

# A shallow scattering layer: High-resolution acoustic analysis of nocturnal vertical migration from the seabed

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Limnol. Oceanogr., 48(3), 2003, 1223-1234 | DOI: 10.4319/lo.2003.48.3.1223

ABSTRACT: Using bottom-mounted, high-frequency, inverted echo sounders (the Tracor acoustic profiling system) to examine acoustic backscattering every 2 min in 50-cm range bins above the seabed, we recorded strong, remarkably regular, nightly migrations of organisms from ⩾0.5 m above the seabed to the upper pelagic layers over a period of 6 d in July-August 1995. Population migration speeds on ascent versus descent (mean ± 1 SD) were not significantly different when estimated from the mode (or leading/trailing edge) of the population and were 0.59 ± 0.24 cm $s^{-1}$ in ascent (0.96 ± 0.25 cm $s^{-1}$ leading edge) and 0.67 ± 0.13 cm $s^{-1}$ on descent (0.78 ± 0.14 cm $s^{-1}$ trailing edge). The SD in start times of the ascent over the six nights was only 3 min, and that in the times of the completion of the descent was 7 min. Emergence began after and reentry was completed before downwelling irradiance at photosynthetically active wavelengths 1 m above bottom reached 0.5 × $10^{-6}$ µmol quanta $cm^{-2}$ $s^{-1}$. Migrators increased column scattering strength at 265 kHz by a factor of 14. Emergence-trap samples and nighttime plankton tows suggested that the migrating population was dominated by mysids, mostly *Neomysis kadiakensis*. Our acoustic results suggest that emergence is much more prevalent and important in coastal and estuarine environments than trapping and net sampling can reveal and hence that this important component of benthic-pelagic coupling requires additional attention both in measurements and in theoretical treatments.