

Assessing Long Term Sound Profiles Including Noise From Anthropogenic Sources in Important Resident Killer Whale Habitat

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Sounds important to killer whales

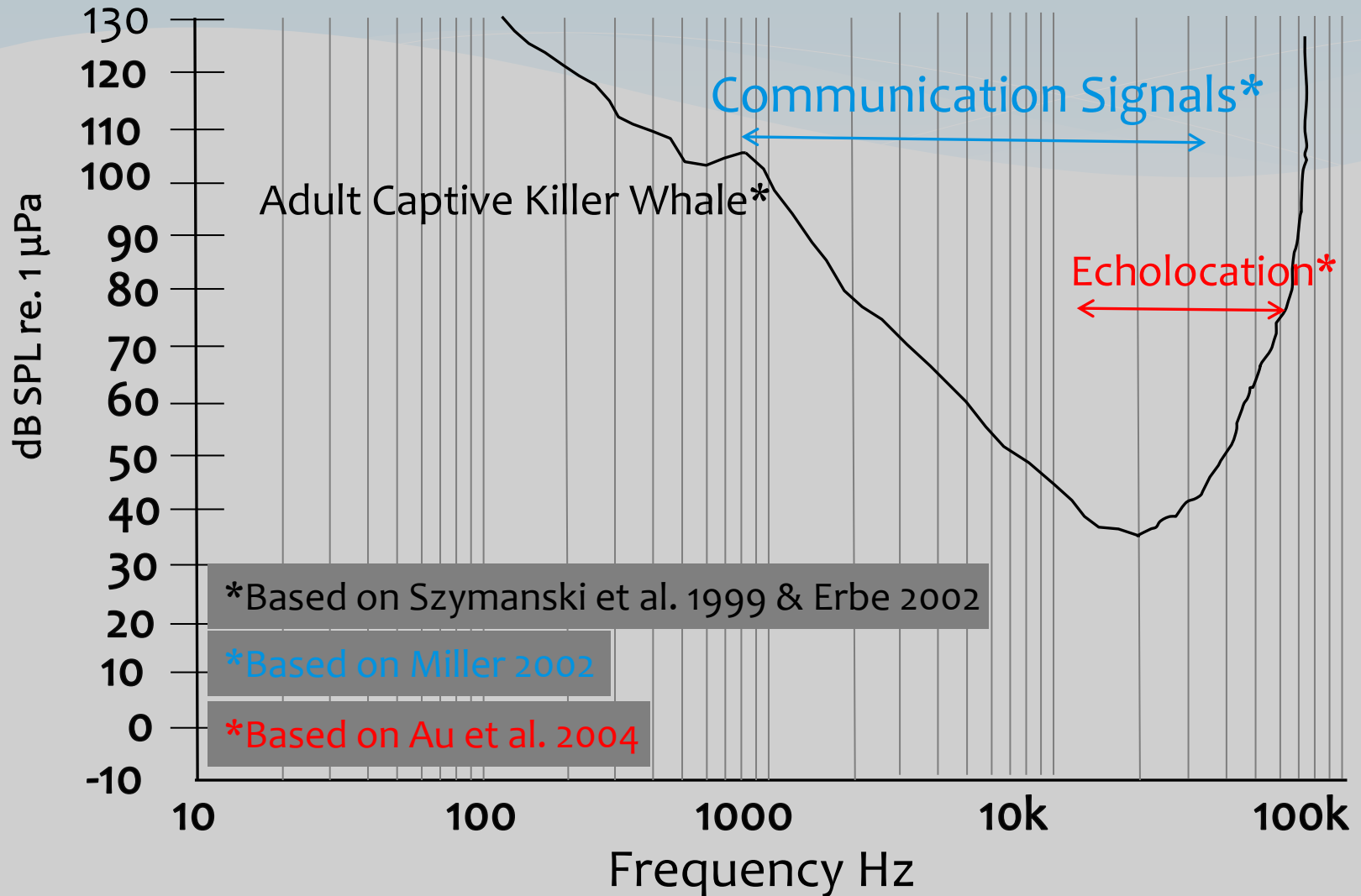
* Natural History

- what is important is effected by adaptations of the auditory system to earlier environments

