10:35

2aAOa9. Comparing repeated sidescan sonar measurements of benthic squid egg beds in Monterey Bay, CA. Kenneth G. Foote (Woods Hole Oceanogr. Inst., Woods Hole, MA 02543), Pat J. Iampietro, and Mary Young (California State Univ., Monterey Bay, Seaside, CA 93955)

The squid *Loligo opalescens* lays its eggs in capsules attached to a flat sandy substrate. These capsules are usually clustered in so-called egg beds. Earlier work in Monterey Bay, CA [Foote *et al.*, J. Acoust. Soc. Am. **119**, 844–856 (2006)] established the acoustic detectability of such egg beds. This work has now been extended in a new study performed in June 2006. An EdgeTech sidescan sonar was towed at nominal 5-m height over the bottom. Measurements were made at 400 kHz, horizontal beamwidth 0.5 deg, along six parallel transects, with adjacent centerlines separated by 30 m. The swath width along each transect was 100 m. The transects were repeated on 10, 13, and 14 June. Data from areas where egg beds were densely concentrated, confirmed by drop video camera, have been excerpted. Comparisons of corresponding data, which are generally very strong, are quantified. The question is asked as to whether such sidescan sonar data can be used differentially to measure egg-laying success or hatching over rather short periods of time. If so, this could be a useful tool both in ecological studies and for management purposes. [Work supported by NURP.]

10:50

2aAOa10. Estimating pressure gradients governing fish shoal dynamics over continental-shelf scales. Srinivasan Jagannathan, Sunwoong Lee, Deanelle T. Symonds (Dept. of Mech. Eng., MIT, 77 Massachusetts Ave., Cambridge, MA 02139), Purnima Ratilal (Northeastern Univ.), and Nicholas C. Makris (MIT, Cambridge, MA 02139)

The environmental pressure gradient and stress field on fish shoals spanning more than 10 km is calculated from a sequence of instantaneous continental-shelf scale OAWRS images of areal fish population density [Science **311**, 660–663 (2006)]. The calculation is based on continuum mechanics and the velocity field of fish groups previously estimated from OAWRS imagery using acoustic flow [Jagannathan *et al.*, J. Acoust. Soc. Am. **119**, 3435 (2006)]. These environmental stress fields describe the driving mechanism behind the dynamic behavior of large fish groups such as expansion, contraction, and translation. Regions of high stress are correlated with regions of high areal fish density. They are also correlated with density waves that convey information across a fish group. Our estimates of environmental stress on fish groups can be correlated with environmetal parameters such as plankton, temperature, and current distributions through physical and biological driving mechanisms.

11:05

2aAOa11. Sonar mapping for coral reef conservation. Lisa Zurk, Joe Lotz, Tim Ellis, James McNames (Elec. and Comput. Eng. Dept., Portland State Univ., P.O. Box 751-ECE, Portland, OR 97207, zurkl@cecs.pdx.edu), and Jean-Louis Ecochard (The Nature Conservancy, Arlington, VA 22203)

Many conservation efforts require an inexpensive and easy-to-use method of mapping and monitoring coral reef structure. A desirable product is a 3D map that effectively portrays the reef relief (and potentially the sub-structure) or features such as fish locations and fish spawning areas. Given field site limitations associated with the reefs, the mapping technique should be portable, rugged, and easy to use. One solution, developed at the Nature Conservancy (TNC), is to utilize a Lowrance fish finding sonar with a GPS system to estimate the top of the coral. This approach has been employed for TNC mapping exercises to generate ArcGIS maps of conservation areas. However, these maps are often negatively affected by sampling and processing artifacts such as sparse collection geometries (causing interpolation errors), distortion due to beam shape, and changes in boat (transducer) position due to wave motion. In this presentation we discuss recent work to address these effects, as well as enhancements to the system by processing acoustic returns from the coral substructure or within the water column for detection of fish populations. The presentation will provide a description of future research, including the intent of making the finished system available as a conservation tool.

Invited Papers

11:20

2aAOa12. Robust analysis of single echo trace obtained by split beam sounder. Masahiko Furusawa (Tokyo Univ. of Marine Sci. and Technol., 4-5-7 Konan, Minato Tokyo 108-8477 Japan, frsw@s.kaiyodai.ac.jp) and Kazuo Amakasu (Natl. Res. Inst. of Fisheries Eng., Kamisu Ibaraki 314-0408 Japan)

The theory and method of the echo trace analysis of single echoes (ETA), which simultaneously analyze the shape and level of single echoes, are almost established. But, the method has not been extensively used. The major reasons are high-quality echoes with a high signal-to-noise ratio (SNR) necessary for the analysis are some times difficult to obtain; the error introduced by transducer motion is large; and conditions for the theory sometimes could not be fulfilled. Therefore, we apply the ETA to the split beam method, which is most advantageous for the ETA, and make the method robust by introducing the following: careful echo selection considering SNR, correction of the effect of transducer motion, smoothing of the trace by regression analyses, introduction of indexes checking reliability, etc. The useful results of our ETA are the track, the swimming speed and orientation, the target strength as a function of tilt angle, and the estimated size of individual fish. The robust ETA was applied to echoes of fish near a sea bottom and of Antarctic krill to confirm the effectiveness of the method.

11:40

2aAOa13. Comparing acoustic model estimations and *in situ* target strength measurements of juvenile walleye pollock (*Theragra chalcogramma*). Kazuhiro Sadayasu (Natl. Res. Inst. of Fisheries Eng., Fisheries Res. Agency, 7620-7 Hasaki, Kamisu, Ibaraki 314-0408, Japan), Tohru Mukai, and Kohji Iida (Hokkaido Univ., Hakodate, Hokkaido 041-8611, Japan)

Recently, many acoustic surveys for the juvenile walleye pollock have been done around the Hokkaido, Japan. Dependence of target strength on fish length is a most important factor in the conversion of acoustic data to fish biomass. However, the relation between target strength and length of juvenile walleye pollock is not well investigated. This study examined the target strength length relationship (3–10 cm) for the echo integration measurements of the juvenile walleye pollock at 38 kHz from acoustic theoretical model predictions and *in situ* measurements. A prolate spheroid model was used to compute the target strength of the fish relative to its orientation. Swimbladder morphologies of live juvenile walleye pollock caught by set net were obtained from transmission of light or soft x-ray, and converted their morphological parameters. Biological samplings using framed mid-water trawl were carried out near