows and fill them in with undisturbed sediments.

Other Pertinent Comments

This study was a survey of the effects of hopper dredging on benthos.
The dredging was done by the U.S. Army Corps of Engineers as a part of the Myrtle Beach Renourishment Project.
Evenness and species richness were similar at both sites.
Diversity was lower at the borrow area 3-6 months after dredging, but was similar for the remainder of the study.

Species composition was still different 30 months post dredging.

Database Entry #60

Kaiser, M. J., K. Cheney, F. E. Spence, D. B. Edwards, and K. Radford. 1999. Fishing effects in northeast Atlantic shelf seas: patterns in fishing effort, diversity and community structure VII. The effects of trawling disturbance on the fauna associated with the tubeheads of serpulid worms. Fisheries Research. 40:195-205.

Keywords: Irish Sea/Trawling/Experimental.

Notes:

Geographic Area

The study area is in the eastern Irish Sea.

Depth Range

Depths ranged from 26-34 m.

Collection Method and Sample Processing

A quantitative epibenthic dredge, based on design of Bergman and Santbrink (1994), was used for sampling.
Samples were sieved over a 10 mm mesh.

Date of Sampling

Sampling began in April 1993 and was done every 6 months for 2 years.

MAJOR FINDINGS

Dominant Abundant Taxa

Trawling had no effect on the mean density of tubeheads when quantified as mean number of tube-building species or the mean number of tubeheads per sample.
In controls, the number of individual animals per tubehead increased significantly with tubehead weight.
In controls, the number of species increased significantly with tubehead weight.
The following suspension and deposit feeders were dominant in cotrol samples: *Pomatoceros triqueter, Pomatoceros lamarcki, Polydora flava, Dodecaceria concharum,* and *Gofingia elongata.*
The following predators were dominant: *Nereis zonata, Eumida sanguinea, Anthura gracilis, Gnathia oxyuraea.*

Entry #60 Continued

Spatial Distribution

There was no significant difference in the mean density of *Pomatoceros* per dredged sample or in the mean number of tubeheads per sample.

In April 1994, there were significantly fewer individuals per gram of tubehead weight in recovering fished sites than in control, but after re-fishing, the difference was no longer significant.

In October 1994, after refishing, the number of individuals per gram of tubehead was significantly lower in fished sites.

Most tubeheads caught in trawls passed through the 80 mm mesh of the trawl and were redeposited on the seafloor, but they're unlikely to resettle in the original orientation.

Other Pertinent Comments

In this study, the northwest sector of the site was disturbed by beam trawling every 6 months for 2 years. Unfished control areas were 100 m adjacent to fished waylines.

Samples from waylines were taken within 24 hours of the fishing disturbance and prior to fishing every 6 months to study the changes that had occurred during the intervening 6 months.

Database Entry #61

Kenny, A. J., and H. L. Rees. 1996. The effects of marine gravel extration on the macrobenthos: results 2 years post-dredging. Marine Pollution Bulletin. 32:615-622.

Keywords: North Norfolk/Dredging.

Notes:

Geographic Area

The study area was in North Norfolk, United Kingdom.

Collection Method

A Hamon grab (0.25 m^2) was used for collection.

Habitat Parameters Collected

Sediment particle size was determined according to the Udden-Wentworth Phi classification scheme.
Sea bed images were taken pre- and post-dredging via side scan sonar.

Date of Sampling

Sampling was conducted from 1992 to 1994.

MAJOR FINDINGS

Dominant Abundant Taxa

Dendrodoa grossularia and *Balanus crenatus* made up 90% of community abundance.

Dominant Biomass Taxa

Dendrodoa grossularia & *Balanus crenatus* made up 70% of community biomass. Both of the species recolonized quickly after dredging.

Habitat Parameter Correlation

The pre-dredged sediment was uniform, gravelly with an even surface profile, but post-dredging, furrows were made 1-2 m wide and 0.3-0.5 m deep, with sand ripples along the base of dredged tracks.
The dredged site sediment size was more variable and had an increase in coarse sediments (>2 mm) , which could be due to the uncovering of a lower gravel layer.

Entry #61 Continued

Natural physical disturbances post-dredging seemed to favor r-selected species for rapid recolonization.

Indication of Turnover Times

There was a significant decrease in biomass immediately post-dredging.
During the12 months post-dredging, there was only a slight increase in biomass, and then a slight
decrease during the 2nd year.
At two years post-dredging, biomass was significantly lower than pre-dredging, but overall dominant species remained similar pre- & post-dredging.
Density of fauna decreased dramatically within two months after dredging, but increased significantly within the next year.
Overall, density increased significantly within the two years after dredging, but still was significantly different from the reference site.
The reference site remained constant in the number of taxa.
The dredged site immediately significantly decreased in number of taxa, but increased again during the year post-dredging.
The number of taxa at the treatment (dredged) site one year post-dredging was not significantly different from the reference or pre-dredged site.
Greatest recolonization was within 12 months after dredging.

Database Entry #62

Lewis, M. A., D. E. Weber, R. S. Stanley, and J. C. Moore. 2001. Dredging impact on an urbanized Florida bayou: effects on benthos and algal-periphyton: Environmental Pollution. US Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Gulf Ecology Division.

Keywords: Dredging/Florida/Bayou-Estuary/Coordinates.

Notes:

Geographic Area

Bayou Texas is in a residential area at the water's edge (Escambia County, adjacent to Pensacola Bay).
There is extensive urbanization in watershed.
Sediment accumulates about 19,000 yds^3 annually.
Depth is 1-2 m at most locations.

Dredging Details

22,800 m^3 of fluvial transported sediment was removed.

Collection Method and Sample Processing

For benthic community composition studies, grab samples were made and passed over a 0.03 mm sieve.
Collections were from within the dredge zone one month prior to and one month post-dredging.

For acute toxicity bioassays, a hydrometric technique was used at four locations within the dredged zone.
Organisms (*Americamysis* (*Mysidopsis*) *bahia*) were exposed and compared to reference sediment from Perdido Bay, FL.

In situ acrylic substrates inside and outside dredge-zoneswere used to study periphyton colonization.

For water quality analyses pre- and post-dredging; portable analytical instrumentation (Hydrolab Corp., Austin TX) and refractometer were used.
PAR (Li-Cor LI-189 Quantum Radiometer/Photometer) was also measured.

A stainless steel ponar grab was used for sediment analysis.
Sediment chemical quality was measured with an intracoupled plasma spectrophotometer and an automated mercury analyzer.

Statistics

The statistics used were ANOVA (One-way & Two-way), Shannon-Weaver diversity index, and Bray-Curtis similarities.

Entry #62 Continued

Environmental Data Collected

Water quality measurements of pH, dissolved oxygen, temperature, salinity, and PAR were made.
Acute toxicity of sediments and chemical quality (mercury, trace metals) was analyzed.

Date of Sampling

Small scale dredging occurred between October 1994 and February 1995.
Sampling was done at various intervals pre-, during, and post-dredging.

MAJOR FINDINGS

Dominant Abundant Taxa

Dominant abundant taxa were the polychaetes (*Laeonereis culveri* & *Streblospio benedecti*).
Copepods increased after dredging.
Diatoms were also abundant.

Correlations

Relative abundances of dominant taxa decreased from 68% one month pre-dredging to 23% one month post-dredging

Comparison to Outside Areas

The effects did not appear to extend seaward outside of the dredged area. No landward samples were taken.
Recovery was based upon species abundance and diversity values.

Database Entry #63

Lindegarth, M., D. Valentinsson, M. Hansson, and M. Ulmestrand. 2000. Interpreting large-scale experiments on effects of trawling on benthic fauna: an empirical test of the potential effects of spatial confounding in experiments without replicated control and trawled areas: Journal of Experimental Marine Biology and Ecology. 245:155-169.

Keywords: Sweden/Experimental/Trawling.

Notes:

Geographic Area

The study took place on the west coast of Sweden in Gullmarsfjorden.

Scale of Study

There were six 1.5 km transects in the inner fjord.
Trawling began after November 1996 and was done repeatedly with two trawls per week (except in January & February due to ice in fjord).
Post-trawling samples were taken from July to November 1997.
Each site was sampled 4 times before and 4 times after trawling.
Three control sites were also sampled.

Depth Range

Trawled areas were about 73-93 m deep, and the maximum depth of the fjord was about 120 m.

Collection Method and Sample Processing

A Smith-McIntyre grab (0.1 m^2) was used.
Mesh sizes used were 1 mm and 4 mm.

Date of Sampling

Pre-trawling sampling was done from July to November 1996.
Post-trawling sampling was done from July to November 1997.

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes, echinoderms, and bivalves were the dominant abundant taxa.

Entry #63 Continued

Dominant polychaetes were *Spiophanes kroyeri, Amphicteis gunneri, Anobothrus gracialis, Melinna cristata, Myriochele oculata, Scalibregma inflatum,* and *Terebellides stroemi.*
Dominant echinoderms were *Amphiura chiajei* and *Amphiura filioformis.*
Dominant bivalves were *Abra nitida* and *Nucula tenuis.*

Results

When compared as a whole, analysis of total numbers of individuals of all species, the number of species, and the numbers of the three dominant species did not reveal any significant effects of trawling.
There was significant interactive spatial and temporal variability.

When paired with control sites, there was temporal change in abundances and number of species between pairs, but these also changed between pairs of controls.
There were even significant differences in control sites, so one control paired to treatment sites does not give adequate/correct information.

Other Pertinent Comments

With one control area, the conclusions about trawling effects are confounded.
It is not reliable to use one control area for each trawled area because of temporal and spatial variability.
Several control areas are needed.

Database Entry #64

The Louis Berger Group Inc. 1999. Use of federal offshore sand resources for beach and coastal restoration in New Jersey, Maryland, Delaware, and Virginia: U.S. Department of Interior Minerals Management Service. OCS Study MMS 99-0036.

Keywords: Virginia/Maryland/Delaware/New Jersey/East Coast/Continental Shelf.

Notes:

Geographic Area

This review covers the Mid-Atlantic Bight from three nautical miles offshore to a depth of 200 m.
The study contains maps that may be potentially put into ArcView.

MAJOR FINDINGS

General Trends

The following general trends were found (Wigley and Theroux 1981):
There was a decreasing density from north to south for arthropods and molluscs.
Polycheates are greatest in the middle of the bight.
Greatest biomass is due to shell intact molluscs, followed by Echinoderms.
Species that dominate the soft bottoms are the polychaetes (*Polygordius, Goniadella, and Lumbrinerides*), bivalves (*Tellina*), gastropods (*Oliva, Terebra*) and the amphipods (*Pseudunicola, Protohaustorius*).
Opportunistic species indicative of fine grained organic sediments are the polychaetes (*Streblospio benedicti, Capitella capitata, Owenia fusiformis)* and amphipods (*Ampelisca*).
Equilibrium species indicative of undisturbed coarse sediments are *Nephyts incisa, Ensis directus, Sabellaria spinulosa, Artica islandica, Nucula, Amphiura,* and *Tellina.*

New York/New Jersey Bight:

Densities were lower than elsewhere in the Bight (range 442-2430/m^2) with an average of 1,254 m^2.
Surface deposit feeding polychaetes dominate the fauna (Maurer et al., 1982).
Commercially important species were the surf clams (*Spisula solidissima*), ocean quahog (*Arctica islandica*), Atlantic sea scallp (*Plactopecten magellanicus*), American lobster (*Homarus americanus*), blue crab (*Callinectes sapidus*), soft clam (*Mya arenaria*), northern quahog (*Mercenaria mercenaria*), American oyster (*Crassostrea virginica*), bay scallop (*Argopecten irradians*), knobbed whelk (*Busycon carica*), and channeled whelk (*Busycotypus canaliculatum*).

Entry #64 Continued

Under the title of "Essential Fish Habitat" the following species have been under concern: surfclam, ocean quahog, and Atlantic Sea Scallop. The paper provides more detail and EFH designation maps for this.

There is a detailed description of some specific studies in the area.
This is a thorough synopsis.

Other Pertinent Comments

Alterations to the bottom following dredging include:
- Changes in bathymetry
  This includes creating pits, eliminating high points or unique features, and changing the depth.
- Direct burial or removal of individuals
- Removal or deposition of fine sediments when there has been a shifting of sand (e.g. sediment resuspension)
- Compositional/textural change (e.g. sands to mud) when the bottom layers are now exposed.
- Low Oxygen conditions could exist if deep pits are created which have minimal flushing
- Water quality also changes, including turbidity due to a suspended sediment plume this occurs at the benthic layer as well due to the draghead of the dredge. The benthic plume may clog feeding apparatus.

Database Entry #65

Lyons, W. G., and S. B. Collard. 1974. Benthic invertebrate communities of the eastern Gulf of Mexico. in R. E. Smith, editor. Marine environmental implications of offshore drilling in the eastern Gulf of Mexico.

Keywords: Florida/Gulf of Mexico.

Notes:

Spatial Distribution

This paper characterizes three distinct areas:

The West Florida Shelf:
The shallow shelf zone is 10-30 m in depth.
The sediment is sandy and much of the fauna is typical of more inshore waters.
The middle shelf zone is 30-60 m in depth.
The sediments are carbonate based with a more diverse species assemblage compared to the shallow shelf.
The outer middle shelf zone is from 60-140 m in depth.
Sediments are carbonate made up of bryozoan, coralline alga, and mollusc fragments.
The fauna is mostly tropically derived.
The deep shelf area is from 140-200 m in depth.
Species abundance and diversity starts to fall off in this region with increasing depth.

The Mississippi-Alabama Shelf:
At this location, there is potentially a reduced faunal diversity compared to the West Florida Shelf.

The Continental Slope:
Formainiferal sands and muds dominate.
There is much less diversity compared to the shelf except for penaeid shrimp, caridean shrimp, and galatheid crabs.

<u>Database Entry #66</u>

Mahadevan, S., J. Culter, S. Hoover, J. Murdoch, F. Reeves, and R. Schulze. 1976. A study on the effects of silt-spill and subsequent dredging on benthic infauna at Apollo Beach embayment: Conservation Consultants, Inc. Submitted to: Department of Environmental Planning, Tampa Electric Company.

Keywords: Florida/Apollo Beach/Spill/Dredging.

Notes:

Study Overview

This study results from an accidental spill (Nov. 1975) of dredged material in a canal of the Apollo Beach, Florida embayment.
Part of the area was dredged for clean-up and part was left undredged.
This study compares the dredged and undredged areas of the spill site, as well as a control site.

Date of Sampling

Sampling was conducted on April 15, 1976.

Collection Method and Sampling Procedure

A petite Ponar grab (sampling area: 0.022 m^2) was used for collections.
Samples were sieved over a 0.5 mm mesh.

Environmental Parameters

Transparency (secchi disc), surface and bottom temperatures (YSI meter), surface and bottom salinity (YSI meter), surface and bottom dissolved oxygen (YSI DO meter), sediment temperature (Mercury hand thermometer), and water depth were all measured.

Habitat Parameters

Mean grain size, median grain size, sorting coefficient, skewness, & kurtosis of sediments were measured.
Organic content and silt-clay fractions of sediment were measured.

MAJOR FINDINGS

Dominant Abundant Taxa

In control areas, the dominant abundant taxa were an amphipod *Ampelisca vadorum*, bivalve *Mulinia lateralis*, and a polychaete *Streblospio benedicti*.

Entry #66 Continued

In undredged areas, the dominant abundant taxa were the polychaetes, *Capitella capitata* and *Streblospio benedicti* (but less than control), and an amphipod, *Ampelisca vadorum* (but less than control).

In dredged areas, the dominant abundant taxa were a polychaete, *Streblospio benedicti* (more than control or undredged) and a bivalve, *Mulinia lateralis* (alot less than control).

Environmental Correlations

Transparency was lower at the undredged site, but dissolved oxygen was greater here.
A bloom of the dinoflagellate *Gyrodinium fissum* was also observed at the undredged site.
Control and dredged sites had similar dissolved oxygen levels.
Temperature and salinity were similar at all sites.
Sediments were poorly sorted and there was more granular variance at the dredged site.
The undredged site was silty, and the other two sites (dredged and control) were a mixture of sandy and silty sediments.
Undredged site had greater organic content and the control site had the lowest average organic content.

Environmental Correlations

More than 85% fauna at the control site were *A. vadorum* and *Mulinia lateralis* and therefore, the presence of silt may coincide with replacement of *M. lateralis* by *C. capitata.*

Spatial Distribution

Several species were present at the control site, but not in other sites:
- Platyhelminthes: *Euplana* sp., *Stylochis* sp. & an unidentified species
- Annelida: *Diopatra cuprea*, *Glycinde solitaria*, *Onuphis eremita oculata*, *Parahesione luteola*, *Prionospio heterobranchia*, *Stenonineris martini*, and an unidentified oligochaete
- Bivalvia: *Ensis minor, Lyonsia hyalina floridana, Macoma tenta, Tagelus divisus*, and an unidentified species
- Gastropoda: *Crepidula plana, Prunum apicinum*
- Amphipoda: *Listiella* sp., *Melita nitida*, *Monoculodes* sp.
- Isopoda: *Edotea montosa, Xenanthura brevitelson*
- Ostracoda: *Haplocytherida setipunctata, Parasterope pollex*
- Phoronida: *Phoronis architecta*
- Ophiuroidea: unidentified species

The polychaete, *Mediomastus californiensis*, was present at the two affected sites, but not the control.

