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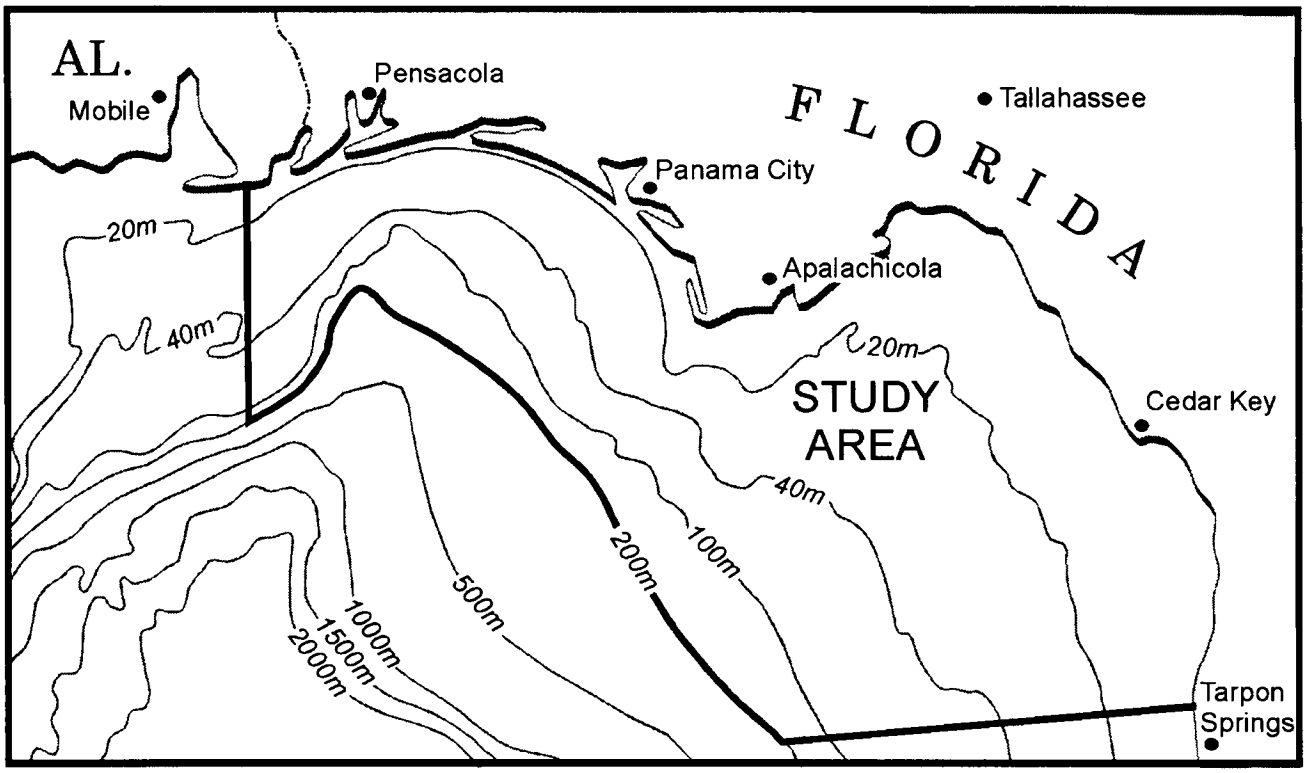
Northeastern Gulf of Mexico Coastal and Marine Ecosystem Program: Data Search and Synthesis, Annotated Bibliography

Appendix E: Biology



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Eastern Region

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Abstract. Between September, 1966 and August, 1968 a survey of decapod crustacea in the Destin-Panama City area was undertaken. Specimens were taken by various methods, returned to the laboratory, measured and preserved. A key for all specimens taken was constructed. Temperature and depth data were taken at all stations.

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Abstract. Tuna fisheries have been rapidly expanding along the southeastern coasts of the United States. The domestic harvest includes albacore (Thunnus alalunca), bigeye (T. obesus), blackfin (T. atlanticus), bluefin (T. thynnus) and yellowfin (T. albacares). Current production and predicted availability suggest the yellowfin are most abundant, plus they are not restricted by harvest regulations such as the two fish per boat limit on bluefin. In the Gulf and South Atlantic region annual landings of yellow fin alone have increased dramatically since 1980 to exceed 6.4 million pounds values in excess of $8.4 million on the dock in 1986. A major portion of the production occurs in Florida with landings recorded in Fort Pierce, Pompano Beach, Key West, Fort Myers, Maderia Beach, Panama City, Destin and Pensacola.

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Abstract. Environmental parameters were monitored weekly at 3 stations in Mulatto Bayou and Catfish Basin, Pensacola Bay, Florida, in an effort to

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Abstract. This report contains all of the then available typical bathythermograph tracings for 1 degree quadrants of the Gulf of Mexico for both winter and summer. The contours of approximate mixed-layer depths in summer and winter are compared.

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Abstract. Estuarine surface films from Escambia Bay, Florida, and adjacent waters were sampled by using the membrane adsorption technique to enumeratemicrobial populations. Samples of the upper 10 micrometers of estuarine surface films yielded microbial populations. These populations were 10 to 100 times greater than those in underlying waters of 10 cm. Predominant bacteria in surface films as isolated on Marine Agar were motile, non-pigmented, gram-negative rods. Colony-forming units of yeasts and molds on Mycological Agar prepared with 50 per cent seawater were found. A greater proportion of the surface film bacteria, as compared to those at 10 cm depth, were capable of growth on freshwater media. With selective isolation media, amyloytic, and lipolytic bacteria appeared to comprise amore significant proportion of the total population. Twenty-one representative bacteria, yeasts, and filamentous fungi from initial sampling of surface microlayers were tested for the effects of selected pesticides on utilization of various substrates.

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Abstract. Samples of inshore surface films from Escambia Bay, Florida and from sites in the North Sea yielded populations of aerobic, heterotrophic microorganisms up to 10^8/ml or $10^6/cm^2$. Hydro-carbonoclastic organisms were in relatively low populations. A comparison of species of yeasts prevalent in North Sea waters before and after oil production activities indicated a shift to a more wide spread distribution of hydro-carbonoclastic forms with possible inhibition of anon-hydrocarbon utilizing species. Examination of various hydrocarbons and chlorinated compounds with the potential of being sequestered in natural films indicated that 66% could potentially alter microbial metabolic processes in the slick. In microcosm studies of estuarine systems representative compounds demonstrated a selective effect for microfungi.

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Abstract. Benchmark studies on the Eastern Gulf of Mexico Outer Continental Shelf were conducted seasonally to establish baseline information prior to extensive oil and gas development activity. No crude oil-like hydrocarbons were found in sediments, benthic organisms, zooplankton, suspended particulates nor dissolved phases on the Florida shelf. Moreover the abundance and diversity of organisms suggested that these organisms are living in an essentially pristine and natural ecological state, and show no evidence of stress owing to influx of pollutants.

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Abstract. This volume contains the introduction, purpose and objectives of the study, description of the study area, and detailed statements of methodology employed for each parameter measured. The geological parameters included: suspended sediment mineralogy, x-radiography, clay mineralogy, and standard sediment size analysis. Chemical parameters included: selected trace elements and hydrocarbons in sediments; biota; and suspended particulate matter. Principal biological analyses included taxonomy of neuston, zooplankton, macroepifauna, macroinfauna, meiofauna, and microinfauna.

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hydrocarbons were found in sediments, benthic organisms, zooplankton, suspended particulates nor dissolved phases on the Florida shelf. Moreover the abundance and diversity of organisms suggested that these organisms are living in an essentially pristine and natural ecological state, and show no evidence of stress owing to influx of pollutants. Some evidence of hydrocarbon anomalies were found in samples from the Mississippi-Alabama shelf probably due to drainage from the Mississippi River.

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Abstract. Benchmark studies on the Eastern Gulf of Mexico Outer Continental Shelf were conducted seasonally to establish baseline information prior to extensive oil and gas development activity. No crude oil-like hydrocarbons were found in sediments, benthic organisms, zooplankton, suspended particulates nor dissolved phases on the Florida shelf. Moreover the abundance and diversity of organisms suggested that these organisms are living in an essentially pristine and natural ecological state, and show no evidence of stress owing to influx of pollutants. Some evidence of hydrocarbon anomalies were found in samples from the Mississippi-Alabama shelf probably due to drainage from the Mississippi River. A study of tissue pathology revealed only parasites in otherwise normal benthic organisms. Major features affecting the study area were the Mississippi River, the Loop Current and hurricane Eloise. Trace metal (Cd, Cr, Cu, Fe, Ni, Pb and V) concentrations in Eastern Gulf samples were at levels expected for non-polluted areas.

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Abstract. T. bowmani, previously considered to be an estuarine species, is shown to reproduce and complete its life cycle in fresh water. Both sexes and all life history stages were collected from March to June 1975, in the Wakulla River, Florida, where chlorinity, alkalinity and total hardness were relatively high. Development was synchronous within a brood but not between broods. Brood size was positively correlated with female size, and ripe ovaries of brooding females suggest that at least 2 broods per female are possible. Breeding appears to occur throughout the year. The relatively high ion content, especially chloride, in the Wakulla River may account for the presence of T. Bowmani. Other estuarine mysids reported from fresh water are noted.

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percentage of female than male hosts were infected, but only females of size classes less than 31 mm long had a greater frequency of infection. Female P. pandalicola- were greatly under-dispersed throughout the host population; 99.6% of the infected hosts carried only 1 female parasite. Control of P. pandalicola- at the infrapopulation level is probably accomplished by some mode of intraspecific competition, and control at the suprapopulation level occurs through an upstream limitation of the transmission range of the cryptoniscus larval stage. Host-parasite interactions appear to be unstable.

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Abstract. A pilot study to analyze the degree of genetic variance in each of 5 species of sea turtles was conducted to determine if full scale sampling and analyses should be performed: Loggerhead (Caretta caretta) from North Carolina and Florida; green (Chelo nia mydas) from Florida, the Caribbean and Hawaiian islands; olive Ridley (Lepidochelys olivacea) and hawksbill (Eretmochelys imbricata) from Florida and the Caribbean Islands; and Kemp's Ridley (Lepidochelys kempi) from Mexico. Blood samples wee analyzed for genetic variance utilizing 12 specific enzyme stains following polyacrylamide gel isoelectric focusing. Frequency of alleles and number of polymorphic loci were tabulated for 4 enzyme systems: lactate dehydrogenase, acid phosphatase, peptidase (a lanine-leucine), and an esterase combination; all other enzyme stains were monomorphic. Only 2 species, caretta and mydas, showed significant polymorphism.

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require consideration in studies of effects of harvesting strategy. The shrimp fisheries of the eastern Gulf of Mexico are analyzed. They are those of Mississippi, Alabama, and west coast of Florida, and includes pink shrimp, P. duorarum, as well as brown and white shrimp. Harvesting strategy refers to the sizes of shrimp harvested, retained, and landed. The relationship between estimated ex-vessel value and weight of reported annual catches of a given species in a given region holds remarkably well over a wide range of fluctuations in reported annual catches. In fisheries, such as shrimp fisheries of the Gulf of Mexico, in which wide fluctuations occur in annual yield in response to fluctuations in recruitment, the best that can be done is to make the best use of whatever recruitment occurs. This lends support to the concept of management of shrimp fisheries by minimum size limits or other approaches which regulate the size of shrimp at first harvest, i.e., closed areas or seasons.

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Abstract. Positive records of marine mammals from the eastern Gulf of Mexico (i.e., Florida, Alabama, and Mississippi) are listed with annotations, and maps are included to show the locations of the records. The species for which there are specific records are Black Right Whale (Balaena glacialis), Minke or Little Piked Whale (Balaenoptera acutorostrata), Bryde Whale (Balaenoptera edeni), Fin Whale (Balaenoptera phsalus), Humpback Whale (Megaptera novaeangliae), Rough-toothed Dolphin (Steno bredanensis), Atlantic Bottlenosed Dolphin (Tursiops truncatus), Gray Grampus or Risso's Dolphin (Grampus griseus), Longsnouted Dolphin (Stenella longirostris), Bridled Dolphin (Stenella frontalis), Spotted Saddleback Dolphin (Delphinus delphis), Short-finned Pilot Whale or Blackfish (Globicephala macrorhyncha), Killer Whale (Orcinus orca), Sperm Whale (Physeter catodon), Pygmy Sperm Whale (Kogia breviceps), Dwarf Sperm Whale (Kogia simus), Antellean Beaked Whale (Mesoplodon europaeus), Goose-beaked or Cuvier's Beaked Whale (Ziphius cavirostris), Manatee or Sea Cow (Trichechus manatus latirostris), and California Sea Lion (Zalophuscalifornianus). The former presence of the now apparently extinct Caribbean Monk Seal (Monachus tropicalis) within the eastern Gulf is noted. Comments are included on additional Gulf records from outside the study area as they relate to the eastern Gulf. Species recorded from within the Gulf but not yet positively from the eastern Gulf study area are Sei Whale (Balaenoptera borealis), Blue Whale (Balaenoptera musculus) -- it is noted that the records of the Blue Whale from elsewhere in the Gulf are questionable, Pygmy Killer Whale (Fereas attenuata), and False Killer Whale (Pseudorca crassidens). Generalizations are included regarding geographical and ecological distribution, population status, life history, food habits, and rare or endangered status of marine mammals within the eastern Gulf study area. It is noted that the manatee and the bottle nosed dolphin are the species in greatest need of study in the area as they are the ones in the greatest potential danger from the activities of man.

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Abstract. Present knowledge of the biology and zoogeography of benthic invertebrates in the Gulf of Mexico is substantially greater than it was two decades ago(as summarized in monographs edited by Hedgepeth, 1953; Galtsoff, 1954. Since then, however, no comprehensive accounts of eastern Gulf benthos have been published, and the extensive literature remains widely scattered. The present account briefly summarizes the major scientific contributions of the past twenty years in benthic invertebrate studies in the eastern Gulf. Emphasis has been placed on the major non-commercial macroinvertebrate taxa since these groups are best known and are frequently diagnostic of faunal areas and community structure. Wide ranging commercially important forms such as penaeid species and Callinectes sapidus are reviewed elsewhere in this report.