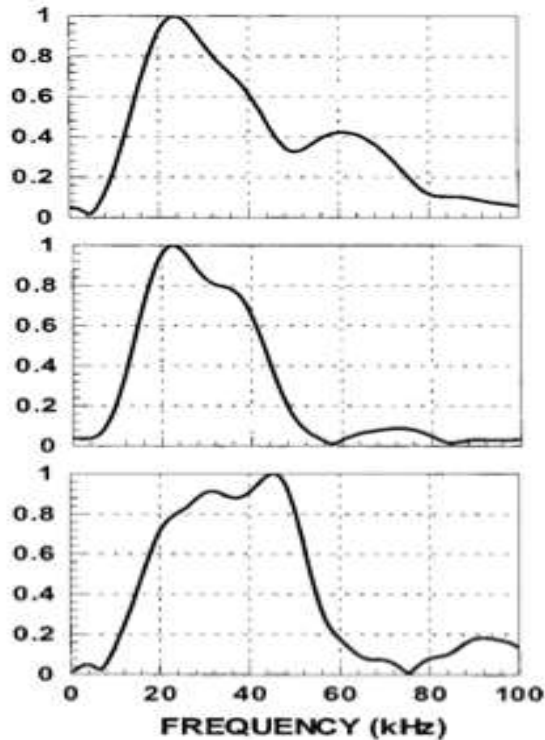
What is important is determined by

- Hearing range (physiological constraints)
 - Hearing sensitivity variability
- Perception (neurological/behavioural constraints)
 - frequencies/intensities useful for orientation, foraging, social communication, eg mating

Not all sounds are perceived equally



Echolocation: Navigation & Foraging



- Bimodal (two peaks)
- Highest Amplitude between 20-60 kHz
- First peak under 20 kHz
- Detection range chinook:
Sea State 0: 50m
Heavy rain: 40m

10

100

1000

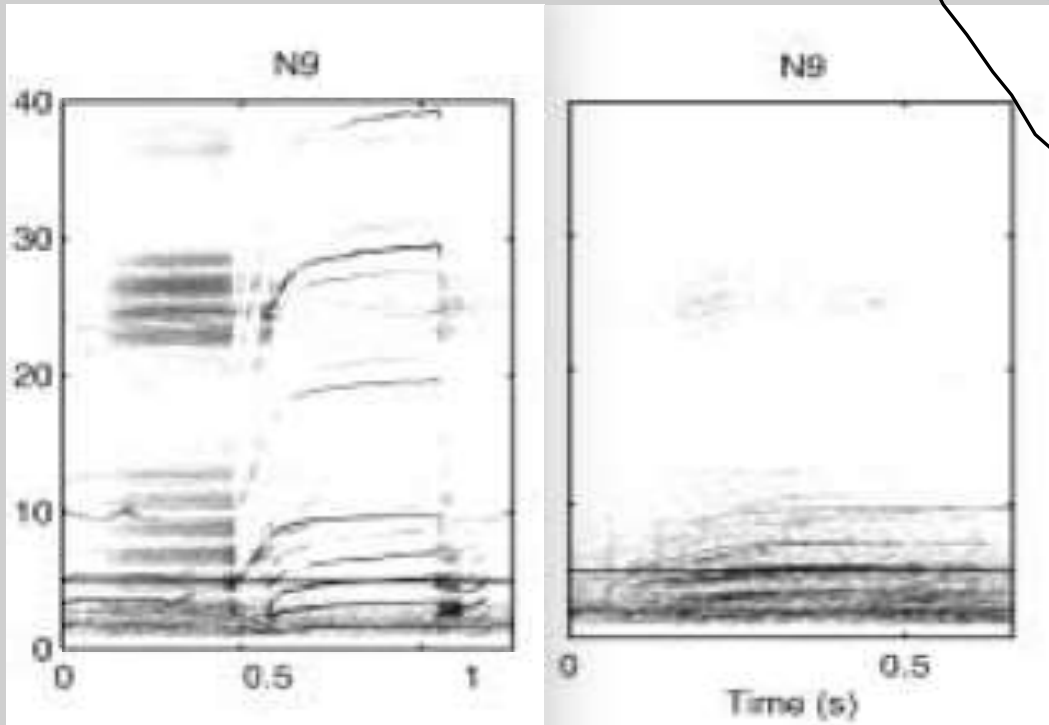
10k

100k

Frequency Hz

Calls

average source level: 152.6 ± 5.9 dB (Miller 2006)