Entry #66 Continued

Capitella capitata and *Sreblespio benedicti* increased in affected sites.
C. capitata (pollution indicator) was more numerous at the undredged site and *S.benedicti* (pioneer sp.) was more numerous at the dredged site.
A gastropod, *Acteon punctostriatus,* was more numerous at the affected site.
An amphipod, *Ampelisca vadorum*, was more numerous at the control and undredged sites, but there weren't as many at the dredged sites.
More than 85% of the fauna at undreged site were *A. vadorum* and *C. capitata.*
Biomass was greatest at the control and lowest at the dredged site.
Species richness was greatest at the control, and was due largely to rare species that hadn't yet established at other two sites; species numbers slightly greater at dredged than undredged site (but not significant).
Equitability was slightly greater at the dredged site, but no significant differences were seen between the three sites in diversity or equitability.
The dredged site had low faunal density, low biomass, and low sp. richness, and not significant difference was seen in species diversity and equitability.
The undredged had moderate faunal density, moderate biomass, low species richness, no significant difference in species diversity or equitability, and high faunal similarity.
The dredged site was typical of a "pioneer" community, and looks to be the most affected by the spill and later dredging.

Recovery

In terms of faunal similarity, the control and undredged sites were most similar to each other, so maybe undredged has recovered to almost "normal".
Faunal density was greatest at the control and lowest at the dredged sites, but possibly because recuperation time of the dredged site was 45 days and the undredged was 156 days.

Other Pertinent Comments

Eight samples were all that were needed for a saturated in species richness.

Database Entry #67

Mahadevan, S, J. Sprinkel, D. Heatwole, and D. H. Wooding. 1984. A review and annotated bibliography of benthic studies in the coastal and estuarine areas of Florida: Report No. 66, Florida Sea Grant College.

Keywords: Florida

Notes:

Study Overview

This is a review of estuarine and coastal areas broken down into Florida counties. The coastal studies do extend into federal waters.

<u>Database Entry #68</u>

Marsh, G. A., P. R. Bowen, D. R. Deis, D. B. Turbeville, and W. R. Courtenay Jr. Volume II. Evaluating benthic communities adjacent to a restored beach, Hallandale (Broward County), Florida. 1980. in G. A. Marsh, P. R. Bowen, D. R. Deis, D. B. Turbeville, and W. R. Courtenay Jr., editors. Ecological evaluation of a beach nourishment project at Hallandale (Broward County), Florida: U.S. Army, Corps of Engineers Coastal Engineering Research Center. Miscellaneous Report No. 80-1 (II).

Keywords: Florida/Gulf of Mexico/Dredging Impacts.

Notes:

Scale of Study

The study extended from the intertidal out 700 m.

Depth Range

The study sites ranged from 0.8-8 m in depth.

Dredging Details

Six years prior to this study 268,000 cubic yards of sediment was moved.

Collection Method and Sample Processing

A previously dredged and neighboring undredged area were sampled.
A 7.9 cm in diameter PVC corer was used.
Samples were washed over a 1 mm sieve.

Environmental Data Collected

Sediment particle size and organic content were determined.

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes dominated representing one half of the taxa and 52.5% of the total abundance.
The families Syllidae, Spionida, and Dorvilleidae were common.
The most common species were *Exogone dispar, Syllis, Schistomeringos rudolphi, Prionospio cristata*, and *Aricidea*.
Oligochaetes were the second most abundant group.

Entry #68 Continued

Recovery

There were no long lasting effects of dredging.several years later (> 5 years, < 10 years) in that faunal denisity was similar.

Database Entry #69

Maurer, D., and W. Leathem. 1981. Ecological distribution of polychaetous annelids from the New England outer continental shelf, Georges Bank: Internationale Revue Der Gesamten Hydrobiologie. 66:505-528.

Keywords: Atlantic/Georges Bank/Survey.

Notes:

Geographic Area

The survey took place on Georges Bank (New England continental shelf).

Scale of Study

408 grab samples were taken over 42 stations on Georges Bank, which is 3.1 x 10^6 ha.

Depth Range

Depth ranged from 38-185 m.

Collection Method and Sample Processing

A modified Smith McIntyre grab (0.1 m^2) was used for collection of samples.
A 0.5 mm mesh Nitex screen was used to sieve samples.

Environmental Data Collected

Temperature and depth were measured.

Habitat Parameters Collected

Sediment grain size analysis, microbial analysis, total organic carbon, and nitrogen were measured.

Date of Sampling

Sampling was done in winter (Feb 7 - March 8) and spring (May 2 - June 2), 1977.

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes comprised a mean 53% of density for the winter samples.

Entry #69 Continued

Polychaetes were 53.8% of the number of all infaunal species per station in the winter.

The dominant species were:

Spiophanes bombyx/Exogone hebes/Euclymene collaris/Exogone verugera/Aricidea catherinae/Phyllodoce mucosa/Cirratulidae spp./Parapionosyllis longicirrata/Schistomeringos caeca/Spiophanes kroyeri/Sphaerosyllis erinaceus/Tharyx sp. B/Goniadella gracilis/Sabellidae spp/Jasmineira filiformis/Maldanidae spp./Nephtyidae spp./Notomastus latericeus/Chone inffundibuliformis/Euchone incolor

Dominant Biomass Taxa

Polychaetes averaged 4.7% of the wet weight of all infaunal species per station in the winter, and were 60.5% when species with hard parts were excluded from the total.
In terms of density, Spionidae, Syllidae, Paraonidae, Maldanidae, and Cirratulidae dominated.
Biomass was also influenced by larger species of:

Nephtyidae/Onuphidae/Lumbrineridae/Maldanidae/Spionidae/Scalibregmida/ Opheliidae/Orbiniidae/Nereidae

Spatial Distribution

The standing crop was lowest for the Gulf of Maine, intermediate for slopes and southwest shelf, and highest for Nantucket Shoals and Georges Bank.
Number of species, species diversity, density, and biomass was relatively low in central portion of Bank; sediment transport/mobility and storms may limit low standing crop.
North and south margins of the Bank were intermediate; frontal systems (providing nutrient enrichment and primary productivity) and predation by demersal fish provide intermediate disturbance, preventing bivalves or tube worms from dominating.

Environmental Correlations

Mean number of species were positively associated with depth, temperature, and gravel, but negatively associated with disolved oxygen.
Mean number of species per station was significantly higher in spring than in winter.
Mean density of polychaetes was positively associated with depth and percent gravel and negatively associated with mean phi.
No significant differences in biomass between winter and spring.
In the spring, biomass increased significantly with dissolved oxygen.

No significant differences in species diversity or evenness were seen between winter and spring.
Evenness and species diversity were positively associated with depth and temperature and negatively associated with dissolved oxygen and microbial biomass.
No significant difference in dominance was seen between winter and spring.

Entry #69 Continued

Number of species and density of polychaetes increased with depth down to 80 m, but there was some decrease in biomass with depth.
Wet weight biomass decreased significantly with depth.

Habitat Parameter Correlation

Number of polychaete species and density increased with coarser sediment.

Other Pertinent Comments

There was a diverse, abundant, and widespread polychaete fauna on Georges Bank.

Database Entry #70

Maurer, D., P. Kinner, W. Leathem, and L. Watling. 1976. Benthic faunal assemblages off the Delmarva Peninsula: Estuarine and Coastal Marine Science. 4:163-177.

Keywords: Atlantic/Delaware/Maryland/Survey.

Notes:

Geographic Area

The survey was conducted on the inner continental shelf off the Delmarva Peninsula, about 100 km southeast of the mouth of the Delaware Bay.

Scale of Study

Nine stations were sampled in May and sixteen stations the following November.

Collection Method and Sample Processing

A 0.04 m^2 Shipek grab was used for collections.
Samples were sieved through 0.25 mm mesh.

Date of Sampling

Samples were collected in May and November 1973

MAJOR FINDINGS

Dominant Abundant Taxa

In May, the dominant abundant taxa were polychaetes, crustaceans, and molluscs.
By November, the number of polychaetes had increased and the numbers of crustaceans had decreased. Molluscs were still present in November, as well.

The top ten species (in abundance) per month, in decreasing order were:
May:
Goniadella gracilis
Lumbrinereis acuta
Trichophoxus epistomus
Clymenella spp.
Echinarachnius parma
Unciola irrorata
Aricidea cerruti
Cirolana polita

Entry #70 Continued

Byblis serrata
Protohaustorius vigleyi

November
Polygordius sp.
Exogone verugera
Trichophoxus epistomus
Spiophanes bombyx
Goniadella gracilis
Lumbrineris acuta
Juvenile echinoid
Echinarachnius parma
Nephtys picta
Unciola irrorata

Other Pertinent Comments

There was no change in numbers of deposit feeders or carnivores from May to November.
The number of individuals increased by 50% from May to November.
There was a large change in the species composition, but relatively little change in the % of fauna in each trophic group or evenness of deposit feeders.

Database Entry #71

Maurer, D., W. Leathem, and C. Menzie. 1982. Macrobenthic invertebrates from the middle Atlantic continental shelf: Internationale Revue Der Gesamten Hydrobiologie. 67:491-515.

Keywords: Atlantic/New Jersey/Outer Shelf.

Notes:

Geographic Area

The survey was on the mid-Atlantic outer continental shelf about 156 km off the coast of New Jersey.

Scale of Study

A 3.2 km diameter study area was sampled (813 ha).
There are 40 sites within the study area, and for this survey, 22 of those locations were sampled.

Depth Range

Depth in the area was 120 m.

Collection Method and Sample Processing

Smith-McIntyre grabs (0.1 m^2), and modified Ponar grabs (0.1 m^2) were taken from the area.
Sediment cores were also taken from the grabs.
Samples were sieved over a 0.5 mm mesh.

Environmental Data Collected

Salinity, temperature, and dissolved oxygen were measured.

Habitat Parameters Collected

Sediment grain size composition and clay minerology were examined.

Date of Sampling

Two cruises were taken, from July 26 - August 1, 1978 and from August 17 - August 22, 1978.

Entry #71 Continued

MAJOR FINDINGS

Domiant Abundant Taxa

Annelids, primarily polychaetes, made up 54.2% of taxa:
Paraonides lyra, Tharyx sp. D, *Lumbrineris latreilli, Onuphis atlantisa, Aricidea neosuecica*
Crustaceans made up 19.5%.
Ampelisca agassizi
Molluscs made up 16.9%.
Dacrydeum vitreum
Parvilucina multilineata
Lucinoma filosa
Echinoderms were 4.9%.
Amphioplus macilentus
Cnidarians were 2.2%.
Sipunculids were 0.8%.
Nemerteans, Priapulids, and Ectoprocts were 0.5%.

Spatial Distibution

No spatial trends were seen in community indices (species richness, diversity, evenness).
Lack of spatial trends may be due to small size of the study area and homogeneity across the area compared to larger studies.

Other Pertinent Comments

The polychaete feeding mode was also examined.
Most were surface sediment feeders, due to relatively immobile sediment with some silt/clay, making good conditions for burrowing tube dwellers.
There was a good proportion of omnivores or potential carnivores in the area.
Data shown in this study were characteristic of the outer continental shelf-shelf break community in the northeastern Atlantic.
Abundances,diversity, species richness, and evenness were similar or slightly higher than those found by Boesch (1977).

Database Entry #72

McKinney, L. D., and D. E. Harper. 1980. The effects of hypoxia on the structure of benthic marine communities in the western Gulf of Mexico: American Zoologist. 20:742.

Keywords: Hypoxia/Texas/Gulf of Mexico.

Notes:

Geographic Area

The survey took place along the upper Texas coast in the Gulf of Mexico.

Spatial Distribution

Before the hypoxic event, there were more species and individuals and higher diversity offshore than inshore.

Environmental Correlations

There was a decrease of infaunal populations nearshore (8 km) and offshore (20 km) after the hypoxic event.

Other Pertinent Comments

The inshore area was less stable, but more resilient to hypoxia, whereas the offshore area was more stable, but had a long-term and more drastic response to hypoxia.

Database Entry #73

McNulty, J. K., R. C. Work, and H. B. Moore. 1962. Some relationships between the infauna of the level bottom and the sediment in south Florida: Bulletin of Marine Science of the Gulf and Caribbean. 12:322-332.

Keywords: Biscayne Bay/Florida/East Coast.

Notes:

Geographic Area

The study took place at Biscayne Bay, Florida.

Collection Method and Sample Processing

Samples were collected with a van Veen grab.
Sieve size was not given.

Habitat Parameters Collected

Sediment grain size was examined.

Date of Sampling

No specific date of sampling was given, but the study lasted for three years.

MAJOR FINDINGS

Dominant Abundant Taxa

Dominant deposit feeders were *Amphioplus, Ophionephthys, Moira, Diopatra, Mellita, Encope,* and *Clypeaster.*
These species were used to relate median grain size to dominant species body size of deposit feeders.
Dominant species of other feeding guilds were not given.

Habitat Parameter Correlation

In terms of tissue weight:

- Detritus feeders were most abundant in the finest sediments (they may feed on the algal surface film).
- Filter feeders were most abundant in the median grain size of about 0.4 mm.
- Deposit feeders were mos abundant at a median grain size of about 0.25 mm.

Entry #73 Continued

Greatest numbers of filter feeders were present at 0.3-0.4 mm grain size.
Using the dominant species of deposit feeders for analyses, there was an increase in the size of an animal with increased particle size (size of individual deposit feeders is related to grain size).

Other Pertinent Comments

The authors mention the importance of larval supply to distribution.
Planktonic larvae may settle out in the first available "tolerable" substrate, rather than traveling to optimal substrates.

Database Entry #74

Messieh, S. N., T. W. Rowell, D. L. Peer, and P. J. Cranford. 1991. The effects of trawling, dredging and ocean dumping on the eastern Canadian continental shelf seabed: Continental Shelf Research. 11:1237-1263.

Keywords: Trawling/Dredging/Ocean Dumping/Canada/Atlantic.

Notes:

Geographic Area

The studies are on the eastern Canadian continental shelf seabed, but specific site varies by study.

Depth Range

Depth varies by study.

Collection Method/Sample Processing

Grab Samples, suction samples, otter trawls (groundfishing), Danish and Scottish Seins (fish), and dry dredges (scallops), hydraulic dredges (surf clams and quahogs), and dragrakes (surf clams and quahogs) were all used in various studies.

Habitat Parameters Collected

Side scan sonar was used to detect physical impacts on bottom sediments.

Impacts on Benthos

Mortality and damage to targets and non-targets by contact with gear was observed.
Increased predation pressure was due to exposure of infauna.
A change in the chemistry/texture of seabed sediments was evident.
Sediment resuspension occurred.
Toxin suspension was an impact.
There was increased nutrient flux and phytoplankton.

Database Entry #75

Miller, D. C., C. L. Muir, and O. A. Hauser. 2002. Detrimental effets of sedimentation on marine benthos: what can be learned from natural processes and rates?: Ecological Engineering. 19:211-232.

Keywords: Delaware Bay /Sedimentation.

Notes:

Overview of Paper

This paper first gives an overview of current thoughts on dredging and disposal, and then goes into a case study in Delaware Bay.
In the Delaware Bay, sand stock-piling is a part of the US Army Corps of Engineers' Delaware River Main Channel Deepening Project.
It is proposed that the dredge material is used to restore beaches, and this study looks at the possible impacts to the shoreline benthic community (sandbuilder worm reefs).
This entry focuses on the expermental manipulation rather than the review of previous studies.

Geographic Area

The study took place in the lower Delaware Bay (Cape Henlopen-Breakwater-Harbor, Primehook Beach, Slaughter Beach).

Scale of Study:

The study covered 23 km stretch of coastline, with transects running bayward across 40 m of lower intertidal zone.

Environmental Data Collected

Temperature, salinity, and wind and wave data (from an offshore weather buoy) was collected.

Habitat Parameters Collected

Sediment erosion/deposition rates in intertidal zone, sediment grain size, and faunal abundances of macrofauna, infauna, and epifauna were measured.

MAJOR FINDINGS

Dominant Abundant Taxa

Marenzelleria viridis (red-gilled mud worm) was common at Cape Henlopen Breakwater

Harbor.

Entry #75 Continued

Ilyanassa obsoleta (mud snail) was common at Breakwater Harbor sand flats.
Sabellaria vulgaris (sessile, reef-builting sandbuilder polychaete) was common along lower Delaware Bay shores.

Habitat Parameter Correlations

Monthly variation in erosion/deposition exceeds depth of most macrofauna, but over an entire year, sediment heights are relatively constant.
M. viridis re-established contact with surface via paired burrow openings, so deposition has little effect.
I. obsoleta burrowed up through 10 cm within 4-8 h, and in a 15 cm layer, over half re-emerged within 24 h; more successful when increments of thin layers were added than when a total thick layer was added at once.
S. vulgaris could emerge from 0.5 cm of sediment, and did so easier with sand than gravel; with a 2 cm layer, very few individuals emerged to the surface, and within 7 days, colonies became anoxic.

Database Entry #76

Newell, R. C., D. R. Hitchcock, and L. J. Seiderer. 1999. Organic enrichment associated with outwash from marine aggregates dredging: A probable explanation for surface sheens and enhanced benthic production in the vicinity of dredging operations: Marine Pollution Bulletin. 38:809-818.

Keywords: Dredging/Sediment plume/United Kingdom.

Notes:

Geographic Area

The study took place on Owers Bank, off the south coast of the United Kingdom.

Environmental Data Collected

Current velocities were measured by doppler current profiling.
Suspended matter and plume morphology was measured by acoustic backscatter.
Water samples were taken from the dredge hopper spillways and also downstream of the dredger for measurements of ash-free dry weight and lipid content analysis.

Date of Sampling

Data from 1995 and 1998 was used in the study, but specific dates were not given.

MAJOR FINDINGS

Environmental Correlations

At 250 meters behind the dredger, most suspended solids were not detectable.
The finest silt-sized particles had disappeared within 480 meters behind the dredger.
The plume was still evident at 480 and 3335 meters; this is assumed to be due to aeration, physico-chemical precipitates, and entrainment of organic matter from sediments.
Scatter and surface slicks are caused by lipids from fragmented invertebrates outwashed from the dredger.
Organic matter from fragmented invertebrates from outwash could enhance species diversity and biomass of benthic invertebrates outside dredged areas.