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were measured. Sediments were analyzed for particle-size distribution, percent organic carbon and percent carbonate. Benthic macro-invertebrates were represented by 162 taxa of 14 major animal phyla. Species composition and faunal densities varied seasonally. Polychaetes and amphipods were the most abundant animal groups; a small number of species were dominant at nearly all stations and highest offshore. Sediment composition was similar to that of Saloman's (1976) study within limits of sampling and processing errors. Faunal composition was found to be different from 1976 but was attributed to normal seasonal and spatial variations. Based on benthic community analyses and sediment parameters, no significant differences were found between nourishment borrow sites and surrounding areas and in the nearshore areas where beach nourishment was conducted. No long-term adverse effects of beach nourishment were detected.

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Abstract. A third year baseline marine environmental survey was conducted and a synthesis report prepared. Marine geology, physical oceanography, marine biology, trace metal and hydrocarbon chemistry of the water column, sediments and tissues were examined for the Mississippi, Alabama, Florida Outer continental shelf in support of prospective OCS oil and gas development. Physical oceanographic and sediment geology data provided information to better understand the biological and chemical distributions. A data base was created merging data collected from 1974-1978 into a single format.

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Abstract. The prime purpose of the MAFLA program was the determination of ongoing or potential impacts on the outer continental shelf (OCS) environment from oil and gas development. The Executive Summary is organized along the same lines as the Program Synthesis Report, with sections on methodology, geology, physical oceanography, chemistry and biology. A brief summary and lists of recommended monitoring parameters and major deficiencies in the data base are also included.

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Abstract. This report presents the results of a four year investigation of the surface sediments of the eastern Gulf of Mexico continental shelf. In

the first two years our approach consisted of sampling from two of the replicate box cores at each station and each season. During the final summer and year the authors altered their approach by collecting a large number of replicates at each of the relatively small number of stations in order to determine small scale variability. In addition to sedimentologically characterizing the MAFLA margin, the authors task was to provide ancillary data for sediment chemistry and benthic biological studies.

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Abstract. Demersal, or bottom fishes, are represented by numerous species at the peak of the trophic level. These top carnivores are, therefore, primary candidates for analysis of any sort of biological concentration or magnification of substances passing through the lower trophic levels. In addition, many of the benthic fishes are substrate-specific and reflect and corroborate distribution of sediment types. Many of the forms exhibit abbreviated larval development, and thus are good indicators of historical zoo-geographical patterns. Finally, to the public at large, fishes represent an identifiable unit, recognizable and deserving of study, especially in regard to possible effects by drilling interests.

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Abstract. The 15 month mean biomass and energetics of the macroalgal and seagrass components of the marine angiosperm community along the west coast of Florida was 229g·m^{-2} dry wt. The highest mean standing stock occurred at Homosassa River Bay (656g·m^{-2} dry wt., or 2.41 tons·$acre^{-1}$

dry wt.). The mean overall standing stock in seagrass beds extending from Anclote Key to Cedar Key, Florida is estimated to be 2.28 x 10^9 metric tons or 3.4 x 10^6 US tons. Available energetics were lowest in the winter months (166 kcal·m^{-2}, Cedar Key, Florida in January and February) and highest in the spring (3911 kcal·m^{-2}, Homosassa River Bay, May and June).

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Abstract. The present study details the occurrence and distribution of the macroinvertebrates of the continental shelf of much of the Gulf of Mexico. The primary study area is the northern Gulf, between Corpus Christi, Texas, and Pensacola, Florida; some information is also provided on the fauna of the Mexican coast, between the mouth of the Rio Soto la Marina, Tamaulipas, and Progreso, Yucatan. The study is based on collections from 146 trawl samples, mostly collected in the depth range of 18 to 183 m. Approximately 50,000 specimens were collected and processed. These represent 356 species in 261 genera and 161 families, and include sponges (10 species), coelenterates (41 species), worms (26 species, in 5 phyla), molluscs (116 species), arthropods (113 species), echinoderms (30 species), ectoprocts (9 species), and urochordates (11 species). Essentially all species are synoptically described, with pertinent comments on distribution and natural history, and are photographically illustrated. Literature pertaining to the fauna and physical characteristics of the Gulf of Mexico is reviewed and discussed. Based upon the results of the present study, the published literature, and unpublished reports, twelve faunal assemblages characteristic of the northern Gulf, from Brownsville, Texas, to Tampa Bay, Florida, in the depth range of 4 to 200 m are proposed. These assemblages are: (a) inner shelf assemblage, Texas-Louisiana shelf (4-20 m); (b) pro-delta fan assemblage (4-20 m); (c) pro-delta sound assemblage (4-20 m); (d) inner shelf assemblage, West Florida shelf (4-20 m); (e) intermediate shelf assemblage, Texas-Louisiana shelf (20-60 m); (f) intermediate shelf assemblage, West Florida shelf (20-60 m); (g)

outer shelf assemblage, Texas-Louisiana shelf (60-120 m); (h) outer shelf assemblage, West Florida shelf (60-120 m); (i) upper slope assemblage, Texas-Louisiana shelf (120-200 m); (j) upper slope assemblage, West Florida shelf (120-200 m); (k) submarine bank assemblage, Texas-Louisiana shelf (20-100 m); and (l) Florida Middle Grounds assemblage, (30-60 m). Physical characteristics, geographic extent, and fauna characteristics of each assemblage are briefly described.

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Abstract. This guide is intended to be a laboratory guide to the marsh invertebrates of the northeastern Gulf of Mexico. It includes taxonomic keys to the major groups of invertebrates and provides detailed descriptions (with illustrations) to the more commonly encountered polychaetes, molluscs and crustaceans. Also given is a general discussion on the importance of tidal marshes and general information on the interaction between organisms found there.

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Abstract. Differences in the structure of epibenthic invertebrate species assemblages were investigated in two estuarine areas in Apalachee Bay, Florida (USA), and related to the presence or absence of pulp-mill effluents. Invertebrate species associated with seagrass beds, mud flats, and oyster reefs were included in the analyses. Surprisingly, several commonly used indicators of pollution stress were ineffective in differentiating the study areas, even though there were large difference in abundance and dominance relationships between them, and these differences were clearly related to the presence of the pulp-mill effluents. Recommendations for data analyses in similar types of studies are made based on the results of this investigation and others in the same study areas.

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Abstract. Specimens of Stenotomus caprinus, the long spined porgy, were captured between 1972 and 1976. Distribution, reproduction, feeding and growth patterns for the species were examined.

Henwood, T.A., P. Johnson and R.W. Heard. 1978. Feeding habits and food of the long spined porgy, Stenotomus caprinus Bean. Northeast Gulf Sci. 2(2):133-137.

Abstract. The long spined porgy, Stenotomus caprinus Bean, is an abundant species in the 40 to 100 meter depth range over much of the northern and western Gulf of Mexico. Gunter & Knapp (1951), Siebenaler (1952), Hildebrand (1954), Caldwell (1955), Roithmayr (1965), Moore et. al. (1970), Perry (1970), Franks et. al. (1972) and Chittenden & McEachran (1976) have documented the occurrence of this species in the 20 to 120 meter range. Despite ample evidence that the porgy is a major member of the offshore demersal fish population, there have been no published reports on the feeding behavior or food of this fish. This study was undertaken in the hopes of characterizing major food items and feeding patterns within the species.

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Abstract. Dermocystidium marinum, a parasitic fungus of oysters, was demonstrated from the stomachs of the snail, Urosalpinx cinerea, from the stomach, intestine and body of three fishes, Gobiosoma bosci, Chasmodes bosquianus, and Opsanus tau, and from the body, especially the setal, of two crabs, Neopanope texana and Rhithropanopeus harrisii. All animals containing D. marinum had scavenged oysters infected by the fungus. A few oysters became lightly infected when kept in aquaria with fishes that had been fed infected oyster tissue. It is concluded that nearly all dying oysters are consumed by animals during periods or normal mortality, so their parasites must pass through the digestive system of scavengers.

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Abstract. The distribution of Vibrio cholerae was examined in 2 Florida estuaries, Apalachicola and Tampa Bay. V. cholerae serotype non-01 was the most abundant serotype, being isolated from 45% of the oyster samples, 30% of the sediments, 50% of the waters, and 75% of the blue crabs: V. cholerae serotype 01 was isolated from only one oyster sample. Strong linear correlations between V. cholerae and temperature, salinity, or the other physical/chemical parameters measured, Escherichia coli, or fecal coliforms were not observed, but a range of temperatures and salinities appeared relevant to the distribution of the organism. The organism was present in the highest concentrations when salinities were 10 ppt-25 ppt and temperatures were 20°C-35°C. In-vitro growth curves of 95 V. cholerae environmental isolates further supported that 10 ppt-25 ppt was an ideal salinity range for the organisms. The results suggest that V. cholerae is a widely distributed organism in the nutrient-rich warm waters of the Gulf Coast estuaries.

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Abstract. Vertical distribution and trophic ecology of hatchetfishes were investigated in the eastern Gulf of Mexico. The four principal species, Argyropelecus aculeatus, A. hemigymnus, Sternoptyx diaphana and S. pseudobscura, ranged in abundance from 21-53 x $10^3/km^2$ in the upper 1,000 m. There is strong evidence for time-space and food resource partitioning among these species. Depth of habitat and diet characteristics are reflected in cryptic adaptations and functional morphology of the two genera.

Hopkins, T.L., D.M. Milliken, L.M. Bell, E.J. McMichael, J.J. Heffernan and R.V. Cano. 1981. The landward distribution of oceanic plankton and micronekton over the west florida continental shelf as related to their vertical distribution. J. Plankton Res. 3(4):645-658.
Abstract. The landward distributions of 69 plankton and 92 micronekton species over the west Florida continental shelf were examined in relation to their vertical distribution in the eastern Gulf of Mexico. Using linear and power-curve regressions, it was found that extent of landward occurrence is significantly correlated with bottom topography in terms

of bottom depth and distance from the open Gulf. Epipelagic plankton species were distributed considerable distances across the shelf whereas the mesopelagic shrimp and fish species were not found landward of slope stations. Possible factors affecting landward distribution, such as currents, vertical migration patterns, and predation, are discussed.

Hopkins, T.S. 1969. The Escambia River and Escambia Bay during Summer, 1969. U.S. Bureau of Commercial Fisheries. Washington, D.C. 54 pp.
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Hopkins, T.S. 1971a. Effects of pesticides on estuarine productivity, II. National Marine Fisheries Service.
Abstract. An ecological investigation of Mulatto and Thompson's bayous, Escambia Bay, Florida, was carried out in order to describe water quality and productivity. Water quality was determined biweekly at 15 stations, phytoplankton standing crop at 9 stations, and fish standing crop at 3 stations. Arochlor 1254, a polychlorinated biphenyl, was measured in representative samples of all animals collected.

Hopkins, T.S. 1971b. Effects of pesticides on estuarine productivity, III. National Marine Fisheries Service.
Abstract. Environmental parameters were measured in Mulatto and Thompson's Bayous, Escambia Bay, Florida, in an effort to describe the effects of pesticides on productivity. Five water quality parameters were monitored weekly at 12 stations and fish and plankton productivities were measured at 1 and 3 stations respectively. Arochlor 1254, a PCB, was monitored in several fish populations at 3 stations, and in an oyster population a one station. Dieldrin, DDD, DDE and DDT were measured in catfish held in cages at one station in Thompson's Bayou.

Hopkins, T.S. 1973a. Marine Ecology in Escarosa. State of Florida, Department of Natural Resources, Coastal Coordinating Council. Tallahassee, FL. 100 pp.

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Abstract. Zooplankton in the eastern Gulf, a warm temperature-subtropical region, seems to show distinct seasonality in abundance. In estuaries and on the southwest Florida shelf the biomass maximum appears in summer whereas in shelf waters of the central and northeastern Gulf the seasonal maximum occurs in winter. No seasonal trend is as yet evident for the Loop Current. Annually, averages for zooplankton biomass range from 0.88 to 0.80 ml/m^3, 0.02 to 0.10 ml/m^3 and 0.01 to 0.10 ml/m^3 in estuarine, shelf, and eastern Central Gulf regions, respectively. Locally both on the shelf and in estuaries biomass can be much higher. The principal holoplankton species in terms of biomass in estuaries appears to be Acartia tonsa. In summer meroplankton significantly augments plankton biomass in inshore waters. The principal hydrographic factors regulating zooplankton distribution in the eastern Gulf are the Loop Current, Mississippi River, and runoff from other small rivers. Upwelling generated by the Loop Current appears to be responsible for

the maximum on the southwest Florida shelf while the Mississippi and other river discharge along with cool meteorological conditions may be primarily responsible for winter peaks on the northern Gulf shelf. Biological factors in addition to annual temperature and runoff cycles may affect seasonal abundance of estuarine zooplankton. There is evidence that ctenophores and scyphomedusae play a major role in regulating dynamics of estuarine microzooplankton. Studies on taxonomic composition of plankton have shown that certain species of pteropods, foraminiferans, and planktonic shrimp can be used to define the Loop Current and other water mass in the eastern Gulf.

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Hopkins, T.S. 1979. Chapter 17. Macroepifauna. pp. 789-835. *In* The Mississippi, Alabama, Florida outer continental shelf baseline environmental survey. Bureau of Land Management, Washington, D.C.

Abstract. Macroepifaunal invertebrates were collected by dredging and trawling at 19 localities in the MAFLA tract of the eastern Gulf of Mexico over three seasons in 1977-1978. In addition, archived samples, from 20 dredge/trawl and 6 dive stations, were also analyzed. Results report a species list of 51 coelenterates, 260 molluscs, 250 decapod crustaceans, 15 stomatopod crustaceans, 9 Pycnogonida, and 95 Echinodermata to the generic rank and below; 26 Families of the Polychaeta are reported. Molluscs were found to be good potential indicators of seasonality and decapod crustaceans and echinoderms maybe good indicators of substrate at certain depths. Faunal assemblages are stronger along contour gradients and species numbers decrease with depth. Each station appears to have a characteristic assemblage which probably relates to such factors as annual temperature and substrate. There is continuing evidence that the MAFLA macroepifauna has its greatest affinites with West Indian stocks.

