Effects of Vessel Noise on Humpback Whales

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Intro and Motivation

- The Western Australian whale population has increased substantially since the cessation of whaling (1979) and is estimated to comprise 20–30,000 whales, increasing 9–12.7% per year (Bejder et al., 2016)
- Whale-watching is a multi-billion-dollar industry that is growing around the world. Typically, tour operators use boats to transport tourists into coastal waters to see groups of whales, dolphins or porpoises
- Marine Biologists report accumulating evidence that boat-based whale-watching negatively affects whale's behavior

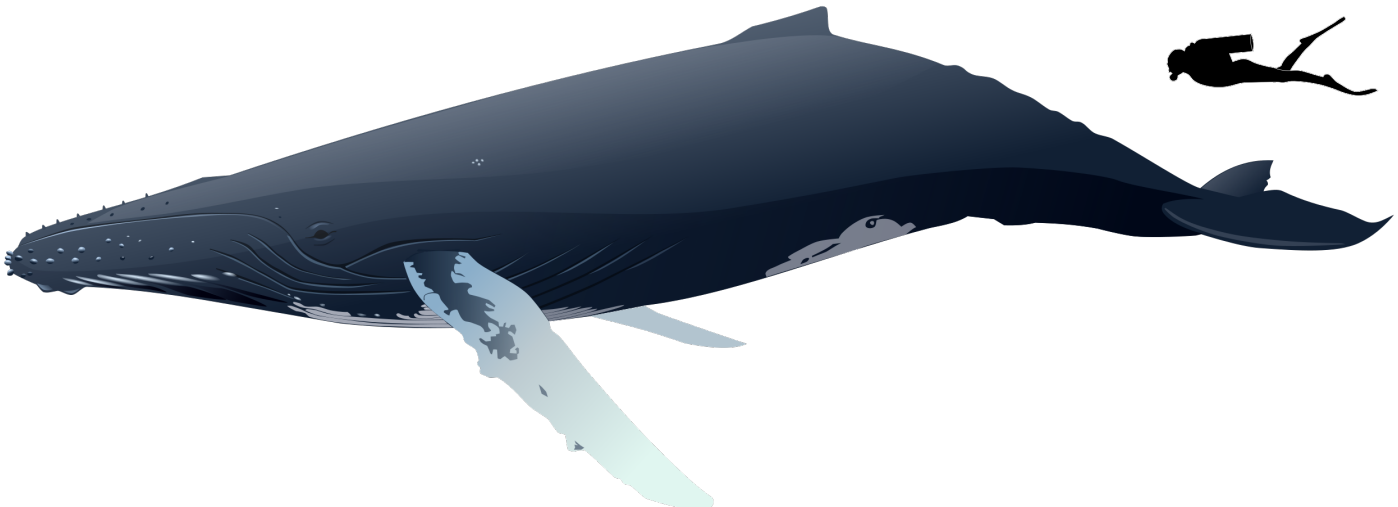


Figure 1: Humpback Whale

Experiment Location

- The tests were performed between 21°45 –22°33 S and 114°08 –114°40 E, from August 1st to October 31st 2018
- The Gulf is an important resting ground for mother and calves, that rest and nurse for a few weeks before continuing their southern migration to their high latitude feeding grounds

Figure 2: Experiment Location

Experiment Description and Data Generation

- Vessel approaches consisted of a typical whale-watch approach; transiting past a logging mother-calf pair at 100 m distance at slow speed
- Vessel noise was played through a transducer that was suspended from the side of the vessel to 1.5 m below the surface to mimic typical depth of propellers/shaft/exhaust of whale-watching vessels.
- The vessel noise imitation was set to different levels: control (124 dB), low (148 dB), medium (160 dB) and high (172 dB)

