

1. Since 1914, the IEO performs multidisciplinary studies of the marine environment, like systematic studies, research projects and specific studies for special requirements.

Different methodologies and data acquisition techniques are used depending on the variables concerned. The acquired data is stored and represented in different formats (Fig. 1)

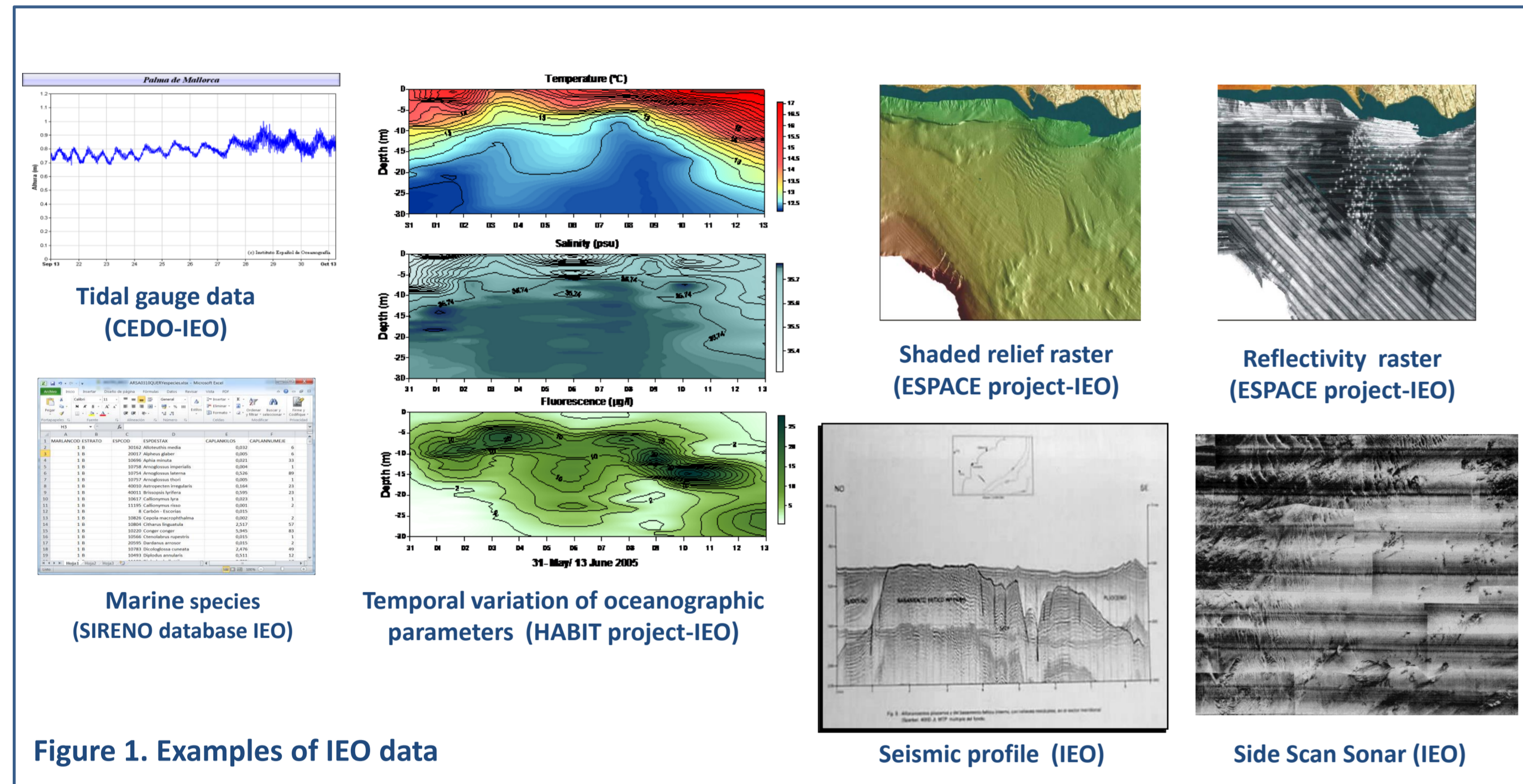


Figure 1. Examples of IEO data

4. All these databases (CEDO, SIRENO, Geology Database, GIS database) and Spatial Infrastructure Data (IDEO) conform the Oceanography Information System of the IEO. Some outputs are shown below (Figs. 6-13).