Database Entry #77

Oakwood Environmental LTD. 1999. Strategic cumulative effects of marine aggregates dredging (SCEMAD): U.S. Department of Interior Minerals Management Service. Contract No. 1435-01-98-CT-30894.

Keywords: United Kingdom /Impact Distance.

Notes:

The impact of sedimentation is likely to be confined to distances within a few hundred meters of the dredge.

Recovery times are most likely on the order of 2-3 years and vary depending upon particle size, currents, wave action, and biological compaction processes.

The dead infauna which are dumped may enhance production in those areas for the remaining benthos and increase secondary production by attracting predators into the area.

Database Entry #78

Oliver, J. S., P. N. Slattery, L. W. Hulberg, and J. N. Nybakken. 1977. Patterns of succession in benthic infaunal communities following dredging and dredged material disposal in Monterey Bay: U.S. Army Engineer Waterways Experiment Station, Dredged Material Research Program, Vicksburg, MS. Technical Report D-77-27.

Keywords: California/Disposal/Dredging.

Notes:

First A Survey Study Was Conducted

Geographic Area

The study area was located in Monterey Bay, California.
One of the transects was at the head on Monterey Submarine Canyon.

Depth Range

The depth range was from 0-20 fathoms.

Collection Method and Sample Processing

Samples were collected along a multiple transects. Eight replicates were taken per station using a 15 cm deep corer (0.018 m^2).
All of the samples were sieved over a 0.5 mm mesh.

Environmental Data Collected

Temperature, river runoff, and organic carbon influx were all measured.

Habitat Parameters Collected

Sediment grain size was determined at each station.

Date of Sampling

This study was conducted over several years, 1971-1975.

Environmental Correlations

During rough seas the sand dollar, *Dendraster excentricus*, and two polychaetes, *Dispio uncinata* and *Nephtys californiensis*, migrated offshore.

Entry #78 Continued

Higher abundances were found during the calmer (summer) months.

** An Experimental Study Was Also Conducted**:

Depth Range

The depths of the experimental plots were 9, 18, and 24 m.

Collection Method and Sample Processing

Three areas had dredged material dumped on them.
Four stations were established within each dredged spoil areas including one station that was outside of the impact zone.
Eight replicate samples were taken per station using a 15 cm deep corer (0.018 m^2).
All of the samples were sieved over a 0.5mm mesh.

MAJOR FINDINGS

Environmental Correlations

Seasonality appears to be more pronounced at the shallower sites.

Indication of Turnover Times

At the most shallow site (9 m):
- The mobile crustaceans were present in relatively large numbers shortly after the dumping (cumaceans; amphipods *Monoculodes spinipes, Synchelidium, Magaluropus longimerus*).
- Less mobile species were not present until the following winter (amphipods *Eohautorius, Paraphoxus*; ostracod *Euphilomedes*; crab *Pinnixa franciscana*).

At the deeper (18 m) site:
- A similar pattern was found to that of the 9 m site.
- Opportunistic polychaetes (*Prionospio*) were also high after the disturbance.

At the deepest site (24 m):
- Polychaetes were naturally more abundant than mobile crustaceans.
- Large ostracods and pportunistic polychaetes (*Armandia brevis, Prionospio pygmaea*, And *Prionospio cirrifera*) recolonized first.

Polychaetes, *Dispio uncinata* and *Gyptis brevipalpa* appeared only in the disturbed sites.

Entry #78 Continued

Recovery appears to occur within 1 year at the shallower site.
Recovery at the deeper site was slower with bivalves and some polychaetes (e.g.*Mediomastus californiensis*) not returning within a year.

Other Pertinent Comments

Immediately after dumping, large flatfishes and starfish moved into the area.
The coarse sediments mixed into the surrounding bottom of the shallower sites much more rapidly.
The rapid mixing was facilitated by storm disturbance at the shallower sites.
Polychaetes appeared to avoid unstable coarse sediments like those found in the shallow areas.

Database Entry #79

*Parker, R. H. 1960. Ecology and distributional patterns of marine macro-invertebrates, northern Gulf of Mexico. In F. P. Shepard, F.B. Phleger, and T. H. van Andel, editors. Recent sediments, northwest Gulf of Mexico, A symposium summarizing the results of work carried on in Project 51
of the American Petroleum Institute 1951-1958.*

Keywords: Alabama/Mississippi/Louisiana/Texas/Gulf of Mexico.

Notes:

Scale of Study

The study area includes estuaries and regions of the shelf up to 100 fathoms.

Collection Method and Sample Processing

A variety of grab samplers were used (e.g., van Veen).
A 1 mm mesh sieve size was used.
Emphasis was placed on organisms which contained hard parts.

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant taxa from 2-11 fathoms is:
- Peleycypod *Abra lioica*
- Crustacean *Squilla empusa*

The dominant taxa from 12-35 fathoms:
- Mud
  - Peleycypod *Varicorbula operculata*
  - Gastropod *Anachis saintpairiana*
- Sand
  - Pelecypods *Chione clenchi, Gouldia cerina*

The dominant taxa from the Outer Shelf (40-65 fathoms):
- Pelecypods *Anadara baughmani, Nuculana jamaicensis, Pecten papyraceus, Pitar cordata*

Spatial Distribution

Fauna appear to separate out into depth-temperatures zones. Within these zones, sediment type influences the feeding type of the community with clay or firm sediments inhabited by detritus feeders or scavengers and sandy sediments by filter feeder or predators.

<u>Entry #79 Continued</u>

There is a shift in species composition between the east and western Gulf of Mexico with the Mississippi River acting as a main dividing line.

Environmental Correlations

There is a higher species abundance and diversity at shallower depths. The depth zone of 2-12 fathoms is the most productive.

Database Entry #80

Pearce, J. B. 1970. The effects of solid waste disposal on benthic communities in the New York Bight: FAO technical conference on marine pollution and its effect on living resources and fishing.

Keywords: New York/Atlantic Coast/Dredging Effects.

Notes:

Collection Method and Sample Processing

Two hundred and 21 stations were sampled using a 0.1 m^2 Smith-McIntyre grab.
Dredge collections using a Sanders modified anchor dredge and large shell dredge were also performed at selected stations.
No sieve size was given.

MAJOR FINDINGS

Spatial Distribution

Sewer sludge and dredge spoil disposal areas with more that 10% organic matter were devoid of a normal benthic population.
The burrowing anemone, *Cerianthus americanus*, the bivalves *Yoldia limatula* and *Nucula proxima*, and rhynchocoel worms were associated with the periphery of dump areas.
Prionospio malmgreni, Spiophanes bombyx, Tellina (bivalve)*, and Spisula solidissima* (surf clam)*, Echinarachnius parma* (sand dollar) and *Cerianthus* are both common at areas away from the disposal.
Only two amphipod species are found in areas of sludge or spoil, *Unicola irrorata* and *Monoculodes edwardsii*. Amphipods seem especially sensitive (for example, *Leptocheirus pinguis*).
Cancer irroratus appears to move onto sludge areas and perish.

Other Pertinent Comments

The dredge spoil area had a different sediment composition compared to neighboring areas and significant levels of contamination (pesticides, petrochemicals).

Database Entry #81

Pearce, J. B., D. J. Radosh, J. V. Caracciolo, and F. W. Steimle Jr. 1981. Benthic fauna. NESA New York Bight Atlas monograph 14: New York Sea Grant Institute.

Keywords: Atlantic Coast/Atlas/New York.

Notes:

This atlas describes the basic biology and distribution of common benthos from the New York Bight area.

Species that can survive in polluted and heavy organic deposits are C*eriantheopsis americanus, Nephtys incisa, Nucula proxima,* and *Phoronis architecta*.

Database Entry #82

Pequegnat, W. E. 1978. An assessment of the potential impact of dredged material disposal in the open ocean: Environmental Effects Laboratory, U.S. Army Engineer Waterways Experiment Station. Contract No. DACW39-76-C-0125 (DMRP Work Unit No. IAII).

Keywords: Literature Review /Disposal Effects.

Notes:

Light attenuation due to dredge disposal may have impacts upon plankton production.
However, the reduction has not been consistently found in the laboratory or the field and any effects should be relatively short lived.
Dredge disposal may increase the nutrient content (total nitrogen, total phosphorus), actually stimulating plankton production offsetting dredging effects.
If the enrichment is too great it can cause a harmful algal bloom, however.
Fine sediments can impact filter feeding benthos through clogging feeding appendages.
Dissolved oxygen can be reduced in areas of dredge disposal but it is dependent upon the nature of the dredged material.
This may be enhanced if bacterial activity is increased due to an input of organic material into the system.
Contaminants are also potential issues with dredge disposal.
Effects may not have to be lethal to have large affects but rather just substantially impact metabolic rates.
Sessil benthos are most susceptible while bivalves can actually incur an oxygen debt if smothered.
The polychaetes, *Nephthys incise* and *Streblospio benedicti* have been found to cope with burial as long as its not too deep.
Nephthys incise is a free burrower while *S. benedicti* is a tube builder.
Decomposing animals after burial may make the sediments uninhabitable due to the release of acids and other toxic products.

Database Entry #83

Phillips, N. W., and B. M. James. 1988. Offshore Texas and Louisiana marine ecosystem data synthesis. Volume II: Synthesis report: U.S. Department of Interior Minerals Management Service. OCS Study MMS 88-0067.

Keywords: Louisiana /Texas /Continental Shelf /Gulf of Mexico /Review.

Notes:

MAJOR FINDINGS

Dominant Abundant Taxa

Nematodes dominate the meiofauna.
Macroinfaunal densities off of Louisiana (2-92 m) range from 6-12,756 individuals/m^2.
In shallow waters of Louisiana the average was 2,600 individuals/m2.
Mean macroinfaunal densities off of Texas (0-140 m) ranged from 248-585 individuals/m^2.
Polychaetes dominate the taxa in both Texas and Louisianna.

Environmental Correlations

Macrofaunal and meiofauna density is higher in general during the warmer months.

Habitat Parameter Correlation

Meiofauna density increase with sand contents greater than 60%.
Polychaete density decreases with depth.

Other Pertinent Comments

Louisiana has a higher infaunal density than Texas.
Suspension feeders are not prominent in the LA/TX area most likely due to the nepheloid layer.
Summer hypoxia is a problem in these areas.
Sediments from sand dredging settle as a carpet of thin clay gel.
Recovery times are directly related to the bottom current's ability to remove the gel.

Database Entry #84

Phillips, N. W. and J. M. Thompson. 1990. Offshore benthic communities. in N. W. Phillips and K. S. Larson, editors. Synthesis of available biological, geological, chemical, socioeconomic, and cultural resource information for the South Florida area: U.S. Department of Interior Minerals Management Service. OCS Study MMS 90-0019.

Keywords: Florida /Gulf of Mexico / Review /Continental Shelf.

Notes:

Scale of Study

The study examines information on the southwest Florida shelf north of the Florida Keys and Dry Tortugas.

MAJOR FINDINGS

Dominant Abundant Taxa

Macroinfaunal abundances typically range from 1,000-14,000 individuals/m^2.
Polychaetes normally dominate followed by crustaceans and molluscs.
The polychaete family Paraonidae is well represented, as are burrowing, subsurface deposit feeders.
The Spionids were also well represented, as are typically tubicolous, surface deposit or suspension feeders.
The most common polychaetes were *Prionospio cristata, Synelmis albini, Mediomastus californiensis, Paraprionospio pinnata,* and *Armandia maculata*.
The most common crustacean was the cumacean, *Cyclaspis*.
The most common bivalve was *Lucina radians*.
The most common tanaid was *Leptochelia*.

Dominant Biomass Taxa

Polychaete biomass appears to be lower compared to the Mid-South Atlantic coast at an average of less than 20 g/m^2 usually.

Environmental Correlations

Infaunal densities tend to decrease with increasing depth.
This appears to be strongly linked with food levels, tied to plankton (particulate organic material) deposition.
There appear to be three main depth categories: 10-23 m, 24-48 m, and 52-148 m.

Bivalves appear to recruit in the spring.

<u>Entry #84 Continued</u>

Habitat Parameter Correlation

There are no clear sediment-animal relationships.
However, high silt content doesn't lead to high densities.

Other Pertinent Comments

Most species are opportunists taking advantage of transient food resources.

Database Entry #85

Poiner, I. R., and R. Kennedy. 1984. Complex patterns of change in the macrobenthos of a large sandbank following dredging: Marine Biology. 78:335-352.

Keywords: Australia/Queensland/Middle Banks.

Notes:

Scale of Study

Transects were located across a dredged area, with some stations on each transect located in the dredged area and some extending beyond the dredged area.
Control areas were also located outside the dredged area.

Geographic Area

The study took place on the Middle Banks, Moreton Bay, Queensland, Australia.

Depth Range

Areas were dredged to a maximum depth of about 17 m.
Maximum depth of Moreton Bay is about 30 m.

Collection Method and Sample Processing

Samples were taken with a 0.1 m^2 Smith-McIntyre grab.
They were sieved through 1 mm mesh

Habitat Parameters Collected

Particle size distribution was examined. (most were medium to find sands with a silt/clay fraction).
The sediment plume was also studied for its distribution, temporal stability, concentration of suspended materials, estimated deposition rates, and estimated deposition extent.

Date of Sampling

Dredging took place from September 1981 through August 1983.
Sampling was conducted in July and August 1982.
(Previous data sets were used as the "before" baseline for pre-dredging comparisons)

Entry #85 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant abundant taxa throughout the study were polychaetes (46%), mollusks (20%), crustaceans (19%), and echinoderms (3%).
A more detailed, thorough list is given in the paper, Table 2.

Habitat Parameter Correlation

There was little change in the sediment composition due to the dredging.
The dredge plume was usually less than 200 m in width and had a maximum cohesiveness of about 8 hours.

Comparison to Outside Areas

In the dredged area, there was a decrease in the number of taxa and individuals.
The decrease could be seen out to 200-400 m from the dredged site.
There was an increase in the number of species and individuals about 1500-2000 m south of the dredged area, which could be due to an increase in resources stirred up and transported to this area by the sediment plume

Database Entry #86

Posey, M. H., T. D. Alphin, S. Banner, F. Vose, and W. Lindberg. 1998. Temporal variability, diversity and guild structure of a benthic community in the northeastern Gulf of Mexico: Bulletin of Marine Science. 63:143-155.

Keywords: Florida/Gulf of Mexico/Survey.

Notes:

Geographic Area

The study area was 25 km offshore from Cedar Key, Florida in the northeastern Gulf of Mexico.

Scale of Study

There were 12 sites spanning 24 km.

Depth Range

The depth was approximately 13 m.

Collection Method and Sample Processing

0.1 m^2 corers were used (15 cm depth) for collection of samples.
Mesh size was 0.5 mm.

Date of Sampling

Sampling was conducted over a two month period in the winter (February-March) and the summer (July-August).
This took place for the summer of 1991 and the summers and winters of 1992 and 1993.

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes were the most abundant, with amphipods, bivalves, and gastropods also being numerous.
The following species were found in high numbers for all sampling periods:
Branchiostoma, Glycera, Cirrophorus, and Oligochaetes.

Entry #86 Continued

Environmental Correlations

Suspension feeders were a significantly greater proportion of the infauna in the summer than in winter.
Deposit feeders were a significantly greater proportion of the infauna in winter than in summer.
Surface burrowers were significantly greater in the summer.

Other Pertinent Comments

The use of guilds to study temporal variation was easier than looking at individual taxa.
There was more constance among years for guilds than individual taxa, so detection of seasonal patterns and temporal change are easier to detect.

Database Entry #87

Posey, M., and T. Alphin. 2002. Resilience and stability in an offshore benthic community: responses to sediment borrow activities and hurricane disturbance: Journal of Coastal Research. 18: 685-697.

Keywords: Atlantic/Hurricanes/North Carolina/Borrow.

Notes:

Background of the Study

Sites were sampled prior to sediment removal (1.5-2 m) and after removal for beach nourishment.
There were also three hurricanes during the study.

Geographic Area

The study took place offshore of Kure Beach, North Carolina.

Scale of Study

The borrow site was 4 x 0.8 km.
There was an adjacent control site for comparison.

Depth Range

The depth was 12-15 m before the removal of 1.5-2 m of sediment from the area.

Dredge Details

The borrow site was from pipe dredge removal of 1-2.5 m sediment. The extent of the removal was 4 km by 0.8 km.

Collection Method and Sample Processing

Petite ponar grabs were used (15 x 15 cm opening, 15 cm depth) for collections.
Samples were sieved over a 0.5 mm mesh.

Date of Sampling

Pre-borrow sampling was done in July and October 1995, May and October 1996, and May 1997.
Sediment removal occured from the summer of 1997 through January 1998.
Post-borrow sampling was done in February, May, and November 1998, and May and October

1999.

Entry #87 Continued

Dominant Abundant Taxa

Polychaetes, crustaceans, and bivalves were the dominant abundant taxa.

Environmental Correlations

The oligochaetes, *Spiophanes, Axiothella,* and *Oxyurostylis* all had higher densities in late spring/summer.

Total faunal density was highest in late spring/summer.

Indication of Turnover Times

There were few significant differences between the control and borrow sites nine months after sediment removal.

After one year, there was little difference detected between the control and borrow sites.

Other Pertinent Comments

Armandia maculata was lower in the borrow site after sediment removal (no difference prior to removal).

Glycera was higher in the borrow site after sediment removal (no difference prior to removal).

Some species differed before the sediment removal, but were even across control and borrow sites afterward: *Crysinella,* Haustoriidae*, Rhepoxynius, Branchiostoma*

Borrow and control sites varied together for some species (maybe due to hurricane disturbance?): *Crysinella, Ervillea* were less dense in post-borrow samples

Nemertea were more dense in post-borrow samples

A lot of seasonal and yearly variation occurred, due in part to disturbances from sediment removal and hurricanes.