Hopkins, T.S. UNKNOWN YEAR-a. Sport fishing activity on Pensacola bridge and Pensacola main beach. Dauphin Island Sea Lab. Dauphin Island, AL.

Abstract. The sport fishery of Pensacola bridge and Pensacola main beach was studied during 1972. Counts and identifications of fish were made, as well as data on the fishing population/pressure.

Hopkins, T.S. UNKNOWN YEAR-b. Upper Escambia Bay Marsh Creek stagnation study. Dauphin Island Sea Lab. Dauphin Island, AL.

Abstract. Nine stations in Upper Escambia Bay were visited daily at dawn from

April to July, 1972 in an effort to document fish kills. Salinity, temperature and dissolved oxygen were measured daily, and fish were identified and counted when kills occurred.

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Abstract. The distributions of all 25 turtle species recorded from Florida (including 17 freshwater, five marine, one estuarine, and two terrestrial species) are mapped and reviewed. Freshwater turtle species density in Florida is among the highest in the world, with 13 species known to co-occur in the Escambia River, and possibly also in the Apalachicola, Wakulla, and Suwannee River basins. Although at least eight exotic species have been introduced into Florida, the only confirmed breeding populations of non-native forms are of Trachemys scripta elegans.

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Abstract. Meiofauna density in the eastern Gulf of Mexico - MAFLA region are in the range for densities from other parts of the world. Marine free-living nematodes comprised 70.3%. Density was highest in shallow inshore waters and decreased to lowest values in depth > 100 m. An inshore density depression is evident south of Mobile Bay were large river inputs apparently reduced meiofauna density. Meiofauna densities peak in moderate to high carbonate, medium to fine sands. Association patterns between and within stations, and between seasons do not show any definite trends. Correlations between taxa and physical parameters are nonexistent or weak. This is due probably to the limited taxonomic identification. Thirty families of marine free-living nematodes were described from nine selected stations. All are indicative of sandy habitats. Some general reports are records for the North American continent.

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Keppner, E.J. 1987b. Five new and one known species of free-living marine nematodes of the family Oncholaimidae (Nematoda: Enoplida) from northwest Florida, U.S.A. Trans. of the Amer. Microscop. Assoc. 106(3):214-231.

Abstract. Describes specimens collected from St. Andrew Bay and Lake Powell. Five new and one known species of the free-living marine nematode family Oncholaimidae are described from non-vegetated, subtidal sediments from St. Andrew Bay and Lake Powell, Bay County, Florida.

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Abstract. Describes specimens collected from St. Andrew Bay. Five new species of free-living marine nematodes of the order Enoplida are described from non-vegetated subtidal and beach sediments in St. Andrew Bay, Bay County, Florida, USA. Anticoma asupplementa n. sp. differs from the similar A. strandi and A. platonovae in the shape of the spicules and gubernaculum. Enoplolaimus pararegius n. sp. differs from the closely related E. regius in the number of setae constituting the subcephalic circle in the male and in the shape of the gubernaculum. Mesacanthoides brevicaudatus n. sp. differs from the other members of the genus in the absence of a gubernaculum and in the shape of the spicules. Trileptium americanum n. sp. differs from the similar T. otti in the position of the pre-anal supplement, length of spicules, presence of three post-anal, supplement-like structures, the absence of pre-anal ducts, and the presence of distinct mandibles. Eurystomina olsonae n. sp. differs from the other members of the genus in the presence of large, broad spicules with a large, barbed, and hooked tip, in the shape of the gubernaculum, and in the presence of large, elevated, labial setae.

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Spartina alterniflora were sampled from three marsh zones: Distichlis spicata leaves were collected only from the high marsh. Changes in nutrient composition in decomposing Juncus and Spartina were followed at three locations within the marsh as well as in a tidal stream. Zonal differences were significant in ash content of live Juncus leaves, ash and lipid of dead leaves, and ash, crude fiber, protein, lipid, and phosphorus content of rhizomes. Ash, lipid, and protein content of Spartina showed significant zonal differences. Annual decomposition of Juncus was 70% in low and upper marsh zones and 30% in the high marsh; Spartina litterbags lost 80 to 89% of weight at all marsh sites.

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Abstract. This series of profiles about coastal aquatic species of commercial, sport, and/or ecological significance is being jointly developed and funded by the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service. It is designed to provide coastal managers, engineers, and field biologists with an introduction to the subject species and a synopsis of the information necessary to relate expected changes (associated with coastal development)in the physiochemical characteristics of estuaries to changes in these selected biological populations. Each profile includes brief sections on taxonomy and identification followed by a narrative of life history, environmental requirements, ecological role, and (where applicable) the fishery of the subject species. A three-ring binder is used for this series to facilitate additions as new profiles are prepared.

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Lewis, T.E. et al. 1994. Effects of predator control on sea turtle nest success on the barrier islands of Apalachicola Bay. pp. 323. *In* K.A. Bjorndal et al., eds. Proceedings of the Fourteenth Annual Symposium on Sea Turtle Biology and Conservation. NOAA Technical Memorandum NMFS-SEFC-351.

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Lindall, W.H. and C.H. Saloman. 1977. Alteration and destruction of estuaries affecting fishery resources of the Gulf of Mexico. Mar. Fish. Rev.
Abstract. Both the commercial and recreational fishing industries of the Gulf of Mexico are overwhelmingly dependent on estuaries. About 90 percent of the commercial catch and 70 percent of the recreational catch are made up of species that are estuarine dependent. Man's alteration of estuaries is threatening these fishery resources. Data from recently published inventories of major natural and man-made estuarine features of the five Gulf coastal states indicated that the total Gulf estuarine area is 13,965,910 acres, including 7,891,611 acres of open-water area and 6,075,299 acres of emergent tidal vegetation. Submerged grass beds total 796,796 acres and live oyster beds amount to 158,611 acres. Major man-made alterations include 4,446 miles of federally maintained navigation channels, 138,458 acres of fill, and 795,609 acres closed to shell fishing because of pollution.

Lindberg, W.J. 1980. Behavior of a xanthid crab occupying bryozoan colonies, and patterns of resource use with reference to mating systems. Ph.D. Dissertation. Florida State University, Tallahassee, FL. 121 pp.

Lindberg, W.J., T.M. Bert and G.P. Genoni. 1992. Alternative hypotheses for low landings in the Cedar Key stone crab (genus Menippe) fishery, 1984-85. pp. 50-59. *In* T.M. Bert, ed. Proceedings: Symposium On Stone Crab (Genus Menippe) Biology and Fisheries. Vol. 50. Sarasota, FL (USA), 25-26 Apr. 1986.
Abstract. Year-to-year fluctuations in yield are to be expected in the Florida stone crab fishery, but depressed landings statewide during the 1983-84 season and a virtual collapse of the Cedar Key fishery in fall of 1984

caused us to evaluate factors that might affect stone crab abundance. Hypotheses are suggested and synthesized into a working model that could explain this extreme event as well as other less obvious annual variations in abundance. An equally important result of this study was that large gaps in our knowledge of stone crab ecology and life history were exposed when we were forced to make many assumptions concerning aspects of stone crab life history in order to derive a working model describing relationships of stone crab abundance to environmental factors.

Little, E.J. 1973. Reestablishment of destroyed oyster reefs. Florida Department of Natural Resources. Tallahassee, FL.

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Little, E.J., Jr. 1958. The sponge fauna of the St. George's Sound, Apalachee Bay, and Panama City regions of the Florida Gulf coast. Master's Thesis. Florida State University, Tallahassee, FL.

Little, E.J., Jr. 1973. Summary of Florida's Pensacola area oyster culture program. National Shellfish Association Proceedings. 64:4-5.

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Abstract. Comprehensive study of the sponges found in northwest Florida. Includes a key for identification.

Livingston, R.J. 1974a. Report on East Bay of the Apalachicola Bay system: Potential impact of pulp mill activities (Buckeye Cellulose Corporation) in the Tate's Hell Swamp. Florida State University. Tallahassee, FL. 6 pp.

Livingston, R.J. 1974b. A system for the determination of chronic effects of pollutants on the physiology and behavior of marine organisms. State University System of Florida. Gainesville, FL.

Livingston, R.J. 1975a. Impact of Kraft Pulp-mill effluents on estuarine and coastal fishes in Apalachee Bay, Florida. Mar. Biol. 32:19-48.
Abstract. Offshore areas in north Florida that received kraft pulp-mill effluents (kme) displayed significant increases in color and turbidity and reductions in dissolved O_2 compared with a nearby control area. Estuarine and marsh fish assemblages in areas of acute impact were severely reduced in numbers of individuals and species. Species diversity could not be used as an indicator of pollution per se, and was useful only when considered in conjunction with various other parameters. Transition areas (between polluted and unpolluted areas) showed increases in species diversity, individuals, and species. in general, the effects of kme on offshore fish assemblages appeared to be due to a complex combination of habitat alteration, reduced benthic productivity, and behavior reactions. Overall, there were some

significant changes in the biota such as reduced dominance and productivity in polluted areas that were similar for the various types of organisms sampled.

Livingston, R.J. 1975b. Resource management and estuarine function with application to the Apalachicola Drainage System. pp. 17. *In* Estuarine Pollution Control and Assessment - Proceedings of a Conference. Vol. 1.

Livingston, R.J. 1976a. Diurnal and seasonal fluctuations of organisms in a north Florida estuary. Estuar. and Coast. Mar. Sci. 4:373-400.

Livingston, R.J. 1976b. Environmental considerations and the management of barrier islands: St. George Island and the Apalachicola Bay System. pp. 86-102. *In* Barrier Islands and Beaches, Technical Proceedings of the 1976 Barrier Islands Workshop, Annapolis, MD. (Contribution No. 7.)

Livingston, R.J. 1976c. Resource management and estuarine function with application to the Apalachicola Drainage System (north Florida, USA). Florida State University. Tallahassee, FL. 23 pp.

Livingston, R.J. 1977a. Analysis of the environmental implications associated with the reopening of the Navarre Pass (Santa Rosa Sound, Santa Rosa County, Florida). Florida Department of Environmental Regulation, Division of Envir. Permitting. Tallahassee, FL.

Livingston, R.J. 1977b. Energy relationships and the productivity of Apalachicola Bay, Final Report. Florida Sea Grant Program, NOAA. 437 pp.

Livingston, R.J. 1977c. Estuarine and coastal research in Apalachee Bay and Apalachicola Bay. *In* Coastal Zone Management Symposium. University of West Florida,

Livingston, R.J. 1977d. Time as a factor in biomonitoring estuarine systems with reference to benthic macrophytes and epibenthic fishes and invertebrates. pp. 212-234. *In* J. Cairns Jr. et al., eds. Biological Monitoring Water and Effluent Quality, ASTM STP 607. American Society of Test. Mat.,

Livingston, R.J. 1978. Short and Long Term Effects of Forestry Operations on Water Quality and the Biota of the Appalachicola Estuary (north Florida, USA). Florida Sea Grant College Program, Technical Paper. 5.

Livingston, R.J. 1980. The Apalachicola Experiment: Research and Management. Oceanus. 23(4):14-21.

Abstract. Since 1971, a continuous, multidisciplinary research program has been carried out in the Apalachicola Bay system in northern Florida. The project originated as a routine assessment of the estuary, including monthly evaluations of water quality and biological productivity. Initial studies indicated relatively high levels of phytoplankton productivity and virtually no pollution from organochlorine compounds. The delicate hydrologic and nutrient regimes of the bay system were observed. To protect this ecosystem, ecologically sensitive lands were purchased by the state in order to establish sanctuaries.

Livingston, R.J. 1981. River-derived input of detritus into the Apalachicola Estuary. pp. 320-332. *In* Proceedings of the National Symposium on Freshwater Inflow to Estuaries. Vol. 1. U.S. Fish and Wildlife Service. Rpt. No. FWS/OBS-81/04.

Livingston, R.J. 1982. Trophic organization of fishes in a coastal seagrass system. Mar. Ecol. Prog. Series. 7:1-12.

Livingston, R.J. 1983a. Identification and analysis of sources of pollution in the Appalachicola River and Bay System. Florida State University. Tallahassee, FL.

Livingston, R.J. 1983b. Resource atlas of the Apalachicola Estuary. Report No. 55. Dept. of Biol. Sci., Fla. State Univ., Sea Grant College. Gainesville, FL. 64 pp.

Abstract. The colored charts and LANDSAT photographs in this small resource atlas vividly illustrate the environment, ecology, and potential of this unique coastal area of western Florida (where Alabama and Georgia touch on Florida). The public relations information type of presentation gives, on two-page spreads each, pictorial, topographic, and statistical data with textual summaries on the following subjects: 1) general overview of the river and bay system and the National Estuarine Sanctuary; 2) physical and chemical features of the barrier islands: depths, tides, and currents; temperature and salinity of surface and bottom waters; water quality features; rainfall and river flow; and nutrients and organic detritus; 3) biological features, covering emergent vegetation, submergent vegetation, microbial ecology, zooplankton, benthic macroinvertebrates, oysters, crabs, shrimp, anchovies, spot, croaker, sand seatrout, commercial and sport fisheries, food webs, and community organization; and 4) regional economics and planning of resource management. An extensive bibliography is appended. Seasonal and annual rainfall, river flow, and temperature variations are shown on bar charts and explained in the text.

Livingston, R.J. 1984a. Ecology of the Apalachicola Bay System: An estuarine profile. Rpt. No. FWS/OBS-82/05. Florida State University, Department of Biological Science. Tallahassee, FL. 165 pp.