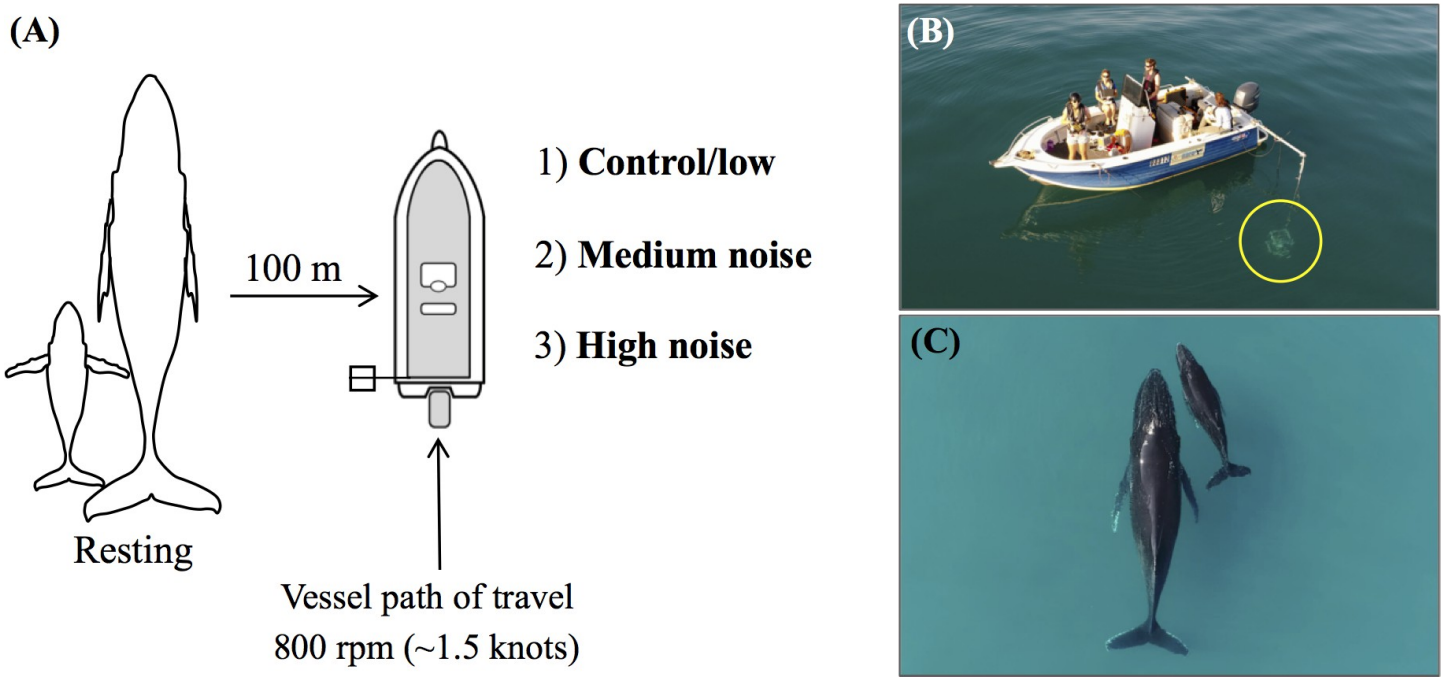
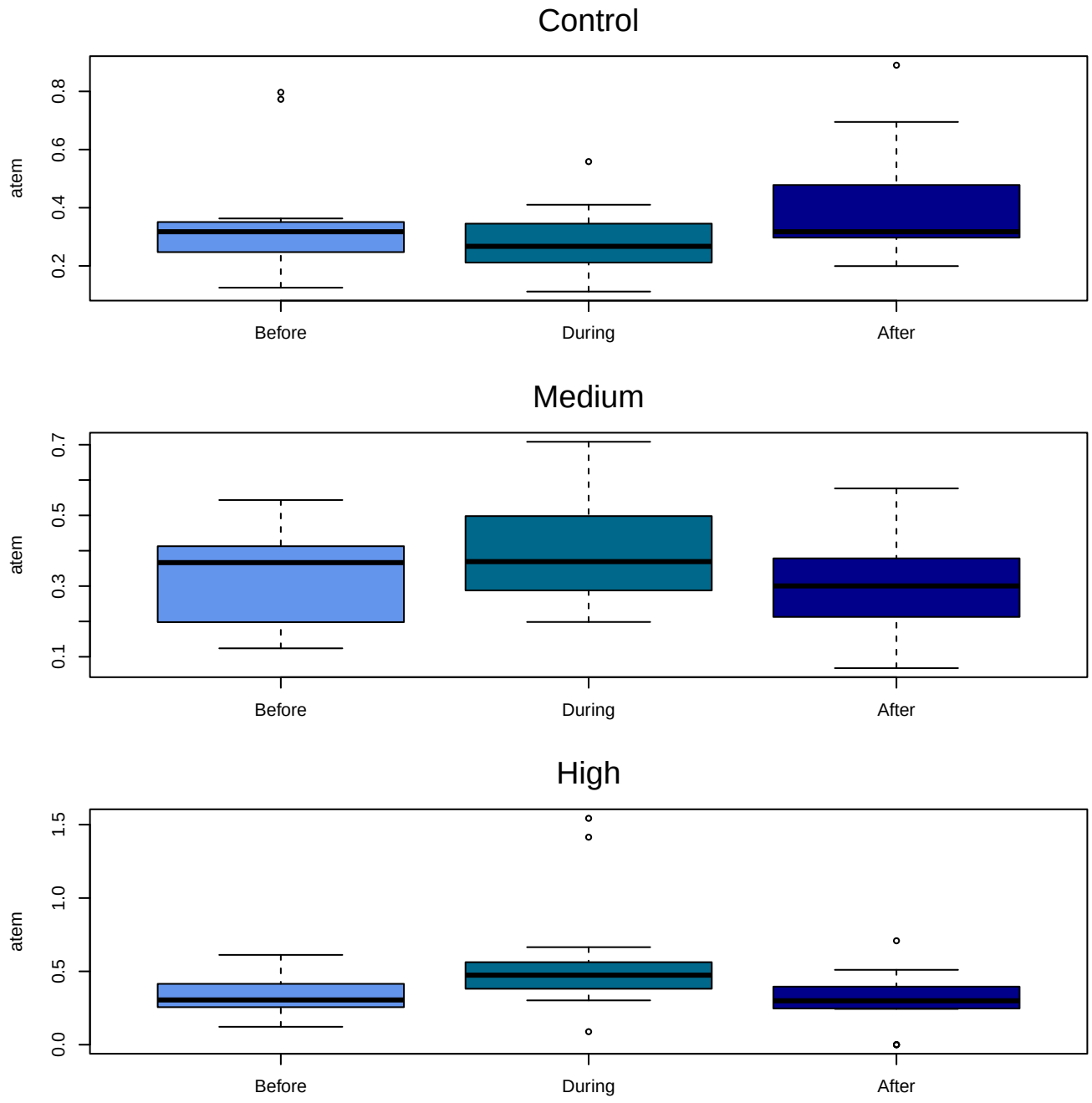