Database Entry #88

Powers, S. P., D. E. Harper, Jr., and N. N. Rabalais. 2001. Effects of hypoxia/anoxia on the supply and settlement of benthic invertebrate larvae: Coastal and Estuarine Studies. 58: 185-210.

Keywords: Continental Shelf/ Louisiana/Gulf of Mexico.

Notes:

Geographic Area

The study area was in the northwest Gulf of Mexico on the Louisianna continental shelf west of the Mississippi River.

Depth Range

The depth ranged from 4-20 m.

Collection Method and Sample Processing

A 0.0232 m^2 Ekman grab was used to sample adult infauna.
Five centimeter diameter cores to 10 cm depth were used to sample juvenile infauna.
Passive plankton collectors, modified from Yund et al. (1991), were used to sample the flux of invertebrate larvae.
PVC panels were used for settlement of barnacle cyprid larvae.

Environmental Data Collected

Salinity, temperature, pH, and dissolved oxygen were measured (Hydrolab Surveyor 3, Seabird CTD, and Endeco T1184).

Habitat Parameters Collected

Vertical profiles were created of dissolved oxygen.

Data of Sampling

Sampling was done in 1994 on July 1 & 21, Aug. 24, Sept. 27, and Oct. 20, and in 1995 on June 22, July 13, August 8 & 28, September 8 (hydrocast only), and September 14.

Entry #88 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

P. pinnata was the most abundant organism.
Nereids and *Sigambra tentaculata* larvae were the second most common larval forms and second most abundant polychaetes in sediments.
In 1994:
- *Paraprionospio pinnata* (spionid polychaete) accounted for the majority of benthic larvae in tube traps.
- Barnacle cyprid larvae accounted for the majority of non-polychaete larvae.
- *P. pinnata* dominated the macroinfaunal community.
- *Chaetezone* sp. B and *Piromis roberti* were also abundant (at some date(s)).

In 1995:
- *P. pinnata* & Nereidae were the most common polychaete larvae.
- *P. pinnata* dominated, and *Balanoglossus* sp., *Neanthes micromma, and Nereis lamellose* were also abundant on some dates.

Spatial Distribution

P. pinnata larvae were in the water column during anoxia.
They (large larvae) increased in abundance in water column when oxygen levels decreased and then increased. settlement when oxygen levels returned above 2.0 mg l^{-1}.
When they increased settlement, numbers in the water column decreased.

Environmental Correlations

No clear patterns of preference in vertical distribution of polychaete larvae were found.
There was a significant effect of hypoxia/stratification on abundance of copepods and chaetognaths:
- In 1994, there were decreased densities during bottom hypoxia.
- In 1995, they were absent from the bottom during periods of hypoxia and water column stratification.
- During normoxic conditions, they were found at high densities in bottom traps.

Other Pertinent Comments

P. pinnata is an opportunistic species, which is why it shows high recovery after hypoxia/anoxia.

Database Entry #89

Pratt, S. D. 1973. Benthic fauna. in S. B. Saila, editor. Coastal and offshore environmental inventory, Cape Hatteras to Nantucket Shoales: Rhode Island University, Graduate School of Oceanography Marine Publication Series. no. 2 (Occasional Publication no. 5).

Keywords: New York/Massachusetts/Virginia/North Carolina/New Jersey/Conneticut/East Coast/Continental Shelf.

Notes:

Geographic Area

The review covered the area from Massachusetts to North Carolina (Mid Atlantic Bight).

MAJOR FINDINGS

Spatial Distribution

On the inner shelf, Cape Hatteras, N.C. is a barrier between the Virginia and Carolinian fauna (Cerame-Vivas and Gray, 1966).

On the outer shelf, Caribbean fauna associated with the Gulf Stream extend another 30 miles north.

Habitat Parameter Correlation

Most of these characterizations come from Wigley (1958).

Sand Fauna (shore 50 m)

This fauna is characterized by high sediment movement, but also with high oxygen and suspended food levels. The list of species is dominated by suspension feeders (e.g., *Spisula*), but also includes several common deposit feeders (*Prionospio malmgreni, Spiophanes bombyx, Spisula, Tellina,* and *Echinarachnius parma)*.

Common fauna include:

- Polychaetes - (suspension feeders): *Scoloplos fragilis, Nephtys bucera, Nephtys picta, Nereis arenaceodonta, Sthenelais limicola, Spiophanes bombyx, Ophelia, Goniadella, Clymenella, Aricidea*; (deposit feeders): *Magelona*
- Bivalves – (suspension feeders): *Spisula solidissima, Astarte castanea, Ensis directus*; (deposit feeders): *Tellina agilis*
- Gastropods - *Polinices duplicatus, Lunatia heros*
- Amphipods - (suspension feeders): haustorids; (deposit feeders and scavengers): phoxocephalids, lysianassids
- Decapods - *Crangon septemspiosus, Cancer irroratus*
- Echinoderm - *Echinarachnius parma*

Entry #89 Continued

Ascidians *Amaroucium, Mogula arenata*
Anthozoan *Paranthus rapiformis*
In the Carolina region, *Spisula raveneli* is substituted for *S. Solidissima* an *Branshiostoma*
becomes more abundant.

Silty-sand Fauna (40-60 m):
This fauna is characterized by a vertical stratification that is not found in sandy habitats. There are many tube dwellers which subside by either suspension or deposit feeding. These areas provide substantial production for fish foraging.
Common fauna include:

- Polychaetes - (deposit feeders): *Pherusa affinis, Clymenella torquata, Maldanopsis elongata, Scalibregma, Nephtys, Harmothoe*
- Bivalves - *Arctica islandica, Cardita borealis, Astarte*
- Amphipods - (deposit feeders): *Ampelisca vadorum, A. verrilli, A. agassizi, A. macrocephala*; (suspension feeders): *Unicola irrorata*
- Isopods - (deposit feeder): *Edotea montosa*
- Cumaceans - deposit feeders
- Anemone - (suspension feeder) *Cerianthus americanus*
- Holothuroidea - (deposit feeder) - *Thyone*

Silt-clay Fauna:
This habitat type is found on the shelf (up to 40 miles out off of southern New England.
Echinoderms tend to dominate including the heart urchin, *Briaster fragilis*, and the ophiuroids *Ophiura sarsi, O. robusta*, and *Amphiura otteri*.
These areas have relatively lower amounts of production for fish consumption.

Database Entry #90

Quigley, M. P., and J. A. Hall. 1999. Recovery of macrobenthic communities after maintenance dredging in the Blyth Estuary, north-east England. Aquatic Conservation: Marine and Freshwater Ecosystems. 9:63-73.

Keywords: Dredging/Blyth Estuary/England.

Notes:

Background

Two areas were delineated: one as a control, dredged very infrequently in the past, and not dredged during the nine months before the study or during the study; the other site was dredged over 33 days from an existing 7-8 m BCD to 9 m BCD.

Geographic Area

The study area was the lower Blyth Estuary (55°08'N, 01°33'W).

Collection Method and Sample Processing

A Harp's Corer (0.0143 m^2) was used for sampling.
The sieve size used was 0.5 mm.

Habitat Parameters Collected

Sediment particle size and content was measured.

Date of Sampling:

Sampling was done from January 1997 to June 1997 (133 days, including the 33 days for dredging and 100 days following).

MAJOR FINDINGS

Dominant Abundant Taxa: (see paper graphs for population trends)

The following taxa made up over 95% of all individuals:

- *Capitella capitata* (polychaete)
- *Eteone longa* (polychaete)-
- *Tubificoides* spp. (*T. benedii* greater than 90% of *Tubificoides* spp.) (oligochaete)
- Nematodes (Pontonema alaeospicula over 95% of nematodes)
- *Angulus tenuis* (mollusc)

Entry #90 Continued

Environmental Correlations

There were no differences in the silt-clay fraction or sediment carbon content across the study period or between sites.

Habitat Parameter Correlation

Abundances of the five common taxa declined to zero immediately after dredging ceased.
Reduced densities were also seen in the control site.
At the impact site, *C. capitata* and *Tubificoides* species had significant increases in abundance seven days after dredging ceased (opportunistic species due to new resources at exploited site).

Indication of Turnover Times

A return to the predredged state was not observed at either station after 100 days.
Four out of five of the common taxa had increased between 40 & 100 days after ceasing dredging, but still were significantly lower than pre-dredging levels.

Comparison to Outside Areas

The effects of dredging were not restricted to the study site alone, but also affected the full width of the section of the estuary.

Database Entry #91

Rabalais, N. N., L. E. Smith, D. E. Harper, Jr., and D. Justic`. 2001. Effects of seasonal hypoxia on continental shelf benthos: Coastal and Estuarine Studies. 58: 211-240.

Keywords: Continental Shelf/Louisiana/Gulf of Mexico.

Notes:

Background

Two study sites on the southeastern Louisiana continental shelf were used:
One site had seasonally severe and persistent hypoxia, and one had aperiodic or moderate hypoxia.
The two sites were:
West Delta (WD)-predominantly silts with some clay and sand
South Timbalier (multiple stations at this site: ST53A, ST53B)

Depth Range

The depths were from 20 to 21 m.

Collection Method and Sample Processing

An Ekman-type closure 0.1 m^2 box corer (20 cm avg. penetration, 10 cm in sandy sediments) was used.
A 0.023 m^2 hand-operated Ekman grabs were taken from the larger box corer for benthic macroinfauna.
7.6 cm diameter acrylic cores were used to subsample box corer, but only at one site from South Timbalier.
The sieve size used was 0.5 mm.

Environmental Data Collected

Hydrographic profiles were done (Hydrolab Surveyor II CTD or SeaBird CTD unit) and oxygen (Endeco 1184 oxygen meters) was measured.

Date of Sampling

Sampling took place from April 1990 to Fall 1991.

Entry #91 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant abundant taxa at West Delta were polychaetes (most), pericaridean crustaceans, bivalves, gastropods, and ophiuroids.
Dominants during most months were *Paraprionospio pinnata* and *Mediomastus ambiseta.*
Armandia maculata increased in August 1990.
Nephtys incisa, Magelona sp. I, *Magelona* sp. H, *Ampharete* sp. A, *Owenia fusiformis, Sigambra tentaculata* & *Cossura soyeri* replaced *A. maculata, Ampharete* sp. A. & *Magelona* sp. I dominated in spring 1991.

The dominant taxa at the ST53A site were the polychaetes *Ampharete* sp. A, *Paraprionospio pinnata*, & *Mediomastus ambiseta*, in spring/early summer, but as hypoxia increased, only *Ampharete* sp. A, *Magelona* sp. H, and the sipunculan *Aspidosiphon* sp. Were abundant.
In August 1990, *Magelona* sp. H & *Aspidosiphon* sp. were the only ones with significant population levels.
In September and October 1990, *Paraprionospio pinnata* and *Armandia maculate* recruited in.
In Spring 1991, *Owenia fusiformis* (a dominant in 1990) was replaced by *Sigambra tentaculata.*

The dominant taxa at the ST53B site were the polychaetes from May to October 1991.
In Spring and early Summer of 1990, the polychaetes *Mediomastus ambiseta, Paraprionospio pinnata*, & *Ampharete* sp. A were common.
As hypoxia increased, only *Ampharete* sp. A., *Magelona* sp. H, & *Clymenella torquata* and the sipunculan *Aspidosiphon* sp. were present.
By August of 1990, only *Magelona* sp. H & *Aspidosiphon* sp. were significant.
Recruitment of *Paraprionospio pinnata* and *Armandia maculata* occurred in the Fall.
Owenia fusiformis and *Clymenella torquata* (dominant in 1990) were replaced by *Sigambra tentaculata* in spring 1991

Environmental Correlations

Variability in species richness and abundance was correlated with dissolved oxygen, water temperature, salinity, and sediment characteristics.
At the South Timbalier site, the number of species and individuals was reduced linearly when the oxygen concentration was less than 0.5 mg l^{-1}.
There was a reduction in species, abundance, and macroinfauna biomass at sites with severe or continuous summer hypoxia.
During periods of non-hypoxia, South Timbalier stations had more species and higher abundances than the West Delta, possibly because of silt sediments at the West Delta site.

Entry #91 Continued

Generally, there was higher species richness and abundance at the South Timbalier B site because
B had higher sand content and sediment variability.

The number of major taxonomic groups at West Delta was consistent, due to the lack of influence of severe hypoxia, but at South Timbalier, there was limited diversity most of the year and especially during severe hypoxia events.

Vertical distribution did not change with hypoxia, which indicated that the species that remained were tolerant.

Database Entry #92

Ranasinghe, J. A., W. T. Harlan, and D. M. Dauer. 1985. Macrobenthic communities of the Dam Neck Disposal site: Department of the Army. Contract DACW65-81C-0051 Work Orders 19 and 23.

Keywords: East Coast/Maryland/Continental Shelf.

Notes:

Geographic Area

The study area was south of the mouth of Chesapeake Bay on the inner continental shelf.

Collection Method and Sample Processing

Two sites were sampled the Dam Neck Ocean Disposal Site Extension and the Dam Neck Interim Ocean Disposal Site.
Five replicate grabs were made using a Shipek grab (0.4 m^2).
Samples were washed through a 0.5 mm mesh sieve.
Commercial benthos were sampled using a Clam Dredge and a Rocking Chair Dredge (10 minute tows).

Statistics

Shannon-Weaver, Margalef's, Pielous's Eveness, and discriminant analysis were used for statistical analyses.

Habitat Parameters Collected

Sediment grain size was examined in this study.

Date of Sampling

Grab samples were taken in November, February, April, and July.
Clam dredge samples were taken in March and May.

MAJOR FINDINGS

Dominant Abundant Taxa

Abundance of commercially important benthos was low.

Entry #92 Continued

Spatial Distribution

Offshore sites with larger grain size had a higher species abundance and diversity.

Database Entry #93

Ray, G. L. 2001. Responses of benthic invertebrate assemblages to the Asbury-Manasquan Inlet beach nourishment project, Northern New Jersey: Proceedings of the Coastal Ecosystems and Federal Activities Technical Training Symposium. August 20-22, 2001.

Keywords: New Jersey/Atlantic Coast/Borrow Areas.

Dredge Details

No details were given on the dredging depth, dredging spatial extent, or number of times it was dredged.

Notes:

Collection Method and Sample Processing

A Smith MacIntyre grab (0.1 m^2) was used with no mention of sieve size.

Sampling Date

Three offshore borrow areas were sampled on a semiannual basis from June 1994-May 2000.

MAJOR FINDINGS

Dominant Abundant Taxa

The borrow areas had a species assemblage typical of non-disturbed medium sand habitat in that area.

The dominant species in abundance were the polychaete, *Protodrilus*; amphipod, *Pseudunicola obliquua*; and tanaid, *Tanaissus psammophilus*.

Dominant Biomass Taxa

Benthic biomass in the borrow areas was dominated by the sand dollar, *Echinarachnius parma*; bivalve, *Spisula solidissima*; bivalve, *Ensis directus* ; tellinid, *Tellina agilis*; and the polychaete, *Magelona papillicornis*.

Comparison to Outside Areas

Dredging resulted in a decreased total abundance, biomass, species richness, and size of sand dollar.

Dredging reduced biomass.

Dredging altered the species composition.

The polychaete, *Spiophanes bombyx*, increased right after dredging.

Entry #93 Continued

Indication of Turnover Times

Abundance recovered quickly with no detectable difference the next season.
Total recovery from dredging (biomass and size of sand dollar) required 2-2.5 years.

Database Entry #94

Renaud, P. E., D. A. Syster, and W. G. Ambrose, Jr. 1999. Recruitment patterns of continental shelf benthos off North Carolina, USA: effects of sediment enrichment and impact on community structure: Journal of Experimental Marine Biology and Ecology. 237:89-106.

Keywords: Atlantic/Inner shelf/North Carolina.

Notes:

Experimental Set-Up

Plastic trays were filled with defaunated sediment.
Controls had only sediment, algal trays had pulverized *Ulva* or *Enteromorpha* added to sediment. Fertilizer trays had a slow release fertilizer added.
Trays were also compared to ambient sediments.

Geographic Area

The study was off the North Carolina Inner Continental Shelf 40 km SE of Wrightsville Beach, NC (23-Mile Reef).
The area is a soft bottom habitat adjacent to a 5 km N-S rock escarpment with 2.54 m vertical relief

Depth Range

The depth was 30 m.

Collection Method and Sample Processing

Plastic trays were filled with sediments and enrichments (control, fertilizer, and algae) and put in the field for recruitment
Cores from each tray were taken:
The core for infauna and sediment grain size analysis was 4.5 cm diameter x 3 cm depth.
The core for pigment analysis, organic carbon, and total nitrogen content was 2 x 2 cm.
Sieve size was 63 um.

Habitat Parameters Collected

Sediment grain size, pigment content, organic carbon, and total nitrogen were measured.

Date of Sampling

Sampling was conducted over three seasons:
Spring: 29 April - 31 May

Entry #94 Continued

Summer: 17 May - 08 June
Fall: 20 September - 04 October

MAJOR FINDINGS

Spring Results

Algal trays had higher total polychaete abundance (10x more than control, fertilized, & ambient).
Algal trays had 4-6x as many harpacticoid copepods as other treatments.
Total crustaceans was higher in algal trays, but not significant.
Nematodes were more abundant in ambient sediments than trays.
Turbellarians were more abundant in ambient sediments than algal or control trays.
Total infauna did not differ significantly between algal trays and ambient sediments, but were about twice in abundant than control or fertilizer trays.
Elevated pigment levels were found in algal trays.
Chlorophyll a and total sediment pigment concentration was higher in ambient sediments than fertilized or control.
Fertilizer did not significantly increase nutrient levels, and mean grain size was also not significantly different.
Mean grain size was finer in trays than ambient sediment.
Bivalves were more abundant in the control than ambient, but nematodes, turbellarians, and total fauna were more abundant in ambient sediments.
Chlorophyll a and total sediment pigment were higher in ambient sediment 10 m from the scarp than all others.