Abstract. Twelve years of studies in the Apalachicola Bay system are reviewed. Included are data on geography, hydrology, chemistry, geology, and biology. The system is part of a major drainage area including four rivers and associated wetlands in Georgia, Alabama, and Florida. The system is in a relatively natural state, though hardly pristine. But economic development and population growth are beginning to threaten it. The area's economic and ecological importance as a food producer and shelter for diverse species has inspired a movement to protect its natural resources, including State and Federal land-purchase programs, integration of county land-use regulations into a comprehensive development, and creation of the Apalachicola River and Bay National Estuarine Sanctuary.

Livingston, R.J. 1984b. Long term effects of dredging and open-water disposal on the Apalachicola Bay System (Final Report). NOAA, Office of Coastal Management.

Livingston, R.J. 1984c. The relationship of physical factors and biological response in coastal seagrass meadows. Estuaries. 7(4A):377-390.

Livingston, R.J. 1984d. Trophic responses of fishes to habitat variability in coastal seagrass systems. Ecology. 65:1258-1275.

Livingston, R.J. 1985. Application of scientific research to resource management: Case history, the Apalachicola Bay system. pp. 103-125. *In* N.L. Chao and W. Kirby-Smith, eds. Proceedings of the International Symposium On Utilization of Coastal Ecosystems: Planning, Pollution and Productivity, 21-27 Nov. 1982, Rio Grande, Brazil. Vol. 1.

Abstract. An account is given of some of the results of a research program conducted in the northeast Gulf of Mexico, examining applications to resource management. The Apalachicola River and Bay system is one of the areas under study and is an important unpolluted and highly productive resource in the southeastern United States. The extensive scientific data base has been used as the basis of a comprehensive resource planning and management effort for the entire Apalachicola basin. This combination of research and planning has led to a variety of management applications, which include the purchase of ecologically sensitive wetlands and barrier islands and the development of advanced land-use plans at the local, state and federal levels.

Livingston, R.J. 1986a. The Choctawhatchee River-Bay system distribution of organisms, fisheries data, guild organization. Final Report. Vol. 3. Center for Aquatic Research and Resource Management, Florida State University. Tallahassee, FL.

Livingston, R.J. 1986b. Choctawhatchee River-Bay System historical trends, review of previous scientific studies, methods and materials, climatological features, sedimentary analysis, water quality features, nutrients, productivity and organic carbon. Center for Aquatic Research and Resource Management, Florida State University. Tallahassee, FL.

Livingston, R.J. 1986c. The Choctawhatchee River-Bay System Seagrass Experiments, planning and management initiatives. Final Report. Vol. 4. Center for Aquatic Research and Resource Management, Florida State University. Tallahassee, FL.

Livingston, R.J. 1986d. Field verification of bioassay results at toxic waste sites in three southeastern drainage systems. Vol. 1-8. Unpublished Manuscript. U.S. Environmental Protection Agency. Corvallis, OR.

Livingston, R.J. 1987a. Field Sampling in Estuaries: The Relationship of Scale to Variability. EPA/600/J-87/364; EPA-R-812053. Florida State Univ. Tallahassee, FL. 17 pp.

Abstract. The spatial/temporal scaling problem (i.e., fitting a given research question to the dimensions of variability of the study area) is particularly pronounced in highly variable systems such as estuaries. Long-term, multidisciplinary studies in the Apalachicola Bay system were used to evaluate variation of different physical, chemical, and biological factors. Specific limitations of weekly, monthly, and quarterly sampling intervals were directly related to the efficiency of the sampling gear, the range of variation in the study parameters, and

specific biological features (motility, recruitment, natural history) of infaunal macroinvertebrates and epibenthic organisms. There are families of spatial and temporal scaling phenomena that should be considered when establishing a given field sampling program.

Livingston, R.J. 1987b. Historic trends of human impacts on seagrass meadows in Florida. pp. 139-156. *In* M.J. Durako et al., eds. Proceedings, Symposium on Subtropical-Tropical Seagrasses of the Southeastern U.S. Florida Department of Natural Resources, Tallahassee, FL. (Florida Marine Research Publication No. 92.)

Livingston, R.J. 1991a. Dog Island: A barrier island ecosystem. Florida State University. Tallahassee, FL.

Livingston, R.J. 1991b. Historical relationships between research and resource management in the Apalachicola River estuary. Ecological Applications. 1(4):361-382.

Abstract. A continuous field effort has been carried out in the Apalachicola River estuary since March 1972. The information generated from this interdisciplinary study has been directly applied to the management of the Apalachicola resource by means of close associations among local, state, and federal officials and university scientists. During the early years, scientific data were instrumental in the prevention of the impoundment of the Apalachicola River. A series of regional studies was carried out to evaluate various forms of effects due to forestry activities, pesticides, and stormwater runoff from urban areas. A review was made of fisheries problems associated with dredging, overfishing, and marine pollution. Results of such studies were directly applied to local management questions. Research that linked the river wetlands with the estuary, in terms of the input of freshwater, nutrients, and organic matter, served as the basis for the purchase of extensive bottomland tracts. Analyses of the long-term scientific data indicated that dominant, commercially important estuarine populations are associated with river flow, local salinity characteristics, and biological (predation, competition) interactions with the salinity regime and food web structure. Such interactions are not straightforward, however; they reflect complex interactions of the freshwater influxes and biological responses in the estuary that are not well understood.

Livingston, R.J. and J.L. Duncan. 1979a. Climatological control of a north Florida coastal system and impact due to upland forestry management. pp. 339-381. *In* R.J. Livingston, ed. Ecological Processes in Coastal and Marine Systems. Plenum Press, New York, NY.

Livingston, R.J. and J. Duncan. 1979b. Short and long-term effects of forestry operations on water quality and epibenthic assemblages of a north Florida estuary. *In* R.J. Livingston, ed. Ecological Processes in Coastal and Marine Systems. Plenum Press,

Livingston, R.J. and E.A. Joyce Jr. eds. 1977. Proceedings: Conference on the Apalachicola Drainage System, 23-24 April 1976, Gainesville, Florida. (Publication No. 26) Florida Department of Natural Resources, Marine Research Laboratory. St. Petersburg, FL. 177 pp.

Livingston, R.J. and N.P. Thompson. 1975. Field and laboratory studies concerning the effects of various pollutants on estuarine and coastal organisms with application to the management of the Apalachicola Bay System. Florida State University, Florida Sea Grant Project. R/EM-1:574.

Livingston, R.J. et al. 1972. The effects of dredging and eutrophication on Mulat - Mulatto Bayou, Research No. 111308016. Florida State University. Tallahassee, FL. 172 pp.
Abstract. The effects of dredging and eutrophication of Mulat - Mulatto Bayou, off Escambia Bay, Pensacola, Florida, on water quality and biological populations was studied jointly by Florida State University and the University of Western Florida from May 1971 to June 1972.

Livingston, R.J., R.L. Iverson, R.H. Estabrook, V.E. Keys and J. Taylor Jr. 1974. Major features of the Apalachicola Bay System: Physiography, Biota, and Resource Management. Fla. Sci. 37(4):245-271.
Abstract. A review was made of various features of the Apalachicola Bay System. Unique physical, chemical, and biological features of this system combine to make it one of the most productive estuarine areas in the state of Florida. Primary productivity and secondary productivity are discussed in relation to various forcing functions (natural and man-induced). Problems associated with development include dredging, sewage effluents, pesticides and a number of up-river activities such as industrialization, cattle ranching, channelization, and damming. The Apalachicola Drainage System is viewed as one of the largest relatively unpolluted areas in the country. However, it is a neglected resource with little management or control; as such it is presently endangered by a number of activities.

Livingston, R.J. et al. 1975. Long-term fluctuations of epibenthic fish and invertebrate populations in Apalachicola Bay, Florida. U.S. National Marine Fisheries Service, Fisheries Bulletin. 74(2):311-321.

Livingston, R.J. et al. 1976a. Associations of epibenthic fishes and invertebrates. pp. 270-411. *In* Florida Sea Grant Technical Paper Final Report, Project R/EM-4. Florida Sea Grant College,

Livingston, R.J. et al. 1976b. Avoidance responses of estuarine organisms to stormwater runoff and pulp mill effluents. pp. 313-331. *In* Estuarine Processes: Uses, Stresses and Adaptation to the Estuary. Vol. 1. Academic Press, New York, NY.

Livingston, R.J., G.J. Kibylinski, F.G. Lewis III and Sheridan P.F. 1976c. Long-term fluctuations of epibenthic fish and invertebrate populations in Apalachicola Bay, FL. National Marine Fisheries Service, Fishery Bulletin. 74(2):311-321.
Abstract. A 3-year study was made concerning seasonal changes in the biota of Apalachicola Bay. The Apalachicola River causes a temporal progression of changes of various environmental parameters in the bay such as salinity, turbidity, nutrients, and detritus levels. Fishes were more widespread in their distribution throughout the bay than invertebrates. This was thought to be related to trophic response and habitat preference. High levels of relative dominance prevailed for both groups with the top three species of each group accounting for more than 80% of

the total number of individuals taken. Peak levels of monthly abundance of various dominant fish species tended not to overlap through a given 12-mo. interval. Invertebrate species abundance usually reached peak levels during summer and fall. The seasonal appearance and distribution of organisms in the Apalachicola Bay system was comparable to that found in other estuaries in the northern Gulf of Mexico. The temporal and spatial distribution of estuarine fishes and invertebrates was associated with species-specific reproductive cycles, trophic relationships, and habitat preferences. The Apalachicola estuary was viewed as a seasonally stable system, with regular temporal fluctuations of the biota through each annual cycle.

Livingston, R.J., R.S. Lloyd and M.S. Zimmerman. 1976d. Determination of sampling strategy for benthic macrophytes in polluted and unpolluted coastal areas. Bull. of Mar. Sci. 26(4):569-575.

Abstract. A series of repetitive samples of benthic macrophytes was used to determine the adequacy of various sampling strategies. Plants were collected at 14 stations in Apalachee Bay (Fla.) on the Gulf of Mexico. Two study areas were involved, one at the mouth of the unpolluted Econfina River, and one at the mouth of the adjacent Fenholloway River, contaminated by kraft mill effluents. Each station was located so as to represent a broad system, such as a grass bed or mud flat. Samples were taken between February 1974 and June 1975 by means of aluminum hoops 0.25 x 0.25 m dropped randomly into 10 x 15 m areas. Seagrasses and algae within each hoop were gathered by divers. A sample was composed of a series of 16 subsamples (0.25·sq m) taken at each station; at one station 40 subsamples (0.25·sq m) were taken. Total dry weight of the whole plant for each species was determined and recorded by station; relative dominance was computed for each station based on previous data. Using confidence limits, the number of subsamples needed to attain a given percentage of the true mean of biomass of each species was determined. A computer program was developed to determine the number of subsamples needed to achieve various levels of species accumulation. It was found that only a few subsamples were needed to determine the biomass of dominant species, while less common species required more sampling. For species determination, stations with low species diversity and reduced biomass required more samples.

Livingston, R.J., P.S. Sheridan, B.G. McLane, F.G. Lewis III and G.G. Kobylinshi. 1977. The biota of the Apalachicola Bay System: Functional relationships. Sponsor: Florida State Univ., Tallahassee.; National Oceanic and Atmospheric Administration, Rockville, Md. Office of Sea Grant. Florida Research Publication No. 26. Florida Univ. Gainesville, FL. 27 pp.

Abstract. Results of a long-term study of the Apalachicola Bay System were discussed with respect to the functional relationships of the biological assemblages of estuarine organisms with the physico-chemical environment. There is a regular seasonal variation in parameters directly related to river flow, including salinity, turbidity, color, and detritus deposition. Thousands of tons (wet weight) of detritus of terrestrial origin such as leaf litter and wood debris are swept into the bay each year by the Apalachicola River. The benthic infauna and epifauna of the Apalachicola Bay System were described with special attention to the dominant species. Organisms such as blue crabs, penaeid

shrimp, sea trout, and other commercially important groups utilize this system as a major nursery area. The system is dependent to a considerable degree on river based parameters and influxes of inorganic and organic substances from upland areas.

Livingston, R.J., N.P. Thompson and D.A. Meeter. 1978. Long-term variation of organochlorine residues and assemblages of epibenthic organisms in a shallow north Florida estuary. Mar. Biol. 46(4):355-372.

Abstract. A 4-year study (1972-76) determined long-term trends of DDT, DDE, DDD, PCBs, and mirex and trawl-susceptible organisms in a shallow, river-dominated estuary in north Florida (Apalachicola Bay). Moderate levels of such compounds were found in various species prior to the restricted use of DDT in 1972. A subsequent precipitous decline in organochlorine residues was attributed to decreased upland usage, major flushing of the river basin in early 1973, and various factors associated with estuarine function. No mirex was found in sediments or aquatic organisms. Apparently, the half-life of organochlorines is relatively short in this bay system. During the study seasonal river flow fluctuations dominated water color, turbidity, salinity, nutrients (NO_3), chlorophyll, and the temporal succession of fish in the bay. Certain long-term trends offish associations were noted; relative dominance of key fish species declined and stabilized while bay-wide species richness and diversity increased with time. Qualitative changes in species representation determined the long-term pattern of community variability. This was consonant with a distinctive fish fauna during the 1st year of sampling. The bay anchovy Anchoa mitchilli was dominant during 9 of the first 12 months of the project; this influenced the time-related changes in community indices. Temporally clustered fish associations reflected the importance of river flow in the estuarine environment. Direct correlation of fish distribution with the rapid disappearance of organochlorine compounds was complicated by a periodic natural phenomena such as storms and river fluctuations.

Loftin, H. 1962. A study of boreal shorebirds summering on Apalachee Bay, Florida. Bird Banding. 33:21-42.

Lomolino, M.V. 1977. The ecological role of the Florida manatee (Trichechus manatus latirostris) in water hyacinth-dominated ecosystems. Master's Thesis. University of Florida, Gainesville, FL. 169 pp.

Lopez, A.M. and P.J. Pristas. 1982. Recreational billfish survey newsletter-oceanic gamefish investigations. National Marine Fisheries Service, Southeast Fisheries Center, Ocean Pelagics Team. Miami, FL.

