

Session 3aAOa

Acoustical Oceanography: Innovations in Fish and Plankton Acoustics III (Poster Session)

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Contributed Papers

All posters will be on display in the Poster Gallery from Monday to Wednesday, 15–17 March. Authors will be at their posters on Wednesday, 17 March. To allow contributors an opportunity to see other posters, contributors of odd-numbered papers will be at their posters from 8:00 a.m. to 10:00 a.m. and contributors of even-numbered papers will be at their posters from 10:00 a.m. to 12:00 noon.

3aAOa1. Comparison of two *in situ* tuna target strength measurement methods. Arnaud Bertrand and Erwan Josse (ORSTOM, BP 70, 29280 Plouzane, France, arnaud.bertrand@orstom.fr)

Two approaches were developed for *in situ* tuna TS measurement in French Polynesia. One consists of coupling split beam TS measurement with sonic tracking of tagged fish. The other one consists of TS measurement on tuna aggregated close to a Fish Aggregating Device. The first method was used on well-identified fish, swimming freely in their environment and allowing observation of the effect of fish behavior on TS up to 500 m of depth. The second method was applied on juvenile fish located close to the surface. In this case, fish were not individually identified and a fish sample was caught by trolling line in order to determine the length and species composition of the aggregation. Both methods are complementary and results are similar according to body length.

3aAOa2. Modeling the target strength of *Meganyctiphanes norvegica*. David T. I. Francis (School of Electron. and Elec. Eng., Univ. of Birmingham, Edgbaston, Birmingham B15 2TT, UK, francist@ee-admn.bham.ac.uk), Tor Knutsen, Kenneth G. Foote (Inst. of Marine Res., N-5024 Bergen, Norway), and Lucio Calise (Centro Marino Internazionale, I-09072 Torregrande (OR), Italy)

The euphausiid *Meganyctiphanes norvegica* is modeled as a fluidlike body having the actual shape of the head and thorax, as reconstructed from dorsal and lateral views recorded with a video camera with macrolens. The mass density has been measured for individual specimens in a density-gradient column, and the longitudinal-wave sound speed in the body, estimated from the measured sound speed through an assemblage of animals in a velocimeter. Theoretical target strength spectra are computed by the boundary element method at a number of discrete frequencies spanning the range 25 kHz to 3.2 MHz. [Support by the following is acknowledged: EU through RTD Contract No. MAS3-CT95-0031, Norwegian Research Council through Grant No. 113809/122, and Bergen Large-Scale Facility (LSF) for Marine Pelagic Food Chain Research.]

3aAOa3. Target strength spectra of swim-bladdered fish. Kenneth G. Foote (Inst. of Marine Res., P.O. Box 1870 Nordnes, N-5024 Bergen, Norway) and David T. I. Francis (Univ. of Birmingham, Edgbaston, Birmingham B15 2TT, UK)

Swim-bladdered fish are modeled by the actual shape of the swimbladder as determined from microtomed sections. Target strength spectra are computed for specimens of pollack (*Pollachius pollachius*) and saithe (*Pollachius virens*). Results obtained with both the Kirchhoff approximation and boundary-element method at each of four ultrasonic frequencies

are compared with each other and with measurements of target strength of the same specimens before swim bladder morphometry. [Partial support of the EU through RTD Contract No. MAS3-CT95-0031 is acknowledged.]

3aAOa4. Broad-scale volume backscattering strength measurements in the Black Sea. Erhan Mutlu, Ali C. Gucu, and Ferit Bingel (Inst. of Marine Sci., P.O. Box. 28, 33731, Erdemli, Icel, Turkey)

Enhanced echograms of high-frequency sound (120 and 200 kHz) from entire tracklines surveyed during summer and winter of 1991–1994 were evaluated to observe volume backscattering in the Black Sea. Echo intensities were filtered through two thresholds for distinguishing suspended scatterers from active swimmers (fish). It was postulated that the backscattering by the suspended matters was associated with bathymetry, seasonal stratification and different levels of mixing of water, and daily migration of zooplankton. The scattering was layered in association with the physical structure in the open water. As bottom depth was shoaled, the vertical structure became more homogenous. Biological scatterers were diversified with zooplanktoners and pelagic fish (anchovy and sprat). Copepod and gelatinous organisms (comb-jelly and moon jellyfish) appeared to be responsible for the zooplanktonic scatterers. Changes in seasonal and diurnal migrational patterns of fish were investigated. During the summer, pelagic fish schools were observed in an offshore area, whereas in winter the schools were confined to the coastal area. In regard to the schooling density, higher concentrations were found in winter.

3aAOa5. Wavelet decompositions versus singular value decomposition (SVD) in a fish target strength estimation. Marek Moszynski and Andrzej Stepnowski (Dept. of Acoust., Tech. Univ. of Gdansk, Narutowicza 11/12, 80-952 Gdansk, Poland, marmo@pg.gda.pl)

The fish target strength estimation when using acoustic echoes from a single-beam echosounder is possible after solving ill-conditioned equations where probability density functions (PDFs) of echo level, target strength, and beam pattern are involved. The modified singular value decomposition (SVD) algorithms are typically used in such cases. Unfortunately, this technique often leads to artifactual modes in solution due to Fourier nature of underlying eigenfunctions. The expectation maximization smoothing (EMS) method is used to improve smoothness of solution but by the cost of increasing the time of computation of estimates. D. L. Donoho (1995) proposed the wavelet-vaguelette decomposition (WVD) as