

CURRICULUM VITAE

Michael Randall Roman

University of Maryland Center for Environmental Studies
Horn Point Environmental Laboratory
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DEGREES AND ADVANCED STUDY:

B. A Lake Forest College (Biology), 1971

M. A. The City College (Biology), 1973

Ph.D. University of New Hampshire (Zoology), 1976

POSITIONS HELD:

Director, Horn Point Laboratory, University of Maryland Center for Environmental Science, October 2001.

Professor, University of Maryland, Center for Environmental and Estuarine Studies, Horn Point Environmental Laboratory, July 1990.

Acting Director, University of Maryland, Center for Environmental Estuarine Studies, Horn Point Environmental Laboratory. April 1, 1989 - October 31, 1990.

Associate Professor, University of Maryland, Center for Environmental and Estuarine Studies, Horn Point Environmental Laboratories, July 1986 July 1990.

Assistant Professor, University of Maryland, Center for Environmental and Estuarine Studies, Horn Point Environmental Laboratories, September 1983 - June 1986.

Assistant Professor, University of Maryland, Center for Environmental and Estuarine Studies, Chesapeake Biological Laboratory, June 1981- September 1983.

Assistant Professor, University of Miami, School of Marine and Atmospheric Science, June 1978 - June 1981.

Postdoctoral Fellow, University of Miami, School of Marine and Atmospheric Science, October 1976 - June 1978.

Research Assistant, Woods Hole Oceanographic Institution, October 1975 – February 1976.

Guest Student Investigator, Woods Hole Oceanographic Institution, September 1974 - October 1976.

Summer Research Assistant, Woods Hole Oceanographic Institution, 1974.

Photo-technician, Marine Biological Laboratory, Woods Hole, MA, Summers 1972 and 1973.

Teaching Assistantship, University of New Hampshire, January 1973 - June 1974.

Teaching Assistantship, The City College, January 1972-June 1973.

GRADUATE COURSES TAUGHT:

Univ. of Miami Biological Oceanography
Marine Population Ecology
Seminar on Topics in Marine Ecology

UMCEES

Plankton Dynamics
Seminar on Topics in Marine Ecology
Seminar on Interdisciplinary Coastal Oceanography

STUDENTS ADVISED:

Univ. of Miami

Daniel Dossman, M.S., 1979 "Nutritional Relationships Between a Harpacticoid Copepod and Mangrove Detritus."

Mark Gottfried, M.S., 1981 "The Ingestion and Assimilation of Coral Mucus Detritus by Reef Zooplankton."

Michael Incze, M.S., 1981 "Episodic Detrital Organic Carbon Export from South Biscayne Bay, Florida."

Mary Alice Russell, M.S., 1981 "The Ingestion of Coral Mucus Particles by Gorgonian Soft Corals."

UMCES

Sarah Libourel - Houde, M.S., 1985 "The Effect of Food Quality on the Functional Ingestion Response of the Copepod, *Acartia tonsa*."

Jacques White, Ph.D., 1991 "Seasonal Study of Zooplankton Dynamics in the Mesohaline Chesapeake Bay."

Carolyn Miller, Ph.D., 1992 "Effects of Food Quality and Quantity on Nitrogen Excretion by the Copepod, *Acartia tonsa*."

Steve Jameson, Ph.D., 1995 "Morphometric Analysis of the Poritidae (Anthozoa:Scleractinia) off Belize."

Judy O'Neil, Ph.D., 1995 "Interaction of Pelagic Harpacticoid Copepods and the Colonial Marine Cyanobacterium *Trichodesmium* spp."

Louise Wooton, Ph.D., 1996 "Patterns of Protein and Energy Availability in Detrital Substrates as a Function of Source and Degree of Degradation."

Juanita Urban, Ph.D., 1997 "The Role of Zooplankton Fecal Pellets in Carbon Flux."

Matt Reaugh, M.S. 2005 "The effects of fresh water flow and grazing on plankton community structure in Chesapeake Bay tributaries."

Scott Lloyd, Ph.D. 2006 "Zooplankton ecology in the Chesapeake Bay estuarine turbidity maximum, with special emphasis on the calanoid copepod, *Eurytemora affinis*."