Abstract. The National Marine Fisheries Service's (NMFS) Miami Laboratory has been conducting surveys of recreational billfishing in the Gulf of Mexico since 1971 and in the Atlantic Ocean and Caribbean Sea since 1972. These surveys were initiated to monitor trends in billfish catch and effort as part of a commitment by the United States to participate in cooperative international investigations through the International Commission for Conservation of Atlantic Tunas (ICCAT), centered in Madrid, Spain. The ICCAT is responsible for coordinating and guiding scientific investigations on stocks of tunas and tuna-like fishes, including billfishes, in the Atlantic Ocean and adjacent seas. Data collected through the NMFS surveys are used in population modeling and

in annual assessments of the status of stocks of Atlantic billfishes, and these results are presented to the international scientific community at ICCAT each year. In addition to the annual monitoring of recreational billfishing throughout the Western North Atlantic, Caribbean Sea, and Gulf of Mexico, NMFS has initiated special surveys designed to determine the total catch of billfishes by U.S. recreational fishermen. One such survey was conducted in 1977 and 1978 and follow-up surveys were conducted in the Gulf of Mexico in 1981 and in the Atlantic, Caribbean Sea, and Gulf of Mexico in 1983. The recreational billfish surveys described in this newsletter are part of a larger research program conducted by the Miami Laboratory's Oceanic Pelagics Team.

Lowe, J.A. et al. 1991. Fish kills in coastal waters 1980-1989. NOAA, National Ocean Service, Office of Ocean Resources Conservation and Assessment, Strategic Environmental Assessment Division.

Lukens, R.R. 1975. The succession of ichthyofauna on a new artificial reef in the northern Gulf of Mexico. Rpt. No. MASGP-75-027. Mississippi-Alabama Sea Grant Consortium. Ocean Springs, MS.

Abstract. A study was conducted from July, 1975, through October, 1977, to monitor the succession of ichthyofauna on a new artificial reef in the northern Gulf of Mexico. Sixty species of fish from 33 families were recorded at the study reef. The Shannon-Weiner species diversity index for the study ichthyofauna ranged from 0.407 to 0.937, exhibiting a positive correlation with seasonal changes in temperature. Values calculated for species richness, evenness, and dominance support the Shannon-Weiner index results. Fifty-four species from that site ranged from 0.000 to 0.809. No pattern of increase or correlation with seasons was indicated at the control. Again the Shannon-Weiner index results were supported by indices of species richness, evenness, and dominance. Fifty-eight percent of the species reported from the experimental reef were primary reef fish. The control site revealed only 15% of species in the primary reef fish group. Secondary reef fish were predominant at the control site with 48%. Colonization at the experimental reef was effected by decreasing water temperatures in winter periods causing several species of fish to be seasonally absent from the reef fauna. The majority of those species returned with the advent of warmer water temperatures. The colonization-decolonization rate curves inadequately illustrated true colonization and decolonization when recurrent species were given the same importance as new species. If recurrent species are not considered, the colonization-decolonization curves more accurately describe actual colonization and decolonization. The modified colonization rate curve conforms to the MacArthur-Wilson theory of island biogeography, however, the decolonization rate does not. These results closely correlate with work done by Smith on patch reefs on the western Florida shelf.

Lukens, R.R. 1981. Ichthyofauna colonization of a new artificial reef in the northern Gulf of Mexico. Gulf Res. Rep. 7(1):41-46.

Abstract. Ichthyofaunal colonization of a new artificial reef was monitored from June 1975 through September 1977. Direct observations were accomplished using SCUBA. Theories of colonization and species equilibrium of islands and island-like habitats were applied to the

colonization data from the artifical reef. Sixty species of fishes from 33 families were recorded at the reef. Fifty-two percent of these species were primary reef fishes and 48% were secondary. Colonization data were produced only from the occurrence of primary reef fish. Data indicate that ichthyofaunal communities in the northern Gulf of Mexico are heavily influenced by seasonal changes in temperature, and that colonization by reef fish in that area does not conform to theories of immigration and extinction for island biotas. These results concur with similar work conducted on reef ichthyofauna in the eastern Gulf of Mexico.

Lyons, W.G. 1970. Memoirs of the Hourglass Cruises: Scyllarid lobsters (Crustacea: Decapoda). Florida Department of Natural Resources Marine Research Laboratory. I(4):74.

Lyons, W.G. 1976. Distribution of Cerithium litteratum (Born) (Gastropoda: Cerithiidae) off western Florida. Veliger. 18:375-377.

Lyons, W.G. 1980. Molluscan communities of the west Florida shelf. Bulletin of the Malacological Union. 45:37-40.

Lyons, W.G. and D.K. Camp. 1982. Zones of faunal similarity within the Hourglass Study Area. pp. 44-46. *In* Proceedings, 3rd Annual Gulf of Mexico Information Transfer Meeting. U.S. Department of the Interior, Minerals Management Service, Washington, D.C.

Lyons, W.G. and S.B. Collard. 1974. Benthic invertebrate communities of the Eastern Gulf of Mexico. pp. 157-165. *In* R.E. Smith, ed. Proceedings, Marine Environmental Implications of Offshore Drilling in the Eastern Gulf of Mexico Conference/Workshop. (Contribution No. 233, FDNR/MRL) State University System of Florida, Institute of Oceanography, St. Petersburg, FL.

Lyons, W.G. et al. 1971. Preliminary inventory of marine invertebrates collected near the electrical generating plant, Crystal River, Florida, in 1969. Florida Department of Natural Resources Marine Research Laboratory. Professional Paper Series No. 14:45.

Lytle, J.S. and T.F. Lytle. 1977a. High molecular weight hydrocarbons in MAFLA sediments and benthic algae and rig monitoring sediments. MAFLA-OCS Program, Technical Report. Bureau of Land Management. Washington, D.C.

Lytle, J.S. and T.F. Lytle. 1977b. Sediment hydrocarbons as environmental indicators in the northeast Gulf of Mexico. *In* D.A. Wolfe, ed. Fate and Effects of Petroleum Hydrocarbons in Marine Organisms and Ecosystems. Pergamon Press.

Lytle, J.S., T.F. Lytle, J.N. Gearing and P.J. Gearing. 1979. Hydrocarbons in benthic algae from the eastern Gulf of Mexico. Mar. Biol. 51:279-288.

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were within a narrow range, 3.16 to 6.38, and indicated slightly enriched to enriched water. Of the total 186 benthic invertebrate taxa, 82% had quality values 0 to 5 that indicate overall clean water conditions. The predominant benthic invertebrates in the Suwannee River were detritivorous and the communities reflected oligotrophic to mesotrophic waters.

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piles from channel dredges can indirectly affect the ecology and usefulness of estuaries by interfering with water circulation and altering salinity. The basic hydrological concepts which determine the effects of dredging should be applicable in other areas. Extensive regulations apparently are not necessary to protect water quality in open water dredging situations but spoil disposal practices from channel dredges must be reconsidered and appropriate new disposal plans developed.

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largely on zooplankton. The importance of zooplankton decreases with ontogenetic development except in certain planktivorous species. As the importance of zooplankton decreases, benthic organisms increase in importance. Some species remain benthic feeders throughout their life cycle while in others, the contribution of bottom animals decreases, and they are replaced in the diet by larger macrocrustaceans and macromobile organisms. These higher predators feed in the water column on actively swimming prey. From these considerations, a conceptual model of the trophic interrelationships in the benthic zone on the continental shelf is proposed. Two food chains are postulated: a planktonic chain involving conversion of energy fixed by phytoplankton to zooplankton for utilization by higher consumers, and a benthic chain involving conversion of energy fixed in organic detritus to detritus feeders for utilization by consumers in the sediment and eventually consumers in the water column.

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Abstract. A comprehensive study of the hydrography, sedimentology and benthic fauna of Panama City Beach. Includes information on the effect of Hurricane Eloise on the benthic fauna. This study presents basic scientific data on the benthic fauna and surface sediments of the nearshore zone of Panama City Beach, Florida, before restoration of the beach, and the results of a study on the effect of Hurricane Eloise on the benthic fauna in the swash zone of Panama City Beach. Surface sediments were analyzed for particle-size distribution, percent carbon, organic carbon and carbonate, and statistical factors. The surface sediments exhibited uniformity over time and location. The benthic invertebrates were represented by 170 species in 26 major taxa. The taxon with the most abundant species (69) was the phylum Polychaeta. The fauna was dominated by 14 species which constituted 80% of the collected individuals. The number of species and the diversity index were lowest in the swash zone and highest at the offshore stations at a depth of 30 feet. Number of individuals was highest in May and August and lowest in November and February. Of the invertebrate species, 21 may be new to science; 15 of the 21 are amphipods and 4 of these are among the most abundant species occurring in the nearshore zone. Correlation of animal abundance to selected sedimentological parameters was low. Mean grain size was the most significant sediment factor tested. The effect of Hurricane Eloise on Panama City Beach was extensive. The beach and primary sand dune were severely eroded. The number of individuals continued to increase for 6 days following the storm; thereafter, it decreased. The number of species increased also, reaching a peak on the third day after the storm, and then it decreased.

Saloman, C.H. and W.A. Fable Jr. 1981. Length-frequency distributions of recreationally caught reef fishes from Panama City, Florida in 1978 and 1979. NOAA Tech. Memo. NMFS-SEFC-61:22.

Abstract. A series of bar charts depict the length frequency of over 10,000 fishes, representing 13 species of reef fishes.

Saloman, C.H. and S.P. Naughton. 1977. Effect of Hurricane Eloise on the benthic fauna of Panama City Beach, Florida, USA. Marine Biology. 42(4):357-363.

Abstract. Compares the populations of organisms inhabiting the swash zone, before and after the hurricane that struck in September 1975. The effect of Hurricane Eloise in Sept., 1975 on the benthic fauna inhabiting the swash zone on Panama City Beach, Florida, USA is described. Damage by the storm to the beach and property was considerable. The effect of the storm on the benthic invertebrates was not adverse, as the number of individuals occurring in the swash zone was about the same after the storm as before. The number of species increased after the storm, but later decreased to approximate numbers before the storm. The increase in the number of species was mainly due to the influx of species that normally occur farther offshore of the swash zone. The lack of heavy rainfall that usually accompanies a hurricane was probably a factor enabling benthic organisms that normally live in high salinities to survive.

Saloman, C.H. and S.P. Naughton. 1978. Benthic macroinvertebrates inhabiting the swash zone of Panama City Beach, Florida. Northeast Gulf Science. 2(1):65-72.

Abstract. A collection and analysis of the invertebrates found in the swash zone (area of the beach washed by waves) of Panama City Beach.

Saloman, C.H. and S.P. Naughton. 1984. Beach restoration with offshore dredged sand: effects on nearshore macroinfauna. NOAA Tech. Memo. NMFS-SEFC-133:20.

Abstract. A study on the ecological effects of beach restoration at Panama City Beach after Hurricane Eloise. This report discusses the effects of depositing dredged material from offshore on benthic macro-invertebrates inhabiting the swash zone and the first sandbar at Panama City Beach, Florida. The dredged material was similar to existing beach material at most sites. The turbidity was relatively low, except near the area of deposition, because alongshore currents dispersed the turbid water. The numbers of individuals at treated stations in the swash zone were reduced after deposition, and five to six weeks later, populations assumed levels comparable to untreated stations. No notable effects of deposition were observed on fauna inhabiting the sandbar. The significant differences in the number of species and individuals between treated and untreated stations both before and after deposition indicated that community composition, distribution, and abundance of macroinvertebrate fauna at similar stations (swash zone and sandbar) may differ naturally, even when the stations are located along the same beach.

Saloman, C.H., S.P. Naughton and J.L. Taylor. 1982a. Benthic community response to dredging borrow pits, Panama City Beach, Florida. U.S. Army Corps of Engineers, Coastal Engineering Research Center, Miscellaneous Report. 82-3:138.

Abstract. An ecological study of the beach invertebrate populations before and after dredging for beach nourishment. Includes hydrographic and sediment data. This report gives biological and physical oceanographic data from baseline work, and studies of dredged and undredged sediments before and after dredging (9-meter contour) for beach nourishment at Panama City

Beach, Florida. These studies were designed to show major short-term environmental effects of offshore dredging and included analyses of hydrology, sediments, and benthos. Hydrological measurements were limited to water temperature and salinity. Analysis of surface sediments included particle-size distribution and carbon chemistry. Average and extreme water temperature and salinity were recorded. Regional nearshore sediments proved to be fine sand, containing less than 1% silt-clay, that was moderately well to well sorted, symmetrical to coarsely skewed, and leptokurtic. Total carbon content averaged less than 0.30%. Over a one year postdredging study, sediment samples from borrow pits showed little variation from these general features. In studies of the benthos, 362 species and 58,068 individuals were recorded among 14 invertebrate phyla and bone fishes. Dominant groups by species and abundance included annelida, mollusca, and arthropoda (crustacea). Faunal comparisons between dredged and undredged areas were made. Information obtained showed that recovery began soon after dredging was complete, or nearly so, within 1 year. These results were similar in most respects to those from study of offshore dredging elsewhere in comparable geographic settings.

Saloman, C.H., S.P. Naughton and J.L. Taylor. 1982b. Benthic faunal assemblages of shallow water sand and seagrass habitats, St. Andrew Bay, Florida. Performed for the U.S. Fish & Wildlife Service. Panama City, FL. 565 pp.

Abstract. Species occurrence and populations at 149 stations in St. Andrew Bay. Includes information regarding the seagrasses and sediments.

Sanders, R.M., Jr. 1983. Hydrologic, diel and lunar factors affecting fishes on artificial reefs off Panama City, Florida. Master's Thesis. Texas A&M University, College Station, TX. 139 pp.

Sastry, A.M. 1961. Studies on the bay scallop, Aequipecten irradians concentricus Say, in Alligator Harbor, Florida. Ph.D. Dissertation. Florida State University, Tallahassee, FL. 118 pp.

Saunders, R.P. and D.A. Glenn. 1969. Diatoms. (Memoirs of the Hourglass Cruises.) Florida Department of Natural Resources, Marine Research Laboratory. St. Petersburg, FL.