Figure 3: Experiment Design

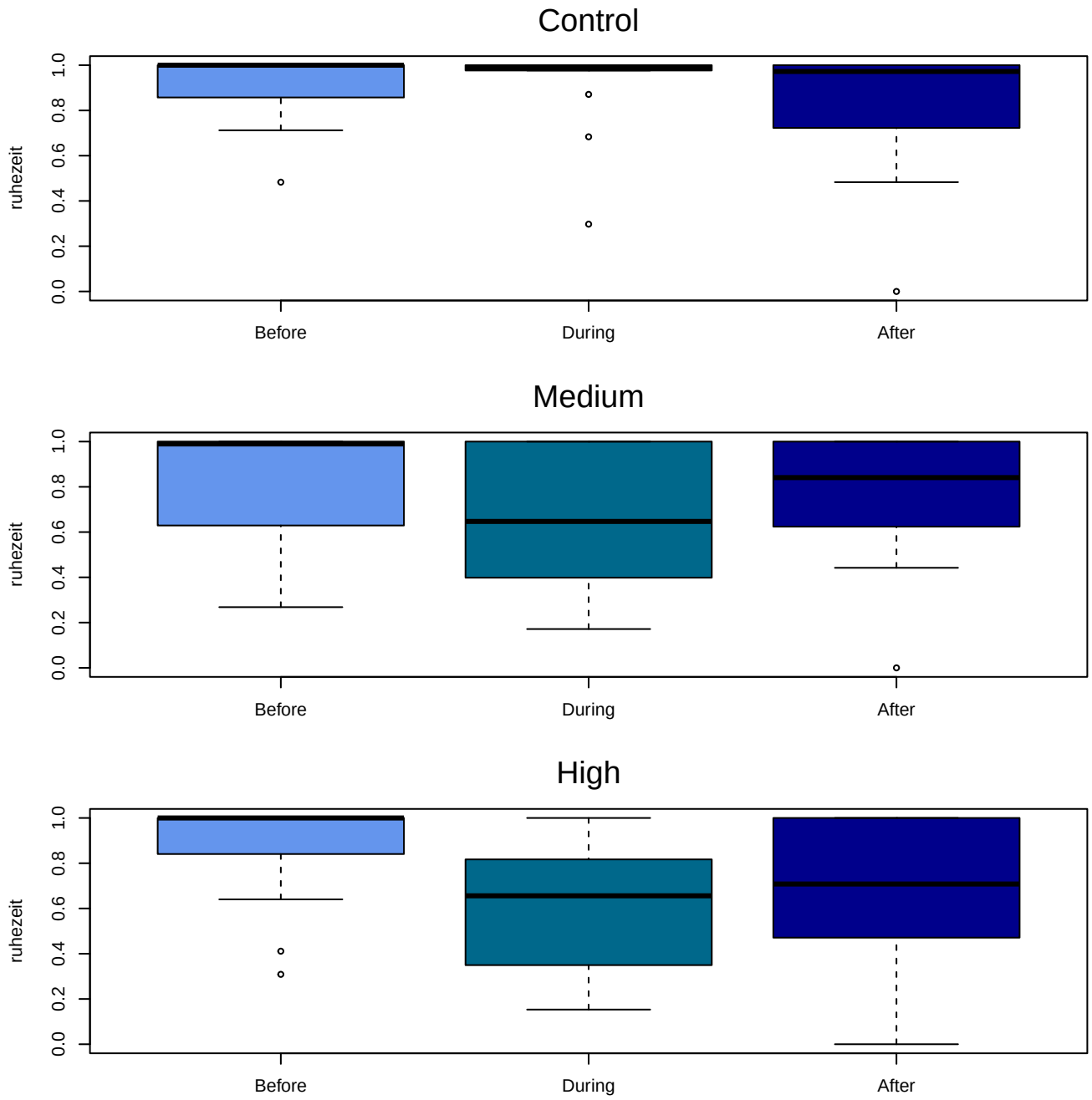
Data

- The Data set contains 42 observations, for which there exist three entries per noise level. One before, one during and one after the whales were exposed to the synthetic vessel noises
- Three different measures were taken:
  - The respiration rate was calculated as the number of breaths per minute
  - The mean swim speed (m/s), calculated by dividing the distance traveled by the duration of a video recording
  - The proportion of time resting

First Comparisons: Respiration Rate



First Comparisons: Proportion of Time Resting



First Comparisons: Speed