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Acoustic behavior of echolocating porpoises during prey capture

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Porpoise echolocation has been studied in target detection experiments using stationed animals and steel spheres as targets, but little is known about the acoustic behavior of free swimming porpoises as they echolocate for prey. Here we used archival tags (modified Dtags) recording audio (400 kHz, 16-bit stereo sampling rate) and animal movements (depth, heading, 3D pitch and roll, and acceleration) to study echolocation in trained porpoises catching fish. The prey capture experiments were conducted with and without suction cups covering the porpoises' eyes. Without the eye cups, the porpoises could use both echolocation and vision to locate and ingest their prey, but with eye cups they could use only echolocation. Our data show that time to prey capture is about 27% greater with eye cups (T-test, $p < 0.01$). They also allow us to describe and compare prey capture in the two experimental conditions, including analysis of the animals' detailed movements and echolocation behavior leading up to and following prey capture events.