POST - DOCS ADVISED:

Parke Rublee, Hans Dam, Xinsheng Zhang, Dave Kimmel, Jamie Pierson

PUBLICATIONS:

- 1977 Roman, M.R. Feeding of the copepod, *Acartia tonsa*, on the diatom, *Nitzschia closterium*, and brown algae, *Fucus-detritus*. *Mar. Biol.* 42:149-155.
- 1978 Roman, M.R. Tidal resuspension in Buzzards Bay, Massachusetts: II. Seasonal changes in the size distribution of chlorophyll-a particle concentration, carbon, and nitrogen in resuspended particulate matter. *Est. and Cstl. Mar. Sci.* 6:37-46.
- Roman, M.R. and K.R. Tenore. Tidal resuspension in Buzzards Bay, Massachusetts: I. Seasonal changes in the resuspension of organic carbon and chlorophyll-a. *Est. and Cstl. Mar. Sci.* 6:37-46.
- Roman, M.R. Ingestion of the blue-green algae *Trichodesmium thiebauti* by the harpacticoid copepod *Macrosetella gracilis*. *Limnol. Oceanogr.* 23:1245-1248.
- Honjo, S. and M.R. Roman. A study of fecal pellets produced by marine calanoid copepods. *J. Mar. Res.* 36:45-57.
- 1980 Roman, M.R. Tidal resuspension in Buzzards Bay, Massachusetts: III. Seasonal cycles of nitrogen and carbon:nitrogen ratios in the seston and zooplankton. *Est. and Cstl. Mar. Sci.* 11:9-16.
- Roman, M.R. and P.A. Rublee. Containment effects in copepod grazing experiments: A plea to end the black box approach. *Limnol. Oceanogr.* 25:982-990.
- Rublee, P.A., H.R. Lasker, M. Gottfried and M.R. Roman. Production and bacterial colonization of mucus from the soft coral *Briarum asbestinum*. *Bull. Mar. Sci.* 30:888-893.
- 1981 Roman, M.R. and P.A. Rublee. A method to determine in situ zooplankton grazing rates on natural particle assemblages. *Mar. Biol.* 65:303-309.

- 1982 Roman, M.R. Zooplankton nutrition (In)Fish Ecology III Symposium. B.J. Rothschild and C.G. H.Rooth (convenors) pp.233-253.Univ.Miami Tech. Rept. 82008,392pp.
- Rublee, P.R. and M.R. Roman. Decomposition of *Thalassia testudinum* litter in flowing seawater tank sand litter bags: Compositional changes and comparison with natural particulate matter. *J.Exp.Mar.Biol.Ecol.* 58:47-58.
- 1983 Roman, M.R. Nitrogenous nutrition of marine invertebrates. pp.347384(In) Nitrogen in the Marine Environment. E.J. Carpenter and D.G. Capone(eds.).AcademicPress,N.Y.900p.
- Roman, M.R., M.R. Reeve and J.L. Froggatt. Carbon production and export from Biscayne Bay, Florida. I. Temporal patterns in primary production, seston and zooplankton. *Est.Cstl.Mar.Sci.* 17:45-59.
- Gottfried, M. and M.R. Roman. The ingestion and incorporation of coral mucusdetritus by reef zooplankton. *Mar.Biol.*72:211-218.
- Incze, M.L. and M.R. Roman. Carbon production and export from Biscayne Bay, Florida.II. Episodic export of organic carbon. *Est.Cstl. Mar.Sci.*17:61-72.
- 1984 Roman, M.R. Utilization of detritus by the copepod, *Acartia tonsa*. *Limnol.Oceanogr.*29:949-495.
- Roman, M.R. Ingestion of detritus and microheterotrophs by pelagic marine zooplankton.*Bull.Mar.Sci.*35:477-494.
- Roman, M.R. and K.R. Tenore. Detritus dynamics in aquatic ecosystems: An overview. *Bull.Mar.Sci.*35:257-260.
- 1985 Roman, M.R., A.L.Gauzens and T.J. Cowles. Temporal and spatial changes in epipelagic microzooplankton and mesozooplankton biomass in warm-core Gulf Streamring 82-B. *Deep-Sea Res.*32:1007- 1022.
- 1986 Roman, M.R., C.S. Yentsch, A.L. Gauzens and D.A. Phinney. Grazer control of the fine scale distribution of phytoplankton in warm-core Gulf Stream rings. *J.Mar.Res.*44:795-813.
- Bishop, J.K.B., M.Conte, P.H.Wiebe, M.R.Roman and C.Langdon. Particulate matter production and consumption in deep mixed layers: observations in a warm-coring. *J.Mar.Res.*33:1813-1842.
- Hanson, R.B., M.T. Alvarez-Ossorio, R.Cal, M.J.Campos, M.R. Roman, G. Santiago, M.Varelaand J.A.Yoder. Plankton response to a spring up welling event in the Riade Arosa, Spain. *Mar.Ecol.Prog.Ser.*32:101-113.

