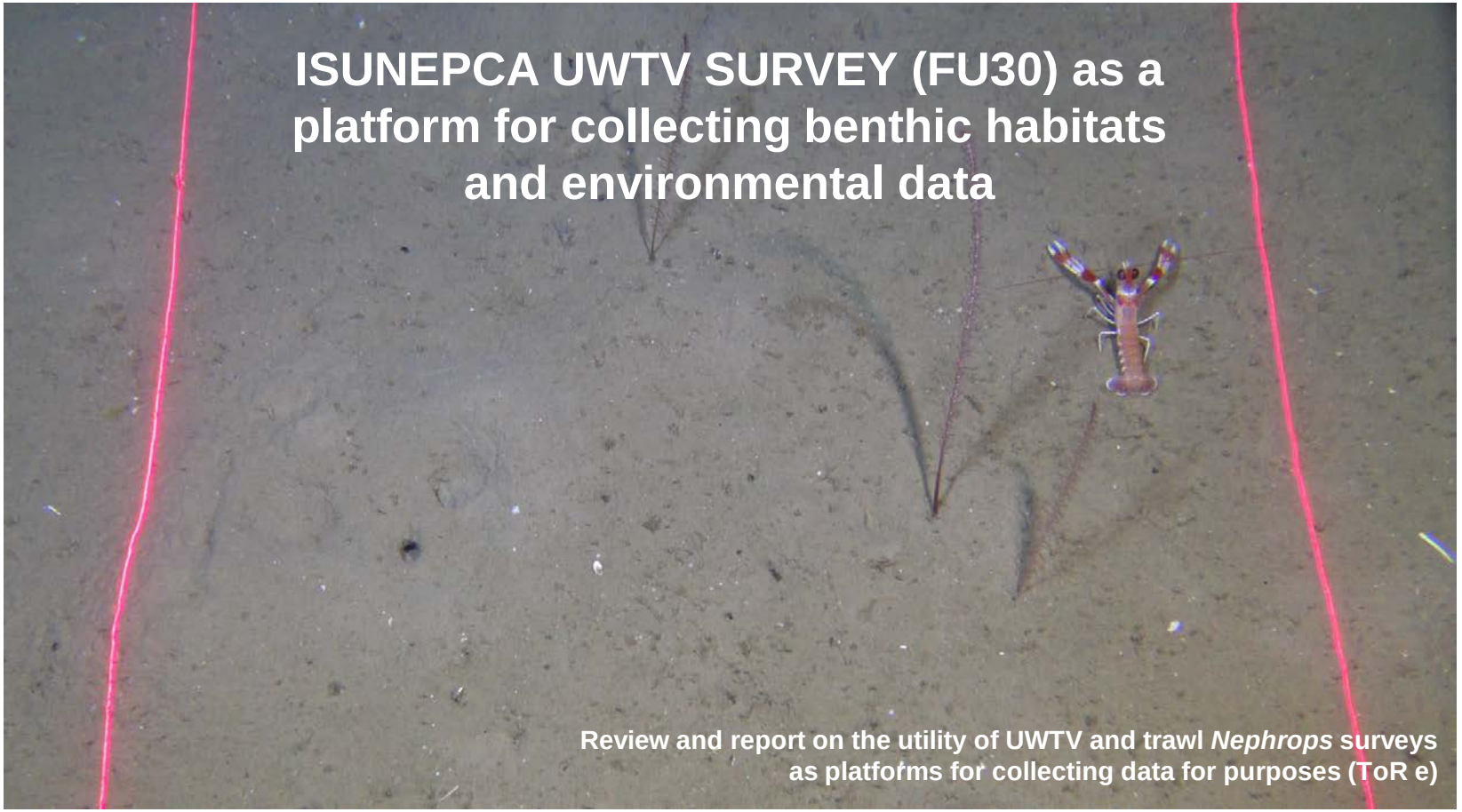


ISUNEPCA UWTV SURVEY (FU30) as a platform for collecting benthic habitats and environmental data

Review and report on the utility of UWTV and trawl *Nephrops* surveys as platforms for collecting data for purposes (ToR e)

