

ACOUSTICS2008/544

Use of broadband active acoustics to study marine organisms

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Broadband signals inherently have more information than narrowband signals. In essence, they have more "channels" of information due to the wider range of frequencies spanned. It is therefore advantageous to use broadband signals in active acoustic studies of marine organisms and to apply techniques that best exploit the broadband nature of the signals. In this presentation, a brief background on the use of narrowband systems for studying marine organisms by these authors and other investigators is given. Limitations to those studies are outlined, with arguments made for the use of broadband acoustics. The past twenty years of studies centered at the Woods Hole Oceanographic Institution are subsequently reviewed in which broadband signals are used both in the laboratory and field to study a variety of organisms—swimbladder-bearing fish and three major anatomical categories of zooplankton. The analyses are divided broadly into two major categories—time and frequency domain—for various types of analyses, including pulse compression processing and spectral analysis. Results are first shown based on studies, one organism at a time, in the laboratory. Those laboratory approaches are then applied to ocean studies of fish and large zooplankton using a new towed instrument spanning the frequency range 1.7 kHz - 100 kHz.