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CSIC Consejo Superior de Investigaciones Científicas | mncn 250 1771 2021 museo nacional de ciencias naturales

NOTA DE PRENSA

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Sponges provide shelter for numerous ocean species

The connectivity and adaptation of Atlantic sponges is threatened by temperature changes and trawling

- Samples were collected from a few meters below the surface to nearly 3,000 meters deep over 6,000 km, from Canada to the Arctic
- Analyzing the conservation status of sponge populations is key to working on the conservation of deep-sea ecosystems

Madrid, July the 22nd, 2025 An international group of researchers led by the Museo Nacional de Ciencias Naturales (MNCN-CSIC) has studied the connectivity and adaptation of a sponge that is very common in the waters of the North Atlantic and the Arctic and forms sponge grounds. Specifically, it is the potato sponge, *Geodia hentscheli*, a very slow-growing and highly vulnerable species to human disturbances such as trawling or rising temperatures. For this research, published in *Molecular Biology and Evolution*, samples of the potato sponge were taken at depths ranging from a few meters to nearly 3,000 meters throughout its known distribution, which extends from Canada to the Arctic. After the genetic analysis of more than 100 samples, whose compositional and functional characterization of the associated

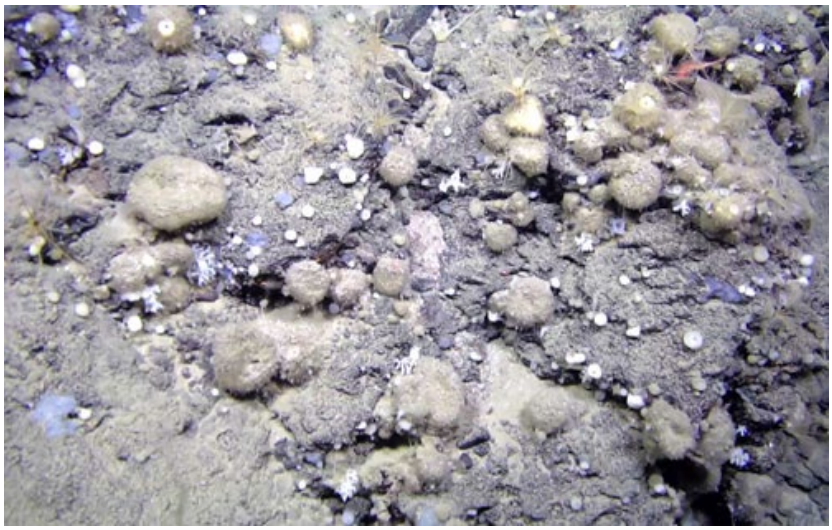

Photo of a North Atlantic sponge ground of *Geodia hentscheli* below 2,000 meters deep. Paco Cárdenas

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microorganisms was carried out in collaboration with the National Center for Biotechnology (CNB-CSC), the team has confirmed that the situation of these sponges is concerning. Factors related to human activities are putting these organisms at risk and could have severe consequences on deep-sea ecosystems, triggering a highly negative cascading effect for many other species related to human activity that puts these organisms at risk and can have severe consequences on deep-sea ecosystems, causing a very negative cascading effect for many other organisms.

Sponge grounds form ecosystems that play a fundamental role in the deep-sea habitats where they are found. “Their function in the deep sea is similar to that of forests in terrestrial ecosystems, as they provide protection to a wide variety of marine invertebrates as well as a significant number of commercially important fish species,” explains MNCN researcher Sergi Taboada, first author of this article. “With this work, we wanted to verify how the populations of these sponges connect with each other and their overall conservation status,” he continues.

“Cutting-edge genetic tools such as massive sequencing and transcriptomics have allowed us to determine that samples of *G. hentscheli* are genetically connected throughout their entire distribution, despite being separated by more than 6,000 km. This interconnection occurs in part thanks to prevailing oceanographic currents,” explains researcher Ana Riesgo, also from the MNCN and co-author of the work. The main current connecting populations of this sponge is the AMOC (Atlantic Meridional Overturning Circulation), a system of ocean currents that transports warm water from the tropics to the North and returns cold water to the South, which plays a crucial role in regulating the climate in the Northern Hemisphere and Europe. The weakening of the AMOC, detected in recent oceanographic studies, in addition to adding uncertainty to the climate, could have difficult-to-predict effects on species like *G. hentscheli*, whose populations depend on these ocean currents to connect with each other. This lack of connectivity could lead to the isolation of some populations, which could lead to their local extinction.

“Our results also confirm clear genetic isolation between populations found below and above 1,300 m depth,” Taboada clarifies. This genetic isolation is caused by environmental factors such as pressure and salinity, which are significantly different below and above this depth. The data obtained indicate that sponges are perfectly adapted to living in these environments with such different environmental conditions, both at the level of the sponge itself and at the level of the microbes that live in symbiosis within sponges.

“This pioneering research in deep-sea marine ecosystems could have important implications for the conservation of extremely fragile habitats such as sponge fields. We hope that our results can be used to protect these important habitats that are at the same time so poorly known,” Riesgo concludes.

S. Taboada, C. Díez-Vives, M. Turon, M.B. Arias, C. Galià-Camps, P. Cárdenas, V. Koutsouveli, F.C. de Carvalho, E. Kenchington, A.J. Davies, y S. Wang. (2025). Connectivity and adaptation patterns of the deep-sea ground-forming sponge *Geodia hentscheli* across its entire distribution. *Molecular Biology and Evolution* DOI: https://doi.org/10.1093/molbev/msaf145

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