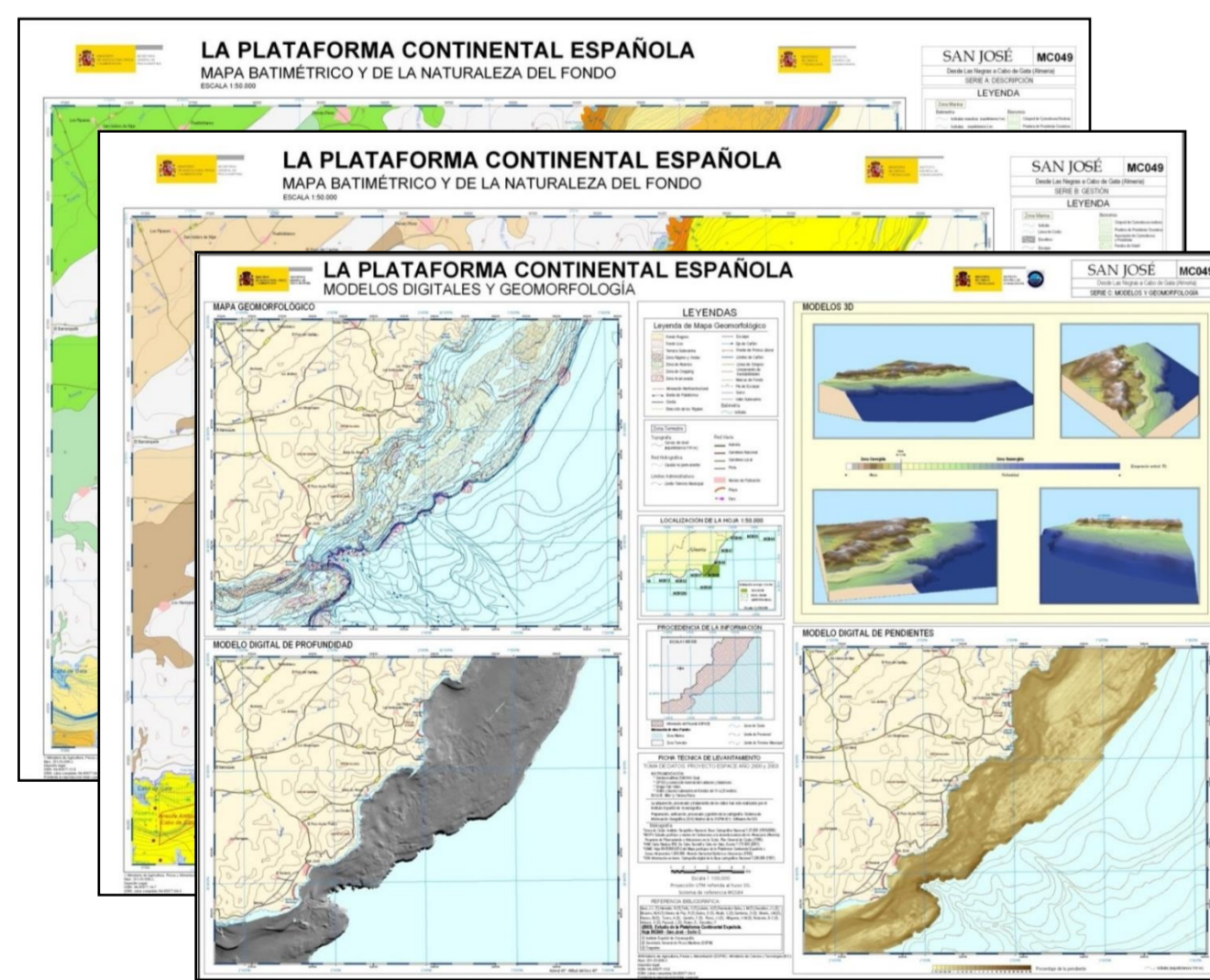


Figure 6. Cartographic series about Spanish continental shelf, acquired from oceanographic surveys. ESPACE project - IEO (www.ieo.es/web/ieo/cartografia)

