

The Marine SoundLib: An open Infrastructure for exploring and understanding Marine Soundscapes

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The Marine SoundLib (<https://marinesoundlib.org>) is an open FAIR and comprehensive digital infrastructure designed to advance research, policy making, monitoring and public engagement in underwater acoustics. The platform provides a curated and continuously growing repository to explore soundscapes across temporal and spatial scales. The Marine SoundLib represents the sound level trends in time and space, based on hybrid millidecade bands per minute. Hidden within these trends are distinct sound events, from known and unknown sound sources (e.g. anthropophony, geophony, biophony). Currently, knowledge regarding potential sources of sound events in dynamic seas is very limited. The curated annotated sound events are stored and listed in a database on the platform, and their similarity is shown based on their acoustic characteristics projected in a 2D space using UMAP. This approach can be key in identifying events that may belong to the same source. The sound events are machine ready for detection and classifying algorithms to effectively process large and heterogenous datasets in order to unravel the acoustic complexity and biodiversity patterns. Registered users can access the Marine SoundLib via the Application Programming Interface (API) and a Python-based Software Development Kit (SDK). This allows for querying the recordings, its metadata and annotations of sound events as well as contributions to the Marine SoundLib. The platform is specifically designed to support machine learning workflows, aiming to provide training datasets and tools for automated detection and classification of biotic, abiotic or anthropogenic sounds. Next steps on the roadmap are connecting to European data infrastructures such as European Marine Observation and Data Network (EmodNet) and the European Digital twin of the Ocean (EDITO). By facilitating open access to standardized acoustic data, Marine SoundLib contributes to improved assessment of marine ecosystem health, supports policy frameworks addressing underwater noise, and fosters collaboration among researchers, industry stakeholders, and citizen scientists. The platform supports more efficient, comprehensive and scalable interpretation of complex marine soundscapes. The initiative aspires to position the platform as the European node in an emerging international network for marine bioacoustics.