Hearing threshold measurements using auditory evoked potentials of four stranded short-finned pilot whales (Globicephala macrorhynchus) in Key Largo, FL

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Abstract

Approximately 26 short-finned pilot whales (Globicephala macrorhynchus) stranded in Cudjoe Key, FL on May 5, 2011. Four of these animals, two adult females and two juvenile females, were transported to a rehabilitation facility in Tarpon Basin, FL. Auditory evoked potentials (AEP) were recorded in response to amplitude modulated (AM) tone pips modulated at 1000 Hz. AEP thresholds were determined at 10, 20, 40, 80 and 120 kHz for all four animals (100 kHz was tested for one animal). Click evoked potentials were also measured. Audiograms were similar to previous findings in pilot whale hearing tests. Short-finned pilot whales have a lower peak sensitivity than other odontocetes such as bottlenose dolphins. Greatest hearing sensitivity was around 40 kHz for all whales, while differences in higher frequency hearing were exhibited between adults and juveniles. Thresholds for the two adult females were 25-61 dB higher at 80 kHz than those for the two juvenile females tested, but were comparable to the previously reported upper limit frequency for an adult pilot whale. Click evoked potentials were similar between the four whales and comparable to previously tested echolocating odontocetes. Five total pilot whales have been tested in this study during two separate stranding events; the previously tested juvenile male was found to have profound hearing loss (Mann et al, 2010 & Schlundt et al, 2011). These findings add to the limited database of pilot whale (short- and long-finned) hearing studies, of which there are only two others (Schlundt et al, 2011 & Pacini et al, 2010).

Methods: Auditory Evoked Potential (AEP)

• Sound stimuli delivered through jawphone
  • Amplitude modulated (AM) tone pips modulated at 1000 Hz
  • Carrier frequencies ranged from 5-120 kHz
  • 0.1 ms click with peak frequency of 62 kHz
• Brain response recorded with 3 electrodes embedded in suction cups using TDT AEP Workstation.

Results: FL Keys Pilot Whale Click AEPs

Fig. 1 (A) Sully, male juvenile short-finned pilot whale that stranded in July 2009 in Willemstad, Curacao. Auditory evoked potential (AEP) hearing test results indicate that this animal has severe hearing loss across all frequencies tested. (B) Female adult short-finned pilot whale tested in FL Keys.

FL Keys Strandings

• Approx. 25 short-finned pilot whales stranded off Cudjoe Key in the FL Keys on May 5, 2011
  • 2 males satellite tagged and released
  • 4 females were tested on May 18, 2011

Conclusions

Five pilot whales have been tested in this study during two separate stranding events. Audiograms for adults and juveniles had comparable thresholds, with cutoff frequencies ranging from 80-100 kHz. These pilot whale upper frequency limits are lower than other odontocetes, such as the bottlenose dolphin which has an upper limit around 120 kHz, but comparable to the killer whale. The juvenile male was found to have profound hearing loss (Mann et al, 2010 & Schlundt et al, 2011). These findings add to the limited database of pilot whale (short- and long-finned) hearing studies (Schlundt et al, 2011 & Pacini et al, 2010).

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