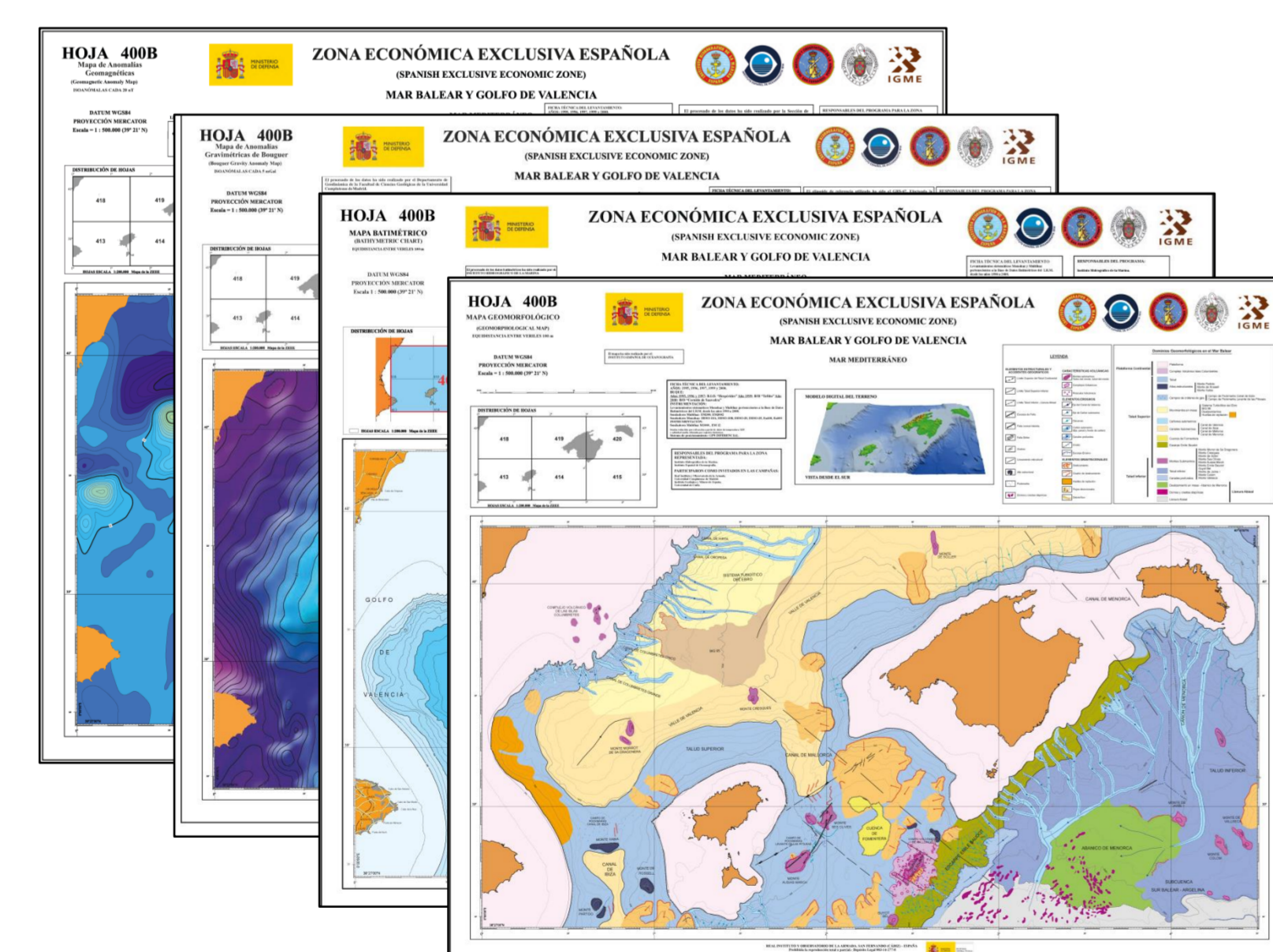


Figure 8. ZEEE- Balearic Sea and Gulf of Valencia Maps, elaborated based on data from IHM, IEO, ROA, UCM and IGME organizations responsible of Spanish Exclusive Economic Zone Project.

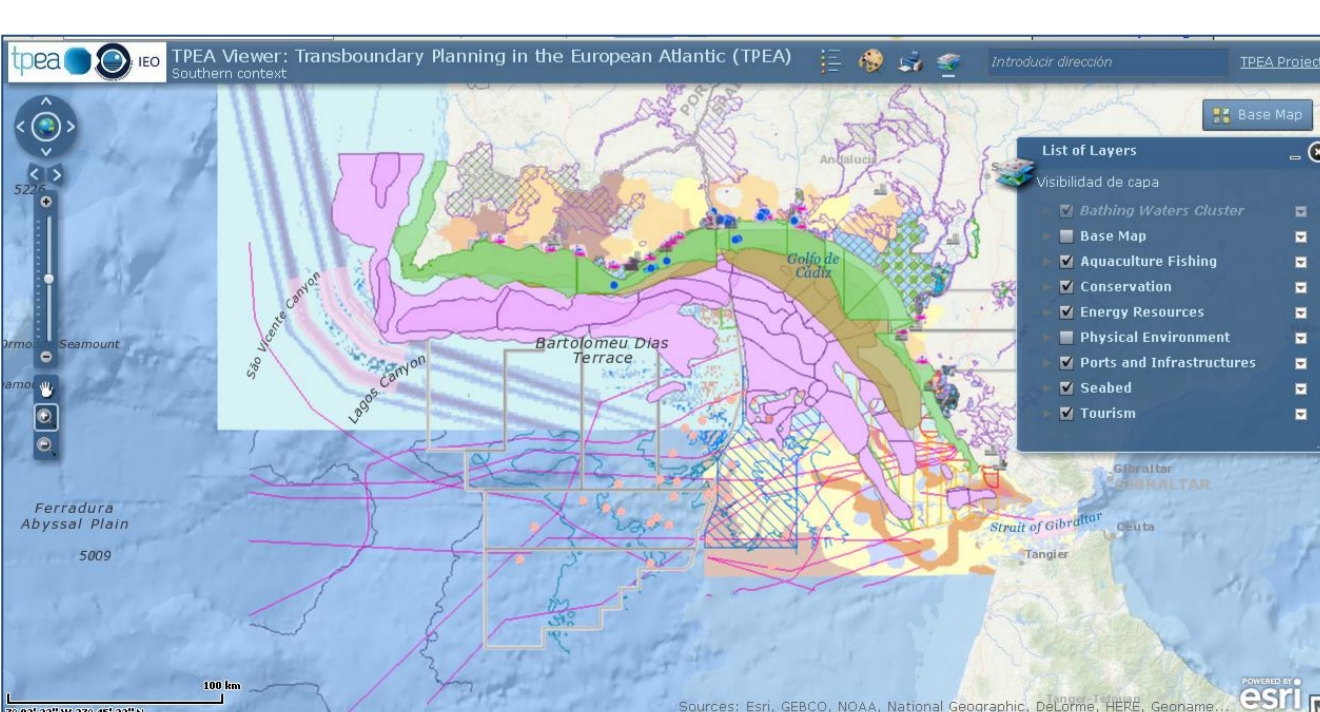


Figure 7. Spatial planning Data Viewer. Gulf of Cádiz, SW Spain. TPEA project - IEO. (<http://barreto.md.ieo.es/TPEAviewer/>)