Yolanda Vila

WGNEPS 2021
On-line meeting
16 – 18 November

ISUNEPCA UWTV SURVEY

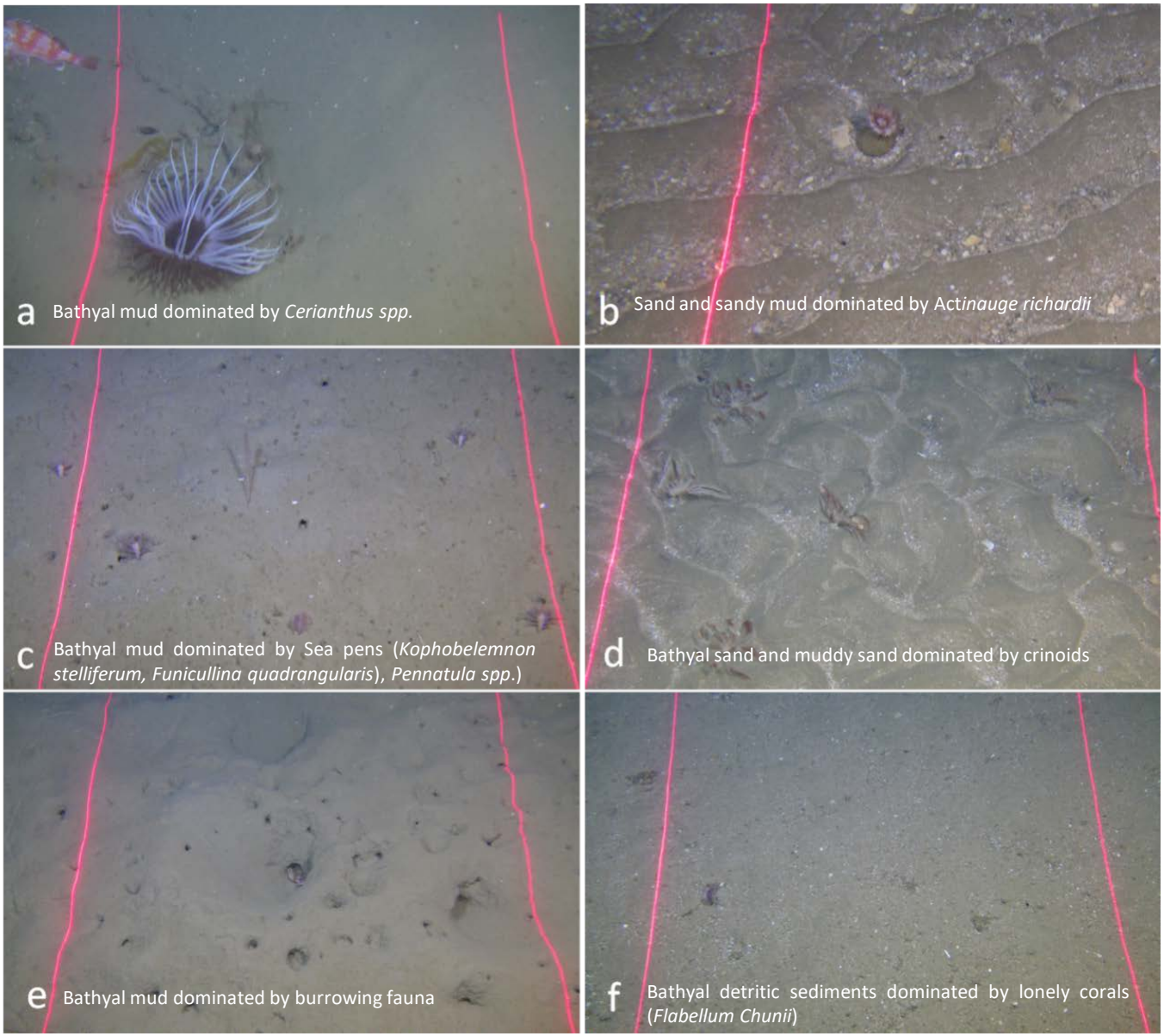
Multi-disciplinary goals

2014 considered exploratory

2015-2019 & 2021 time series

- ✓ To estimate the *Nephrops* density
- ✓ To delimit the boundaries of *Nephrops* ground using Beam trawl
- ✓ To estimate macro benthic species density and occurrence of trawl marks and litter on the sea bed
- ✓ To collect oceanographic data (CTD in Sledge)
- ✓ To collect sediment samples
- ✓ To collect sea bed morphological and backscatter information

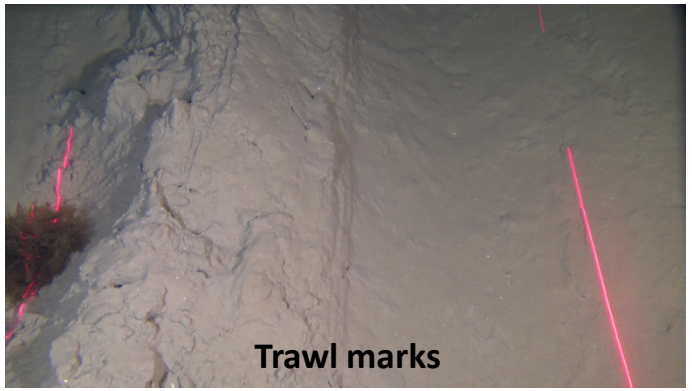
Some bathyal sedimetary habitats identified from footages taken during ISUNEPCA UWTV surveys time series