10

100

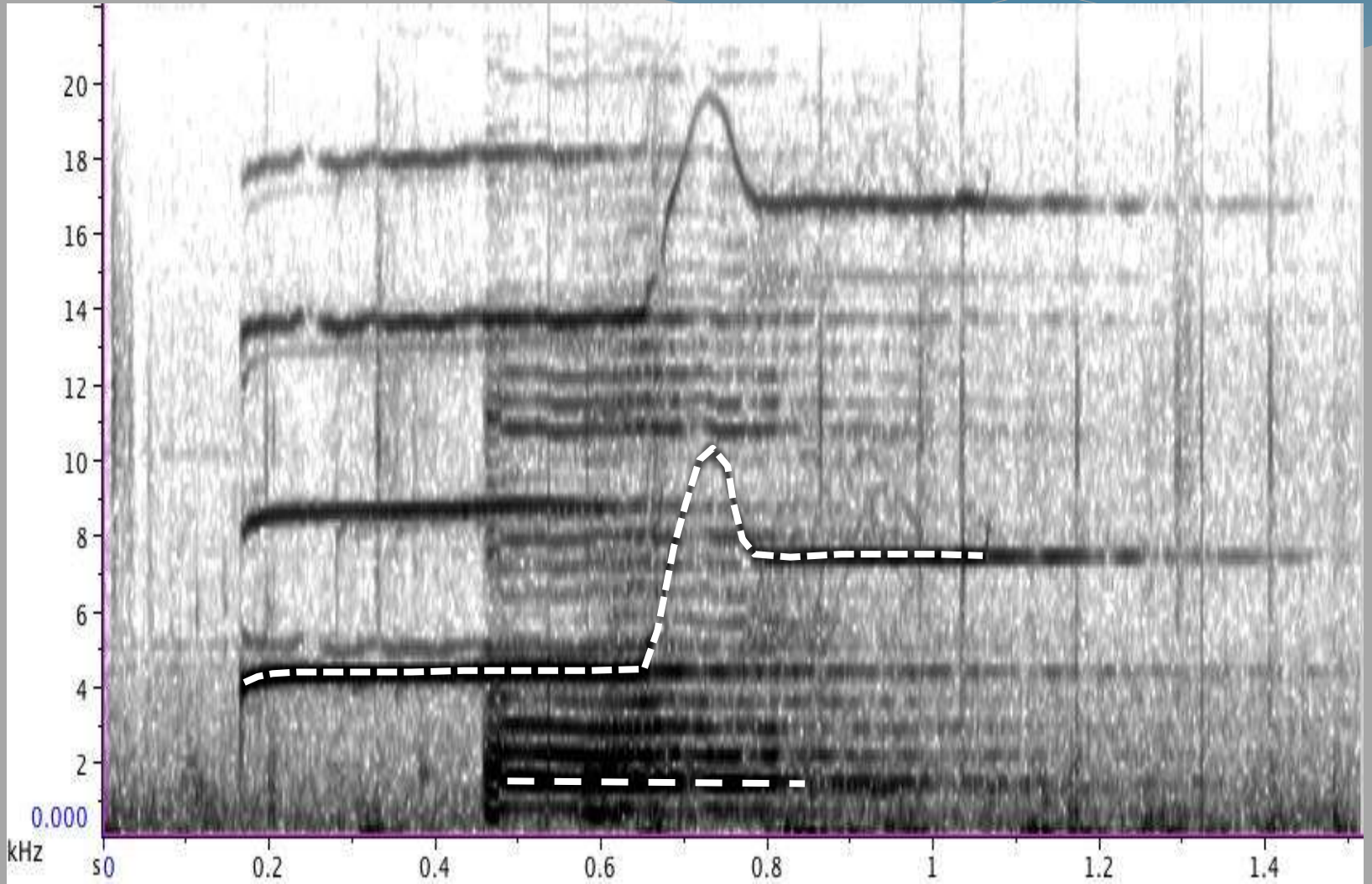
1000

10k

100k

Frequency Hz

Calls



Project Goals

1. To determine changes in sound levels over time with reference to different sound sources and their relative contribution to overall received levels
2. To determine sound propagation loss within the habitat relative to the type of sound source
3. To characterize a habitat acoustically
e.g. determine influences of underwater topography, currents, wind, and anthropogenic inputs on sound levels and propagation characteristics
4. To determine absolute and relative sound exposure levels for animals spending time in the habitat