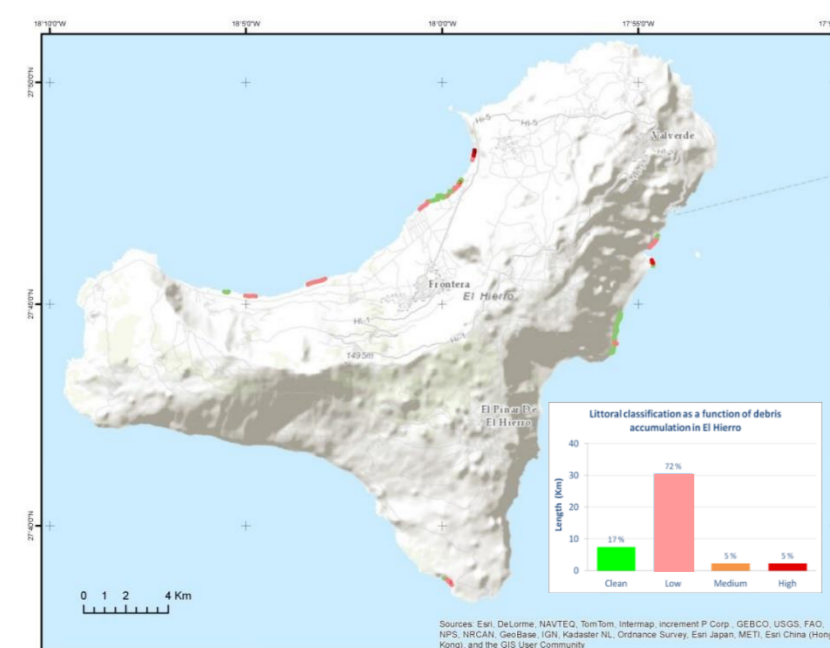


Figure 9. Marine litter distribution in the coast of El Hierro, Canary Islands, Spain. OMARCOST project - IEO.

2. The information is organized into different databases according to the subject and the variables represented (geology, fisheries, aquaculture, pollution, habitats, etc.). There is a clear need to organize, standardize, integrate and relate the different databases as well as to provide access to information. Regarding to geology, several projects provide us marine geology information from batymetric, seismic, sample and direct observation (ROV, Lander) data. The geology database allows to store and manage all this information.

In 1964 the DATA CENTER of IEO (CEDO) (<http://indamar.ieo.es>) was created in order to organize the data about physical and chemical oceanography, to standardize this information and to serve the international data network SeaDataNet (www.seadatanet.org)

Years later, in 1997, the first initiative to organize the IEO spatial information in a Geographical Information System (GIS) emerged, and posteriorly, in 2010, this GIS was consolidated as the IEO institutional GIS.

The GIS allows the information to be organized, visualized, consulted and analyzed. Besides, it allows to develop high quality thematic cartography. The GIS is an essential tool in the decision making of aspects like protection of marine environment, sustainable management of resources and marine spatial planning among others.

The information from different IEO databases is integrated into a corporate Geodatabase (Esri format). The Geodatabase is one of the most advanced systems of geo-information storing and managing (Fig. 2).