- Mullin, M.M. and M.R. Roman. In situ feeding of a schooling mysid, *Anisomysis* sp. On Davies Reef. *Bull.Mar.Sci.*39:623-629.
- 1987 Boicourt, W.C., S.-Y. Chao, H.W. Ducklow, P.M. Glibert, T.C. Malone, M.R. Roman, L.P. Sanford, J.A. Fuhrman, C. Garside and R.W. Garvine. Physics and microbial ecology of a buoyant estuarine plume on the continental shelf. *EOS*68:666-668.
- Cowles, T.J., M.R. Roman, A.L. Gauzens and N. Copley. Short-term changes in the biology of a warm-core ring: Zooplankton biomass and grazing. *Limnol.Oceanogr.*32:653-664.
- Houde, S.E.L. and M.R. Roman. Effects of food quality on the functional ingestion response of the copepod, *Acartia tonsa*. *Mar. Ecol. Prog. Ser.*40:69-77.
- 1988 Roman, M.R., H.W. Ducklow, J.A. Fuhrman, C. Garside, P.M. Glibert, T.C. Malone and G.B. McManus. Production, consumption and nutrient cycling in a laboratory mesocosm. *Mar.Ecol.Prog.Ser.*42:39-52.
- Roman, M.R., K.A. Ashton and A.L. Gauzens. Day/night differences in the grazing impact of marine copepods. *Hydrobiologia.*167/168:21-30.
- 1990 Roman, M.R., M.J. Furnas and M.M. Mullin. Zooplankton abundance and grazing at Davies Reef, Great Barrier Reef, Australia. *Mar.Biol.* 105:73-82.
- Valdes, L., M.R. Roman, M. Alvarez-Ossorio, A.L. Gauzens and A. Miranda. Zooplankton composition and distribution off the coast of Galicia, Spain. *J. Plankton Res.*12:629-643.
- 1991 Roman, M.R. Pathways of carbon incorporation in marine zooplankton: Effects of developmental stage and food quantity. *Limnol. Oceanogr.* 36:796-807.
- Glibert, P.M., C. Garside, J.S. Fuhrman and M.R. Roman. Time dependent changes of inorganic and organic nitrogen and NH_4 regeneration in the plume of the Chesapeake Bay estuary, USA and its regulation by large heterotrophs. *Limnol.Oceanogr.* 36:895-909.
- White, J.R. and M.R. Roman. Measurement of zooplankton grazing using particles labeled in light and dark with [methyl - ^3H] methylamine hydrochloride. *Mar. Ecol.Prog.Ser.*71:45-52.
- 1992 Glibert, P.M., C.A. Miller, C. Garside, M.R. Roman and G.B. McManus. NH_4 regeneration and grazing: Interdependent processes in size fractionated $^{15}\text{NH}_4$ experiments. *Mar.Ecol.Prog.Ser.*82:65-74.
- Hawser, S.P., J.M. O'Neil, M.R. Roman and G.A. Codd. Toxicity of blooms of the cyanobacterium *Trichodesmium* to zooplankton. *J.Appl. Phycol.*4:79-86.

O'Neil, J.M. and M.R. Roman. Grazers and associated organisms of *Trichodesmium*. 61-73, In: Carpenter, E.J., D.G. Capone and J.G. Rueter (eds.) *Biology and Ecology of Diazotrophic Marine Organisms: Trichodesmium and Other Species*. NATO ASI Series, Kluwer Acad. Publ.

White, J.R. and M.R. Roman. Egg production by the calanoid copepod *Acartia tonsa* in mesohaline Chesapeake Bay: the importance of food resources and temperature. *Mar. Ecol. Prog. Ser.* 86:239-249.

