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# New advances in the study of the biodiversity of the SCI "Volcanes de fango del golfo de Cádiz" (southwestern Spanish Margin)

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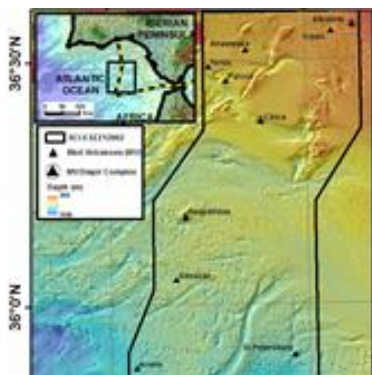
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**Introduction:** The Gulf of Cádiz represents an important seepage area with ca. 70 mud volcanoes (MV), of which one third are located in European waters (Spain and Portugal). Previous projects and expeditions resulted on a large amount of information on different aspects of MV of the Moroccan margin, which seem to have a higher seepage activity than those of the Iberian margin. Those studies mainly focused on their geological characteristics, whereas others offered novel information on their associated biota, especially the endosymbiont-bearing invertebrates as well as non-previously described species (Vanreusel et al. 2009). In 2014, the MV of the Spanish margin of the Gulf of Cádiz were included in the Natura 2000 network (Site of Community Importance - SCI "Volcanes de fango del golfo de Cádiz" - ESZZ12002) under the framework of the Life + project INDEMARES. Nowadays, the LIFE IP PAF INTEMARES project represents an opportunity for improving the knowledge on the biodiversity of this SCI.



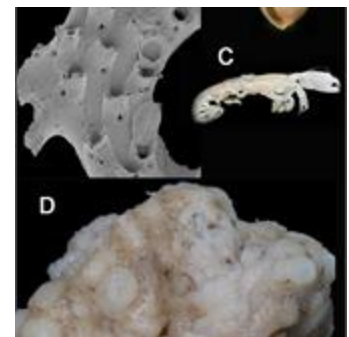
**Material and methods:** Samples and underwater images were obtained in MV and their adjacent bottoms from 300 to 1100 m water depth in the SCI, during the INDEMARES/CHICA and ISUNEPAC expeditions (Fig. 1). Sampling was carried out using box-corer/Shipek, benthic dredge, beam-trawl and otter-trawl.

Figure 1 Location of the Site of Community Importance "Volcanes de fango del golfo de Cádiz" and of the main fluid venting structures

Samples were sieved (10, 5, 1 and 0.5 mm) and individuals separated from the sediment, preserved in 70% Ethanol-4% Formaldehyde and identified. Transects with the ROV LIROPUS 2000 and photogrammetric sleds (APHIA 2012, HORUS) were done in different areas and completed the faunistic list with other species.

**Results and discussion:** More than 1000 species have been listed so far in the SCI, with molluscs displaying the highest number of species, followed by fishes, annelids, decapod crustaceans, cnidarians, sponges, echinoderms and bryozoans in decreasing order. Other groups are less represented such as brachiopods, sipunculids, nemerteans and ascidians or could not be studied yet (e.g. peracarid crustaceans). Recent revisions of some groups, mainly poriferans, bryozoans and molluscs, may result in the description of more than 10 new species to science such as the sponge *Myrmekioderma indemaresi* (dedicated to the INDEMARES project) (Sitjà et al. 2018) or the bryozoan *Reteporella victori* (dedicated to the mud volcano specialist Victor Díaz del Río, Ramalho et al. 2018) (Fig. 2). Other species are new records for the area the echinoderm *Hacelia superba*; the decapod crustacean *Calliax lobata* (García Raso et al. 2018); the molluscs *Pseudosimnia flava*, *Neopycnodonte zibrowii*, *Solemya elarraichensis* and *Lucinoma asapheus*; the fishes *Zenion hololepis*, and *Opisthoproctus grimaldii*. Around 20 species are included in local, national and international lists of threatened or vulnerable species, such as the cnidarians (*Madrepora oculata*, *Dendrophyllia cornigera*, *Lophelia pertusa*), echinoderms (*Centrostephanus longispinus*), molluscs (*Charonia lampas*) and fishes (*Centrophorus granulatus*). Also, an interesting ‘ascidian garden’ with the species *Polycarpa mamillaris* has been observed on carbonate structures, between 229 and 459 depth. Gazul, Pipoca and Chica displayed the highest species richness values, but Anastasya displayed low ones due to its extremophile sedimentary conditions with chemosynthetic-based communities and also the high trawling activity. The role of cold seeps and the formation of methane-derived authigenic carbonates for increasing biodiversity when compared to adjacent soft bottoms was noticeable in Gazul, Anastasya and Chica. A high number of species have been recorded in the SCI, as a result of the geological, geochemical, oceanographic and habitat heterogeneity of this area. The faunistic list of this area has increased considerably in 10 years from 30 spp. (Díaz-del-Río et al., 2009) to more than 1000 spp. (this study) due to the high sampling effort using different techniques targeting the infaunal, epifaunal and demersal species, new multidisciplinary sampling expeditions and the contribution of experienced taxonomists on different phyla, among other factors.

Figure 2: Some examples of the new species and records detected in the SCI. A) the bryozoan *Reteporella victori* Ramalho, López-Fé & Rueda, 2018; B) the gastropod *Pseudosimnia flava*; c) the decapod *Calliax lobata*; D) the sponge *Myrmekioderma indemaresi* Sitjà, Maldonado, Farias & Rueda, 2018.



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## References

Díaz-del-Río, V., Palomino, D., Vázquez, J.T., Rueda, J.L., Fernández-Salas, L.M. & López-González, N. (2009). Nuevas evidencias de enlosados y chimeneas carbonatadas en el campo de volcanes de fango de El Laberinto (Golfo de Cádiz, SO de la península ibérica). *Actas de 6º Simposio sobre el Margen Ibérico Atlántico*, Oviedo, 297-300. García Raso, J.E., García-Muñoz, J., Mateo-Ramírez, A., López González, N., Fernández-Salas, L., & Rueda, J.L. (2019). Decapod crustaceans Eucalliidae in chemoautotrophic bathyal bottoms of the Gulf of Cadiz (Atlantic Ocean), environmental characteristics and associated communities. *Journal of the Marine Biological Association of the United Kingdom* 99(2), 437-444. Ramalho, L.V., López-Fé, C.M., Rueda, J.L. (2018). Three species of Reteporella (Bryozoa: Cheilostomata) in a diapiric and mud volcano field of the Gulf of Cádiz, with the description of Reteporella victori n. sp. *Zootaxa*. 4375(1): 90. Sitjà, C., Maldonado, M., Farias, C., Rueda, J.L. (2018) Deep-water sponge fauna from the mud volcanoes of the Gulf of Cadiz. *Journal of the Marine Biological Association of the United Kingdom* 1–25. Vanreusel, A., Andersen, A.C., Boetius, A., Connelly, D., Cunha, M.R., Decker, C., Heeschen, K., Hilario, A., Kormas, K.A., Maigniem, L., Olu, K., Pachiadaki, M., Ritt, B., Rodrigues, C., Sarrazin, J., Tyler, P., Van Gaever, S. & Vanneste, H. (2009). Biodiversity of Cold seep ecosystems along the European margins. *Oceanography* 22, 118-135.

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