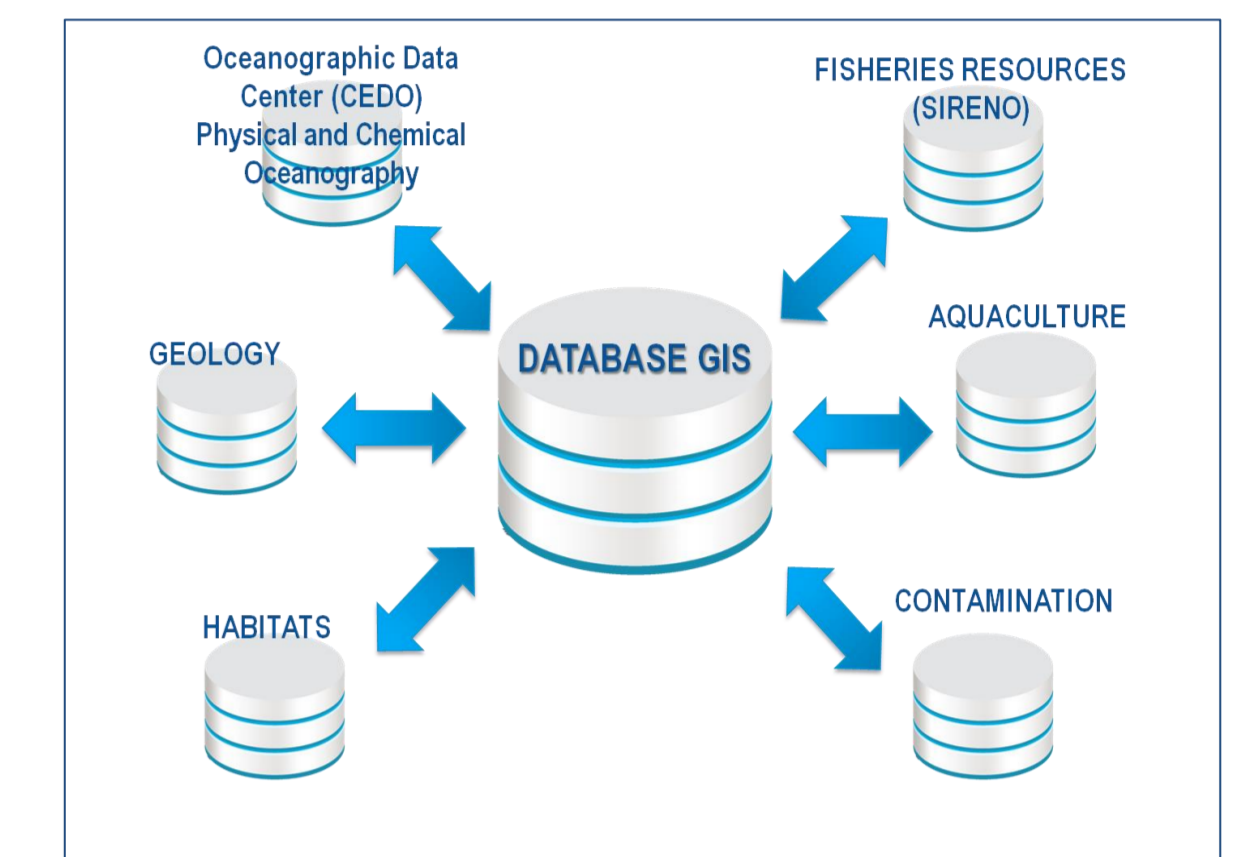


Figure 2. IEO Databases scheme

3. Presently, the knowledge of marine environment, its protection and its spatial planning are extremely relevant issues. Therefore, several European initiatives (EMODNET, Growth Blue, Horizon 2020, etc.) are being developed. To carry out these initiatives is imperative that the marine information will be standard, interoperable and accessible. Following this trend, the UE elaborated the INSPIRE DIRECTIVE 2007/2/CE, which provides guidelines and standards to share the information through Spatial Data Infrastructure.

In this regard, the IEO in 2010, initiated the development of Spatial Infrastructure Data of IEO: IDEO (Fig. 3, 4 and 5).

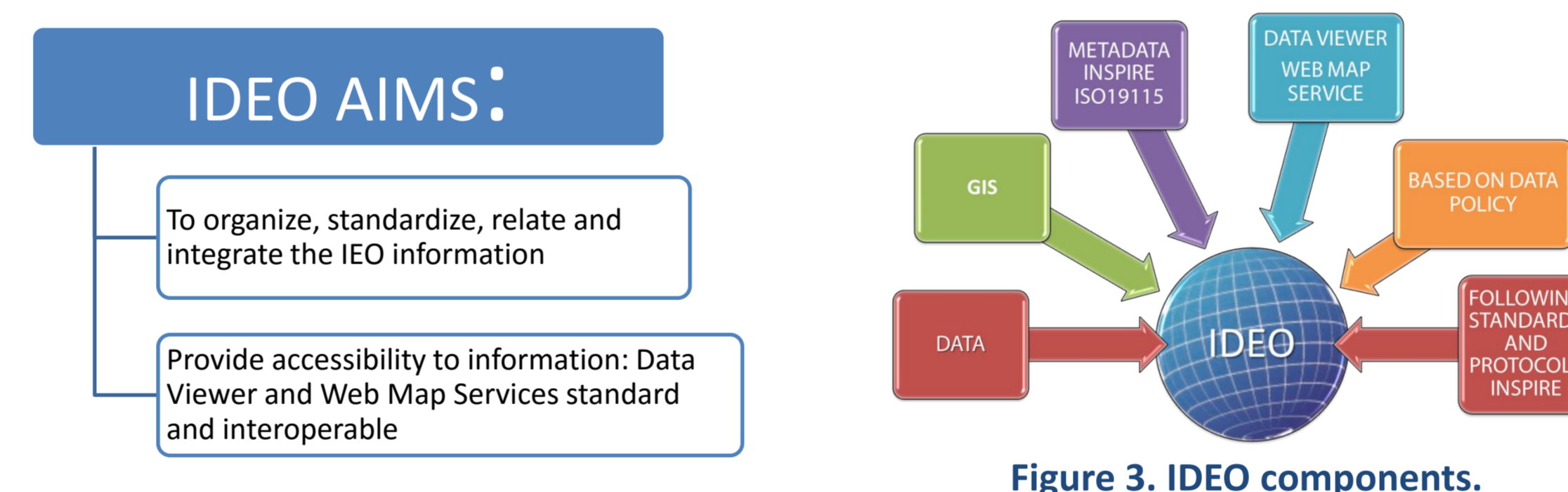


Figure 3. IDEO components.

In order to facilitate the access to the Spatial Data Infrastructure of IEO, the IEO Geoport was developed in 2012. It mainly involves a metadata catalog and the access to the data viewers and Web Services of IDEO (Fig. 4)