Summer Results

There were few effects of fertilizer on sediment parameters.
There were significantly more capitellids and total polychaetes in fertilized than in controls.
Pheophytin was greater at 75 m than 10 m.

Autumn Results

In control trays, total polychaetes, harpacticoids, total crustaceans, and total fauna recruited more readily at 10 m than 75 m.
In ambient sediments, total syllid polychaetes, total polychaetes, harpacticoids, and total crustaceans were more abundant at 75 m

Harpacticoids and total crustaceans were more abundant in control trays than ambient sediments.
Control and ambient trays had greater chlorophyll a and total pigment at 10 m than 75 m.
Organic carbon and total nitrogen were highest in ambient sediments.
In ambient sediments, carbon was higher at 10 than 75 m.

Entry #94 Continued

Trays had a slightly finer grain size than ambient sediments.

Overall

No significant general effect of distance from rock escarpment in abundance of infaunal groups was found.
Elevated sediment pigment concentrations led to increased recruitment to defaunated sediment.
Newly settled infauna may be food limited, so patches of macroalgal detritus may be important.
Inorganic enrichment had no effect in the spring, but stimulated recruitment of two of the nine infaunal groups in the summer (one group was the capitellid polychaetes-known to respond to sediment organic enrichment).
Inorganic enrichment did not enhance benthic microalgal growth.

Database Entry #95

Rice, S. A., and J. K. Culter. 1984. Analysis of sampling procedures for benthic infaunal communities at an ocean dredged material disposal site: Camp Dresser & McKee Inc. Mote Marine Laboratory Technical report No 87.

Keywords: Gulf of Mexico/Continental Shelf/Geographic Coordinates.

Notes:

Geographic Area

The study site was the Ocean Dredged Material Disposal Site 4, Eastern Gulf of Mexico.
Two stations were sampled - 27°31.5'N, 83°04.9'W and 27°30.5'N, 83°03.8'W.

Collection Method and Sample Processing

The study site was sampled using Scuba.
A corer (12.5 cm x 12.5 cm x 23 cm) with a surface area of 0.016 m^3 was used.
A 0.5 mm mesh sieve was used for faunal analysis.

Date of Sampling

The study site was sampled in May.

MAJOR FINDINGS

Dominant Abundant Taxa

The faunal denisities ranged from 15192-37756 organisms per m^2 at station 28 and 4,744-30,769 organisms m^2 at station 30.
Nematodes represented 38-37.6% of the fauna found.
Polychaetes dominated the fauna after nematodes, with 127 different taxa (30-38% of the total taxa):
- The polychaetes *Armandia maculata* (6.7%), *Cirrophorus lyra* (7.2%), and *Pionosyllis aesae* (8.25) were a dominant component of the total abundance.
- Bryozoan (*Selenaria* sp.) dominated at station 30 representing 14.3% of the total taxa.
- Crustaceans (6%), molluscs (2%), and echinoderms (1%) were also found in high percent of total taxa.

Entry #95 Continued

Other Pertinent Comments

This study was designed to compare the species saturation curves between two different soft bottom areas.

Database Entry #96

Rice, S. A., G. W. Patton, and S. Mahadevan. 1981. An ecological study of the effects of offshore dredged material disposal with special reference to hard-bottom habitats in the eastern Gulf of Mexico: Mote Marine Laboratory. Submitted to: Manatee County Chamber of Commerce.

Keywords: Florida/Gulf of Mexico/Disposal.

Notes:

Background

The location studied is a dredged material disposal site.
In spring 1981, approx. 290,000 m^3 of dredge material from Bayboro Harbor, St. Petersburg, Florida was disposed of in this area.

Geographic Area

The survey took place 14 miles off the mouth of Tampa Bay.

Scale of Study

The area surveyed 0.65 nautical miles square (area of disposal site).

Depth Range

The depth ranged from 12-17 m.

Collection Methods and Sample Processing

Collection was with a petite Ponar grab.
A sieve size of 0.063 mm was used.

Date of Sampling

SCUBA was used for preliminary visual observations on April 10, 1981.
Sediment Samples were taken in June 1981.
Fathometer recordings were made in June 1981.
Diver sled observations of hard bottom regions to the west were made in July 1981.

Habitat Parameters

Sediment grain size characteristics and heavy metal analyses were done.

Entry #96 Continued

MAJOR FINDINGS

Spatial Distribution

Sediment had highest silt composition near the center of the disposal site.
A large area over central and southern portions of disposal site were buried under 10-20 cm of fine silt.
There was a paucity of macroinvertebrates near the center of the site.
Burrowers and epibenthic echinoderms were the predominant inverts near borders of disposal site, as well as some sponges, soft corals, and hard corals.
Burrowers and echinoderms were found in northeast corner of disposal site, but no corals or sponges.
Some hard and soft corals were found in the northwest corner.

Other Pertinent Comments

Silt contents are much higher than those found in previous studies (Taylor, 1979)
High levels of zinc, cadmium, and lead were in accumulated dredge material.
These levels appear sufficient to prevent recolonization by many invertebrates due to toxicity to adults or reproductive suppression.
Ripples in sediment indicate that currents are strong enough to transport sediments.
Sediments from the disposal site appeared to be transported to outside sites.

Database Entry #97

Rowe, G. T. 1971. The effects of pollution on the dynamics of the benthos of New York Bight. Thalassia Jugoslavica 7:353-359.

Keywords: Atlantic/New York/Disposal.

Notes:

Background

The Bight is the site of waste disposal of various types, which are segregated and dumped into prescribed regions, based on the origin of the waste.
Such waste disposal areas are a dredge spoil dump center and an acid-iron disposal site, and are compared to a control site in this study.

Geographic Area

The study took place in the New York Bight (west Atlantic), bound by northern New Jersey and Long Island, New York.

Collection Method and Sample Processing

A 0.2 m^2 van Veen grab, 0.04 m^2 van Veen grab, and a Birge-Ekman grab (225 cm2) were used for collections.
Mesh sizes were 0.75 mm, 0.42 mm, & 1.0 mm, depending on station.

Date of Sampling

Sampling was done from September 1968 to July 1971.

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant abundant taxa were:
- Polychaetes: *Cossura longocirrata, Prionospio malmgreni, Tharyx acutus, Nephthys incisa*
- Tube-dwelling anemone: *Cerianthus* sp.
- Bivalve: *Nucula proxima*

Spatial Distribution

Higher diversity was found offshore, possibly because of lower annual temperature variation in deeper waters.

Entry #97 Continued

Low diversity was found adjacent to dump zones, but there was high abundance of the organisms there, possibly due to the ability of a few individuals to respond quickly to environmental perturbations.

On mud bottoms, as researchers went down the Gorge offshore, diversity increased as abundance decreased.

Environmental Correlations

Alot of organisms were found in Hudson Gorge, which is a receptacle for organic-rich sediments from Hudson and Raritan River estuaries, and also may receive pollutants due to its close proximity to dumping grounds. Therefore, the abundance could possibly be due to the increased abundance and quality of food compared to the adjacent continental shelf.

Database Entry #98

Saila, S. B., S. D. Pratt, and T. T. Polgar. 1972. Dredge spoil disposal in Rhode Island Sound. University of Rhode Island, Kingston: Marine Technical Report. No. 2.

Keywords: North Atlantic Coast/Rhode Island/Disposal Area.

Notes:

Geographic Area

8.2 million cubic yards of dredge spoil from the Providence River (silt and compact sands) were deposited 4 miles offshore of Newport Rhode Island over a period of three years.

Depth Range

The depth of the study area was 32-35 m.

Collection Method and Sample Processing

Benthos were sampled post dredging using a 1/10 m^2 Smith-McIntyre grab.
Grab samples were subsampled using a 28 cm^2 core.
A 0.75 mm sieve size was used.

Statistical Analysis

A percent similarity index was used to compare depositional areas with natural areas.

MAJOR FINDINGS

Dominant Abundant Taxa

The spoil dump area was colonized by a community similar to that found on adjacent sand bottoms, but not silt.
The spoil dump area was dominated by *Ampelisca agassizi*.
Several deposit feeding polychaetes and the amphipod, *Leptocheirus pinguis*, were found in higher abundance on the spoil than in the natural area.

The natural sand areas were dominated by: *Byblis serrata* (suspension feeding amphipod), Haustoriid (deposit feeding amphipod), *Cirolana concharum* (scavaging isopod), *Echinarachnius parma* (deposit feeding echinoid), and *Jaculella obtuse* (detritus feeding foram).

Entry #98 Continued

The natural silty areas are dominated by *Cerianthus americanus* (suspension feeding anthozoan), *Edwardsia* (suspension feeding actinarian), *Bostrichobranchus pilularis* (suspension feeding tunicate), *Pitar morrhuana* (suspension feeding bivalve), *Periploma papyratium* (suspension feeding bivalve), *Nucula delphinodonta* (deposit feeding bivalve), *Nucula proxima* (deposit feeding bivalve), *Ampelisca abdita* (suspension feeding amphipod), sabellariid (suspension feeding polychaete), *Pherusa affinis* (deposit feeding polychaete), *Lumbrineris fragilis* (deposit feeding polychaete), *Clymenella torquata* (deposit feeding polychaete), *Owenia fusiformis* (deposit feeding polychaete), *Sternaspis scutata* (deposit feeding polychaete), and *Polycirrus* (deposit feeding polychaete).

The nearby areas to the dump site were dominated by: *Ampelisca agassizi* (deposit feeding amphipod), *Ampelisca vadorum* (suspension feeding amphipod), *Byblis serrata* (suspension feeding amphipod), Unicola irrorata (deposit feeding amphipod), *Leptocherius pinguis* (suspension feeding amphipod), *Orchomella pinguis* (deposit feeding amphipod), *Phoxocephalus holbolli* (deposit feeding amphipod), *Ptilanthura tenuis* (deposit feeding amphipod), and *Diastylis* (deposit feeding cumacean).

Indication of Turnover Times

The study area contained some spots that hadn't received any spoil for up to three years.
Full colonization of a disposal area by its original community may take several years.

Comparison to Outside Areas

Spoil areas did not contain *Ceriantus americanus, Edwardsia, Periploma papyratium*, and *Bostrichobranchus pilularis*.
Characteristic of the spoil areas were the polychaetes: *Prionospio malmgreni, Cymenella torquata, Pherusa affinis, Tharyx acutus, Ninoe nigripes,* and bivalve: *Nephtys incise*, *Ampelisca agassizi* was only present on the edge of the dump area.
Patterns of abundance and species diversity were not clear when it came to comparing natural versus disposal areas.

Other Pertinent Comments

Ampeliscans may be able to extend their tubes rapidly enough to keep up with mild sediment deposition.
Nephtys incise (polychaete), *Streblospio benedicti* (polychaete), and *Mulinia lateralis* (bivalve) were able to burrow up through 6 cm of sediment.

Entry #98 Continued

Turbidity affects feeding by mechanical damage to respiratory structures and diluting the actual food supply. This appears to be of minor concern unless heavy swells prolong sediment suspension.

Anoxia becomes a problem for less tolerant infauna if the sediments have greater than 3% organic material.

It appeared that there was a low probability in this study for fauna (Bivalves: *Nassaruis trivittatus, Nephtys incise,* and *Mulina lateralis*; Polychaete: *Streblospio benedicti*) introduced with the dredge spoil to establish a healthy offshore population.

Database Entry #99

Saloman, C. H. 1974. Physical, chemical, and biological characteristics of nearshore zone of Sand Key, Florida, prior to beach restoration. Part IX Benthic Invertebrates: U.S. Army Corps of Engineers. Interservice Support Agreement No. CERC 73-27.

Keywords: Florida/Gulf of Mexico/Dredging Impacts/Geographic Coordinates.

Notes:

Geographic Area

The study was set on the West Coast of Florida.

Scale of Study

The study extended from Blind Pass to Clearwater Pass, Florida.

Dredge Details

The borrow pit was 8.4 m when it was originally dredged and 5.4 m deep three years later at the time of this study. The pit was 389 m long and 128 m wide with a slope of 30-45 degrees.

Collection Method and Sample Processing

General Survey:
The specific geographic coordinates of each station are given.
Twenty six transect lines were established with eight sampling stations per transect.
A corer was used (1/64 m^2).
All samples were washed through a 0.701 mm sieve.

Borrow Pit Comparison:
Fauna inside versus outside of three borrow pits off of Treasure Island were examined.
Three old borrow pits were initially dredged in 1969 and eight cores were collected monthly for nine months in 1972. The same core was used as in the general survey.
One borrow pit was dug in 1972 in which samples were taken pre and post dredging.
Four samples were taken at nine stations along two transects.

Statistical Analysis

A Margalef diversity index was calculated.

Entry #99 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

General Survey:
Polychaetes were the most abundant taxa (31% of all individuals).
The second and third most abundant taxa were nematodes and pelecypods.

Borrow Pit Comparison:
For the 1969 borrow pit polychaetes dominated (56% of the fauna) followed by mollusks (30%).
For the 1972 borrow pit a similar diversity and abundance of infauna was found in the newly dredged site (less than 2 months post dredging).

Spatial Distribution

General Survey:
Offshore communities were more diverse than beach communities.

Borrow Pit Comparison:
For the 1969 borrow pit:
The abundance and diversity of organisms was lower in the borrow pits compared to undisturbed areas.
Mollusc size was reduced in the borrow pits.

Environmental Correlations

In the general survey offshore benthic diversity was highest in the summer.

Database Entry #100

Saloman, C. H., S. P. Naughton, and J. L. Taylor. 1982. Benthic community response to dredging borrow pits, Panama City Beach, Florida: US Army, Corps of Engineers Coastal Engineering Research Center. Miscellaneous Report No. 82-3.

Keywords: Florida/Gulf of Mexico/Dredging Impacts.

Notes:

Scale of Study

The study extended for 35 km from West Pass of St. Andrew Bay to Philips Inlet.

Depth Range

The study area was 9 m in depth.

Dredging Details

After 10 days the dredged area was 3-5 m deep.
After 1 year the dredged area was 1 m deep.
Dredging was only performed one time with the spatial extent of dredging undefined.

Collection Method and Sample Processing

Two areas were sampled prior to beach renourishment.
One area was sampled in a borrow area at multiple times after dredging and compared to a nearby undredged site.
Six areas were sampled one time (12 months after dredging) both inside and outside of a borrow pit.
A total of eight stations were sampled.
Several stations were sampled pre-dredging.
Samples were taken using a box corer (1/64 m^2) to a depth of 23 cm.
At each station replicate samples (4-36) were taken.
Samples were washed over a 0.7 mm mesh.

Habitat Parameters

Sediment particle size and organic content were measured.

Statistical Analysis

The Shannon-Weaver and Morisita Index were calculated.
Additionally, stability analysis was conducted.

Entry #100 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Densities ranged from 1,506-7,178 individuals/m^2 with an average of 3,883 individuals/m^2.
The most species rich taxa collected were polychaetes.
Species abundance ranged from 1,506-7,178 and averaged 3,833 individuals/m^2 .
Species richness and abundance was dominated by polychaetes.
Polychaetes represented 55 percent of the total abundance followed by molluscs (19%), arthropods (18%), cnidaria (2%), and cephalochordates (2%).

Environmental Correlations

Faunal abundances were lower in the winter compared to summer.
Species richness and abundance was lowest in fall and spring with a peak in midsummer and late fall.

Habitat Parameter Correlation

There appears to be little sediment-faunal relationship differences between borrow and control areas.

Indication of Turnover Times

Recovery after dredging takes between 3-12 months.
Recovery times were rapid due to moderate wave energy, transporting currents, a fauna which is adapted to disturbance, and a fauna with high reproductivity.
Abundances were actually higher in borrow areas after several months.

Other Pertinent Comments

They feel that dredging had no long term affects because it was several small dredged areas versus one large pit. The smaller pits are able to fill in quickly.
Factors affecting dredged areas are:

- wave energy or current transport of sediments
- currents that supply recruits
- native fauna adapted to substrate disruption
- length of reproductive periods

Database Entry #101

Sanders, H. L. 1968. Marine benthic diversity: A comparative study. American Naturalist. 102:243-282.

Keywords: Review/Benthic Diversity.

Notes:

Depth Range

The depth varies by station, but the overall range is 0.5 m (Pocasset River) to 2,500 m (Abyssal Rise).

Collection Method & Sample Processing

Samples were collected with an anchor dredge and Higgins meiobenthic sled.
A 0.4 mm mesh was used.

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant abundant taxa were polychaetes and bivalves.

Spatial Distribution

Lowest diversity was in boreal estuaries, such as Buzzaards Bay.
Highest diversity was in tropical shallow marine areas, such as Bay of Bengal.
Deep sea (continental slope) benthos have diversity on the same order as tropical shallow seas.
In the Bay of Bengal, the number of species is higher in sand than mud stations.
In upwell areas, there was low benthic diversity because of oxygen depletion.

Other Pertinent Comments

The numerical percent composition and number of species was found to be poorly correlated with each other.
Number of species is the more valid diversity measurement.
This study uses the rarefaction method to study diversity.

Database Entry #102

Schaffner, L. C., and D. F. Boesch. 1982. Spatial and temporal resource use by dominant benthic Amphipoda (Ampeliscidae and Corophiidae) on the Middle Atlantic Bight outer continental shelf: Marine Ecology Progress Series. 9:231-243.

Keywords: Atlantic/New Jersey/Mid-Atlantic Bight/Outer Shelf.

Notes:

Scale of Study

Five stations with different sedimentary habitats were surveyed.

Depth Range

Depths ranged from 50-100 m.