White, J.R. and M.R. Roman. Seasonal study of grazing by metazoan zooplankton in the mesohaline Chesapeake Bay. *Mar. Ecol. Prog. Ser.* 86:251-261.

1993 Roman, M.R., H.G. Dam, A.L. Gauzens and J.M. Napp. Short-term changes in meso-zooplankton biomass and grazing in the Sargasso Sea off Bermuda. *Deep-Sea Res.* 40:883-901.

Roman, M.R., A.L. Gauzens, K. Rhinehart and J.R. White. Effects of low oxygen waters on Chesapeake Bay zooplankton. *Limnol. Oceanogr.* 38:1603-1614.

1994 Purcell, J.E., J.R. White and M.R. Roman. Top-down and bottom-up effects on *Acartia tonsa* copepods in Chesapeake Bay. *Limnol. Oceanogr.* 39:263-278.

1995 Caron, D.A., H.G. Dam, P. Kremer, E.J. Lessard, L.P. Madin, T.C. Malone, J.M. Napp, E.R. Peele, M.R. Roman and M.J. Youngbluth. The contribution of microorganisms to particulate carbon and nitrogen in surface waters of the Sargasso Sea near Bermuda. *Deep-Sea Res.* 42:943-972.

Dam, H.G., M.R. Roman and M.J. Youngbluth. Downward export of respiratory carbon and dissolved inorganic nitrogen by diel-migrant mesozooplankton at the JGOFS time-series station. *Deep-Sea Res.* 42:1187-1197.

Dam, H.G., X. Zhang, M. Butler and M.R. Roman. Mesozooplankton grazing and metabolism in the equatorial Pacific during the JGOFS EqPac study: implications for carbon and nitrogen fluxes. *Deep-Sea Res.* 42:735-756.

Murray, J.W., R.T. Barber, M.R. Roman, M. Bacon and R. Feely. Physical and biological controls on carbon cycling in the equatorial Pacific: US JGOFS EqPac Process Study. *Science* 266:58-65.

O'Neil, J.M. and M.R. Roman. Grazing of the pelagic harpacticoid copepods *Marcosetella*, *Miracia* and *Oculisetella*, on the colonial cyanobacterium *Trichodesmium* spp. from the Caribbean. *Hydrobiol.* 292/293:235-240.

Roman, M.R., D.A. Caron, P. Kremer, E. J. Lessard, L.P. Madin, T.C. Malone, J.M. Napp, E.R. Lessard and M.J. Youngbluth. Spatial and temporal changes in the partitioning of organic carbon in the plankton community of the Sargasso Sea off Bermuda. *Deep-Sea Res.* 42:973-992.

Roman, M.R., H.G. Dam, A.L. Gauzens and J. Urban-Rich. Mesozooplankton variability on the equator at 140°W during the JGOFS Eq Pac study. *Deep-Sea Res.* 42:673-694.

Tenore, K.R. + 18 co-authors including M.R. Roman. Fisheries and oceanography off Galicia, N.W. Spain (FOG): Mesoscale spatial and temporal changes in physical processes and resultant patterns of biological productivity. *J. Geophys. Res.* 100:10943-10966.

White, J.R., M.R. Roman, H. Dam and X. Zhang. Latitudinal gradients in mesozooplankton biomass encountered in north-south transects across the equator at 140°W during the JGOFS Eq Pac study. *Deep-Sea Res.* 42:715-735.

Zhang, X., H.G. Dam, J.R. White and M.R. Roman. Latitudinal gradients in mesozooplankton grazing and metabolism along 140°W during the JGOFS Eq Pac study. *Deep-Sea Res.* 42:695-714.
1997

Landry, M.R., R.T. Barber, R.R. Bidigare, F. Chai, K.H. Coale, H.G. P.G. Verity, J.W. White. Iron and grazing constraints on primary production in the central equatorial Pacific: An Eq Pac synthesis. *Limnol. Oceanogr.* 42:405-418.

Roman, M.R. and A.L. Gauzens. Copepod grazing in the equatorial Pacific. *Limnol. Oceanogr.* 42:623-634.

1998 Fine, R., Cox, C., Curry, W., Druffel, E., Fox, J., Lukas, R., Murray, J., Opdyke, N., Powell, T., Roman, M., Royer, T., Sharp, L., Thompson, A., Weaver, A. *Global Ocean Science: Toward an Integrated Approach*. National Academy Press, 165pp.