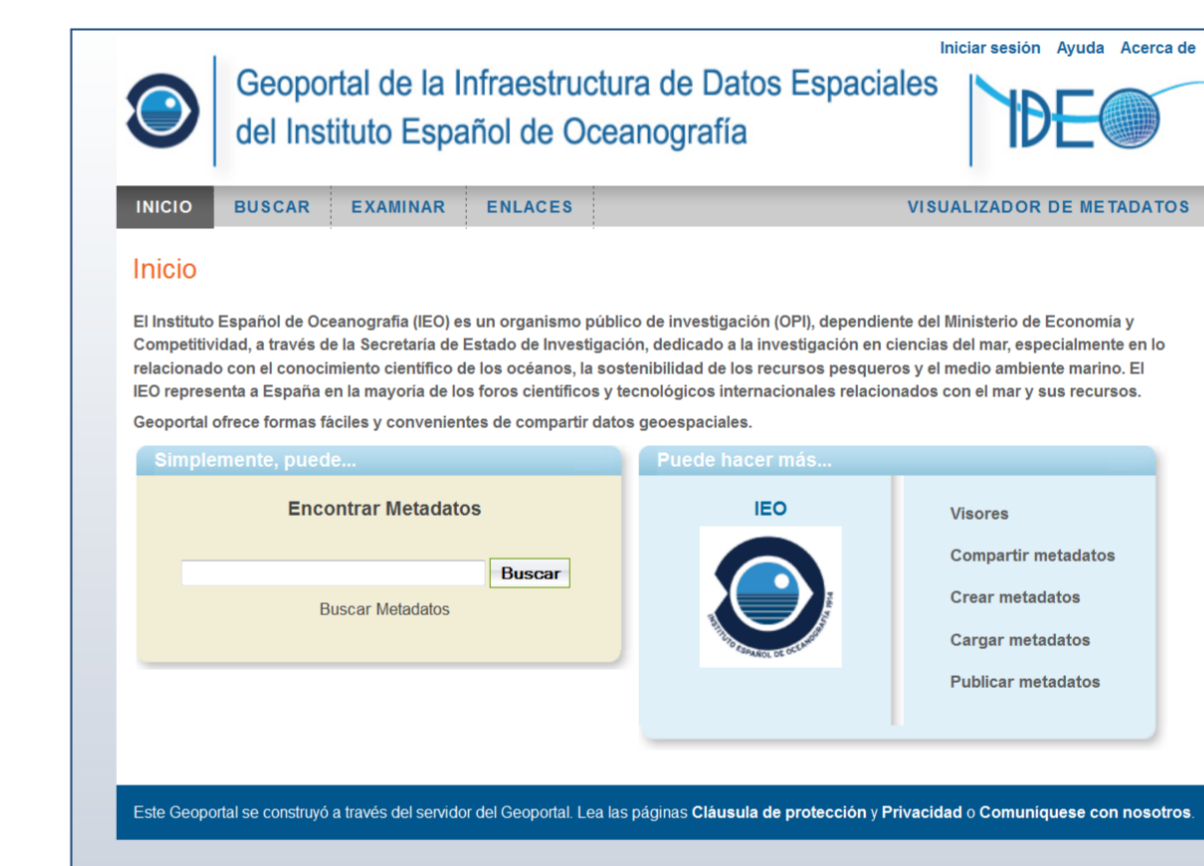


Figure 4. IEO Geoport. (<http://www.geo-ideo.ieo.es/geoportalideo/>)

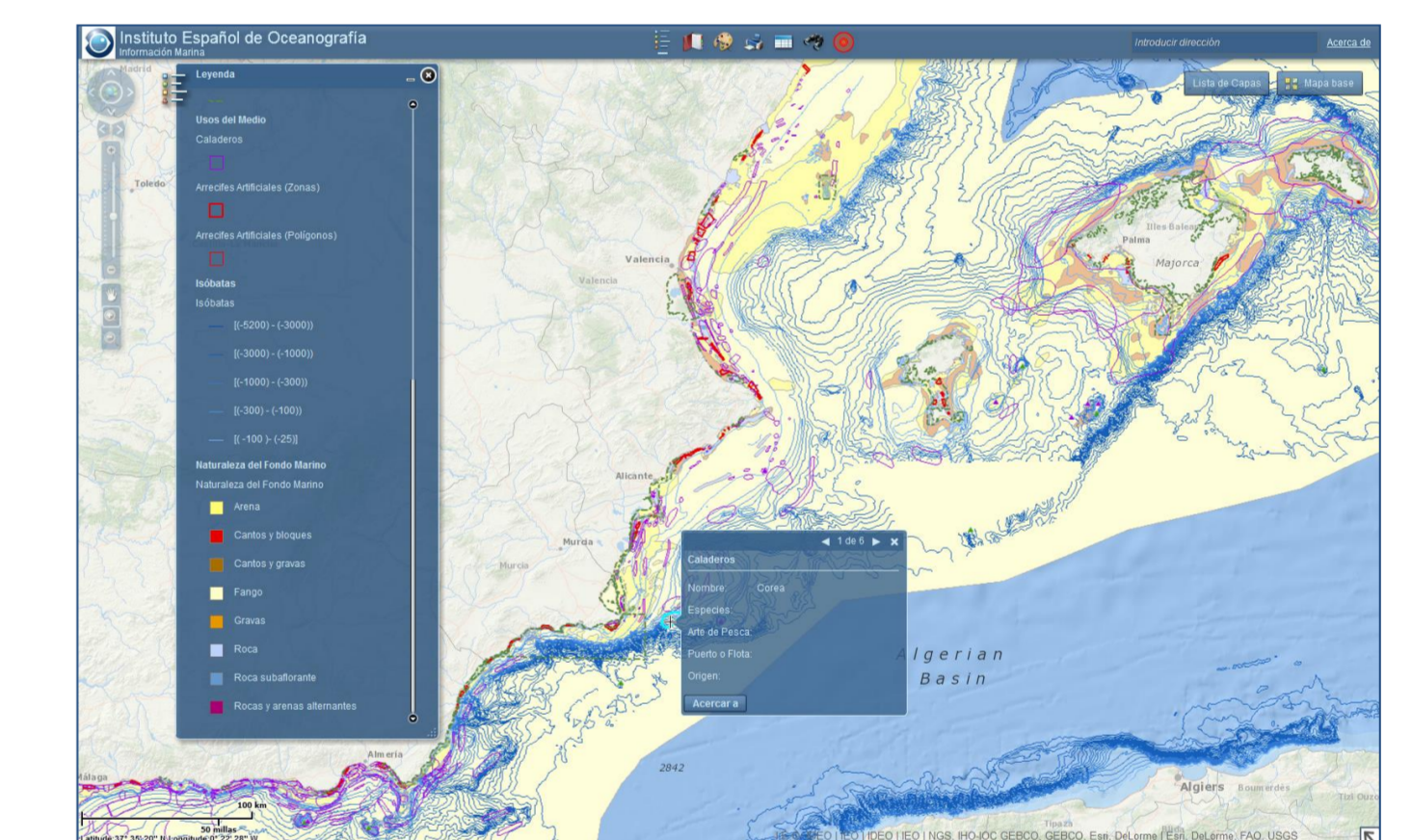


Figure 5. IEO Data Viewer of marine information. (<http://www.ideo-base.ieo.es/>)

