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,2025.

[Ask the audience: Characterization of diving pressure on marine caves using diving operators' knowledge](#)

. Mediterranean Marine Science. Vol 26. No. 4 (2025). <https://doi.org/10.12681/mms.41113>

Abstract: Marine caves are considered biodiversity hotspots and serve as refuge habitats for both endemic and non-endemic species. Due to their low resilience, this habitat is considered vulnerable and is included as a key habitat in the European Union's (EU) Habitats Directive (92/43/EEC). Recreational diving has been identified as a significant threat to this habitat, causing sediment resuspension, destruction of epibenthic organisms by contact, and the accumulation of exhaled air from divers on the ceiling, which can lead to the death of benthic organisms trapped in the air pockets. Consequently, urgent management measures for recreational diving in this fragile habitat are necessary, particularly since this activity has experienced substantial growth during the last decades, evolving into a form of mass tourism. The development of effective management strategies for marine caves is challenging, as their exploitation and distribution are poorly known and cannot be estimated using traditional oceanographic mapping techniques applied to other benthic habitats. In this study, we conducted face-to-face, semi-structured questionnaires with dive operators, and used their Local Ecological Knowledge to estimate the spatial distribution of submerged and semi-submerged marine caves affected by recreational diving, the frequency of this activity, and the perception of diving centers regarding the impact of their activity on marine caves of the islands of Majorca and Menorca (Balearic Islands, Spain). Additionally, diving centers were asked to suggest potential measures to mitigate these impacts. Our results indicate that this approach is effective in identifying marine caves affected by recreational diving (a total of 111

marine caves were identified) and in determining key factors regarding the impact of recreational diving (accessibility of the cave and proximity to the diving center). This methodology also reveals that dive operators are generally aware of the reasons for protecting marine caves and the good practices required to protect this habitat, but little effort is made to implement these practices. These findings underline priority areas for intervention and suggest conservation practices to manage recreational diving in marine caves.

Keywords: Marine Caves, Local Ecological Knowledge, Marine Conservation, Public Engagement, Tourism.