Savage, T. 1972a. Florida mangroves: A review. Florida Department of Natural Resources Laboratory, Leaflet Series. 7(2):1-15.

Savage, T. 1972b. Florida mangroves as shoreline stabilizers. Florida Department of Natural Resources Marine Research Laboratory. Professional Paper No. 19

Savage, T., J.R. Sullivan and C.E. Kalman. 1975. An analysis of stone crab (Menippe mercenaria) landings on Florida's west coast, with a brief synopsis of the fishery. Florida Department of Natural Resources, Marine Research Laboratory. St. Petersburg, FL. 37 pp.

Savastano, K.J., K.H. Faller and R.L. Iverson. 1984. Estimating vegetation coverage in St. Joseph Bay, Florida with an airborne multispectral scanner. Photogrammetric Engineering and Remote Sensing. 50(8):1159-1170.

Abstract. A four-channel multispectral scanner (MSS) carried aboard an aircraft was used to collect data along several flight paths over St. Joseph Bay, Florida. Various classifications of benthic features were defined from the results of ground-truth observations. The classes were statistically correlated with MSS channel signal intensity using multivariate methods. Application of the classification measures to the MSS data set allowed computer construction of a detailed map of benthic features of the bay. Various densities of seagrasses, various bottom types, and algal coverage were distinguished from water of various depths. The areal vegetation coverage of St. Joseph Bay was not significantly different from the results of a survey conducted six years previously, suggesting that seagrasses are a very stable feature of the bay bottom.

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Scheibling, R.E. 1981. Differences in body size and growth rate between Echinaster morphs from the Gulf of Mexico. International Echinoderm Conference. Tampa, FL.

Schmidley, D.J. 1981. Marine mammals of the southeastern United States Coast and the Gulf of Mexico. U.S. Fish and Wildlife Service, Office of Biological Services Report No. FWS/OBS-80/41. 163 pp.

Abstract. All of the available data from a 1979 study/survey on the distribution and abundance of marine mammals in the study area was synthesized for this report. The information for cetaceans and pinnipeds is presented in two sections: an analysis of observations and individual species accounts. The former compares the frequency of strandings, sightings, and captures for each species each month. The species accounts present distribution, abundance, status, seasonal movements, and life history for 35 species.

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Schomer, N.S. 1974. Systems models and simulations of the recovery of Escambia Bay. Master's Thesis. University of West Florida, Pensacola, FL. 91 pp.

Abstract. The purpose of this investigation is to develop and simulate system models of Escambia Bay that will be useful in evaluating the potential for recovery of the Bay subsequent to the abatement of pollution sources. These models will be used to assess the responses of certain critical variables to alterations in flows from various sources from both within and outside of the study parameter.

Schooley, J.K. 1980. The structure and function of warm temperate estuarine fish communities. Ph.D. Dissertation. University of Florida, Gainesville, FL.

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Serafy, D.K. 1979. Echinoids (Echinodermata: Echinoidea). *In* Memoirs of the Hourglass Cruises. 5(3) Fla. Dept. of Nat. Resour., Mar. Res. Lab., St. Petersburg, FL.

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Servies, J.A. 1974. A bibliography of west Florida. Vol. 1-3. University of West Florida, John C. Pace Library. Pensacola, FL.

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Shabica, S.V., N.B. Cater and E.W. Cake. 1983. Proceedings of the Northern Gulf of Mexico Estuaries and Barrier Islands Research Conference, June 13-14, 1983, Biloxi, MS. National Park Service, Southeast Regional Office. Atlanta, GA. 119 pp.

Abstract. These proceedings include papers given at the Northern Gulf of Mexico Estuaries and Barrier Islands Research Conference. This conference was held to bring together much of the current knowledge of barrier islands and estuaries of the northern Gulf. Fifteen of the forty-four presentations given at the conference are published here as format papers. The volume is divided into four sections; estuaries, offshore petroleum exploration and development, barrier islands, and resources management.

Shaffer, R.N. 1993. Bibliography of research on St. Andrew Bay, its tributaries, and the nearby coastal waters of Bay County, Florida. National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Technical Memo. NOAA-TM-NMFS-SEFSC-320:67.

Abstract. The indexed bibliography is one of a three-part project, the goal of which is to collect and to make available the research that has been

performed on St. Andrew Bay. Many of the publications are considered 'gray literature'--they have not appeared in professional, refereed journals. As a result, much of the literature is difficult to access by means of the traditional scientific indexes. It is hoped that the compendium will serve as a guide to what has been accomplished so far in understanding the biota and ecology of St. Andrew Bay, its tributaries, and the nearby coastal waters.

Shafland, P.L. 1979. Non-native fish introductions with special reference to Florida. Fisheries. 4:18-24.

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Shaw, M. 1975. Managing St. Vincent's Wildlife. Florida Wildlife. 29(6):2-4.

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Sheridan, P.F. 1979a. Three new species of Melita (Crustacea: Amphipoda), with notes on the amphipod fauna of the Apalachicola Estuary of NW FL. Northeast Gulf Sci. 3(2):60-73.

Sheridan, P.F. 1979b. Trophic resource utilization by three species of sciaenid fishes in the Northwest Florida estuary. Northeast Gulf Sci. 3(1):1-14.
Abstract. Food habits of Atlantic croaker (Micropogonias undulatus), spot (Leiostomus xanthurus), and sand seatrout (Cynoscion aranarius) were examined in 1976 collections from Apalachicola Bay, Florida. Ontogenetic, spatial, and temporal aspects of diet were considered. Polychaetes were the main food of croakers over all collections, followed in importance by detritus, fishes, insect larvae, mysids, and infaunal shrimp. Diet specialization occurred with growth of croakers, so that one or two food types dominated the diet. Polychaetes and harpacticoid copepods dominated the average spot diet, followed by detritus, bivalves and nematodes. Several distinctive patterns in feeding were noted on ontogenetic and spatial bases, but not on a temporal basis. Intraspecific diet correlation indicated similar feeding patterns in all but the smallest (20-29 mm) and largest (100-109 mm) size classes examined.

Sheridan, P.F. and R.J. Livingston. 1979. Cyclic trophic relationships of fishes in an unpolluted, river-dominated estuary in north Florida. pp. 143-161. *In* Ecological Processes in Coastal and Marine Systems. Plenum Press, New York, NY.

Sheridan, P.F. and R.J. Livingston. 1983. Abundance and seasonality of infauna and epifauna inhabiting a Halodule wrightii meadow in Apalachicola Bay, Florida. Estuaries. 6(4):407-419.
Abstract. The fauna inhabiting a Halodule wrightii meadow in Apalachicola Bay, Florida, was studied from March 1975 through February 1976. The infaunal community was sampled by monthly coring. Fifty-eight species were recorded, averaging 35 species per month. A maximum faunal abundance of

104,338 organisms per square meter in April was one of the highest infaunal densities recorded in the literature. Sixteen species accounted for 84% of the total numbers and 80% of the total biomass over the study period. Numerical dominants were Hargeria rapax, Heteromastus filiformis, Ampelisca vadorum, Aricidae fragilis), and oligochaetes. Biomass dominants were Tagelus plebeius, Neritina reclivata, Ensis minor, and Haploscoloplos fragilis. Life history notes are given for several dominant species. Epibenthic fishes and macroinvertebrates were sampled by monthly trawling. Twenty-three species of fishes (mostly juveniles) were collected near the coring site, with most species and individuals recorded during the months May through September.

Sherman, K.M. et al. 1983a. A technique for subsampling meiofauna. Presented at Benthic Ecology Meeting, Florida Institute of Technology, Melbourne, FL.

Sherman, K.M., J.A. Reidenauer, D. Thistle and D. Meeter. 1983b. Role of a natural disturbance in an assemblage of marine free-living nematodes. Mar. Ecol. Progr. Ser. 11(1):23-30.

Abstract. One of the predictions of theoretical treatments of soft-bottom benthos is: if disturbance were responsible for the persistence of a species in a community, that species should become disproportionately abundant in recently disturbed patches. This prediction was investigated using marine free-living nematode species in subtidal (2 to 3 m depth) sediments off the Florida panhandle (29°54.55'N, 84°31.45'W), frequently disturbed by stingrays (Dasyatis sabina). In disturbed sediments nematode densities gradually increased over 4 days until they exceeded abundances in background sediments 96 h after the initial disturbance. None of the species examined responded to disturbance in the manner expected. The authors conclude that small-scale natural disturbances are not important in the maintenance of nematode species in this community.

Sherrod, C.L. and C. McMillan. 1985. The distributional history and ecology of mangrove vegetation along the northern Gulf of Mexico coastal region. Contrib. Mar. Sci. 28:129-140.

Shier, C.F. 1965. A taxonomic and ecological study of shallow water hydroids of the northeastern Gulf of Mexico. Master's Thesis. Florida State University, Tallahassee, FL. 170 pp.

Abstract. Monthly samples of shallow water hydroids were collected from 6 station in the northeastern Gulf of Mexico for one year beginning in July, 1963. Environmental notes on temperature, salinity, abundance, and bottom type were kept.

Shines, J.E. 1979. Distribution of mangrove communities: State of Florida. U.S. Environmental Protection Agency. Final Rpt. Contract No. 68-03-2636

Shinn, E.A., B.H. Lidz and C.D. Reich. 1993. Habitat impacts of offshore drilling: eastern Gulf of Mexico. (OCS Study MMS 93-0021) U.S. Department of the Interior, Minerals Management Service, Gulf of Mexico OCS Region. New Orleans, LA. 78 pp.

Abstract. In the survey six offshore exploratory drill sites in a variety of environments and water depths were examined using a small research submersible. Sites varied from locations off northwest Florida to as far west as offshore Alabama. Water depths ranged from 21 m (70 ft) to 149 m

(489 ft), and bottom sediments ranged from carbonate mud to shelly quartz sand and silt to hard limestone. The age of the sites ranged from 15 months to 17 years. In a previous MMS-funded study, Shinn et al. (1989) and Dustan et al. (1991) examined eight sites off south Florida, where the age of the sites ranged from 2 to 29 years. The study documented repeatedly variability of impact from site to site.

Shipp, R.L. and S.A. Bortone. 1978. Demersal fishes of the MAFLA lease area. pp. 848-888. *In* Dames and Moore, ed. MAFLA Final Report. Vol. II, Chapter 19. BLM,

Shipp, R.L. and S. Bortone. 1979. Chapter 19. Demersal fish. pp. 861-867. *In* The Mississippi, Alabama, Florida outer continental shelf baseline environmental survey. Bureau of Land Management, Washington, D.C.

Abstract. Demersal fishes from the MAFLA lease area were collected during four sampling periods: summer 1976, summer 1977, fall 1977, winter 1978. All specimens were identified, weighed, measured, and archived. Data were submitted to the data management group of Dames & Moore for analysis, which were then interpreted. Initial indications are of significant range extensions of fishes in the northeastern Gulf of Mexico, especially in the vicinity of the northeast segment of the De Soto Canyon. Several undescribed species were discovered during the effort period. Families containing species of especial concern to the MAFLA goals are discussed. Data analysis techniques are utilized describing various biological parameters. In addition, samples collected during 1975-1976 as a component of an earlier MAFLA effort were incorporated into the analysis.

Shipp, R.L. and T.S. Hopkins. 1978. Physical and biological observations of the northern rim of the DeSoto Canyon made from a research submersible. Northeast Gulf Sci. 2(2):113-121.

Abstract. During June, 1978, the research submersible DIAPHUS completed 27 dives in the north central Gulf of Mexico. Fourteen of these were concentrated on and around the high relief, northern ledge or rim of the DeSoto Canyon, located at depths of 50-60 m, and approximately 25 km south of Navarre, Florida. The ledge is composed of limestone outcroppings. The invertebrate fauna is characterized as two principle assemblages, one associated with a sand-shell-coraline-algae slope and the other with a limestone block ledge. The ichthyofauna is dominated by deep water reef species, thirty of which are identified and their habitat and abundance described.

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Sikora, W.B. and J.P. Sikora. 1982. Habitat suitability index models: southern kingfish. U.S. Fish and Wildlife Service, Office of Biological Services Report FWS-OBS-82-10.31. 22 pp.

Simmons, A.T. 1972. The dynamics of nitrogen and phosphorus in a bayou estuary. Master's Thesis. University of West Florida, Pensacola, FL. 46 pp.

Abstract. The nitrogen and phosphorus cycles and dynamics were described for

Bayou Texar, Florida, by monitoring levels of nitrate, nitrite, ammonia, orthophosphate, organic nitrogen, organic phosphorus at five stations from June, 1971 to February, 1972.

Simonson, J.L. and R.J. Hochberg. 1992. An analysis of stone crab (genus Menippe) claws and their use in interpreting landings on Florida's west coast. pp. 26-35. *In* T.M. Bert, ed. Proceedings of a Symposium On Stone Crab (Genus Menippe) Biology and Fisheries. Sarasota, FL (USA), 25-26 Apr. 1986)

Abstract. Size-specific data on stone crab claw type (crusher, pincer, regenerated), "handedness" (right crusher, left crusher), and type (good, problem, bad) of break (point at which the claw had been broken from the body) were obtained from claws landed at processing houses in four Florida counties near the openings and closings of the 1983-84 and 1984-85 stone crab harvesting seasons. Right-handed crushers constituted 77% and 60% of all claws examined during the 1983-84 and 1984-85 seasons, respectively. Good breaks (indicative of the highest probability of survival of declawed crabs) were observed on 70% of the claws; problem and bad breaks were observed on 19% (1983-84) and 11% (1984-85) of the claws, respectively. Jumbo claws had the lowest frequency of good breaks. The percentage of claws with good breaks was generally higher in Wakulla County than in Collier County, probably because techniques for handling captured crabs differed in the two areas. Regenerated claws constituted 7.6% of all claws sampled; most were medium-sized pincers and intermediates (claws with dentition intermediate between the patterns characteristic of original pincer and crusher claws). The frequency of regenerated claws decreased significantly as claw size increased. In Collier County, the proportions of regenerated claws found in closing season samples from both seasons were lower than those found in the respective opening-season samples; a similar decrease in the proportion of regenerated claws between the opening and closing of the season was seen in the 1984-85 season at Wakulla County.

