{rokbox title=| Map of the study area showing the raw presence (A) and absence (B) records of Funiculina quadrangularis; records are color-coded according to the data source. :: Image: Authors|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-climate-driven-habitat-shifts-farriols-2026-thumb-et-al.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-ieo-csic-climate-driven-habitat-shifts-farriols-2026-et-al.jpg{/rokbox}

Jade Millot, Valentina Lauria, Vincent Georges, Christopher J. Smith, Carlos Dominguez-Carrió, Athanasios Evangelopoulos, Vasilis Gerovasileiou, Giovanni Chimienti, Emanuela Fanelli, Julian Evans, Michele Casini, Marie-Claire Fabri, Pierluigi Carbonara, Paola Rinelli, Daniela Massi, Adriana Profeta, Angélique Jadaud, Chiara Manfredi, Caterina Stamouli, Chryssi Mytilineou, **Maria Teresa Farriols**, Claudia Musumeci, Mario Sbrana, Slavica Petović, Luca Pisani, Daryl Agius, Nikolaos Kamidis, Ioannis Thasitis, Jerina Kolitari and Sandrine Vaz, 2026. **Climate-driven habitat shifts of the vulnerable sea pen Funiculina quadrangularis in the Mediterranean Sea.**
Aquat. Living Resour. 2026, 39, 11. https://doi.org/10.1051/alr/2026004

Abstract:The tall sea pen *Funiculina quadrangularis* (Pallas, 1766), a widespread octocoral species found in Mediterranean soft-bottom habitats, is recognized by the Food and Agriculture Organization of the United Nations as a vulnerable marine ecosystem indicator due to its sensitivity to bottom trawling. Adapted to stable environments, its distribution could be affected by the combined impacts of climate change, particularly warming bottom waters, and trawling activities. Records from the Mediterranean International Trawl Survey program and other sources were used in an ensemble species distribution modelling approach to predict current habitat suitability and project potential habitat shifts under the intermediate IPCC climate scenario SSP2–4.5 for 2050 and 2100. Results indicated a widespread distribution across the Mediterranean continental shelf and slope, with the species typically found between 100 and 750 m depth (occasionally as shallow as 20 m) and tolerating temperatures between 12°C and 16°C. By 2050, over 80% of the current habitat was projected to remain suitable. However, only 50% were expected to serve as climate refugia by 2100, likely due to warming bottom waters and increased salinity. Some habitat gains were projected (e.g., Ligurian Sea, Corsican waters, deep Eastern Mediterranean), but uncertainties persist regarding the species' ability to colonize these new areas. Despite its presence in trawled areas, suggesting a relatively lower fishing pressure sensitivity than other VME taxa, significant habitat shifts were projected under future climate conditions. Therefore, it is essential to prioritize conservation efforts in areas projected to remain suitable over time. The climate refugia identified through this study offer critical guidance for future climate-smart VME management plans, helping to ensure the long-term survival of *F. quadrangularis* in the Mediterranean Sea.

Keywords:Megabenthos,climate refugia,conservation management,soft bottoms,SDM,VME.