Roman, M.R. The coastal ocean processes (CoOP) program. *Mar. Tech. Soc. Jour.* 32:17-22.

Roman, M.R. Review of The Arabian Sea: Living Marine Resources and the Environment. *The Quarterly Review of Biology* 72:218.

Smith, S.L., M. Roman, K. Wishner, M. Gowing, L. Codispoti, R. Barber, J. Marra, I. Prusova and C. Flagg. Seasonal response of mesozooplankton to monsoonal reversals in the Arabian Sea. *Deep Sea Res.* 45:2369-2405.

Urban-Rich, J.D., Hansell and M.R. Roman. Effect of food concentration on fecal pellet carbon/volume ratio: Analysis of zooplankton fecal pellet carbon using a high temperature combustion method. *Mar. Ecol. Prog. Ser.* 171:199-208.

1999 Roman, M.R. and W.C. Boicourt. Dispersion and recruitment of crab larvae in the Chesapeake Bay Plume: Physical and biological controls. *Estuaries* 22:563-574.

- 2000 Bamstedt, U., D.J.Gifford, X.Irigoien, A.Atkinson and M.Roman. Zooplankton Feeding. p297-399, (In) ICES Zooplankton Methodology Manual. R.Harris, P.Wiebe,J.Lenz, H.R. Skoldal and M.Huntley (Eds).Academic Press,N.Y.684p.
- Roman, M.R.,S.Smith, K.Wishner,X.ZhangandM.Gowing. Mesozooplankton production and grazing in the Arabian Sea. Deep Sea Research.47:1423 - 1450.
- Zhang, X., M. Roman, A. Sanford, H. Adolf, C. Lascaraand R. Burgett. Can an optical plankton counter produce reasonable estimates of zooplankton abundance and biovolume in water with high detritus? Jour.ofPlanktonRes.22:137 - 150.
- 2001 Roman, M.R., D.V.Holliday and L.P.Sanford. Temporal and spatial patterns of zooplankton in the Chesapeake Bay turbidity maximum. MarineEcologyProgressSeries.213:215-227.
- 2002 Roman, M.R., H.A.Adolf, M.R.Landry, L.P.Madin, D.K.Steinbergand X. Zhang. Estimates of oceanic mesozooplankton production: A comparison using the Bermuda and Hawaii time-series data. Deep Sea Research II49:175-192.
- Roman, M.R., H.G. Dam, R. LeBorgne and X.Zhang. Latitudinal comparisons of Equatorial Pacific Ocean zooplankton. The Equatorial Pacific JGOFS Synthesis 49(13-14):2695-2713.
- Roman, M.R. et al. A Century of Ecosystem Science: Planning Long-Term Research in the Gulf of Alaska. National Academy Press, Washington, DC.
- 2003 Valle-Levinson, A., C. Lascara, W.C. Boicourt and M. Roman. On the linkage among density, flow and bathymetry gradients at the entrance to the Chesapeake Bay. Estuaries 26:1437-1449.
- 2004 Kimmel, D.G. and M.R. Roman. Long-term trends in mesozooplankton abundance and community composition in the Chesapeake Bay, USA: Influences of fresh water input. Marine Ecology Progress Series.267:71 83.
- Richardson, T.L., G.A. Jackson, H.W. Ducklow and M.R. Roman. Planktonic food webs of the equatorial Pacificat0°,140'W:asynthesis of EqPac time-series carbon flux data. Deep-Sea Research 51:1245-1274.
- Zhang, X., R.E. Hood, M.R. Roman, P.M. Glibert and D.K. Stoecker. Pfiesteria piscicida populationdynamics:A modeling study,pp.528 - 530, In: K.A. Steidinger, J.H.Landsberg, C.R. Thomas and G.A.Vargo(eds), Harmful Algae 2002, Proceedings of the Xth International Conference Harmful Algae. Florida Fish and Wildlife Conservation Commission and Intergovernmental Oceanographic Commission of UNESCO.