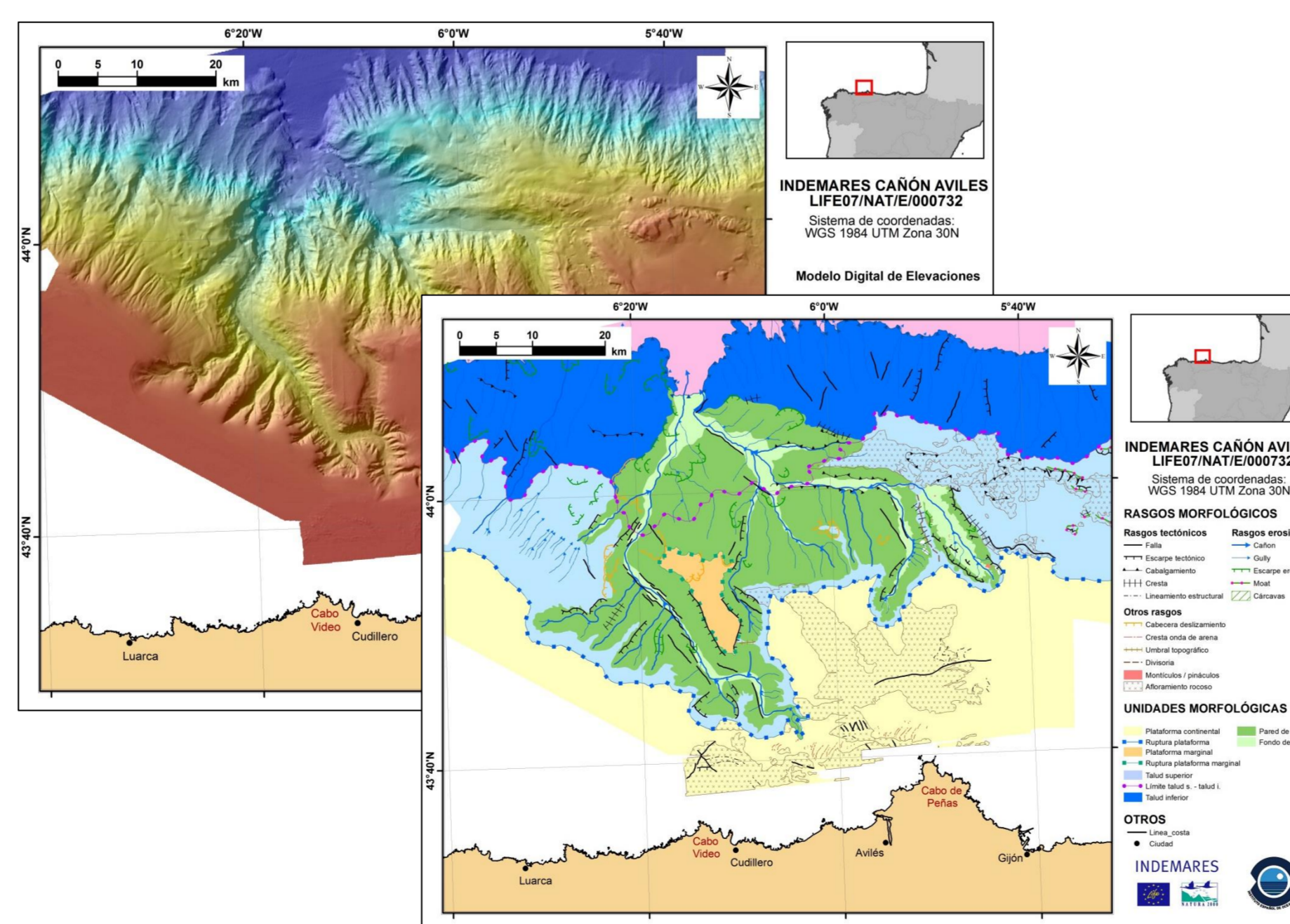


Figure 10. Avilés Canyon System Marine Protected Area Maps, compiled in the framework of the EU-funded INDEMARES (LIFE+) project "Inventory and designation of marine Natura 2000 areas in Spanish sea".