Collection Method and Sample Processing

A 0.1 m^2 Smith-McIntyre grab was used for sampling.
A mesh size of 0.5 mm was used.

Habitat Parameters Collected

Sediment grain size distribution and total organic carbon content of surface sediments was measured.

Date of Sampling

Sampling took place from November 1975 to August 1977.

MAJOR FINDINGS

Dominant Abundant Taxa

Unciola irrorata is found throughout area, and is common over much of the mid-Atlantic shelf.
Erichthonius rubricornis was most abundant at the shallow swale station.
Ampelisca vadorum was found primarily in intermediate habitats (mostly ridge, and some flank).
Byblis serrata was found mostly in intermediate habitats (some ridge, mostly flank).
Ampelisca aggassizi was found in high densities at deep swale stations and lower, but still relatively high densities in shallow swales.

Entry #102 Continued

Spatial Distribution

Little habitat partitioning was noted in the corophiid group, and all 3 species were at maximum abundance in the shallow swale.

More segregation was seen for ampeliscids:

A. agassizi was in deeper habitats with finer sediments (clear partitioning from other ampeliscids).

A. vadorum and *B. serrata* were in intermediate habitats.

The only corophiid species to coexist with *A. aggassizi* was *U. irrorata* (faculatative tube dweller).

U. inermis was found in poorly sorted sediments with shell hash, so avoids competition for resources with *U. irrorata* through different microhabitats

Temporal Relationships

E. rubricornis was most abundant during spring and summer, and least in fall.

U. irrorata was most abundant during spring and winter 1977, least in fall.

U. inermis was at a maximum in late springand summer, and lowest in winter.

Therefore, even though *U. irrorata* & *U. inermis* have spatial overlap, peaks in population density are offset.

B. serrata was the only ampeliscid not most abundant during spring or summer.

A temporal change in abundance did not appear to decrease resource competition between the species studied, possibly because of a constant thermal regime in area.

Corophiids had strong seasonal trends, while Ampeliscids were relatively presistent over time.

Rare & Absent Fauna

U. inermis was only abundant at one station in poorly sorted coarser sands.

Database Entry #103

Schaffner, L. C., M. A. Horvath, and C. H. Hobbs III Jr. 1996. Effects of sand-mining on benthic communities and resource value: Timber Shoal, Lower Chesapeake Bay: The Virginia Department of Conservation and Recreation.

Keywords: Virginia/Continental Shelf/East Coast/Geographic Coordinates.

Notes:

Geographic Area

The Buckroe site on Thimble Shoal, less than 2.5 km offshore of Buckroe Beach, in the Chesapeake Bay area was used.
Geographic coordinates for the individual stations is given in the text.

Scale of Study

The study area was a 330 x 240 m area.

Depth Range

The depth at the study site was 5 m.

Collection Method and Sample Processing

Four samples were taken within and outside of the pit.
The control samples were within 100 m of the pit.
A Smith-MacIntyre grab was used and then subsampled with two 10 cm cores.
A surface and Profile Imaging Camera System were used.
A sieve size of 0.5 mm was used.
Wet weight was determined.

Statistics

The Index of Biotic Integrity developed for Chesapeake Bay was used.
It incorporates multiple metrics (Shannon-Weaver, Percent of pollution tolerant species, percent deposit feeders).

Environmental Data Collected

This is a polyhaline system (>20 ppt).

Entry #103 Continued

Date of Sampling

A comparison of pre vs. post dredging of the borrow area was made, along with a separate control areas.
Samples were also taken at 1, 3, 6, 15, 18, 25, 30, 36, 42, 48, and 54 months post-dredging.

MAJOR FINDINGS

Dominant Abundant Taxa

Annelids were the numerical dominants.
The dominant taxa in the Thimble Shoals region were the polychaetes *Spiophanes bombyx, Scolelepis*, and *Spio* and the molluscs *Ensis directus* and *Acteocina canaliculata.*
Spiophanes bombyx was the dominant species found in the control areas.
The pit area had a higher abundance of the polychaetes, *Paraprionospio pinnata,Streblospio benedicti,* and *Mediomastus ambiseta.*

Dominant Biomass Taxa

Molluscs and annelids dominated the biomass.
Molluscs dominated at both the borrow and control sites prior to dredging but then decreased.
Ensis directus was the most important mollusc in terms of biomass.

Comparison to Outside Areas

Faunal abundance decreased inside the pit for the first month compared to the control area.
Biomass decreased in both the pit and control areas post dredging.
There was no difference in the vertical distribution of fauna in cores from the pit versus control areas.
Blue crab density was higher in the pit than control area.
The index of biotic integrity was not different enough between areas to suggest that the “health” was different.

Other Pertinent Comments

Benthic organisms are good to look at impacts because they are sedentary and an integral part of the Chesapeake Bay ecosystem.

Database Entry #104

Seiderer, L. J., and R. C. Newell. 1999. Analysis of the relationship between sediment composition and benthic community structure in coastal deposits: Implications for marine aggregate dredging: ICES Journal of Marine Science. 56:757-765.

Keywords: North Sea/Dredging.

Notes:

Geographic Area

The survey location was East Anglia (southern North Sea), east of Orford Ness, Suffolk.

Scale of Study

There were 40 sampling sites.

Depth Range

The depth was 30 m.

Collection Method and Sample Processing

Collections were made with a 0.25 m2 Hamon grab.
Sediments were wet sieved to 63 um, and dry sieved in the range of 64 um-64 mm.
Biological material was sieved in 1 mm.

Environmental Data Collected

Sediment grain size distribution was analyzed.

Date of Sampling

Sampling was done in August 1996.

MAJOR FINDINGS

Dominant Abundant Taxa

Crustaceans and polychaetes were the most abundant taxa.

Entry #104 Continued

Environmental Correlations

There was no clear relation between particle size distribution of sediments as a whole and distribution of biological communities in survey area.

It appears that sediment granulometry only plays a minor role in the benthic community structure.

Habitat Parameter Correlation

Lagis koreni, a polychaete, and other opportunists, can re-establish following disturbance or burial, so can occur in high densities in mobile deposits, such as sand and silt.

Sabellaria spinulosa, a small colonial polychaete, was associated with deposits with a relatively high proportion of sand and gravel, which provides substratum for attachment of sand tubes they live in.

Database Entry #105

Shaw, J. K., P. G. Johnson, R. M. Wewing, C. E. Comiskey, C. C. Brandt, and T. A. Farmer. 1982. Benthic macroinfana community characterization in Mississippi Sound and adjacent waters: US Army Corps of Engineers, Mobile District, Mobile, AL.

Keywords: Gulf of Mexico/Mississippi/Geographic Coordinates.

Notes:

Geographic Area

The survey was conducted off of Mississippi.

Scale of Study

The study area includes the Mississippi Sound and adjacent areas on the inner continental shelf (30 m depth).
Station latitude and longitudes are given in Table 2.

Collection Method and Sample Processing

Eight random samples were taken at each station.
A box core was used to take a 0.0625 m^2 sample to a depth of 15 cm.
A subsample of the box core was taken.
All samples were washed over a 0.5 mm mesh sieve.
Individauls were identified to species along with feeding guild and taxanomic guild.
A wet weight was determined for each major taxa.

Statistics

Shannon-Weaver, Pielous's Index, Margalef's Richness Index, and Morisita's Dispersion Index were calculated.
Cluster Analysis, Factor Analysis, Ordination, and Discriminant Analysis were also performed.

Habitat Parameters Collected

Sediment grain size, organic carbon, and percent moisture was determined for each sample.

Date of Sampling

Two fall and spring samples were taken.

Entry #105 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Mean density was 2,871 individuals m^2.
Annelids were the dominate taxa accounting for 69.8% of all individuals sampled.
The species *Magelona* cf. *phyllisae* comprised greater than 10% of the community composition over all stations.

Dominant Biomass Taxa

Mean biomass was 5.54 g/m^2.

Environmental Correlations

Densities were higher during the spring but species composition was similar in both spring and fall.

Habitat Parameter Correlation

The polychaetes *Diopatra cuprea, Oxyurostylis smithi, Cossura soyeri, Myriochele oculata, Magelona* cf. *phyllisae, Prionospio cirrifera,* and *Clymenella torquata* were characteristic of muddy bottom.
Branchiostoma caribaeum, Spiophanes bombyx, Polygoridus, and *Brania wellfleetensis* were characteristic of sandy bottom.
Species specific responses were found to sediment texture, depth, and graphic kurtosis.

Indication of Turnover Times

Less mobile crustaceans, molluscs, and less opportunistic polychaetes are found more abundantly offshore compared to inshore.
This suggests that the offshore areas are less disturbed and inhabited by species which are less adapted to tolerate disturbance.

Database Entry #106

Sherk, J. A. Jr. 1971. The effects of suspended and deposited sediments on estuarine organisms: Literature summary and research needs: US Army Corps of Engineers. Contract No. DACW73-70-C-0013.

Keywords: Review /Dredging Effects /Estuaries.

Notes:

Pertinent Comments

Other than smothering and habitat destruction, sediment load may also affect species behavior or metabolism.
Due to sediment resuspension and reduced light penetration, the oxygen demand is increased with maintenance dredging.
In high salinity conditions, there may be a release of phosphorus with sediment suspension.
A level of over 0.1 g l^{-1} of suspended material concentration can affect filter feeding rates and efficiencies.
A thin layer of silt can impact larval settlement.
Hydrogen sulfide toxicity can be increased in areas of oceanic dumbing.

Future studies need to:
- -determine threshold levels, which may change with life stage.
- -realize that not all sediment suspensions are equal due to different sediment sizes, shapes, chemical components.
- -conduct more laboratory experiments.

Database Entry #107

Sisson, J. D., J. Shimeta, C. A. Zimmer, and P. Traykovski. 2002. Mapping epibenthic assemblages and their relations to sedimentary features in shallow-water, high-energy environments: Continental Shelf Research. 22:565-583.

Keywords: Massachusettes/Continental Shelf/East Coast.

Notes:

Geographic Area

The study area is off of Martha's Vineyard Island, Massachusetts (41.340-41.348°N, 70.604-70.596°W).

Scale of Study

The size of the study area was a 600 x 600 m box.

Depth Range

The depth range of the study area was 8-12 m.

Collection Method and Sample Processing

The sampling method was to use SCUBA with acoustic underwater location transponders. Documentation with photographs and enumeration of epifauna within quadrats was also done.

MAJOR FINDINGS

Dominant Abundant Taxa

Divers noted many *Diopatra* tubes and high densities of the spionid tube worm *Spiophanes bombyx* and the sand dollar *Echinarachnius parma*.

Spatial Distribution

Epibenthos patchiness was on the scale of 10-100 m.

Habitat Parameter Correlation

Sand dollars were found in coarse sand sediments.

Entry #107 Continued

Tube worms occurred almost exclusively in the belts of fine sediment.
Mud patches did not contain a high abundance of epifauna.

Other Pertinent Comments

Collection methods review:
Box cores best quantitative information on a cm-scale and are hard to position on the scale of 1 -10 m.
Benthic sleds and towed video equipment cover large areas but have coarse spatial resolution.
With SCUBA, navigation is tough and the scale is limited to 50 m.
ROV can operate on the scale of 100-1000 m, but is expensive.

Database Entry #108

Snyder, G. R. 1976. Effects of dredging on aquatic organisms with special application to areas adjacent to the northeastern Pacific Ocean: Marine Fisheries Review. 38:34-38.

Keywords: Pacific/Dredging/Disposal.

Notes:

Impacts on Aquatic Resources from Dredging

There are mechanical effects from dredging, increased turbidity and sedimentation, and other miscellaneous effects.

Mechanical Effects

Mechanical effects of dredging include physical removal of organisms, destruction of natural vegetation, and depressions in substrate with altered dissolved oxygen and hydrogen sulfide levels.

Turbidity/Sediment

Turbidity and sedimentation affect primary production, which then affects the food chain and can decrease or eliminate further production.

Miscellaneous Effects

Water clarity decreases, and bottom deposits effect larval settlement and development.
Sediments can result in higher hydrogen sulfide concentrations.
Release of chemicals from mud into water column can occur.

Impacts of Disposal

Disposal can lead to a loss of organisms because dredge and disposal sites are incompatible (differences in salinity, bottom material, etc.).
Burial of organisms is a short term impact of dredging, and covering of fixed epifauna is also a potential impact.
Turbidity can cause clogging of feeding structures and gills, causing respiration, excretion, and feeding effects. Turbidity can also cause prevention of reproduction by destruction of eggs, littoral suffocation, disruption of primary production, and an increase in oxygen demand.
The following are also possible impacts of disposal:
- Anoxia
- Toxic chemical release

Loss of habitat

Entry #108 Continued

Decreased euphotic zone depth
Increased nutrient uptake and release
Decreased primary productivity
Overall community disruption

Disposal also increases the possibility of releasing pesticides, nutrients, contaminants, etc. from resuspended sediments.

Database Entry #109

Somerfield, P. J., H. L. Rees, and R. M. Warwick. 1995. Interrelationships in community structure between shallow-water marine meiofauna and macrofauna in relation to dredgings disposal: Marine Ecology Progress Series.127:103-112.

Keywords: United Kingdom/Dredging/Disposal.

Notes:

Geographic Area

The survey took place in Liverpool Bay, UK.

Scale of Study

There were seven stations on a transect; two of these stations are within a disposal site (New Site Z dredgings disposal site).
The survey of macro- and meiofauna was from a transect consisting of five undisturbed stations and two stations that serve as dredge disposal locations.

Depth Range

The transect runs along a 10 m depth contour.

Collection Method and Sample Processing

For sediment analysis, a day grab was used.
For macrofauna collections Day grabs were used and subsamples were taken from these with a 50 ml syringe.
For meiofauna collections, Craib core samples were taken.
Macrofauna were sieved through 1 mm mesh
Meiofauna were sieved through 63 um mesh.

Feeding Guild, Taxonomic Guild, Genus, Species

Because of abundances, meiofaunal analyses were limited to nematodes and copepods.

Habitat Parameters Collected

Sediment analysis was done for metals concentrations, and percent silt/clay and organics was also measured.

Entry #109 Continued

Date of Sampling

Sampling took place in September 1981.

MAJOR FINDINGS

Dominant Abundant Taxa

The dominant copepod was *Canuella perplexa.*
The dominant nematodes outside the disposal site were *Sabatieria celtica, Richtersia inaequalis, Spirinia parasitifera,* and *Metoncholaimus scanicus.*
The dominant nematodes in the disposal site were *Sabatieria punctata, Sabetieria breviseta,* and *Daptonema tenuispiculum.*
There were also high numbers of *Lagis koreni* at one of the disposal stations.

Spatial Distribution

There was lower evenness, richness, diversity, and species abundance in the disposal stations.
There was a general decrease in the number of individuals and species in the disposal stations.
There were extremely low copepod numbers along the transect, and at some locations, no copepods were collected.
Although nematode abundance wasn't significantly affeted, the community was more highly dominated and less diverse within the disposal area.

Database Entry #110

Steimle, F. W. Jr., and R. B. Stone. 1973. Abundance and distribution of inshore benthic fauna off southwestern Long Island, N.Y: NOAA. Technical Report NMFS SSRF-673.

Keywords: New York /Atlantic.

Notes:

Scale of Study

The study was from the near shore area extending out to 11.1 km.

Depth Range

The depths ranged from greater than 10-20 m.

Collection Method and Sample Processing

Monthly sampling was conducted for one year at 1.8 km intervals along seven transects.
A total of 432 grabs were made using a Petersen grab (0.0624 m^2).
One and 2 mm size mesh sieves were used.

MAJOR FINDINGS

Dominant Abundant Taxa

Three major assemblages were found: medium sand assemblage, silty sand assemblage, and *Mytilus edulis* associated assemblage.
The range of macrofaunal density in the medium sand assemblage was from 49-2,030 individuals/m^2.
The silty sand assemblage average density was 1,440 individuals/m^2.
The medium sand assemblage was dominated by the bivalve, *Tellina agilis*; burrowing amphipod, *Protohaustorius deichmannae*; sand dollar, *Echinarachius parma*; tubiculous amphipod, *Unciola irorata*; and surf clam, *Spisula solidissima*.
The fine silty sand assemblage was dominated by the bivalve, *Nucula proxima* and polychaete, *Nephtys incisa*.
The *Mytilus edulis* associated assemblage was dominated by the polychaetes, *Harmothoe extenuate, H. imbricate, Nereis succinea*, and *Lepidonatus squamatus*; crab, *Neopanope texana*; and anemone, *Metridium senile*.

Spatial Distribution

The sand assemblage increased in faunal density with depth.
Overall, species diversity increased with depth.

Entry #110 Continued

Other Pertinent Comments

Juvenile rock crabs, *Cancer irroratus*, recruited in high abundance during the summer.

Database Entry #111

Stern, E. M., and W. B. Stickle. 1978. Effects of turbidity and suspended material in aquatic environments. A literature review: U.S. Army Engineer Waterways Experiment Station Environmntal Laboratory, Dredged Materials Research Program. Technical Report D-78-21.

Keywords: Suspended Sediments /Dredging Effects /Review.

Notes:

Pertinent Comments

Many times laboratory experiments do not produce the same results obtained in the field.
Measures of turbidity (optical light scattering) and sediment suspension (wt. per volume) are not interchangeable. The most appropriate measure for examining animal impacts is suspended sediment as turbidity is an inferred measurement.
The suspended sediment concentration, temperature, and dissolved oxygen can interact in a highly complex and non-additive manner.
Turbidity can impact organisms through direct mortality or sublethal effects such as reduced growth rates, prevention of recruitment (egg and larval success), modification of natural movement patterns, and reduction in food resources.
The extent and duration of oxygen depletion needs to be defined when determining impacts.
Increased turbidity can both decrease (lower light penetration) and increase (more nutrients) photosynthesis in the water column.
Sediment suspension effects differ depend upon the current temperature, dissolved oxygen, and salinity conditions present.
Effects, therefore, are dependent upon what other stressors exist.
Suspension feeders are most affected due to an increased effort with reduced returns when feeding.