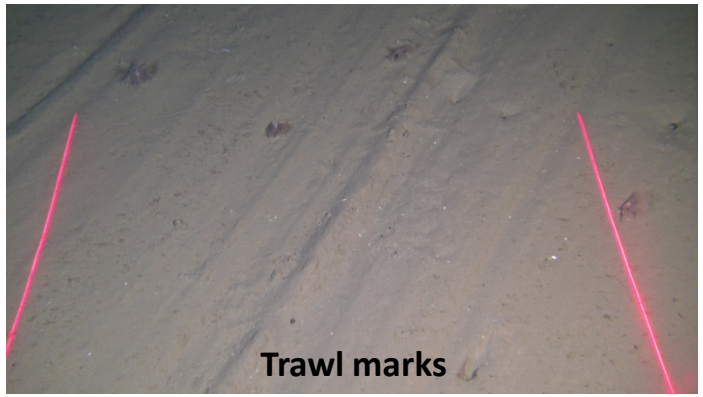


Antropogenic impact

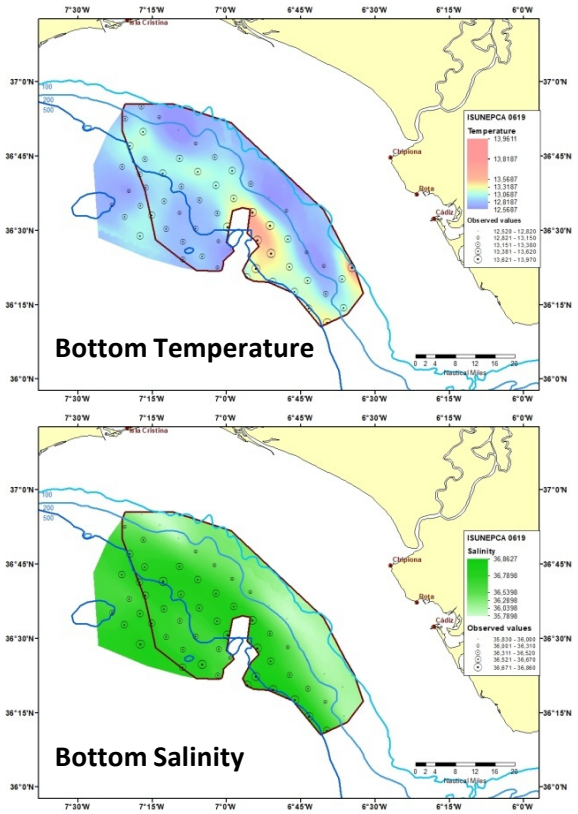
Litter

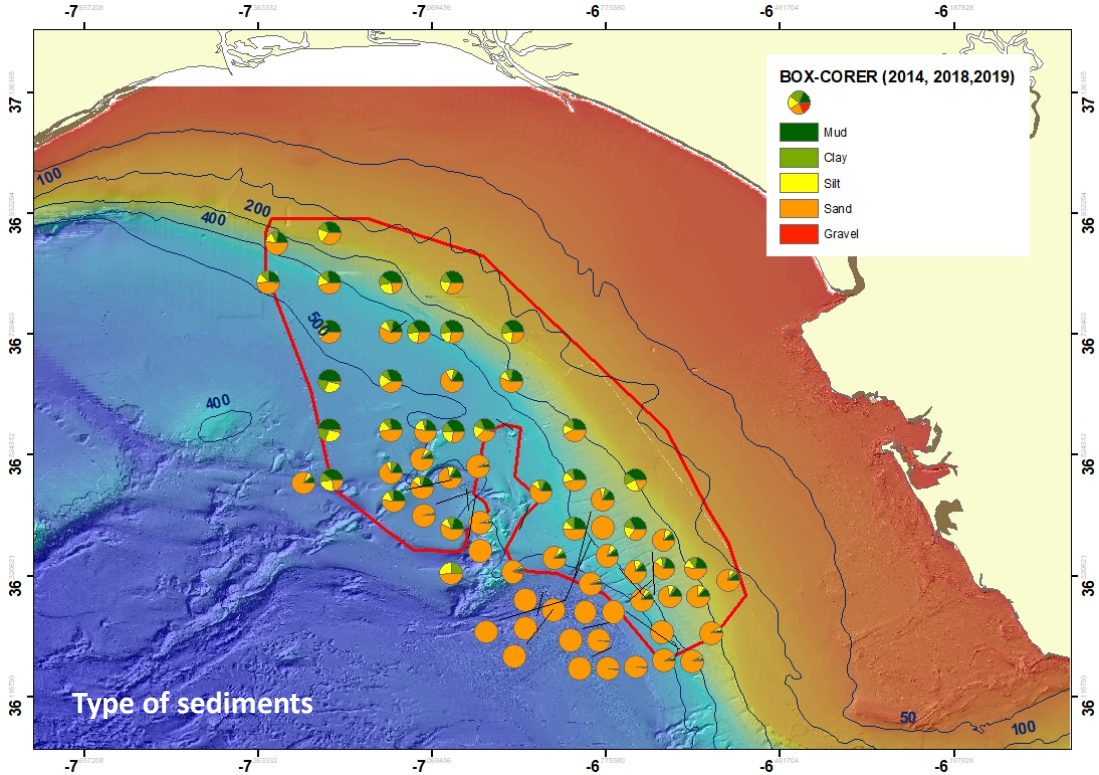
Fishing activity





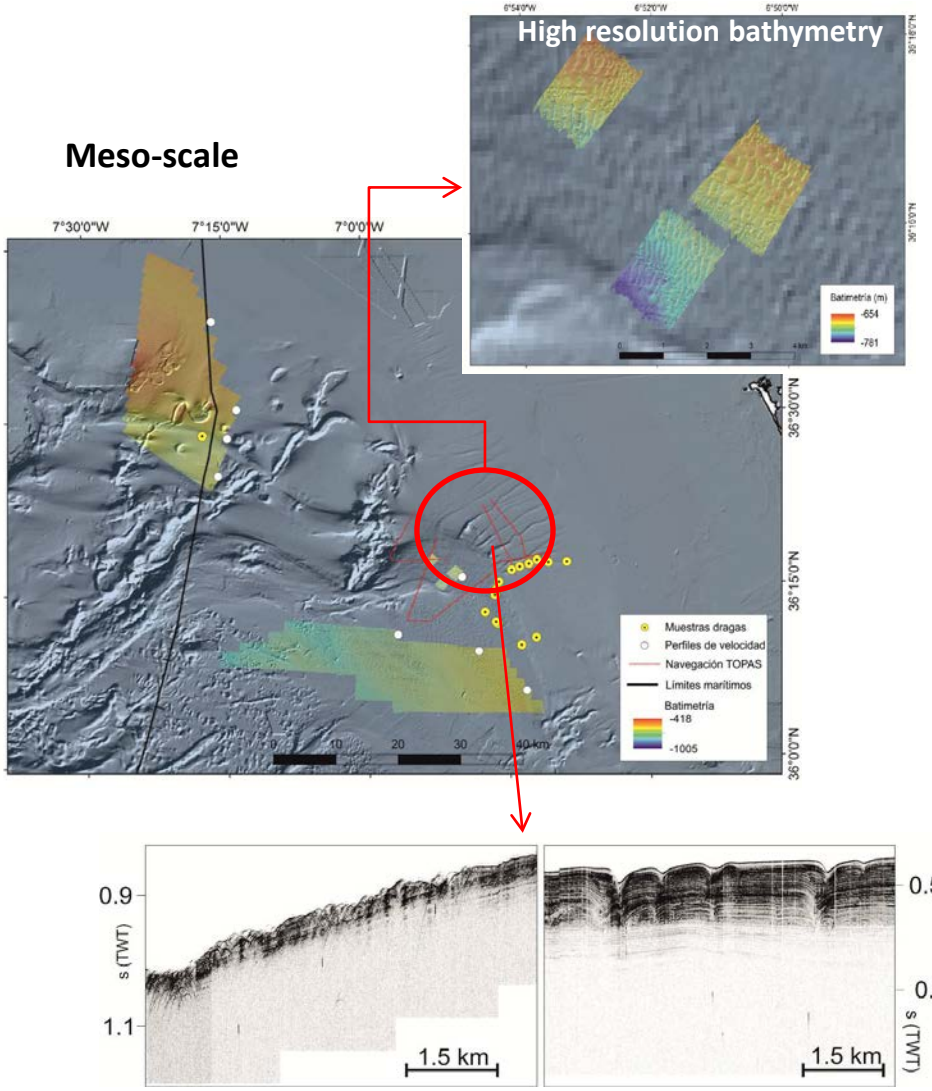
Environmental variables

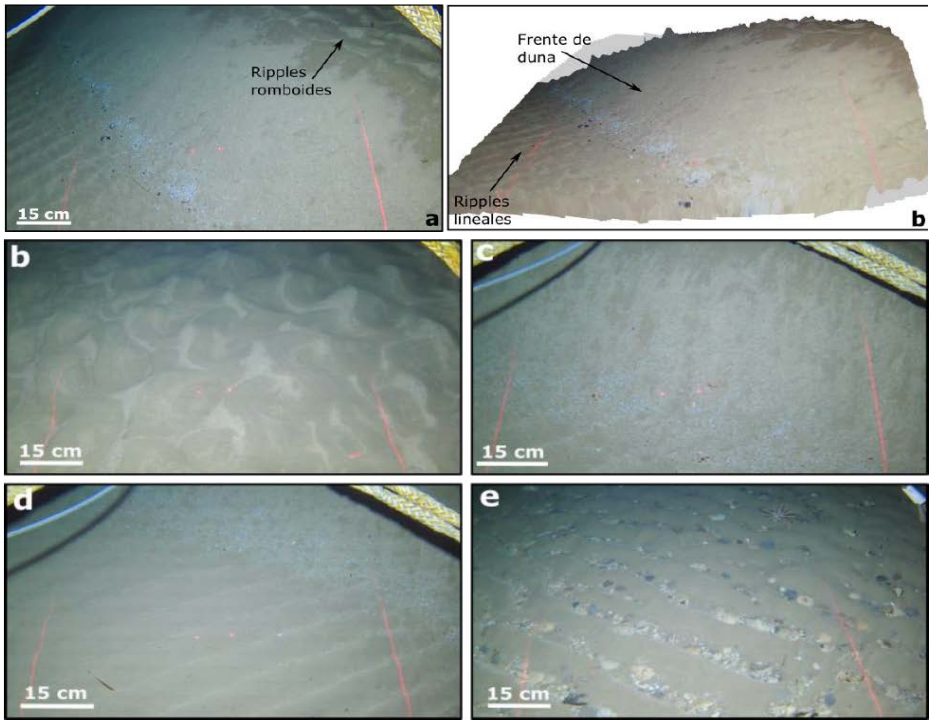




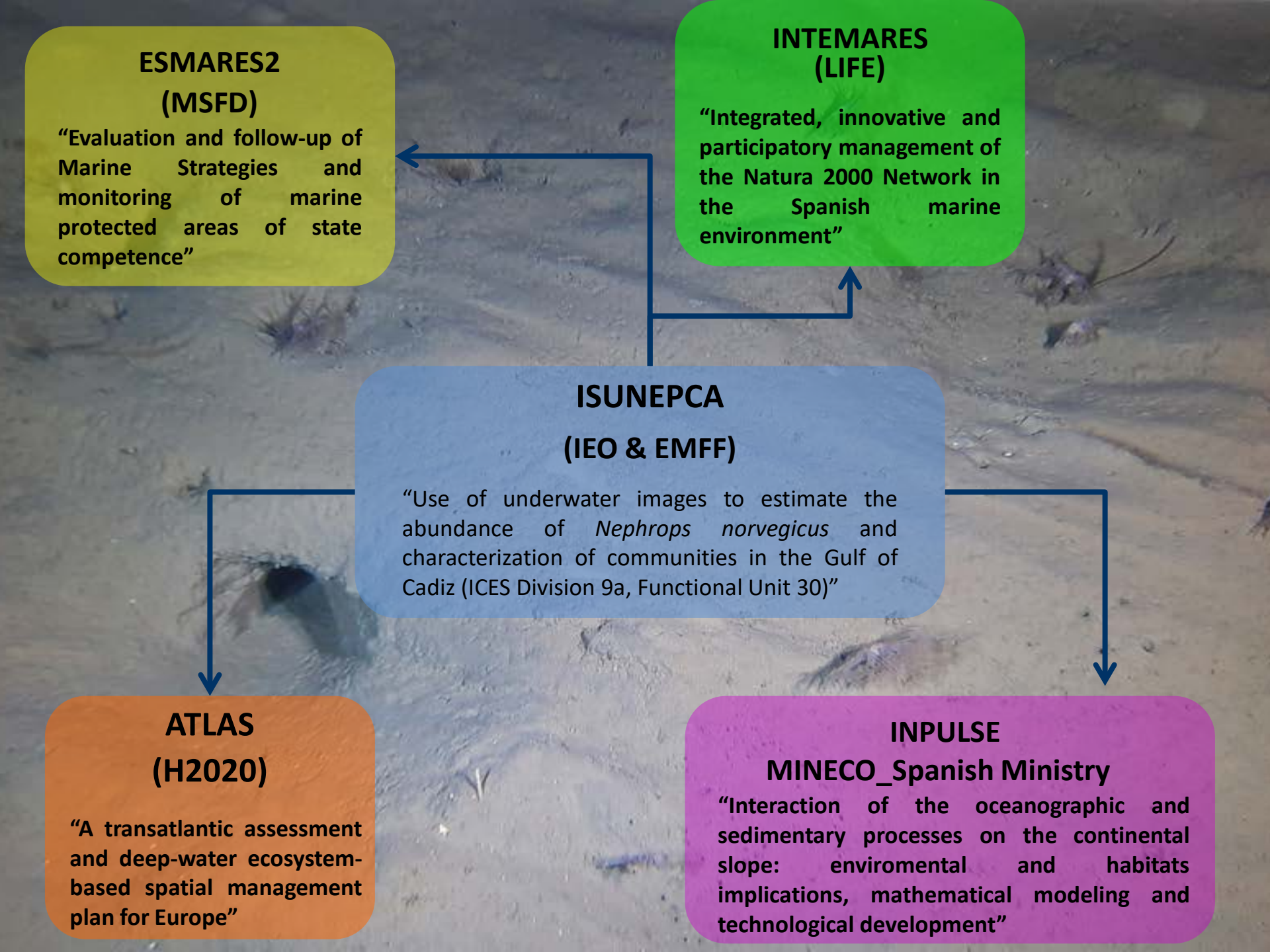
Sea bed morphology

Meso-scale





Micro-scale:
Seafloor microtopography
Predominant oceanographic dynamics


ESMARES2
(MSFD)
"Evaluation and follow-up of Marine Strategies and monitoring of marine protected areas of state competence"
INTEMARES
(LIFE)
"Integrated, innovative and participatory management of the Natura 2000 Network in the Spanish marine environment"
ISUNEPCA
(IEO & EMFF)
"Use of underwater images to estimate the abundance of *Nephrops norvegicus* and characterization of communities in the Gulf of Cadiz (ICES Division 9a, Functional Unit 30)"
