{rokbox title=|Schematic plot of the difference in acoustic beam :: Image: Authors| thumb=|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-unveiling-bathypelagic-zone-acoustic-vertical-profiler-pena-et-al-2023-thumb.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-unveiling-bathypelagic-zone-acoustic-vertical-profiler-pena-et-al-2023.jpg{/rokbox}

Marian Peña, Santiago Hernández-León, 2023. **Unveiling the bathypelagic zone with an acoustic vertical profiler** . Deep Sea Research Part I: Oceanographic Research Papers. Volume 200, October 2023, 104134. https://doi.org/10.1016/j.dsr.2023.104134

Abstract: There is a growing interest in the study of mesopelagic and bathypelagic species due to their implication in the active carbon flux and climate change. Underwater acoustics is one of the most efficient methods to study such widely distributed communities. However, there are several challenges among which the reduced spatial resolution with depth for vessel-mounted echosounders stands out. The increase in sampling volume with range precludes observation of fine structures within the scattering layers or the study of less-aggregated organisms far from the transducer face. Echosounders are thus increasingly being deployed in alternative platforms that get the transducer close to the layers of interest. We present here the comparison between two active acoustic platforms used to analyse mesopelagic and bathypelagic species: a vessel-mounted EK60 scientific echosounder and a 6000 m depth rated Acoustic Zooplankton Fish Profiler (AZFP) attached to a CTD rosette. Both systems depicted similar vertical distributions and scattering at 38 kHz for the main scattering layers recorded around the Canary Islands but the finer vertical resolution of the AZFP discerned a series of sub-layers within them that differed in scattering, avoidance and sparsity. The availability of high frequencies at depth also provided further insights on the frequency response of those layers. However, the horizontal orientation of the AZFP created sidelobe artefacts close to the surface and bottom that limit its use in those areas. Signal-to-noise ratio of the AZFP system in the bathypelagic zone also precludes applying echointegration analysis at those depths or outside the denser scattering layers. Finally, the visualization of horizontal or temporal patterns such as migration or mesoscale features is limited to a coarse resolution using data from closely spaced successive stations. New challenges encountered with vertically-deployed echosounders and recommendations for their use are pointed out. Although no scattering layers were detected in the bathypelagic zone, this study unveils an area never before recorded acoustically.

Keywords: AZFP, Deep Scattering Layers, Canary islands, Sub-layers, Multifrequency, Noise, Horizontal orientation, Sparsity, Avoidance