Database Entry #112

Thistle, D., L. A. Levin, A. J. Gooday, O. Pfannkuche, and P. J. D. Lambshead. 1999. Physical reworking by near-bottom flow alters the metazoan meiofauna of Fieberline Guyot (northeast Pacific): Deep-Sea Research I. 46:2041-2052.

Keywords: Atlantic/Pacific/Deep Sea/Disturbance.

Notes:

Geographic Area:

Two reworked sites were surveyed: Sea Pen Rim & White Sand Swale, in Fieberling Guyot, northeast Pacific (992 km west of San Diego).
One control site was Porcupine Seabight in the northeast Atlantic.
The other control site was the San Diego Trough in the eastern north Pacific.

Depth Range

Depths of the survey sites were as follows: Sea Pen Rim, 630-640 m, White Sand Swale, 580 -585 m, Porcupine Seabight, 1320-1340 m, and San Diego Trough, 1220 m.

Collection Method & Sample Processing

A multiple corer was used for vertical distribution.
A remote underwater manipulator was used to study the proportion of surface vs. interstitial harpacticoids.
Alvin with Ekman Style corers (15x15 cm & 16.2x16.2 cm, both 10 cm depth) were also used.
Sieve sizes were 300, 150, and 63 um.
The study focused on harpacticoids and nematodes.

Environmental Data Collected

Particle Composition, percent organic carbon and nitrogen, percent calcium carbonate, and bacterial counts were all measured.

MAJOR FINDINGS

Spatial Distribution

There were significantly less surface harpacticoid fauna at Fieberling Guyot (reworked) than San Diego Trough (control).
Interstitial harpacticoid fauna were significantly higher at Fieberling Guyot (reworked) than San Diego Trough (control).

Entry #112 Continued

The ratio of 0-1 and 0-2 cm abundance of harpacticoids, ostracods, and kinorhynchs was significantly less at Fieberling Guyot (reworked) than Porcupine Seabight (control).
There were less (median ratio) nematodes at Fieberling Guyot (reworked) than Porcupine Seabight (control), but not significantly.
The relative abundance of harpacticoids and nematodes [H/(H+N)] was significantly greater at Fieberling Guyot (reworked) than Porcupine Seabight and other quiescent deep sea sites (control).

Other Comments

Currents at Fieberling Guyot (reworked) were about 20 cm s^{-1} at 4 cm above the bottom.
Currents at Porcupine Seabight (control) were less than or equal to 13 cm $s^{-1.}$
Modal current at San Diego Trough (control) was 3 cm s^{-1} and the maximum was 10 cm $s^{-1.}$

Database Entry #113

Turbeville, D. B., and G. A. Marsh. 1982. Benthic fauna of an offshore borrow area in Broward County, Florida: U.S. Army, Corps of Engineers Coastal Engineering Research Center. Miscellaneous Report No. 82-1.

Keywords: Florida /Gulf of Mexico /Borrow Pit.

Notes:

Geographic Area

The study site was 1.6 km south of Deerfield Beach, FL.
The study site an offshore borrow area is a sand flat located between two reefs.

Scale of Study

The borrow area is still a pit after eight years and is 200 m long and 70-75 m wide.

Depth Range

The depth of the pit is about 3-5 m. Maximum depth was 15 m.

Dredge Details

The study area had 274,016 m^3 of sand dredged from it in 1972.
The area was dredged one time.
After 8 years, the pit was 200 m long, 70-75 m wide, and 3.5-5 m deep.

Collection Method and Sample Processing

Two control and two borrow area stations were sampled using a 7.9 cm diameter PVC corer.
Sampling was conducted four times for a total of twenty-four cores per station.
Samples were washed through a 1 mm sieve.

Statistical Analysis

Shannon-Weaver Index, Equitability index, and faunal similarity were calculated.

Environmental Data Collected

Sediment organic content and particle size were determined.

Entry #113 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Polychaetes (32.4 percent of all individuals) and bivalves (46.3%) were the dominant taxa.

Densities ranged from 873-12,831 individuals/m^2 and the average density decreased from summer to spring. (Avg. density/m^2: June 5,204, September - 2,960, September 2,856, and March 1,551).

The dominant species were the bivalves, *Ervilia nitens, E. concentrica, Transennella stimpsoni, Pleuromeris tridentate*; polychaete, *Lumrinereis tenuis*; and tanaid, *Apseudes*.

Environmental Correlations

Sediment organic content was not different between the control areas and borrow pit.

There was a greater percentage of coarse sand in the borrow pit compared to control areas.

Comparison to Outside Areas

Borrow pits had a higher species diversity and faunal density than control areas (five years post dredging).

Other Pertinent Comments

Juveniles of the bivalve E. *nitens* dominated in one of the borrow areas.

Database Entry #114

U.S. Ecological Protection Agency. 1983. Environmental Impact Statement (EIS) for Tampa Harbor, Florida ocean dredged material disposal site designation: USEPA Office of Water Criteria and Standards Division.

Keywords: Continental Shelf/Florida/Gulf of Mexico.

Dredge Details

There are two disposal sites, one is one nautical mile square while the other is 0.68 nautical miles^2. The larger site had 4,939,600 yards^3 dumped on it, while the smaller site had 1,901,800 yards^3 dumped.
The larger site was used for two years and was one year old at the time of this study. The smaller site was used for four years, but it had been inactive for ten years prior to this study.

Notes:

Spatial Distribution

Shallow Shelf (10-30 m):
The shallow shelf has a soft bottom and fine textured sediments.
This area is characterized by the polychaetes *Aglaophamus verrilli, Paraprionospio primata,* and *Owenia fusiformis*.
This is an often disturbed community due to freshwater runoff, storms, and temperature swings.

Middle Shelf (30-140 m):
Diversity drops off with depth and a lack of hard bottom substrate.
The deeper sandy areas are characterized by the mollusc, *Chamys*; crustacean, *Munida*; and the echinoderms, *Astropectin* and *Echinaster*.

Deep Shelf (140-200 m):
This area has minimal species diversity compared to the shallow shelf.

Recovery/Turnover Times

Recovery of a disposal area is generally first by opportunistic polychaetes, then mobile crustaceans and then finally by a return of predisturbed species.
Shallow high energy sites are expected to recover the quickest (7-12 months).
Recovery should be based not only upon abundance information but upon recolonization of the original species composition as well.

Other Pertinent Comments

Disposal effects will depend upon the degree of similarity between dredged material and the

Entry #114 Continued

natural sediments at the disposal site, the amount of material disposed, frequency of disposal, chemical constituents, nutrient content, and amount of turbidity created.

Benthos effects may result from burial, oxygen depletion, and changes in the sediment characteristics.
An increased turbidity layer may also increase mucus production, pseudofecal production, reduce feeding, and increase respiration.
The more naturally disturbed an area is, the less likely disposal will have large effects.

Database Entry #115

Versar Inc. 1997. Evaluation of benthic macrofaunal resources at potential sand borrow sources: Townsends Inlet to Cape May Inlet, Cape May County, New Jersey. U.S. Army Coprs of Engineers Contract No. DACW61-95-D-0011.

Keywords: New Jersey/Atlantic Coast.

Notes:

Geographic Area

Four potential sand borrow areas located near Seven Mile Island, New Jersey.

Collection Method and Sample Processing

Samples were taken inside of and outside of potential borrow areas.
A Young-Modified Van Veen grab sampler was used.
A 0.5 mm mesh size was used to sieve samples.
Ash free dry weight biomass was determined for the infauna.

Statistical Analysis

Shannon-Wiener and Simpson's indices were calculated.

Environmental Data Collected

Water quality parameters were taken including DO, salinity, temperature, turbidity, and pH.

Habitat Parameters Collected

Sediment grain size and total organic content were measured.

MAJOR FINDINGS

Dominant Abundant Taxa

The same taxa did not dominate at all areas.
The following fauna were dominant:

- Bivalve *Nucula annulata*
- Hautorid amphipods Protohaustorius deichmannae
- Polychaetes *Aricidea cerrutti, Mediomastus ambiseta, Polygoridus, Streblospio benedicti, Prionospio steenstrupi*
- Tanaids *Tanaissus psammophilus*

Entry #115 Continued

Dominant Biomass Taxa

When surf clams were not present amphipods and polychaetes dominated the biomass.

Other Pertinent Comments

Only two species of commercial value were collected, blue mussel (*Mytilus edulis*) and the Atlantic surf clam (*Spisula solidissima*).

Dredging impacts include:

- removal of the community
- increased turbidity
- changes in sediment composition

Recovery from dredging is expected to take from three months to a year for complete recovery.
Bivalves are expected to be the most impacted by dredging.
Amphipods due to their mobility are expected to be minimally impacted.

Polychaetes are expected to be intermediate in their level of impact due to dredging.

Database Entry #116

Vittor, B. A. 1978. Abundance, diversity, and distribution of benthic polychaetous annelids in the Eastern Gulf of Mexico. in N. Blake, editor. The Mississippi, Alabama, Florida, outer continental shelf baseline environmental survey: U.S. Department of Interior Bureau of Land Management. AA550-CT7-34.

Keywords: Mississippi/Alabama/Florida/Continental Shelf/Gulf of Mexico/Geographic Coordinates.

Notes:

Geographic Area

The study area was comprised of 30 Stations ranging from Sarasota, FL to Mississippi and ranged across the shelf.

Depth Range

A depth range of 20-800 m was examined.
Macrofauna specifically were looked at from 11-171 m

Collection Method and Sample Processing

Macrofauna were sampled using a box core 21.3 x 30.5 cm.
Nine replicate box coers were taken per station.
Indentification was made to taxanomic guild.
Polychaete wet weight was taken.

Statistics

Species Richness, Shannon-Weaver, and Evenness were done on macrofaunal samples.
Cluster Analysis was also done.

MAJOR FINDINGS

Spatial Distribution

Polychaete species richness is greater north of Cape San Blas, Florida.

Environmental Correlations

Polychaete biomass was greatest during the summer and winter seasons.

<u>Entry #116 Continued</u>

Habitat Parameter Correlation

A greater polychaete biomass was found at locations less than 100 m deep.
A greater polychaete abundance was found in medium sand with shell hash and coral rubble.
Fine sediments are dominated by deposit feeding lumbrinerids, cirratulids, opheliids, and spionids, along with tube-dwelling maldanids and chaetopterids.

Other Pertinent Comments

Polychaete abundance and diversity increases in sediments which are more stable.
Polychaetes recruited heavily after winter storms suggesting that “habitat perturbations which decimate benthic standing crop may not have long-lasting impacts on the benthos.”
The MAFLA benthic environment is dynamic due to winter storms and hurricanes.
Hurricane Eloise caused sediment perturbation up to 50 m in water depth.

Database Entry #117

Watling, L., and E. A. Norse. 1998. Disturbance of the seabed by mobile fishing gear: a comparison to forest clearcutting. Conservation Biology 12(6): 1180-1197.

Keywords: Review/Dredging/Trawling/Disturbance.

Notes:

MAJOR FINDINGS

Structure (coral reefs, rhizome mats, mudballs, etc) is important to species diversity.

Since many marine species are slow-growers and long-lived (gorgonians, quahogs, sponges, etc.),
disturbances are very detrimental.

The following area examples of disturbances examined:
- -Abiotic: lava flows, currents, iceburg scour, etc.
- -Biotic: bioturbation, digging for food, etc.
- -Anthropogenic-harbor dredging, sediment extraction, boating activities, fishing practices

Mechanisms for slow patch recolonization are:
- -patch type, seasonality of recruitment, larval dispersal mechanisms
- -physical/chemical alterations to the seabed, removal of top layers of sediments and possibly
  - -high quality food
- -non-linear changes in recolonization due to fragmentation of landscape

Depending on where the disturbances occur, organisms will recover differently
Organisms on sandy beach areas were used to frequent disturbances, so area suited for quick recovery.
Organisms in continental slopes and submarine canyons are not used to frequent disturbance, so may be slower to recover

Possible consequences mentioned (other than direct effects on fauna) were:
- -Change of carbon and nitrogen cycling due to disturbance to sediment/water interface
- -Diminished food quality
- -Removal of organic material;
- -Resuspension and oxidation of carbon, acting as a source of carbon to the water column
- -Suspension of matter (can be negative to visual feeders)
- -Increase in anoxic areas

Management options discussed were:
- -Precautionary management
- -Matching of fishing gear to the disturbance vulnerability of the seabed

-Establishment of "no trawling" zones in all shelf and slope ecosystems

Entry #117 Continued

-Public education
-Extension of the policy-making process to a wider range of people than just those with fishing interests

The area trawled annually is about 150 times the terrestrial area that is clearcut (see table for comparisons).

Database Entry #118

Weston, D. P., G. R. Benthos, L.R. DeRouen, R. W. Hann, D. M. Casserly, and C. Giammona. 1982. West Hackberry brine disposal project pre-discharge characterization. Department of Energy Contract No. DE-AC96-80P010228.

Keywords: Texas/Louisiana/Gulf of Mexico.

Notes:

This is a study to look at an area that will receive salt brine in the future due to salt mining of salt domes in an effort to make caverns in which to store petroleum reserves.

Geographic Area

Geographic coordinates are given for all of the sampling stations.
Sampling was performed off shore of Texas and Louisiana.

Depth Range

Sampling in this study was performed following the 10 m depth contour.

Collection Method and Sample Processing

Grab samples were taken using a Smith-McIntyre grab ($0.1m^2$).
A 0.5 mm screen was used.

Statistical Analysis

Shannon Weaver and evenness indices were calculated.
Cluster analysis was performed on the data.

Date of Sampling

Sampling was conducted in winter-early spring.

Entry #118 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Mean density of the study area was 3307 individuals m^{-2} with a range of 624-10,478 individuals m^{-2}.

The following taxa were dominant (>4%) of the total number of individuals collected on any date:

Barnacle *Balanus improvisus*
Cumacean Oxyurostylis
Mollusc *Mulinia lateralis*
Phoronid - Phoronis
Polychaetes *Cossura soyeri, Diopatra cuprea, Magelona pacifica, Mediomastus californiensis, Paraprionospio pinnata, Sabellides*

The species *Sabellides* and *Phoronis* compromised 46-79% of all of the individuals collected.
Tubiculous species and deposit feeders were common.

Environmental Correlations

Densities increased from winter to spring.

Habitat Parameter Correlation

Species composition did not appeared to change with percent sand but abundances did with a division between sites with greater or less than 25% sand.

Mediomastus californiensis, Magelona pacifica, Cirratulus filiformis, Phoronis, and *Paraprionospio pinnata* generally prefer sandier substrates.

Other Pertinent Comments

The fauna are typical of r selected or disturbance species which will make the detection of impacts complicated.

From - Parker, R.H., A.L. Crowe, and L.S. Bohme. 1980. Describe living and dead benthic (macro-meio) communities. Volume I. In: W.B. Jackson and G.M. Faw (eds.) Biological/CChemical survey of Texoma and Capline Sector salt dome brine disposal sites off Louisiana, 1978-1979. NOAA Technical Memorandum, NMFS-SEFC-29:

This area off of Louisiana is known to have critically low bottom dissolved oxygen values during the summer time which may control larval settlement and survival.

Polychaetes and mollusks settle out in the fall and winter with most having a life cycle of one year.

Entry #118 Continued

No consistent correlation exists between sediment type and benthic abundance or diversity.
Polychaetes dominate the taxa in terms of biomass and abundance.
The taxa are reflective of an unpredictable environment.

Database Entry #119

Wigley, R. L., and A. D. McIntyre. 1964. Some quantitative comparisons of offshore meiobenthos and macrobenthos South of Martha's Vineyard: Limnology and Oceanography. 9:485-493.

Keywords: Massachusetts /Atlantic Coast.

Notes:

Depth Range

The depth of sampling ranged from 40-567 m.

Collection Method and Sample Processing

Ten stations were sampled at ten mile intervals.
Geographic coordinates are listed in the text for actual station locations.
Two 0.1m^2 Smith-McIntyre grab samples were taken at each station.
Samples were washed through a 1 mm sieve for macrobenthos and 0.074 mm for meiofauna.
A subsample of 4 cm deep and 3.48 cm in diameter was taken for meiobenthos.
Wet weights were determined.

Date of Sampling

The sampling was conducted in June 1962.

MAJOR FINDINGS

Dominant Abundant Taxa

There were three major macrofaunal groups:

1) Inner Continental Shelf (40 m):
   Burrowing amphipods dominated at 3,000-4,000 m^2 with a wt. weight of 30 g/m^2.
   Meiobenthos ranged from 662/10 cm^2 with a wt. weight of 3.26 mg.

   Mid Continental Shelf :
   Polychaetes dominated in this area along with molluscs.
   Amphipods are still common but not dominant.

2) Outer Continental Shelf (84-179 m):
   Echinoderms dominated (specifically echinoderms) at 100-700 m^2.
   Molluscs (lamellibranches) were also an important component of the fauna (200-500 m^2).

Entry #119 Continued

Foraminiferans dominated the meiobenthos with a density of 399 individuals/10 cm^2 and a wt. of 2.1 mg.

3) Continental Slope (> 300 m):
Polychaetes were the most abundant taxa (400-800/m^2).
Biomass was low at 1.3 g/m^2.
Rare pogonophorans were present.
Meiofauna were rare with sparse nematodes with an abundance of 122 individuals per 10 cm^2 and 0.68 mg.

Spatial Distribution

Macrofaunal density and biomass decreased with depth.
Kinorhynchs, gastrotrichs, copepods, and ostracods meiofauna were restricted to the shallower areas of the shelf.