Methods

Stationary Recording

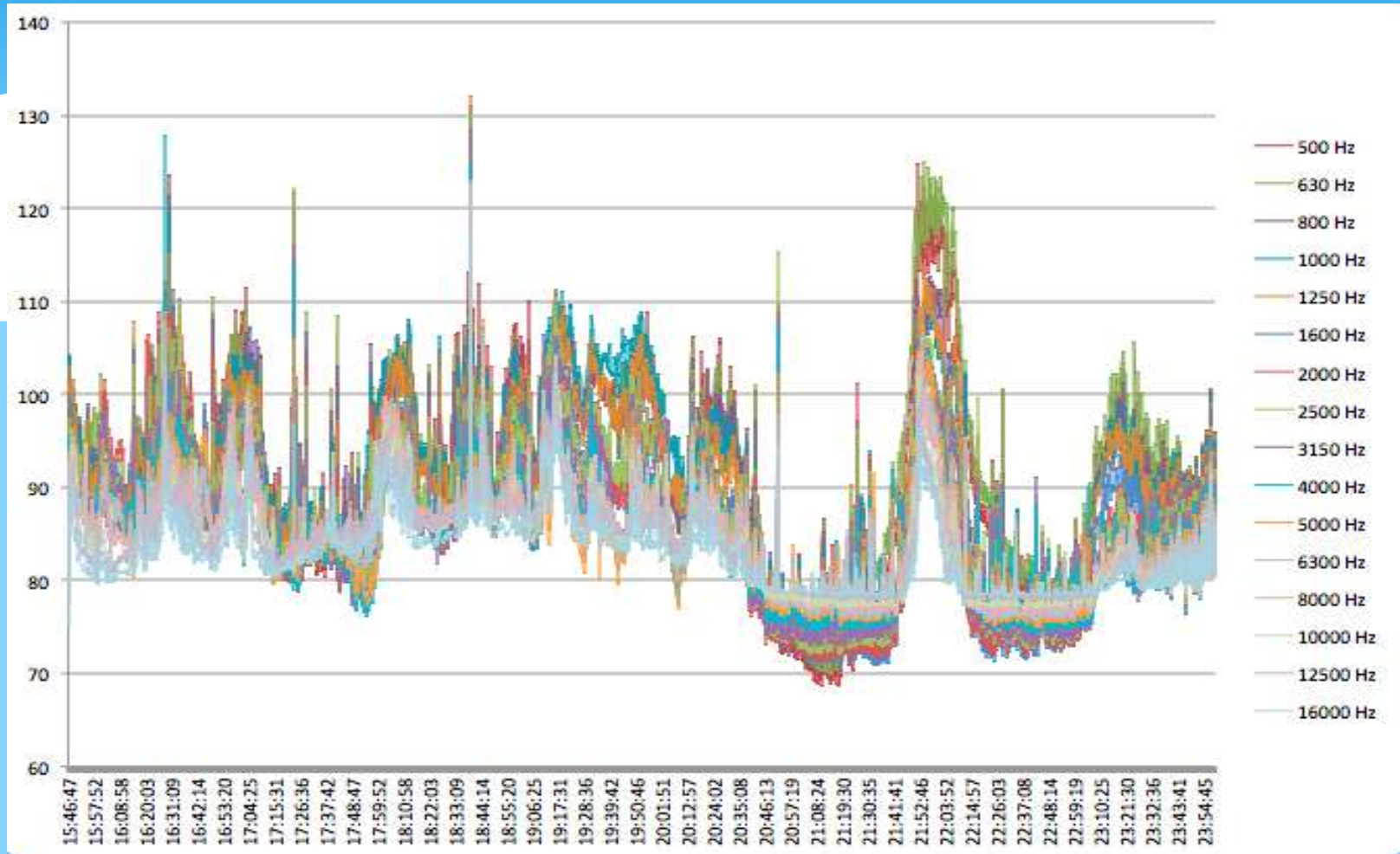
- Hydrophone arrays at different locations in important habitats
 - reflecting physically and ecologically different habitat types
 - differ in vessel traffic patterns
 - Record sounds continuously over a multi year period
 - Record vessel traffic patterns continuously over a multi-year period
 - vessel types and densities
 - record distances from array
 - record approximate vessel speeds and directions
-

