



# Effect of anthropogenic noise on the acoustic active space in the Lusitanian toadfish

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Mate attraction is mediated by acoustic signals in the Lusitanian toadfish, *Halobatrachus didactylus*. Males aggregate in suitable shallow habitats and advertise their presence to females with a loud sound, the boatwhistle (BW, c. 140 dB SPL, i.e. re. 1  $\mu$ Pa, at 0.1 m). The acoustic active space of male BW is dependent not only on propagation constraints of the habitat, but also on the background noise that is affected by anthropogenic noise such as generated by boating activities.

We measured attenuation of BWs and of its representative pure tone components (120 Hz and 240 Hz) in an estuary breeding site (the Tagus estuary). BWs produced by breeding males were recorded with 2 m spaced equalized hydrophones in a linear array. Vocalization active space was estimated by comparing the envelopes of auditory evoked potentials (AEPs) using these recordings as stimuli, i.e. with BW recorded at increasing distances from the source. Another estimation was obtained by comparing attenuation of frequency tones with auditory sensitivity. These measurements point to an active space for the BW at c. 2 m deep water ranging between 6 and 13 m, depending on its spectral characteristics. In the presence of boat noise this range was strongly affected. Noise from small outboard motorboats and a larger ferryboat, presented at 130 dB SPL, reduced the active space to c. 2.5-4 m and 7-8.5 m, respectively. We further measured the vocal interactions (call alternation) between males at increasing distances. Vocalizations of close neighbors were entrained while the interaction pattern disappeared in distances above a few meters, pointing to an active space of BW of the same magnitude or a little longer.

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