Database Entry #120

Wigley, R. L., and R. B. Theroux. 1981. Atlantic continental shelf and slope of the United States - Macrobenthic invertebrate fauna of the middle Atlantic Bight region - faunal composition and quantitative distribution: U. S. Geological Survey. Geological Survey Professional Paper 529.

Keywords: East Coast/Massachussettes/North Carolina/Deleware/Virginia/New York/New Jersey/Maryland/Continental Shelf/Continental Slope.

Notes:

Geographic Area

The study area was along the Middle Atlantic Continental Shelf with the northern border at Cape Cod and Nantucket Shoals, Massachusetts, and the southern border at Cape Hatteras, North Carolina.

Scale of Study

Samples were taken on an 18 km grid.

Collection Method and Sample Processing

Van Veen grabs (0.1 m^2), Smith-McIntyre grabs (0.1 m^2), and Campbell grabs (0.56 m^2) were all used.
A 1 mm mesh size was used to sieve fauna.

Habitat Parameters Collected

Sediment grain size, sediment organic content, and water depth were measured.

MAJOR FINDINGS

Dominant Abundant Taxa

The following fauna were found to be in high abundance:

Annelids - *Scalibregma, Nephtys, Maldane, Sabella, Spiophanes*
Gastropods - *Alvania, Cylichna, Nassarius*
Bivalves - *Nucula, Cyclocardia, Astarte, Thyasira*
Cirripedia - *Balanus*
Amphipoda - *Trichophoxus, Leptocheirus, Ampelisca, Unicola*
Isopoda - *Cirolana*
Echinoidea - *Echinarachnius*
** This includes coastal waters as well.

Entry #120 Contintued

Dominant Biomass Taxa

The following fauna were found to contribute a large biomass:

Coelenterata - *Cerianthus*
Annelids - *Nephtys, Streblosoma, Maldane, Lumbrineris*
Bivalves - *Arctica, Astarte, Cyclocardia, Mulinia, Ensis*
Gastropoda - *Buccinum, Nassarius*
Amphipoda - *Trichophoxus, Leptocheirus, Unicola*
Decapoda 0 *Cancer*
Isopoda - *Cirolana*
Asteroidea - *Astropecten*
Echinoidea - *Echinarachnius, Brisaster*
**This includes coastal waters as well.

Spatial Distribution

The importance of arthropod abundance decreased from North to South.
The importance of Mollusc abundance increased from North to South.
Annelid abundance was most important and Echinoderm abundance least important in the New York Bight (middle).
Molluscs were most important in terms of biomass and greatest in the New York Bight.
Echinoderms and Annelids were 2nd and 3rd most important in terms of biomass.

Areas off southern Massachusetts and Rhode Island have a high density of benthos (>1,000/m^2).
In the areas off Delaware, Virginia, and North Carolina densities were substantially lower.
There was a large biomass (100-500 g/m^2) in the north compared to the south (<25 g/m^2).

Pattern of the dominant taxa:
Annelids were high (500-1999/m^2) on the shelf south of Massachusetts but low in the Chesapeak area (<25 g/m^2). The same pattern was found in biomass with 200 g/m^2 compared to (<1 g/m^2).
Molluscs were found in most areas with a high biomass (> 100g/m2) between Cape Cod and Delaware Bay. The central region of the continental shelf had the lowest density compared to more inshore and offshore areas.
Gastropods were absent from the central and outer parts of the shelf (except south of Rhode Island and in the Massachusetts area (10-999/m^2).
Bivalves wide spread over the shelf with lower densities in the central region.
Arthropods were distributed throughout. High denisites (>2000/m^2) of arthropods were found in the southern New England area and northern New York.
Arthropod biomass displayed the same pattern.

Entry #120 Continued

Cirripedia density and biomass was highest north of New York to Cape Cod (500-7932/m^2 and 500-1104g/m^2).
Isopods had the highest density and biomass on the inner shelf and were fairly evenly distributed (1-24/m^2, 0.5-5.0g/m^2).
Amphipods were present across the shelf with many areas of high abundance. Denisities ranged from 10-19000/m^2 with a biomass of 1-175g/m^2).
Decapods were distributed all over the shelf (most areas <25/m^2), with highest biomass on the inner and middle shelf.
Brachiopods were distributed only northeast of Cape Hatteras and southeast of Norfolk, Virginia on the outer shelf with densities of 1-99/m^2 representing only 1g/m^2.
Echinoderms represented low densities over much of the shelf, but represented a large biomass contribution (5-855g/m^2). High densites were found on the outer shelf in southern New England, the inner shelf of New York, and the central Chesapeake shelf.
Echinoids had a high density (25-500/m^2) on the midshelf of Chesapeake and very high off New York-Delaware (500-2083/m^2). A high biomass was found on most of the shelf (0.01 -25g/m^2) with a high spot on the outer shelf off Cape Cod (100-855g/m^2).
Ophiuroids were found in moderate to high densities (25-1018/m^2 along the outer shelf between New York and Cape Cod. Biomass ranged from (<1g/m^2 to 77g/m^2).
Asteroid density was highest in the New England region (10-48/m^2) with a biomass 50-210g/m^2.
Asteroids were not common off Chesapeake.

Detailed maps show the distribution of different taxa.

Environmental Correlations

Density increased with increasing bottom temperature range.

Habitat Parameter Correlation

Density decreases as particle size decreased.
No correlation was found with organic content and density.

Database Entry #121

Woodward Clyde Consultants Inc. 1983. Southwest Florida shelf ecosystem study - year 1 final report: U.S. Department of Interior Minerals Management Service. OCS Contract 14-12-001-20142.

Keywords: Florida /Continental Shelf /Gulf of Mexico.

Notes:

Geographic Area

Sampling was done between offshore of Charlotte Harbor, FL and the Dry Tortugas.
A list containing the Latitude and Longitude for each station.

Scale of Study

The study was conducted on the Southwest Florida Shelf.

Depth Range

The sites ranged in depth from 19.6-89.8 m.

Collection Method and Sample Processing

Fifteen stations were sampled in both the spring and fall. Three stations were located on five different transects.
Camera video and still shots were taken for qualitative and percent cover estimates. Otter trawls were conducted over both live and soft bottom for qualitative assessment.
Five replicate box core samples (modified Reineck Box Corer 15 cm x 30 cm x 40 cm) were taken at each soft bottom station.
A 0.5 mm mesh sieve was used for analysis.

Statistics

Shannon-Weaver Index, Equitability (J'), Margalef's Index, Gini's index of diversity using the dominance measure, and Cluster Analysis were done.

Habitat Parameters Collected

Sediment grain size, sediment total carbonate, sediment hydrocarbons, and sediment trace metals (Ba, Cd, Cr, Cu, Fe, Pb, Ni, Va, Zn) were collected in this study.

Entry #121 Continued

MAJOR FINDINGS

Dominant Abundant Taxa

Macrofaunal denisities ranged from 2,012-8,161 organisms/m^2.
Polychaetes (>50% of the total fauna) dominated the taxa in both abundance and number of species for both the spring and fall.
Crustaceans (12-14.9% of the total fauna) were the next most abundant taxa followed by molluscs at 10-12%.
The eight dominant taxa ($\geq$5% of total faunal density and occurring at least at one third of the stations) were:

Polychaete: *Paraonidae, Fabricia, Prionospio cristata, Synelmis albini, Ampharete acutifrons*
Bivalve: *Lucina radians*
Oligochaeta
Nemertina

Spatial Distribution

Oligochaeta, nemertina, and the polychaetes (*Paraonidae, Fabricia*, and *Prionospio cristata*) decrease in abundance with increasing depth.
The polychaete, *Synelmis albini,* increases in abundance with increasing depth. It dominated in a zone between 60-90 m in depth.
Faunal densities decreased general from nearshore to offshore stations.
Latitudinal and seasonal differences in taxonomic richness were minimal.
Taxonomic richness was relatively less on the inner shelf stations.

Habitat Parameter Correlation

The Polychaetes (*Fabricia, Prionospio cristata,* and *Ampharete acutifrons*) and the bivalve, *Lucina radians*, were restricted to silt/clay sediments.
No relationships between taxonomic richness or abundances were found with sediment characteristics.

Other Pertinent Comments

They did not detect any major changes in species composition with season.

Database Entry #122

Zajac, R. N., and R. B. Whitlatch. 2003. Community and population-level responses to disturbance in a sandflat community: Journal of Experimental Marine Biology and Ecology 294: 101-125.

Keywords: Connecticut/Atlantic/Estuary.

Notes:

Scale of Study

Five sets of 1 m^2 experimental plots were located in an intertidal sandflat.
Each plot consisted of a control and a disturbance plot.

Depth Range

The study was done in the intertidal zone.

Dredge Details

The disturbance plots were 1 m^2 and were only disturbed one time.
The plots were disturbed to a depth of 15 cm with defaunated sediment placed back on top.
The time frame for recolonization was from August to December.

Collection Method and Sample Processing

For faunal samples, a 5 cm diameter core (10 cm depth) was used.
A 2.4 cm diameter core (2 cm deep) was used for sediment grain size analysis.
A mesh size of 212 um was used.

Habitat Parameters Collected

Sediment grain size was measured.

Date of Sampling

Treatments were established on August 1, 1989 and plots were sampled every two weeks until the end of December, 1989.

MAJOR FINDINGS

Dominant Abundant Taxa

The following species were abundantly dominant:

Entry #122 Continued

Highest Abundances:
Parapiosyllis longicirrata (syllid polychaete) was the most abundant spp.
Streptosyllis arenae (syllid polychaete)
Oligochaetes

Moderate Abundances:
Brania welfleetensis (syllid)
Gemma gemma (venerid clam)
Hybrobia totteni (gastropod)

Relatively Low Densities:
Scolelepsis squamata (spionid polychaete)
Lumbrineris tenuis (limrinerid polychaete)
Capitella capitata
Nereis acumunata (nereid polychaete)

Spatial Distribution

For *P. longicirrata,* control and disturbed sites were marginally significant.
For *S. arenae*, control and disturbed densities did not equilibrate until ambient density declined to the level of disturbed plots.
For oligochaetes, there were no significant differences.
C. capitata was the only species that had greater abundance in disturbed plots than in controls.

Habitat Parameter Correlation

At the beginning of the study, plots had a higher fraction of coarser sediments (after initial disturbance). Differences were present until mid September, and began to get similar in October. By late October, there were no significant differences in sediments.
The equilibration of sediment grain sizes coincides with peak densitites of *C. capitata* (*C. capitata* recruits to areas of fine particles).

Indication of Turnover TImes

Population abundances of most species equilibrated to ambient levels by mid-October and November.
The greatest recovery of community structure was between 2 and 4 weeks, and sites were and almost identical by December.
Overall community structure didn't return to ambient conditions until the end of the study period (Dec.), so community recovery occurred after at least 4 months.
Population size structure of *P. longicirrata* still hadn't equilibrated by the end of the study.
Some species (*S. squamata* & *L. tenuis*) were at ambient densities two weeks afterdisturbance, but then declined sharply, which indicates initial colonization and poor survivorship, so these species were unable to establish themselves.

Chronological List of NEGOM OCS Ecosystem Studies Publications From the USGS Coastal Ecology & Conservation Research Group

Weaver, D. C., K. J. Sulak, W. Smith-Vaniz, and S. W. Ross. 1999. Community structure and trophic relationships of demersal reef fishes of the Mississippi-Alabama outer continental shelf. Pp. 286-292, In: Proceedings Seventeenth Gulf of Mexico Information Transfer Meeting, Kenner, LA, December 1997, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA, OCS Study MMS 99-0042 (M. McKay and J. Nides, eds.).

Gardner, J. V., K. J. Sulak, P. Dartnell, L. Hellequin, B. Calder, and L. A. Mayer. 2000. The bathymetry and acoustic backscatter of the Pinnacles area, northern Gulf of Mexico. U.S. Geological Survey Open-File Report 2000-350, 35 pp.

Weaver, D. C., and K. J. Sulak. 2000. Trophic subsidies in the twilight zone: Food web structure of deep reef fishes along the Mississippi-Alabama outer continental shelf. Pp. 203-208, In: Proceedings: Eighteenth Gulf of Mexico Information Transfer Meeting, Kenner, LA, December 1998, U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region, New Orleans, LA, OCS Study MMS 2000-030 (M. McKay and J. Nides, eds.).

Gardner, J. V., P. Dartnell, K. J. Sulak, B. Calder, and L. Hellequin. 2001a. Physiography and late Quaternary-Holocene Processes of northeastern Gulf of Mexico outer continental shelf off Mississippi and Alabama. Gulf of Mexico Science 2001(2):132-157.

Gardner, J. V., L. A. Mayer, J. E. Hughes Clarke, P. Dartnell, and K. J. Sulak. 2001b. The bathymetry and acoustic backscatter of the mid shelf and upper slope off Panama City, Florida, northeastern Gulf of Mexico. Cruise Report, RV *Moana Wave*, Cruise M1-01-GM, September 3, through October 12, 2001. U.S. Geological Survey Open-File Report 2001-448, 60 pp.

Gardner, J. V., P. Dartnell, and K. J. Sulak. 2002a. Multibeam mapping of the West Florida Shelf, Gulf of Mexico. U.S. Geological Survey Open-File Report OF02-5, CD-ROM; online at: http://geopubs.wr.usgs. gov/openfile/of02-5.

Gardner, J. V., P. Dartnell, and K. J. Sulak. 2002b. Multibeam mapping of the Pinnacles Region, Gulf of Mexico. U.S. Geological Survey Open-File Report OF02-6, CD-ROM; online at: http://geopubs.wr.usgs.gov/ openfile/OF02-6.

Weaver, D. C. G. D. Dennis III, and. K. J. Sulak. 2002. Community structure and trophic ecology of demersal fishes on the Pinnacles Reef tract. U.S. Department of the Interior, U.G. Geological Survey Biological Sciences Report USGS BSR 2001-0008; Minerals Management Service, OCS Study MMS-2002-034.

Gardner, J. V., J. E. Hughes Clark, L. A. Mayer, and P. Dartnell. 2003. Bathymetry and acoustic backscatter of the mid and outer continental shelf, head of DeSoto Canyon, Northeastern Gulf of Mexico – Data, images, and GIS. USGS Open-File Report OF03-007, CD-ROM; online at: http://geopubs.wr.usgs.gov/ openfile/OF03-007.

Edwards, R. E., and K. J. Sulak. 2003. The potential of deepwater petroleum structures to affect Gulf of Mexico fisheries by acting as fish aggregating devices (FADs) pp. 55-72, IN: (M. McKay and J. Nides, eds.) Proceedings of the Twenty-First Annual Gulf of Mexico Information Transfer Meeting, U.S. Department of Interior, Minerals Management

Service, New Orleans, LA, MMS OCS Study Report 2003-005 (CD-ROM), January 2002, 748 pp.

Edwards, R. E., and K. J. Sulak. 2003. Overview of fisheries of the deep Gulf of Mexico. pp. 56-63. IN: (W. W. Schroeder and C. F. Wood, eds.) Workshop on Deepwater Environmental Studies Strategies: A Five-Year Follow-Up. U.S. Department of Interior, Minerals Management Service, New Orleans, LA, MMS OCS Study Report 2003-030 (CD-ROM), May 2003, 118 pp.

Lyczkowski-Shultz, J., D. S. Hanisko, K. J. Sulak, and G. D. Dennis, III. 2003. Characterization of ichthyoplankton within the U.S. Geological Survey's Northeastern Gulf of Mexico (NEGOM) Study Area. Based on analysis of Southeast Area Monitoring and Assessment Program (SEAMAP) sampling surveys, 1982-1999. USGS Outer Continental Shelf Ecosystem Studies Program Report USGS-BSR 2004-XXX (CEC NEGOM Program Investigation Report No. 2003-01, November 2003), available in CD-ROM format and online in Adobe© .pdf format at: http://cars.er.usgs.gov/coastaleco/

Thurman, P, R. McBride, G. D. Dennis, III, and K. J. Sulak. 2003. Age and reproduction in three reef-dwelling serranid fishes of the Northeastern Gulf of Mexico Outer Continental Shelf: *Pronotogrammus martinicensis*, *Hemanthias vivanus* & *Serranus phoebe* (with preliminary observations on the Pomacentrid fish, *Chromis enchrysurus*. USGS Outer Continental Shelf Studies Ecosystem Program Report USGS-BSR-XXX (CEC NEGOM Program Investigation Report No. 2003-02, December 2003), available in CD-ROM format and online in Adobe© .pdf format at: http://cars.er.usgs.gov/coastaleco/

Brooks, R. A., S. S. Bell, C. N. Purdy, and K. J. Sulak. 2004. The benthic community of offshore sand banks: a literature synopsis of the benthic fauna resources in potential MMS OCS sand borrow areas. USGS Outer Continental Shelf Studies Ecosystem Program Report USGS-BSR-XXX (CEC NEGOM Program Investigation Report No. 2004-01, February 2004) ; Minerals Management Service, OCS Study MMS-2004-XXX, available in CD-ROM format and online in Adobe© .pdf format at: http://cars.er.usgs.gov/coastaleco/

Other Publications Resulting in Part From NEGOM OCS Research Undertaken by the USGS Coastal Ecology & Conservation Research Group

Stevens, P. W., C. K. Bennett, and J. J. Berg. 2003. Flyingfish spawning (*Parexocoetus brachypterus*) in the northeastern Gulf of Mexico. Environmental Biology of Fishes 67:71-76

Quattrini, A. M., S. W. Ross, K. J. Sulak, A. M. Necaise, T. L. Casazza, and G. D. Dennis. 2004. Marine fishes new to continental United States waters, North Carolina, and the Gulf of Mexico. Southeastern Naturalist (In Press).

Caruso, J., S. W. Ross, and K. J. Sulak (submitted 2004). New records of deep-water lophiids from off the southeastern U.S. submitted to Bulletin of Marine Science.

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