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Steady inter and intra-annual decrease in the vocalization frequency of Antarctic blue whales

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Time averaged narrow-band noise near 27 Hz produced by vocalizations of many distant Antarctic blue whales intensifies seasonally from early February to late October in the ocean off Australia's South West. Spectral characteristics of long term patterns in this noise band were analyzed using ambient noise data collected at the Comprehensive Nuclear-Test-Ban Treaty hydroacoustic station off Cape Leeuwin, Western Australia over 2002–2010. Within 7 day averaged noise spectra derived from 4096-point FFT (0.06 Hz frequency resolution), the –3-dB width of the spectral peak from the upper tone of Antarctic blue whale vocalization was about 0.5 Hz. The spectral frequency peak of this tonal call was regularly but not gradually decreasing over the 9 years of observation from 27.7 Hz in 2002 to 26.6 Hz in 2010. The average frequency peak steadily decreased at a greater rate within a season at 0.4–0.5 Hz/season but then in the next year recovered to approximately the mean value of the previous season. A regression analysis showed that the interannual decrease rate of the peak frequency of the upper tonal call was 0.135 ± 0.003 Hz/year over 2002–2010 ($R^2 \approx 0.99$). Possible causes of such a decline in the whale vocalization frequency are considered.

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Article Outline

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KEYWORDS, PACS, and IPC

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acoustic noise, acoustic variables measurement, bioacoustics, biocommunications, regression analysis, underwater sound

PACS

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43.80.Ka

Sound production by animals: mechanisms, characteristics, populations, biosonar

43.30.Nb

Noise in water; generation mechanisms and characteristics of the field

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G01H

Measurement of mechanical vibrations or ultrasonic, sonic or infrasonic waves

G10K11/00

Methods or devices for transmitting, conducting or directing sound in general; Methods or devices for protecting against, or for damping, noise or other acoustic waves in general

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