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Application of multiple angle acoustic scatter to remote fish classification

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Observation of broadband acoustic scatter from fish at multiple angles has the potential to offer advantages for remote classification in cases where the species exhibit differences in size and or body shape, and animal orientation is unknown or difficult to estimate. However, the total angular coverage of the observations, available bandwidth, and the inter- and intra-species variability in size can significantly influence classification accuracy. These parameters are investigated using laboratory data collected from ten different fish species using a linear array of receivers and a single transmitter with an effective angular coverage of up to 25 degrees with a 3 degree sampling increment. Results indicate that when the species exhibit significant differences in length, even two observations covering only 10 degrees are sufficient to obtain an 80 percent improvement in classification accuracy over a single observation angle. This holds true for a wide range of animal orientations. As inter-species size similarity increases, and intra-species size variability increases, more observations covering a larger range of angles are required to maintain a similar improvement in classification accuracy.