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Abstract. Color changes in the sera of the sand dollar, Mellita quinquies perforata (Leske), were found to reflect environmental stress. This response was used to map the distribution of stress in a natural environment, Cedar Key, Florida (northeastern Gulf of Mexico).

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Abstract. One hundred one reef-fish species representing 38 families were collected and/or observed at 12-40 m depths in the eastern Gulf of Mexico between May 1970 and October 1972. A toxic dinoflagellate bloom (Gymnodinium breve) and subsequent stress conditions occurring within the study area during summer 1971 resulted in mass mortalities of reef biotas over at least 1536 km of central west Florida shelf. Preliminary observations on reef-fish succession following the G. breve red tide are presented and discussed.

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Abstract. Some 3460 benthic samples of S. salomani collected in the nearshore zone of Panama City beach Florida were examined. Information on the sedimentology, distribution and abundance, sex ratio and fecundity is presented.

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Abstract. The distribution and zoogeography of the decapod fauna of the continental shelf of the northeastern Gulf of Mexico was studied by sampling 108 stations on 14 cruises of the R/V Tursiops from October, 1970 to October, 1971. Specimens were identified, sexed and counted. Associated data includes temperature, salinity, depth and bottom type.

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Abstract. During a survey of macrobenthos at 4 sites in Apalachee Bay, Florida, USA, some specimens of L. floridana were collected at 3 field sites in shallow subtidal sediments. All of the sites were polyhaline

with salinities ranging 19-34 ppt. and were subjected to wind and tide induced water levels. The characteristics of the sites are described in detail. It is concluded that neither a silt-clay fraction nor high sediment organic content may be of great consequence in the distribution of this species.

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comparison of seasonal influences on oyster production. After 9 months, oysters reached a mean shell length of 66, 59, and 62 mm for the fall, winter and spring plants, respectively. Survival did not differ significantly among oyster plants. Greatest growth was observed in Jan. for fall-planted oysters and in Apr. for both winter and spring oyster plants. Negligible growth occurred during the summer months for all plants. The potential of triploidy on performance of oysters cultured in subtropical waters was evaluated by planting diploid and triploid seed in July 1991. Resulting data are used in presenting planting and harvesting strategies for providing marketable product year-round in Florida.

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Abstract. Storms and hurricanes are the most important of the natural environmental quality problems affecting the eastern Gulf Coast. Wind, flooding, and storm surges are shown to have caused extensive damage to coastal areas over the years. These destructive elements have taken their toll on beaches, vegetation, development, and water supplies. Dredge and fill operations are one of the artificial environmental factors that have caused problems in the eastern Gulf. Statewide, Florida has lost 796,000 acres of original habitat to dredge and fill; 23,521 acres of Florida's Gulf coast were filled through 1967. Dredging and filling have destroyed many grass beds and much marine habitat in Florida. Many wetlands in Mobile Bay have been filled, and the extensive dredging necessary for the maintenance of the harbor has caused much turbidity and sediment in the Bay. Industrial pollution and sewage contamination on the eastern Gulf coast coexist generally with large communities and concentrations of industry. It is estimated that 31% of the area of Florida's west coast estuaries is polluted. Tampa Bay and Pensacola Bay have both had large, pollution-associated fish kills. In Alabama, Mobile Bay is extensively polluted, and there is some pollution on the Gulf coast and near Dauphin Island. Mississippi has a number of bays and estuaries that are undergoing hyperfertilization because of sewage. Industrial wastes have not yet caused major pollution problems in that state. Beach erosion is both a natural and man-made environmental problem. In Florida 351 miles of Gulf and estuarine shoreline are critically eroded; in Alabama, 32 miles, and in Mississippi, 36.9 miles.

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and N, B, H' were the least at the "inner" mesohaline station. Dominant species appeared cyclically and the presence of juveniles indicated recruitment. Even during the seasonal cycles dominance showed distinct differences in spatial distributions. The dominance hierarchy differed from station to station and some species showed shifts in the hierarchical order. Spatial distributions of species appeared to be governed by salinity regimes and to some extent by the substratum.

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Wharton, C.H. et al. 1976. Forested wetlands of Florida - Their Management and Use. Report to Division of State Planning. University of Florida, Center for Wetlands. Gainesville, FL.

Wharton, C.H. et al. 1977. Forested wetlands of Florida--their management and use. Florida Division of State Planning. Tallahassee, FL. 347 pp.

White, D.C., R.J. Bobbie, S.J. Morrison, D.K. Oosterhof, C.W. Taylor and D.A. Meeter. 1977. Determination of microbial activity of estuarine detritus by relative rates of lipid biosynthesis. Limnology and Oceanography. 22(6):1089-1099.

Abstract. Microorganisms colonizing allochthonous detritus (live oak leaves) incubated in a north Florida estuary show metabolic activity that can be assayed reproducibly by the incorporation of sodium acetate into the lipids in a 2-h period without introducing subculture bias. Relatively uncolonized live oak leaves show only about 1% of the biosynthetic capacity of leaves incubated in the estuary for 1 wk. Lipid synthesis is proportional to time for at least 2 h and also to detrital mass. Random sampling from pooled portions of many leaves greatly reduces the variance of activities from individual leaves. Rates of phospholipid synthesis paralleled the total extractable ATP and the alkaline phosphatase activity during a 6-wk incubation of live oak leaves in Apalachicola Bay. Rates of incorporation into lipids paralleled the respiratory and the -alpha--D-mu-annosidase activities over the same period, suggesting that lipid biosynthesis is a reasonable measure of detrital microbial activity.

White, D.C. et al. 1979. Effect of Surface Composition, Water Column Chemistry, and Time of Exposure on Composition of Detrital Microflora and Associated Macrofauna in Apalachicola Bay, Florida. pp. 83-115. *In* R.J. Livingston, ed. Ecological Processes in Coastal and Marine Systems. Plenum Press, New York, NY and London.

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White, K.H. 1971. The relationship between the sedimentary material used by polychaetes in tube building and the microdistribution of sediments. Master's Thesis. Florida State University, Tallahassee, FL.

Whitfield, W.K. 1973. Construction and rehabilitation of commercial oyster reefs in Florida from 1949 through 1971 with emphasis on economic impact in Franklin County, Florida. Florida Department of Natural Resources Marine Research Laboratory. Special Science Report No. 38:42.

Whitfield, W.K., Jr. and D.S. Beaumariage. 1977. Shellfish management in Apalachicola Bay: past, present, future. pp. 130-140. *In* R.J. Livingston and E.A. Joyce, eds. Proceedings, Conference on the Apalachicola Drainage System. (Publication No. 26) Florida Department of Natural Resources, Marine Research Laboratory, St. Petersburg, FL.

Whiting, N.H. and G.A. Moshiri. 1974. Certain organism - substrate relationships affecting the distribution of Uca minax. Hydrobiology. 44:481-493.
Abstract. Substrate, temperature and oxygen relationships were studied as they effect populations of Uca minax, a decapod crustacean. These data were collected between December, 1968 and December, 1972.

Wicksten, M.K. 1986. Shell-carrying in Hypoconcha sabulosa (Herbst, 1799) (Decapoda, Brachyura). Crustaceana. 50(3):319-320.
Abstract. Members of the genus Hypoconcha (Brachyura, Dromiidae) carry shells of pelecypods over the dorsal surface of the carapace. Williams (1984) reported that H. arcuata "is always found occupying a valve of some lamellibranch shell, preferably a clamshell, which it carries about upon its back after the manner of a hermit crab. By means of the claws on its fourth and fifth pair of legs, perhaps aided by pressure of its body against the shell, it clings so tightly that removing it from the shell without crushing it is almost impossible". There are no reports of shell-carrying behavior in H. sabulosa. The author obtained two H. sabulosa from Gulf Specimen Company. The crabs were trawled off Panacea, Florida, in the northeastern Gulf of Mexico. Both carried shells of the giant cockle, Dinocardium robustum (Lightfoot).

Wiggins, D. 1992. Comprehensive shellfish harvesting area survey of Pensacola Bay System, Escambia and Santa Rosa Counties, Florida. Florida Department of Natural Resources, Shellfish Environmental Assessment Section. Tallahassee, FL.

Wilber, D.H. 1988. The role of mate guarding in stone crabs. Ph.D. Dissertation. Florida State Univ., Tallahassee, FL. 146 pp.
Abstract. The reproductive biology and residency patterns of over 800 stone crabs (Menippe mercenaria, M. adina, and their hybrid) were examined during an eight-month tagging study at artificial, concrete block reefs constructed near intertidal oyster reefs and subtidal seagrass beds in Franklin and Wakulla Co., Florida. A test of the effect of precopulatory guarding on sperm production in stone crabs revealed guarding males contained significantly more sperm (90-100 million) than non-guarding males exposed to pre-molt females or pre-molt males (40-50 million sperm). The influence of sexual selection and predation on post-copulatory guarding durations in stone crabs was also examined. Males guarded significantly longer (126 h beyond the female's molt) when another male stone crab was present than when an intermolt female (84 h) or a blue crab (83 h) were present. Sexual selection appears important in maintaining postcopulatory mate guarding in stone crabs.

Wilber, D.H. 1989. Reproductive biology and distribution of stone crabs (Xanthidae, Menippe) in the hybrid zone on the northeastern Gulf of Mexico. Mar. Ecol. Prog. Ser. 52(3):235-244.

Abstract. Reproductive biology and residency patterns of over 800 stone crabs (Menippe mercenaria, M. adina, and their hybrids) were examined during an 8-month tagging study in 1986 at artificial, concrete block reefs constructed near intertidal oyster reefs and subtidal seagrass beds in Franklin and Wakulla Counties, Florida, USA. Characteristics of adult crabs occurring intertidally in the summer included a male-biased sex ratio (5M:1F), a prevalence of M. adina and hybrids, a high frequency of molting males, and low sperm content in males. Subtidally in the summer, the adult sex ratio was female-biased, the Menippe -complex forms occurred at equivalent frequencies, and male sperm content was higher. In the fall, sex ratios became more uniform in both habitats, the intertidal male molting frequency declined, and intertidal male sperm levels increased.

Wilber, D.H. 1994. The influence of Apalachicola River flows on blue crab, Callinectes sapidus, in north Florida. Fisheries Bull. 92(1):180-188.

Abstract. Regression and time series analyses were used to investigate the relation between Apalachicola river flows and blue crab, Callinectes sapidus, harvests in and around Apalachicola Bay, Florida. Apalachicola River flows in one year were positively correlated with Franklin County blue crab landings during the next year ($r^2$0.32, P<0.001, 1952-90), and the strength of the correlation increased when only more recent years were examined (r^2-0.49, P = 0.001, 1973-90). In this area, blue crabs mature to a harvestable size by one year of age. Apalachicola River flows were also correlated with neighboring Wakulla County blue crab landings with a one-year time lag (r^2 = 0.52, P=0.001, n=17), but were not associated with blue crab landings for the remaining west coast of Florida. The mean monthly flow from September to May, termed the growout period, was the parameter most highly correlated with the following year's blue crab landings. Of five north Florida rivers examined, the Apalachicola River was most highly correlated with Franklin and Wakulla County blue crab landings. Results of this study further document the influence of Apalachicola River flows on estuarine productivity. The positive relation between flows and blue crab harvests a year later suggests that low flow conditions in the estuary during the growout period negatively affect juveniles. Although the underlying causes of the correlations are not known, the effect of inflows on estuarine salinity is one of several possible mechanisms that warrants further investigations.

Wilber, T.P., Jr. 1990. Influence of size, species and damage on shell selection by the hermit crab Pagurus longicarpus. Mar. Biol. 104(1):31-39.

Abstract. Shell preferences were examined in Pagurus longicarpus collected from Wakulla Beach, Florida, USA in 1987. Relative shell size was a more important shell characteristic in shell selection than either shell species or shell damage. Hermit crabs rarely selected relatively large shells but often selected relatively small shells over damaged shells. Preferences for a particular shell species were offset by varying the relative size or condition of the preferred shell species. Because specific environment al pressures are linked to particular shell characteristics, an assessment of the importance of various shell

features may indicate which environmental pressures are ameliorated via the gastropod shell. Predation and desiccation are linked to relatively small shells and particular shell species; these stresses may be minimized by alternative behavioral mechanisms.

Williams, C.D., D.M. Nelson, M.E. Monaco, S.L. Stone and C. Iancu. 1990. Distribution and abundance of fishes and invertebrates in eastern Gulf of Mexico estuaries. Estuarine Living Marine Resources Report No. 6. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Ocean Service. Rockville, MD. 105 pp.

Abstract. This report presents information on the spatial and temporal distribution, relative abundance, and life history characteristics of 12 invertebrate and 24 fish species in 13 estuaries along the eastern Gulf of Mexico coast. Species used included those with commercial, recreational, and ecological value and those that are used as indicator species of environmental stress, such as the Atlantic croaker (*Micropogonias undulatum*) and American oyster (*Crassostrea virginica*). The estuaries ranged from Mobile Bay in Alabama to Florida Bay at the southern tip of Florida.

Williams, J.E., Jr. and R.W. Phillips. 1972. North Florida sandhill crane populations. Auk. 89(3):541-548.

Williams, J.T. and R.L. Shipp. 1980. Observations on fishes previously unrecorded or rarely encountered in the northeastern Gulf of Mexico. Northeast Gulf Sci. 4(1):17-27.

Abstract. Twenty-one species of marine fishes previously unrecorded or rarely encountered in the northeastern Gulf of Mexico were taken by trawl, dredge, spear or hand capture or observed by SCUBA or research submersible. Biological data are added to the knowledge of all these forms, and several species are shown to have permanent populations in the region.

Williams, L.E., Jr. and L. Martin. 1970. Nesting populations of Brown Pelicans in Florida. pp. 154-169. *In* Proceedings: 24th Annual conference of the southeastern association of the Game and Fish Commission.