ATLAS
(H2020)
"A transatlantic assessment and deep-water ecosystem-based spatial management plan for Europe"
INPULSE
MINECO_Spanish Ministry
"Interaction of the oceanographic and sedimentary processes on the continental slope: enviromental and habitats implications, mathematical modeling and technological development"

https://www.eu-atlas.org/

ATLAS PROJECT – Funded by European Horizont 2020

✓ The ATLAS project is targeted to improve our understanding of complex deep-sea ecosystems and their associated species, including those that are new to science

Case Study 7. Gulf of Cadiz/ Strait of Gibraltar/ Alborán Sea

✓ This case study focuses on understanding the Atlantic-Mediterranean biodiversity and connectivity and address the role of the Mediterranean waters regarding those aspects. The area supports intensive anthropogenic activity, including tourism, fisheries, aquaculture, oil and gas exploitation, bioactives, wind energy and it is an important area for maritime traffic.

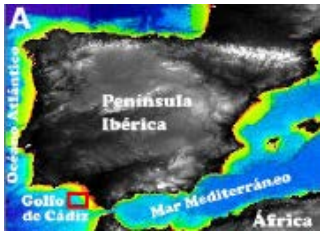
INTEMARES PROJECT – Funded by LIFE PROGRAMME OF THE EUROPEAN UNION

"Integrated, innovative and participatory management of the Natura 2000 Network in the Spanish marine environment"

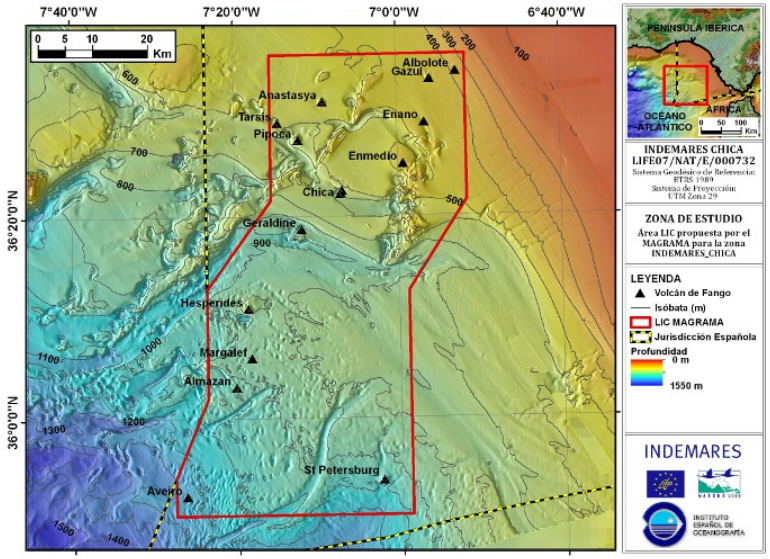
https://intemares.es/en/the-project

✓ Aims to achieve a network of marine spaces of the Natura 2000 Network

Case study: SCI Mud volcanoes of the Gulf of Cadiz



The study area contains 4 main geomorphic features with 7 different sedimentary facies that harbor 11 main habitat types, some of them included in the Habitat Directive (92/43/EEC) such as reefs (Habitat 1170) and submarine structures made by leaking gases (Habitat 1180)



