

ACOUSTICS2008/3393
**Spawning Behaviour and Spatial Distribution of Atlantic Herring
on Georges Bank Revealed by Ocean Acoustics Waveguide Remote
Sensing**

Purnima Ratilal^a, Zheng Gong^a, Daniel Cocuzzo^a, Mark Andrews^a, Srinivasan Jagannathan^b, Ioannis Bertsatos^b, Tianrun Chen^c, Hector Pena^d, Ruben Patel^d, Olav Godo^d, J. Michael Jech^e, Thomas Weber^f
and Nicholas Makris^c

^aNortheastern University, 302 Stearns Center, Rm 311, 360 Huntington Ave, Boston, MA 02115, USA

^bMassachusetts Institute of Technology, Room 5-435, 77 Massachusetts Avenue, Cambridge, MA 02139, USA

^cMassachusetts Institute of Technology, Room 5-212, 77 Massachusetts Avenue, Cambridge, MA 02139, USA

^dInstitute of Marine Research, PO Box 1870, 5817 Bergen, Norway

^eNOAA/Northeast Fisheries Science Center, 166 Water Street, Woods Hole, MA 02543, USA

^fUniversity of New Hampshire, Ctr. for Coastal and Ocean Mapping, 24 Colovos Road, Durham, NH 03824,
USA

An ocean acoustics waveguide remote sensing (OAWRS) system was deployed in the Gulf of Maine, near Georges Bank to image Atlantic herring and other fish populations from Sep-Oct 2006. OAWRS provides spatially unaliased imaging of herring over wide areas, spanning over 100 km diameter. Migration and spawning behaviour of Atlantic herring was observed using OAWRS over several diurnal periods, including massive movements on and off the bank to spawn. Measurements made simultaneously with a conventional fish-finding echosounder (CFFS) and a multibeam sonar provide the depth distribution and local 3D morphology respectively of the herring schools in the water column. Concurrent trawl surveys provide identification of the fish species. Measurements made by OAWRS and CFFS systems are highly correlated. Examples will be provided of the co-registration between the two systems over a one week period. Calibration of the OAWRS system using CFFS estimates of fish population densities along with a full-field scattering model that takes into account both coherent and incoherent scattering from a fish group is discussed. The fish swimbladder is modelled as a spheroidal bubble. Resonance scattering behaviour of herring is observed in the OAWRS system with significant changes in scattering amplitude over the 300 Hz to 1.5 kHz frequency range of the OAWRS system.