

Sound Levels of Participating Vessels during the 2023 Vessel Speed Reduction Program in the Santa Barbara Channel

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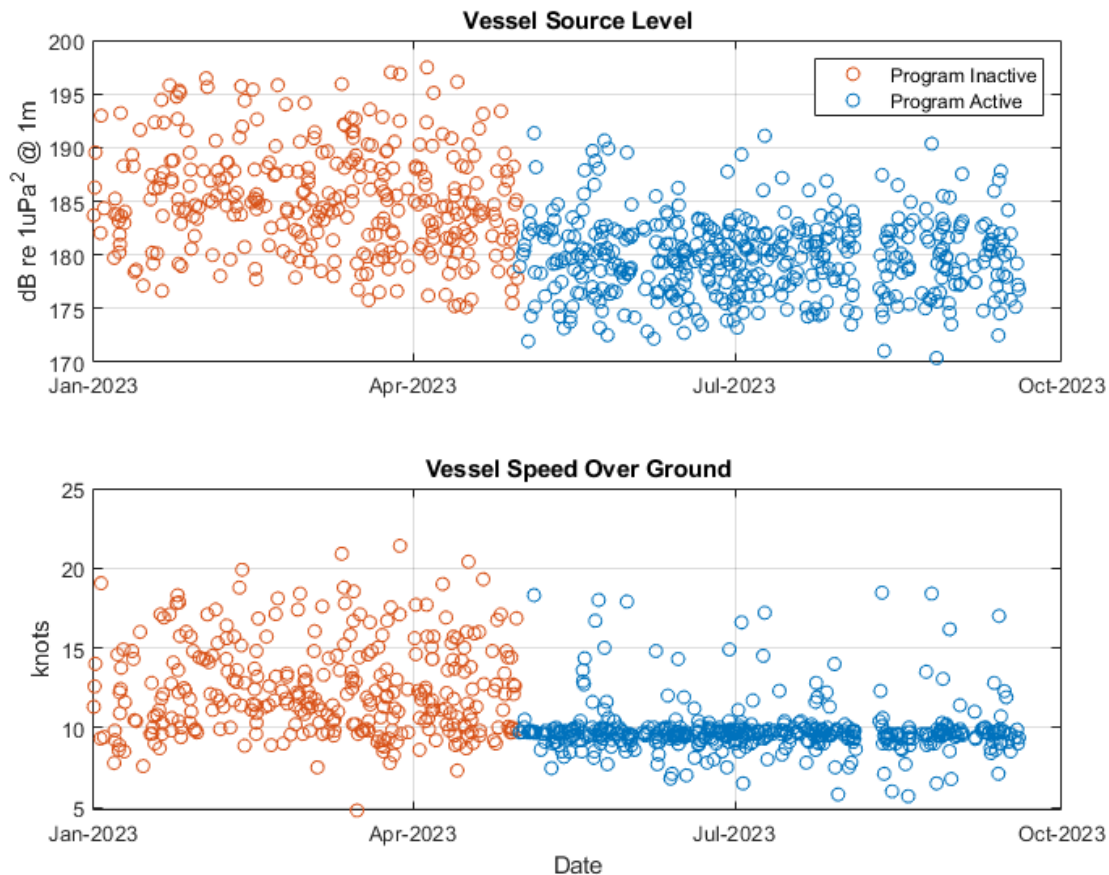
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Background

In 2014, the Channel Islands National Marine Sanctuary (CINMS) partnered with the Santa Barbara County Air Pollution Control District, Ventura County Air Pollution Control District, National Marine Sanctuary Foundation, and the Environmental Defense Center to implement a voluntary, incentive-based vessel speed reduction (VSR) initiative known as the Protecting Blue Whales and Blue Skies Program (hereafter VSR program). Enrollment was made available to companies operating container ships or vehicle carriers within the VSR zone, which extends approximately from Point Conception southeast to the Long Beach Harbor. In addition to its original goals of reducing the risk of ship strikes on endangered whales and decreasing air pollution emissions, the VSR program also recognized the opportunity to address underwater noise pollution in the Santa Barbara Channel (SBC). The potential for reducing noise pollution from commercial shipping by reducing vessel speeds may allow the VSR program to address an even more comprehensive conservation initiative than originally anticipated (ZoBell et al. 2021).

In 2018, the VSR program changed from a transit-by-transit approach to a fleet-based approach to incentivize slow speeds across all transits taking place in the VSR zone. In the fleet approach, container ship and vehicle carrier companies that cooperated in the program were rewarded based on the percentage of nautical miles that all vessels in their fleets traveled at 10 knots or less during the 2018 program season in the VSR zone. Companies with fleets that demonstrated higher percentages of cooperating transit miles were awarded with financial rewards and positive press. The fleet-based program has been utilized from 2018 to present. In 2023, the program was active May 1 through December 15.

Key message: The transits of the vessels participating in the VSR program in 2023 were **5.4 dB/transit** quieter while the program was active versus when the program was inactive. This reduction is higher than any previous program year analyzed.



Methods and Results

In this report, source levels of participating vessels were compared while the Blue Whales and Blue Skies Vessel Speed Reduction program was active versus inactive in 2023. In order to account for any differences in distance from the source to the receiver between hydrophone deployments, reductions in received sound pressure levels were assumed from reductions in source levels.

Source levels were determined by applying the propagation loss between the recording device and the source at the closest point of approach (CPA) to the received levels for each vessel transit. Received levels for each vessel transit were averaged over the data window period that equaled the time it took the ship to travel its length, as defined by ANSI/ASA (2009). Received levels were calculated for each ship passage by dividing the time series into 1 s non-overlapping segments. For each 1 s interval, a fast-Fourier transform (FFT) and Hanning window with FFT length of 10,000 samples and no overlap provided the power spectral density (PSD) in 1 Hz bins. Ten times the base-10 logarithm of the PSD in 1 Hz bins was used to convert to sound pressure received levels in decibels (dB) referenced to a unit pressure density (1 μPa^2). The hydrophone calibration was then applied to achieve the calibrated RL in dB re 1 μPa^2 . Propagation loss was calculated using a modified Lloyd's mirror propagation loss model and was

applied to the received level to estimate the source level of each transit (Gassmann et al. 2017, ISO 17208).

The average source level of participating vessels while the program was active in 2023 was 179.8 dB re $1\mu\text{Pa}^2$ @ 1m versus 185.2 dB re $1\mu\text{Pa}^2$ @ 1m while the program was inactive. This result concludes that there was a 5.4 dB / transit reduction of vessel source levels while the program was active.

References

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