1:40

1pAOa2. Echo characteristics of two salmon species. Patrick A. Nealson (School of Aquatic and Fishery Sci., Univ. of Washington, Box 355020, Seattle, WA 98195-5020), John K. Horne (Univ. of Washington, Seattle, WA 98195-5020), and Debby L. Burwen (Alaska Dept. of Fish and Game, Anchorage, AK 99518-1599)

The Alaska Department of Fish and Game relies on split-beam hydroacoustic techniques to estimate Chinook salmon (*Oncorhynchus tshawytscha*) returns to the Kenai River. Chinook counts are periodically confounded by large numbers of smaller sockeye salmon (*O. nerka*). Echo target-strength has been used to distinguish fish length classes, but was too variable to separate Kenai River chinook and sockeye distributions. To evaluate the efficacy of alternate echo metrics, controlled acoustic measurements of tethered chinook and sockeye salmon were collected at 200 kHz. Echo returns were digitally sampled at 48 kHz. A suite of descriptive metrics were collected from a series of 1,000 echoes per fish. Measurements of echo width were least variable at the −3 dB power point. Initial results show echo elongation and ping-to-ping variability in echo envelope width were significantly greater for chinook than for sockeye salmon. Chinook were also observed to return multiple discrete peaks from a single broadcast echo. These characteristics were attributed to the physical width of chinook exceeding half of the broadcast echo pulse width at certain orientations. Echo phase variability, correlation coefficient and fractal dimension distributions did not demonstrate significant discriminatory power between the two species. [Work supported by ADF&G, ONR.]

1:55

1pAOa3. Alaskan river environmental acoustics. Peter H. Dahl (Appl. Phys. Lab., Univ. of Washington, Seattle, WA 98105-6698), Carl Pfisterer (Alaska Dept. of Fish & Game, Fairbanks, AK), and Harold J. Geiger (Alaska Dept. of Fish & Game, Douglas, AK)

Sonars are used by the Alaska Department of Fish and Game (ADF&G) to obtain daily and hourly estimates of at least four species of migratory salmon during their seasonal migration which lasts from June to beginning of September. Suspended sediments associated with a river's sediment load is an important issue for ADF&G's sonar operations. Acoustically, the suspended sediments are a source of both volume reverberation and excess attenuation beyond that expected in fresh water. Each can impact daily protocols for fish enumeration via sonar. In this talk, results from an environmental acoustic study conducted in the Kenai River (June 1999) using 420 kHz and 200 kHz side looking sonars, and in the Yukon River (July 2001) using a 120 kHz side looking sonar, are discussed. Estimates of the volume scattering coefficient and attenuation are related to total suspended sediments. The relative impact of bubble scattering and sediment scattering is also discussed.

2:10

1pAOa4. Echo integration of nonuniform fish densities. Robert Kieser (Dept. of Fisheries and Oceans, Pacific Biological Station, 3190 Hammond Bay Rd., Nanaimo, BC, Canada V9T 6N7) and John Hedgepeth (Tenera Environ., San Luis Obispo, CA 93401)

Echo integration is a well recognized method for measuring backscatter intensity and for estimating fish density. EI is appropriate for high and low fish densities as long as the target distribution is uniform across the beam. This is generally the case in mobile applications that use a downward looking transducer. However uniform fish distribution across the beam cannot be assumed in riverine applications that use a stationary side looking system. Observed distributions are often very nonuniform especially when migrating fish are surface or bottom oriented. EI may still be possible if the relative vertical fish distribution is known and reasonably constant over time. *A priori* estimates of the vertical fish density distribution could be from split-beam observations when densities are lower or from video observations. A model for the EI of nonuniform fish densities is developed, typical results are simulated to test the model and its application is discussed.

2:25

1pAOa5. Acoustic quantification of fish in the riverine environment: Challenges. Kenneth G. Foote (Woods Hole Oceanogr. Inst., Woods Hole, MA 02543)

Quantifying fish acoustically in rivers presents many challenges. Some are common to other aquatic environments, but are exacerbated in rivers. Acoustic issues of particular concern are reviewed. These include the backscattering cross section of fish, sampling volume, and both volumetric and surface reverberation. Advantages of methods based on multiple observations of the same fish, such as Doppler analysis, target-tracking, and sensing the angular dependence of fish scattering, or on correlation analysis, given sufficient bandwidth, are emphasized. The need for calibration of involved acoustic devices is mentioned.