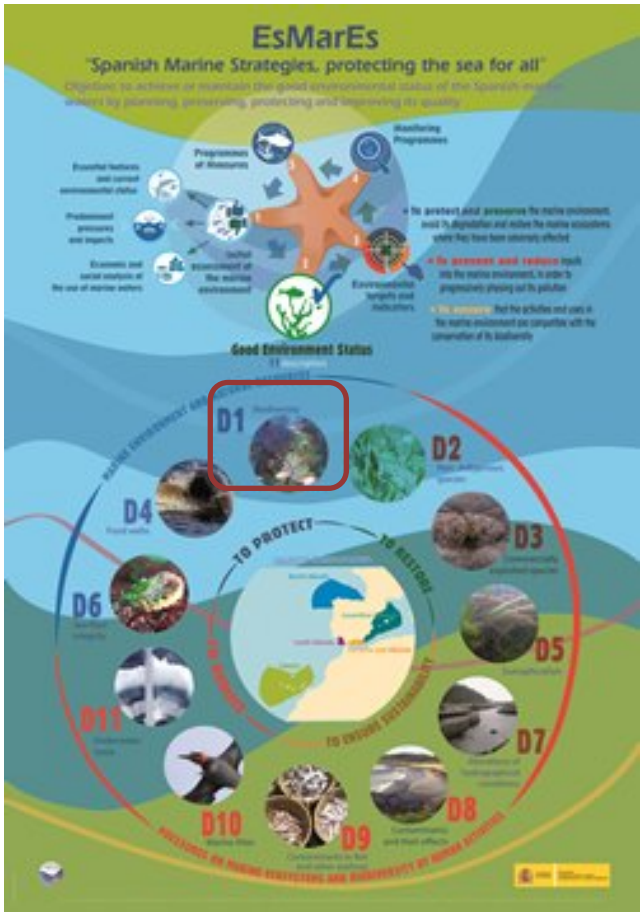
VICEPRESIDENCIA TERCERA DEL GOBIERNO

GOBIERNO DE ESPAÑA

MINISTERIO PARA LA TRANSICIÓN ECOLÓGICA Y EL RETO DEMOGRÁFICO

ESMARES2 PROJECT – MSDF

"Evaluation and follow-up of Marine Strategies and monitoring of marine protected areas of state competence"



SUD-ATLANTIC MARINE SUBDIVISION

https://www.miteco.gob.es/es/costas/temas/proteccion-medio-marino/estrategias-marinas/demarcacion-sudatlantica/

INPULSE PROJECT – Funded by Spanish Ministry

“Interaction of the oceanographic and sedimentary processes on the continental slope: enviromental and habitats implications, mathematical modeling and technological development”

Goals:

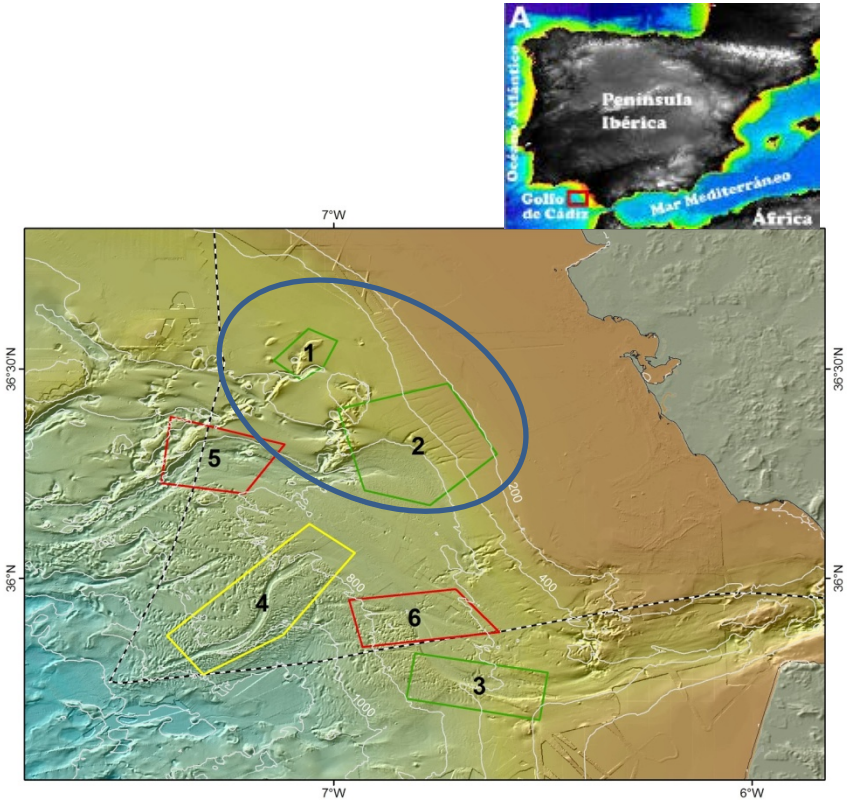
1. Characterization, modeling and numerical simulation of current oceanographic processes and their variability

2. Geomorphological analysis of the seabed to meso and micro-scale

3. Identification and characterization of current and recent sedimentary processes

4. Interaction of hydrodynamics with morphological and sedimentary features and their influence on habitat development

5. Design and deployment of an underwater sensor network demonstrator with acoustic communication



SCIENTIFIC PAPERS

Lozano, P., et al., 2019. **Habitat distribution and associated biota in different geomorphic features within a fluid venting area of the Gulf of Cádiz (South Western Iberian Peninsula, NE Atlantic Ocean).** In: Seafloor Geomorphology as Benthic habitat. GeoHAB Atlas of Seafloor Geomorphic Features and Benthic Habitats, chapter 52. 2ª edition. Eds: P. Harris & E. Baker. 10.1016/B978-0-12-814960-7.00052-X

Lozano, P., et al., 2020. **Multiprocess interaction shaping geoforms and controlling substrate types and benthic community distribution in the Gulf of Cádiz**. Marine Geology. 423. 106139. 10.1016/j.margeo.2020.106139

Urra, J., et al.,.2021. **Dee-sea habitat characterization using acoustic data and underwater imagery in Gazul mud volcano (Gulf of Cadiz, NE Atlantic).** Deep Sea Research Part I 169: 2021, 103458, ISSN 0967-0637.