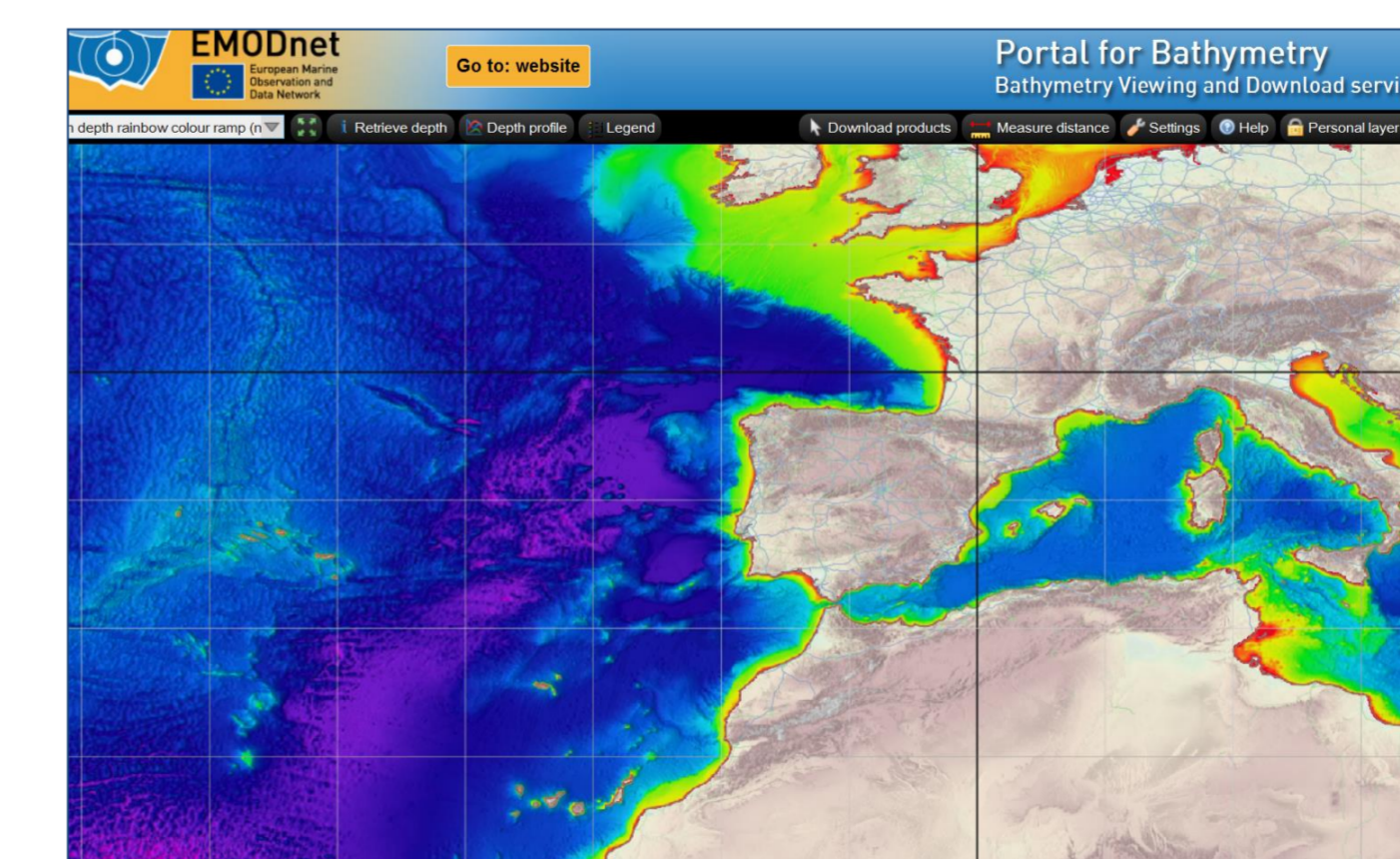


Figure 11. Portal for Bathymetry. DMT elaborated based on data from multiple institutions of several european countries, among them is the IEO (<http://www.emodnet-hydrography.eu/>)

Figure 12. Species distribution in Northern Spain littoral. Cartography developed from the information gathered in Initial assessment of Marine Strategy Framework Directive. MARINE GIS project - IEO.

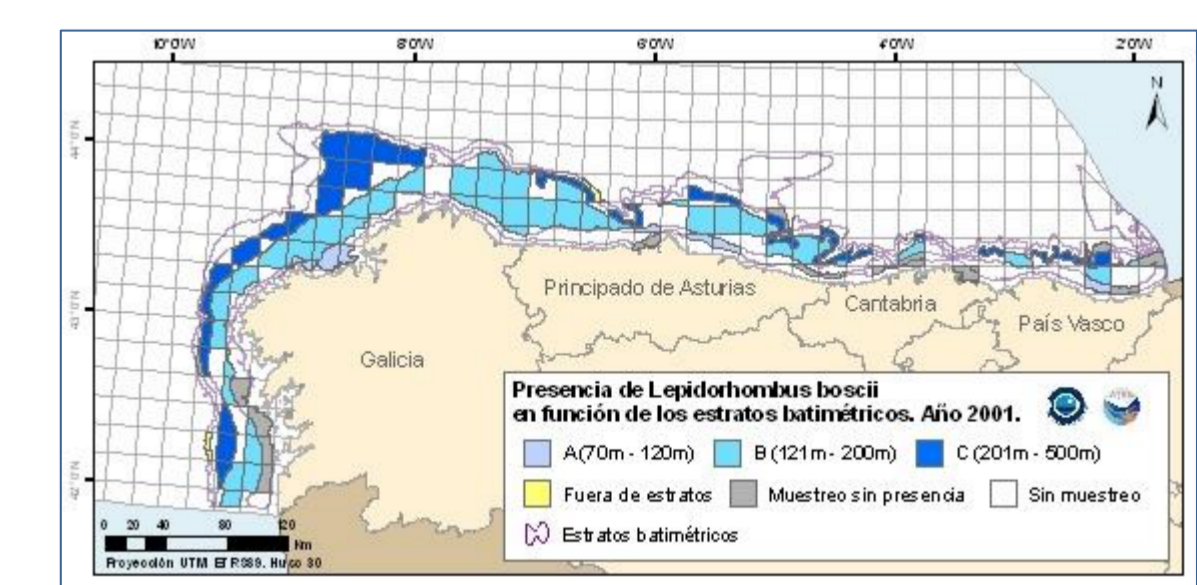


Figure 13. Study of morfo-sedimentary process and estructural control of submarine canyons in southeast of Iberian Peninsula. Preliminary study of the geological risk and its impact on people and effect of anthropogenic activity on marine environment. PhD thesis in process. (Tello, O.). IEO.