Williams, S.A. 1981. Salinity differences between a high and low marsh of northwestern Florida. Fla. Sci. 44(4):224-228.

Abstract. An analysis of soils from a high marsh and low marsh in northwestern Florida showed that they contained large amounts of sand, and were low in cation exchange capacity and exchangeable cations. The soils examined contained high levels of soluble salts. Soils from the low marsh had higher cation exchange capacities than did the layers below.

Willing, T.E., R.M. Darnell, M.A. Ibrahim and L. Berner. 1973. Caloric values of marine animals from the Gulf of Mexico. Contrib. Mar. Sci. 17:1-7.

Willis, C. and J. Carlton. 1974. Efforts in coastal vegetation restoration and marine habitat construction. pp. 13-14. *In* Proceedings of the First Annual Conference on Restoration of Coastal Vegetation in Florida. Florida Department of Natural Resources,

Wilson, A.J. and J. Forester. 1978. Persistence of Aroclor (Trade Name) 1254 in a contaminated estuary. Bull. Environ. Contam. Toxicol. 19(5):637-640.

Abstract. The brief report summarizes the concentrations of PCB's in oyster tissue (*Crassotrea virginica*) observed from April 1969 to June 1976 at three locations in the Escambia Bay estuary, following elimination of an accidental leak of Aroclor 1254 from an industrial site. Data showed that PCB's in oyster tissues decreased after the leak was eliminated, but a steady-state concentration was reached. No Aroclor 1254 was detectable in water at stations sampled, but was detectable in sediments. The study demonstrates the persistence of PCB's long after point-source discharges are eliminated.

Wilson, C.R. 1972. A vitamin B_{12} study in portions of Escambia and Blackwater Bays, Florida. Master's Thesis. University of West Florida, Pensacola, FL. 70 pp.

Abstract. Vitamin B12 was measured by the lactobacillus and ochromonas assays from 5 stations in Mulatto Bayou and Catfish Basin, Florida between August and October, 1978. Other measurements included depth, temperature, pH, salinity, turbidity, and bacterial counts.

Winstead, J.T. and V. Mitchell. 1975. Macroinvertebrates of the Navarre Pass, Florida area. [Presented at: 39th Annual Meeting of the Florida Academy of Sciences; Florida Southern College, Lakeland, FL (USA); 20th Mar 1975]. Fla. Sci. 38:7.

Abstract. A baseline study of macroinvertebrates in the Navarre Pass, Florida area was attempted in the summer of 1974 before the construction of a proposed pass across Santa Rosa Island. Benthic, epibenthic and shoreline areas were sampled. Sixty five benthic samples from thirteen stations were taken with a diver operated coring device. Epibenthic samples were taken with a one meter Otter Trawl while a ten meter seine was employed to sample shoreline areas. Results showed polychaete worms, especially Loimia viridis-, comprised the majority of organisms with mollusks second and crustaceans third. Benthic biomass ranged from 260 mg at Station 1 to 4755 mg at Station 10. The study should permit a follow up of assessment of the effects, if any, the completed pass will have upon the macroinvertebrate fauna of the area.

Witham, R. 1973. A bacterial disease of hatchling loggerhead sea turtles. Fla. Sci. 36(2):226-228.

Wolfe, S.H. 1990. Ecological Characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa Rivers. U.S. Department of the Interior, Minerals Management Service. Biological Report 90(21):323. Florida State Dept. of Environmental Regulation, Tallahassee. Sponsor: Southwest Florida Water Management District, Tallahassee.; National Wetlands Research Center, Slidell, LA.; Minerals Management Service, New Orleans, LA. Gulf of Mexico OCS Region.

Abstract. This report is one in a series that provides an ecological description of Florida's Gulf coasts. The watersheds described herein, with their myriad communities, produce many benefits. The maintenance of this productivity through enlightened resource management is a major goal of this series. This report will be useful to the many people who have to make decisions regarding the use of the natural resources of the area. This region includes the drainage basins and nearshore waters of the west coast of Florida between, but not including, the Anclote River basin and the Suwannee River basin. This document is a summary of the

available information on the Springs Coast area of Florida, for use by planners, developers, regulatory authorities, and other interested parties.

Wolfe, S.H., J.A. Reidenauer and D.B. Means. 1988. Ecological Characterization of the Florida Panhandle. Biological Report 88(12); OCS/MMS-88/0063. Florida State Department of Environmental Regulation. Tallahassee, FL. 299 pp.

Abstract. The study provides a concise description of the Florida Panhandle, which extends from the Ochlockonee River basin west to the Florida-Alabama border and north to the Georgia and Alabama borders. It identifies alterations in terrestrial and aquatic habitats caused by increased urbanization, industrialization, sewage and effluent discharge, river flow alteration, stormwater runoff, and dredge and fill activities. The report is an extensive review and synthesis of available literature on the local physical setting and ecology and provides a discussion of important impacts on the habitats within the region.

Wood, D.A. 1986. Official lists of endangered and potentially endangered fauna and flora in Florida (2 September 1986). Florida Game and Fresh Water Fish Commission. Tallahassee, FL.

Wood, D.A. 1994. Official lists of endangered and potentially endangered fauna and flora in Florida. Florida Game and Fresh Water Fish Commission.

Woolfenden, G.E. and A.J. Meyerriecks. 1963. Caspian tern breeds in Florida. Auk. 80:365-366.

Woolfenden, G.E. and R.W. Schreiber. 1973. The common birds of the saline habitats of the eastern Gulf of Mexico: their distribution, seasonal status, and feeding ecology. *In* J. Jones, ed. A Summary Knowledge of the Eastern Gulf of Mexico. State University System of Florida, Tallahassee, FL.

Worth, D.F. and J.B. Smith. 1976. Marine turtle nesting on Hutchinson Island, Florida, in 1973. Florida Department of Natural Resources, Marine Research Laboratory. St. Petersburg, FL. 17 pp.

Yerger, R.W. 1974. The fishes of the Apalachicola National Forest. U.S. Dept. of Agriculture, Forest Service. 39 pp.

Yockey, R.H. 1974a. An ecological survey of sponges from the eastern Gulf of Mexico. Master's Thesis. University of Florida, Gainesville, FL. 59 pp.

Yockey, R.H. 1974b. Survey of Crystal River sponge fauna. pp. 104-116. *In* Crystal River Environmental Progress Report to the Federal Interagency Research Advisory Committee. Vol. III. Florida Power Corp.,

Young, D. 1974a. Saltmarsh and the effect of thermal plume. pp. 92. *In* Crystal River Power Plant: Environmental Considerations. Final Report to the Interagency Research Advisory Commission. Vol. II. Florida Power Corp., St. Petersburg, FL.

Young, D.L. 1974b. Studies of Florida Gulf coast salt marshes receiving thermal discharges. pp. 532-550. *In* J.W. Gibbons and R.R. Sharitz, eds. Thermal Ecology: Proceedings of a Symposium, Augusta, Ga., 1973. U.S. Atomic Energy Commission, Office of Information Services, Oak Ridge, TN.

Young, D.L. 1977a. Appendix A2: Studies of Florida Gulf Coast salt marshes receiving thermal discharges. pp. 140-158. *In* Crystal River Power Plant: Environmental Considerations. Final report to the Interagency Research Advisory Commission. Vol. II. Florida Power Corp., St. Petersburg, FL.

Young, D.L. 1977b. Saltmarshes and thermal additions at Crystal River, Florida. pp. 437. *In* Crystal River Power Plant: Environmental Considerations. Final Report to the Interagency Research Advisory Commission. Vol. II. Florida Power Corp., St. Petersburg, FL.

Young, W.T. 1972. Investigations of biological conditions and water quality in eastern Escambia Bay relative to fish and oyster mortality during September, 1971. Florida Department of Pollution Control, Northwest Region. Gulf Breeze, FL.

Young, W.T. and R.W. Cantrell. 1972. Biological Study Report: Eleven Mile Creek - Perdido Bay. Unpublished. Florida Department of Pollution Control. Tallahassee, FL.

Young, W.T. et al. 1987. Biological and physicochemical assessment of St. Andrew Bay estuaries 1986-1987: A Special Monitoring Project Basin Survey. State of Florida Department of Environmental Regulation, Northwest District, Biology Section.

Zahm, G. and E. Jemison. 1987. Behavior and capture of wood ducks in pecan groves. Field Ornithology. 58(4):474-479.

Zajac, R.N. and R.B. Whitlach. 1982. Responses of estuarine infauna to disturbance. I. Spatial and temporal variation of initial recolonization. Marine Ecology Progress Series. 10:1-14.

Zieman, J.C. and R.T. Zieman. 1989. Ecology of the seagrass meadows of the west coast of Florida: A community profile. U.S. Department of the Interior, Fish and Wildlife Service, Research and Development. 168 pp.
Abstract. The report summarizes information on the ecology of seagrass meadows on the west coast of Florida, from south of Tampa Bay to Pensacola. The area contains more than 3,500 ha of seagrass beds, dominated by three species, Thalassia testudinum (turtle grass), Syringodium filiforme (manatee grass), and Halodule wrightii (shoal grass). Beds occur both on the shallow, zero-energy continental shelf and in inshore bays and estuaries. Species ecology, distribution, biomass, and productivity of these dominant seagrass species are discussed.

Zimmerman, M.S. 1974. A comparison of the benthic macrophytes of a polluted drainage system (Fenholloway River) with an unpolluted drainage system (Ecofina River). Master's Thesis. Florida State University, Tallahassee, FL.

Zimmerman, M.S. and R.J. Livingston. 1976a. Effects of Kraft mill effluents on benthic macrophyte assemblages in a shallow-bay system (Apalachee Bay, North Florida). Mar. Biol. 34:297-312.

Abstract. A 14-month study was carried out to determine the impact of kraft-mill effluents on the offshore benthic macrophyte distribution in a shallow north Florida bay. a polluted river drainage system was compared to an adjoining unpolluted one. Affected are as were characterized by elevated levels of color and turbidity, reduced benthic macrophyte biomass, reduced species diversity and altered species composition. Areas of chronic impact had reduced biomass. On either side of the drainage system uniform increases in number of species were observed. Benthic macrophyte distribution, in terms of biomass and species composition, was considered an important indicator of the impact of kme on this shallow-bay system. Species normally inhabiting deeper water were found in areas of increased turbidity and color, thus explaining the maintenance of species diversity with reduced biomass. Benthic plant assemblages reflected variations in dominance and the occurrence of opportunistic species.

Zimmerman, M.S. and R.J. Livingston. 1976b. Seasonality and physiochemical ranges of benthic macrophytes from a north Florida estuary, Apalachee Bay, Florida. Bulletin of Marine Science. 20:33-45.

Zimmerman, M.S. and R.J. Livingston. 1979. Dominance and distribution of benthic macrophyte assemblages in a north Florida estuary (Apalachee Bay, Florida). Bull. of Mar. Sci. 29(1):27-40.

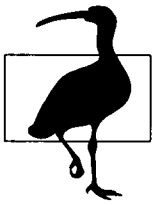
Abstract. A comparative analysis was made concerning the distribution of benthic macrophyte assemblages in shallow portions of Apalachee Bay. This included a comparison of areas affected by bleached kraft mill effluents (BKME) (the Fenholloway River system) with appropriate uncontaminated control stations (the Econfina River system). Meter-square samples of benthic macrophytes were collected monthly in both areas. Relative dominance was generally higher in the unpolluted areas. Four species of red algae (Laurencia poitei, Digenia simplex, Gracilaria verrucosa, G. foliiferia-) were found at all stations. Areas of acute effect were found to have extremely low biomass and characteristic assemblages of various macrophyte species. Most of the species in unpolluted areas were present in portions of the Bay characterized by chronic (low) levels of BKME. However, biomass was consistently reduced in such areas when compared to control stations. It was postulated that selective removal of dominant species by BKME (e.g., increased levels of colour and turbidity) allowed recruitment of various 'rare' species in areas of chronic impact, thus contributing to anomalous patterns of community structure when compared to published data from other pollution-stressed aquatic system s.

Zuboy, J.R. and J.E. Snell. 1982. Assessment of the Florida stone crab fishery, 1980-1981 season. NOAA Tech. Memo. NMFS-SEFC-79:21.

The Department of the Interior Mission

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering sound use of our land and water resources; protecting our fish, wildlife, and biological diversity; preserving the environmental and cultural values of our national parks and historical places; and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people by encouraging stewardship and citizen participation in their care. The Department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

The National Biological Service Mission



As a bureau of the Department of the Interior (DOI), the National Biological Service's (NBS) primary mission is to provide the scientific understanding and technologies needed to support sound management and conservation of our Nation's biological resources. Independence from regulatory and management decision making greatly lessens the chance that scientific results will be viewed as less than objective science or subservient to the needs of policy makers. NBS provides credible, objective, and unbiased information needed by resources managers in the Department of the Interior in a form that allows them to assess, predict, and manage the biological consequences of various policies and management practices. Although the primary focus of the biological research is to meet DOI needs, the activities undertaken with natural resource research funding will also serve the science needs of a wide range of partners, including State governments, other Federal agencies, and private landowners.

The Minerals Management Service Mission

As a bureau of the Department of the Interior, the Minerals Management Service's (MMS) primary responsibilities are to manage the mineral resources located on the Nation's Outer Continental Shelf (OCS), collect revenue from the Federal OCS and onshore Federal and Indian lands, and distribute those revenues.

Moreover, in working to meet its responsibilities, the **Offshore Minerals Management Program** administers the OCS competitive leasing program and oversees the safe and environmentally sound exploration and production of our Nation's offshore natural gas, oil and other mineral resources. The MMS **Royalty Management Program** meets its responsibilities by ensuring the efficient, timely and accurate collection and disbursement of revenue from mineral leasing and production due to Indian tribes and allottees, States and the U.S. Treasury.

The MMS strives to fulfill its responsibilities through the general guiding principles of: (1) being responsive to the public's concerns and interests by maintaining a dialogue with all potentially affected parties and (2) carrying out its programs with an emphasis on working to enhance the quality of life for all Americans by lending MMS assistance and expertise to economic development and environmental protection.