CHAPTER 52

Habitat distribution and associated biota in different geomorphic features within a fluid venting area of the Gulf of Cádiz (Southwestern Iberian Peninsula, Northeast Atlantic Ocean)

Pablo Lozano[1], José L. Rueda[2], Marina Gallardo-Núñez[2], Carlos Farias[3], Javier Urra[2], Yolanda Vila[3], Nieves López-González[2], Desirée Palomino[3], Olga Sánchez-Guillamón[3], Juan T. Vázquez[2] and Luis M. Fernández-Salas[3]

[1]*Universidad de Cádiz, F. de Ciencias del Mar y Ambientales, Polígono Río San Pedro, Cádiz, Spain* [2]*Instituto Español de Oceanografía, CO de Málaga, Fuengirola, Spain* [3]*Instituto Español de Oceanografía, CO de Cádiz, Cádiz, Spain*

Abstract

The Gulf of Cádiz (GoC) is influenced by the collision of the Alborán Domain with the North African and South Iberian margins, resulting in a hydrocarbon-rich fluid venting area. The interaction of the Eastern North Atlantic Central Water mass and the Mediterranean Outflow Water strongly influences seabed topography and substrate types. Both geological and oceanographic processes determine the distribution of a wide variety of geomorphic features, habitats, and species. Based on high-resolution multibeam echosounder data (both bathymetric and backscatter) and ground truthing with more than 100 videos and 50 samples, we have mapped and characterized an area of more than 1000 km² in the shallow part of the Site of Community Importance denominated "Volcanes de fango del golfo de Cádiz" (Mud volcanoes (MVs) of the GoC). The study area shows four main geomorphic features (diapiric structures, MVs, channels, and other erosive related features and flat areas) with seven different substrate types that harbor 11 main habitat types. Some are included in the Habitat Directive (92/43/EEC), such as reefs (Habitat 1170) and submarine structures made by leaking gases (Habitat 1180).

Keywords: Fluid venting; mud volcanoes; diapiric ridges; channels; Gulf of Cádiz; benthic habitats; biodiversity


Marine Geology 423 (2020) 106139
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journal homepage: www.elsevier.com/locate/margo

Multiprocess interaction shaping geoforms and controlling substrate types and benthic community distribution in the Gulf of Cádiz

Pablo Lozano[a,*], Luis Miguel Fernández-Salas[b], Francisco Javier Hernández-Molina[c], Ricardo Sánchez-Leal[d], Olga Sánchez-Guillamón[d], Desirée Palomino[d], Carlos Farias[d], Ángel Mateo-Ramírez[e], Nieves López-González[e], Marga García[e], Juan-Tomás Vázquez[e], Yolanda Vila[b], José Luis Rueda[e]

ARTICLE INFO

ABSTRACT

The Iberian margin in the Gulf of Cádiz hosts a fluid venting area embedded into a contourite depositional drift and is a natural laboratory to study how multiple interacting processes shape the seafloor. A high-resolution morpho-sedimentary analysis, based on geophysical data, sediment samples and submarine imagery, has been carried out to the extent and evolution of the main geoforms are discussed, and the influence of geological, oceanographic and biogenic processes conditioning substrate types and benthic community distribution are evaluated. The interplay of geological (e.g., salt and shale diapirism, mud volcanism), oceanographic (e.g., water mass circulation, secondary circulation, vertical eddies, internal waves) and biogenic (e.g., methane-derived authigenic carbonates formation, coral mound aggradational) processes drives the formation of a large variety of geoforms including, among others, contourite drifts, channels, diapiric ridges, mud volcanoes, pockmarks, and coral mounds. At a smaller scale, the interaction between massive and fluid extrusive, biogenic, and bottom current-related processes (both depositional and erosive) determines the distribution of substrate types and benthic communities, which have been classified as belonging to different biotopes.

1. Introduction

The seafloor morphology and the various substrate types result from geological, oceanographic and biological processes interacting at different temporal and spatial scales, from hundreds of kilometers for plate motions, to centimeters for bio-constructions (Lecours et al., 2015; Micallef et al., 2018; Camerlenghi, 2018). Advances in remote-sensing imagery are improving high-resolution mapping techniques and increasing our understanding of seabed diversity in deep marine environments. In particular, the latest generation of multibeam echosounders, combined with underwater seafloor images and more accurate sediment sampling, have recently been used to generate higher resolution morphology and seabed maps. Correlating these maps with oceanographic data can help further decode formational mechanisms and the evolutionary history of seabed morphologies (Lecours et al., 2015; Micallef et al., 2018).

Geological processes, including those associated with salt and shale kinematics, like mud diapirism, are long-term factors that shape the seafloor. These processes dominate areas that are experiencing ongoing collisional tectonics (Kopf, 2002), particularly as part of active and non-active accretionary wedges. Examples of this include the Barbados Accretionary Wedge (Brown and Westbrook, 1988), southwestern Taiwan (Cheng et al., 2014), the Mediterranean Ridge (Limonov et al., 1996) and the Gulf of Cádiz (Somoza et al., 2003; Fernández-Puga et al., 2007; Medialdea et al., 2009). Extrusive (e.g., mud volcanism) and collapse (e.g., pockmarks) morphologies are commonly associated with mud diapirism due to pressurized fluid migration (Milkov, 2000; Kopf, 2002; Ceramicola et al., 2018). At a smaller scale, microbial activity linked to fluid migration can cause the formation of methane-derived authigenic carbonates (MDACs), which can effectively change the seafloor substrate type from a soft sediment to a hard substrate (Greinert et al., 2001).

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E-mail address: pablo.lozano@uca.es (P. Lozano).

