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False killer whale hearing adjustment during echolocation measured with evoked potentials

Paul Nachtigall[a] and Alexander Supin[b]
[a]University of Hawaii, Hawaii Institute of Marine Biology, P.O. Box 1106, Kailua, HI 96734, USA
[b]Institute of Ecology and Evolution, 33 Leninsky Prospect, 119071 Moscow, Russian Federation

While much has been previously learned about the echolocation performance and characteristics of the outgoing signals of echolocating dolphins and small whales, we have measured hearing using evoked potentials during echolocation. We have found that: (1) the whale may hear her loud outgoing clicks and much quieter returning echoes at comparable levels, (2) the whale has protective mechanisms and hears her outgoing signals at a level about 40 dB lower than similar signals presented directly in front of her, (3) when echo return levels are lowered either by making the targets smaller or by placing the targets farther away - without changing the levels of her outgoing signals, the hearing of those echoes remains at almost the same level, (4) if targets are made much smaller and harder to echolocate, the animal will increase what she hears of her outgoing signal - as if to heighten overall hearing sensitivity to keep the echo level hearable, and (5) the animal has an active 'automatic gain control' mechanism in her hearing based on both forward masking that balances outgoing pulse intensity and time between pulse and echo and active hearing control. Overall, hearing during echolocation appears to be an actively changing process.