Methods

Mobile Recordings

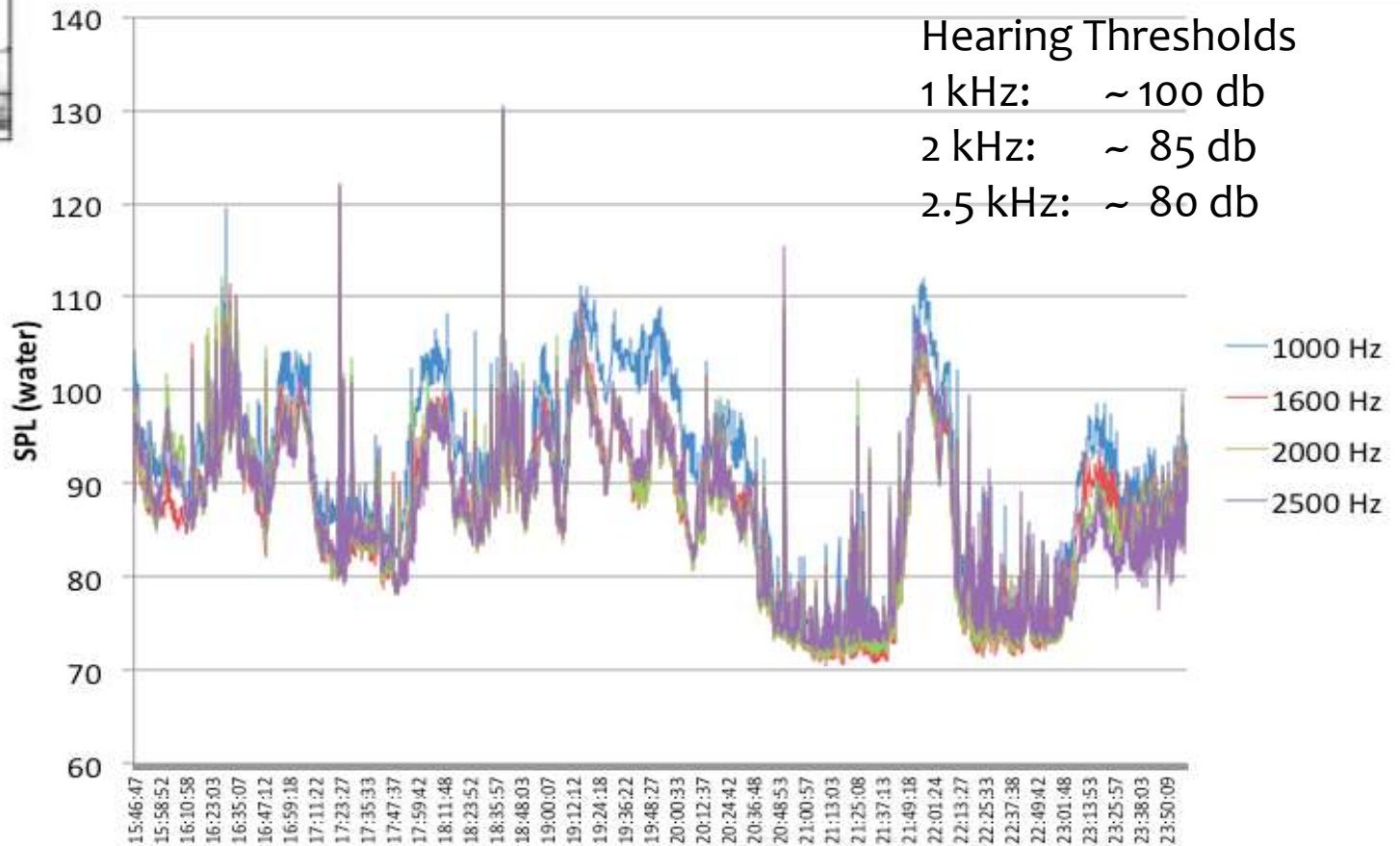
- Record sounds at different depths and habitat locations
 - when whales and vessels are present
 - during various weather and tide conditions
 - Transmit/Record test signals at various distances from arrays
 - Record vessels at close ranges
 - report vessel types and speeds
 - record distances from array
 - record at two different depths
-

Data Collection and Analysis (Stationary Recordings)



Automated Real Time Analysis Tool provided by Sound Technology Inc.

Data Collection and Analysis



Data Collection and Analysis

Hearing Thresholds

8 kHz: ~ 50 db

12.5 kHz: ~ 42 db

16 kHz: ~ 40 db