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Available online 20 January 2020
0025-3227/


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journal homepage: http://www.elsevier.com/locate/dsri

Deep-sea habitat characterization using acoustic data and underwater imagery in Gazul mud volcano (Gulf of Cádiz, NE Atlantic)

Javier Urra[a,*], Desirée Palomino[a], Pablo Lozano[a], Emilio González-García[a], Carlos Farias[b], Ángel Mateo-Ramírez[a], Luis Miguel Fernández-Salas[b], Nieves López-González[a], Yolanda Vila[b], Covadonga Orejas[c], Patricia Puerta[c], Jesús Rivera[d], Lea-Anne Henry[e], José L. Rueda[a]

ARTICLE INFO

ABSTRACT

Gazul is the shallowest mud volcano (MV) within the Shallow Field of Fluid Expulsion (SFFE) of the northeastern Gulf of Cádiz (NE Atlantic; 300–1200 m depth). The SFFE represents an important geo- and biodiversity area that was designated as a Site of Community Importance under the European Habitats Directive in 2014. In this study, geological features, habitats and associated biodiversity, as well as anthropogenic impacts, were characterized at Gazul MV from underwater imagery and multibeam bathymetry. Multivariate methods using the Bray-Curtis similarity index identified six main habitats, each of which harbored a characteristic faunal assemblage that included: (1) sandy ripple bottoms typified by the actiniarian Actinauge richardi; (2) muddy, muddy, coarse sand and bioclastic bottoms dominated by the solitary coral Rhabdocyathus cheili; (3) coarse sand and bioclastic bottoms, together with soft sediments covered by scattered methane-derived authigenic carbonates (MDACs) (mixed bottoms), characterized by the echinoid Cidaris cidaris; (4) hard bottoms comprising MDACs dominated by a wide variety of sponges and gorgonians; (5) coral-rubble bottoms typified by the presence of colonial scleractinian communities dominated by Madrepora oculata and (6) mixed bottoms characterized by the presence of a styelid ascidian. Slope and water depth were the main factors explaining assemblages' distribution, which was also supported by the presence of MDACs such as slabs, crusts and chimneys on the seafloor, as well as by the geomorphologic diversity of Gazul MV. The results highlight Gazul MV as an eco-biologically important area harboring different vulnerable marine ecosystem (VME) elements with indicator taxa such as scleractinians, sponges, gorgonians and black corals. ROV images revealed abandoned or lost fishing gears and marine debris on the seafloor, indicating anthropogenic impacts in Gazul MV and adjacent areas. Indeed trawling fisheries activities have also been detected in Vessel Monitoring System datasets. A fishery restricted area is recommended in Gazul MV due to the occurrence of diverse VMEs and species included in different conservation directives and conventions.

1. Introduction

Submarine elevations (e.g. seamounts, mounds, diapiric ridges, mud volcanoes) are considered exceptional seafloor features harboring distinct benthic and demersal associated communities and habitats (Samadi et al., 2007; Ramos et al., 2010; Rueda et al., 2010; Corbera et al., 2019), which can even promote large pelagic biodiversity in the open ocean (Morato et al., 2008; Holland and Grubbs, 2007; Litvinov, 2007). There is a strong link between deep-sea benthic communities at submarine elevations with local bottom current and substrate types (Van Rooij et al., 2010). In areas with strong bottom currents, erosion and sediment transport are promoted and, in some cases, hard substrates are enhanced and colonized by suspension feeders (Van Rooij et al., 2010; Ganser et al., 2011). In those areas, associated benthic communities are

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Available online 14 December 2020
0967-0637/

CONGRESS

2ND General Assembly. 24-28 abril 2017
Mallorca (Spain)

Gallardo-Núñez, M.; Rueda, J.L.; Farias, C.; González-García, E.; Sánchez-Guillamón, O.; Bárcenas, Patricia;López-González, N.; Vila, Y. **Characterization of habitats and megafauna in Norway lobster (*Nephrops norvegicus*) fishing grounds using underwater images within the Gulf of Cadiz**. 2015. 643-646. Volumen de Comunicaciones presentadas en el VIII Simposio sobre el Margen Ibérico Atlántico (MIA15). Díaz-del-Río-Español, V. . Servicios Integrales de Artes Gráficas.718pp.

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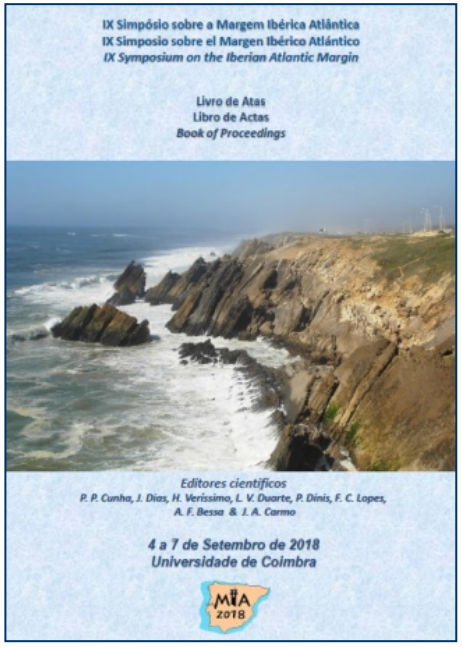

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García-Canales, Cristina., 2019. Guía identificativa de tipos de madrigueras y fauna macrobentónica asociada a los fondos de cigala a partir de imágenes submarinas. **Identification guide of burrows and benthic-demersal megafauna associated to the Norway lobster grounds from underwater images.** MSCThesis 2019. Universidad de Cádiz-IEO.CO.Cádiz. Supervised by Yolanda Vila

Jiménez-Romero, Raúl, 2019. Análisis de las formas de fondo del Golfo de Cádiz y su relación con el tipo de sustrato y las corrientes marinas usando imágenes submarinas. **Analysis of the bottom forms of the Gulf of Cadiz and their relationship with the type of substrate and marine currents using underwater images** MSCThesis 2019. Universidad de Cádiz-IEO.CO.Cádiz. Supervised by Desirée Palomino & Luis Miguel Fernández-Salas.

ISUNEPCA UWTV Survey

EXCELLENT PLATFORM

To obtain information about benthic habitats and environmental variables

To improve the knowledge about the biodiversity, the ecosystems and their relationship to the oceanographic processes on the circa and bathyal sedimentary bottoms in the Gulf of Cadiz


Thanks for your attention!!