- 2005 Roman, M.R., J.E. Adolf, J. Bichy, W.C. Boicourt, L.W. Harding, E.D. Houde, S. Jung, D.G. Kimmel, W.D. Miller and X. Zhang. Chesapeake Bay plankton and fish abundance enhanced by Hurricane Isabel. *EOS* 86:261-265.
- Roman, M., X. Zhang, C McGilliard and W.Boicourt. Seasonal and annual variability in the spatial patterns of plankton biomass in Chesapeake Bay. *Limnology and Oceanography*.50:480-492
- Kemp, W.M., Boynton, Adolf, Boesch, Boicourt, Brush, Cornwell, Fisher, Glibert, Hagy, Harding, Houde, Kimmel, Miller, Newell, Roman, Smith and Stevenson. Eutrophication of Chesapeake Bay: Historical trends and ecological interactions. *Mar.Ecol.Prog.Ser.*303:1-29
- 2006 Hood, R.E., X. Zhang, P.M. Glibert, D.K. Stoecker and M.R. Roman. Modeling the influence of nutrients, turbulence and grazing on *Pfiesteria* populations. *Harmful Algae*5:459-479.
- Kimmel, D.G., M.R. Roman and X. Zhang. Spatial and temporal variability in factors affecting mesozooplankton dynamics in Chesapeake Bay: Evidence from biomass size spectra. *Limnology and Oceanography*51:131-141.
- Kimmel, D.G., W.D. Miller and M.R. Roman. Regional scale climate forcing of mesozooplankton dynamics in Chesapeake Bay.*Estuaries*29: 375-387.
- Richardson T.L., G.A. Jackson, H.W. Ducklow and M. R. Roman. Spatial and seasonal patterns of carbon cycling through planktonic food webs of the Arabian Sea determined by inverse analysis. *Deep-Sea ResearchII*53:555-575.
- Roman, M.R., M. Reaugh and X. Zhang. Ingestion of the dinoflagellate *Pfiesteria piscicida* by the calanoid copepod, *Acartia tonsa*. *Harmful Algae* 5:435-441.
- Vanderploeg, H.A. and M.R. Roman. Analysis of zooplankton distributions using optical plankton counters. *Journal Geophysical Research* 111:C05S01.
- Zhang,X., M. Roman, D. Kimmel, C. McGilliard and W. Boicourt. Temporal and spatial variability in plankton and hydrographic variables along an axial transect in Chesapeake Bay. *Journal Geophysical Research* 111:C05S11.
- 2007 Reaugh, M.L., M. R. Roman and D. K. Stoecker. Changes in plankton community structure and function in response to variable freshwater flow in two tributaries of the Chesapeake Bay. *Estuaries and Coasts*. 30: 403-417.
- 2008 Miller, C.A. and M.R. Roman. Effects of food nitrogen content and concentration on the forms of nitrogen excreted by the calanoid copepod, *Acartia tonsa*. *J. Exp. Mar. Biol. Ecol.* 359: 11-17.

Janke, R.A., M.R. Roman and K.H. Brink. Coastal Ocean Processes Program: Advancing interdisciplinary research and technology development. *Oceanography* 12: 18-21.

2009

Kimmel, D.G., W.C. Boicourt, J.J. Pierson, M.R. Roman and X. Zhang. A comparison of the mesozooplankton response to hypoxia in Chesapeake Bay and the northern Gulf of Mexico using biomass size spectrum. *J. Exp Mar. Biol. Ecol. In Press*.

Kimmel, D.G., W.D. Miller, L.W. Harding, E.D. Houde and M.R. Roman. Estuarine ecosystem response captured using synoptic climatology. *Estuaries and Coasts In Press*.

Ludsin, S.A., X. Zhang, S.B. Brandt, M.R. Roman, W.C. Boicourt, D.M. Mason and M. Constantini. Hypoxia-avoidance and planktivorous fish in Chesapeake Bay: Implications for food web interactions and fish recruitment. *J. Exp Mar. Biol. Ecol. In Press*.

Pierson, J.J., M.R. Roman, D.G. Kimmel, W.C. Boicourt and X. Zhang. Quantifying changes in the vertical distribution of mesozooplankton in response to hypoxic bottom waters. *J. Exp Mar. Biol. Ecol. In Press*.

Zhang, H., S.A. Ludsin, D.M. Mason, A.T. Adamack, S.B. Brandt, X. Zhang, D.G. Kimmel, M.R. Roman and W.C. Boicourt. Hypoxia-driven changes in the behavior and spatial distribution of pelagic fish and zooplankton in the northern Gulf of Mexico. *J. Exp Mar. Biol. Ecol. In Press*.