

Of Manatees and Men: A Story of Understanding and a Model for Finding Environmentally Friendly Solutions

Dr. Edmund R. Gerstein

Director Marine Mammal Research and Behavior, Florida Atlantic University
gerstein2@aol.com 561 338-9185

Mrs. Laura A. Gerstein

Officer, Leviathan Legacy Inc
leviathanlegacy@aol.com 561 338-9185

Dr. Joseph E. Blue

Leviathan Legacy Inc.
joeblue@earthlink.net 407 851-4105

Mr. Steven E. Forsythe

Head Signal Processing, Naval Undersea Warfare Center, Division Newport
ForsytheSE@Npt.NUWC.Navy.Mil 401 832 8963

Abstract: A comprehensive series of underwater psychoacoustic tests were conducted to measure the Florida manatees' hearing abilities and investigate their ability to detect and locate sounds of approaching vessels and other anthropogenic signals. The results yielded the audiogram, critical ratios, and directional hearing of various signals, while revealing sensory constraints that make manatees vulnerable to collisions with boats and barges. Complimentary to the behavioral measurements, underwater acoustic surveys of manatee habitats and noise propagation demonstrate significant Lloyd mirror and acoustical shadowing effects, further challenging acoustic detection of approaching vessels. Ironically, slow speed regulations designed to protect manatees increase

collision risks in a majority of manatee habitats as ambient conditions mask the sounds of these vessels. Tests reveal that manatees can readily hear and localize higher frequency modulated sounds at levels just above ambient. This acoustic sensitivity provides a window through which manatees can be alerted of approaching vessels using very low intensity, directional signals. The interdisciplinary investigation of the boat strike problem has helped define the phenomenon and yielded a method of mitigation with minimal environmental impact. As the great whales are also confronted with near surface propagation challenges in the sea, the approach maybe applicable for addressing ship strikes and whales.