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Insights to dolphin sonar discrimination capabilities with human listening experiments

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Dolphins have a very keen sonar system that is able to make fine discriminations between complex targets such as proud and buried mines. To understand the cues that dolphins use for fine target discrimination, human listening experiments have been conducted with echoes from real targets using a simulated broadband dolphin echo-ranger. Echoes are stretched in time to translate the echoes into the human auditory range. The human performance is usually as accurate as the dolphin, with the additional benefit of being able to get feedback on cues used. Various types of discrimination and detection experiments have been conducted paralleling dolphin sonar experiments. Discrimination of material composition of cylinders and spheres, detection of target in clutter and cylinder wall thickness difference discrimination experiment have been performed. The human listeners performed as well or better than the dolphins at the task of discriminating between a standard target and comparison targets. Click pitch, echo duration, time-separation pitch and timbre are some of the cues used by human listeners to discriminate targets. Dolphins may use some of the same echo features as humans. Human listening studies can quickly identify salient combinations of echo features that permit object discrimination and also help refine dolphin experiments.