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25 YEARS OF RESEARCH: A MARINE PROTECTED AREA FOR CETACEANS AND MARINE TURTLES IN THE STRAIT OF GIBRALTAR

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INTRODUCTION

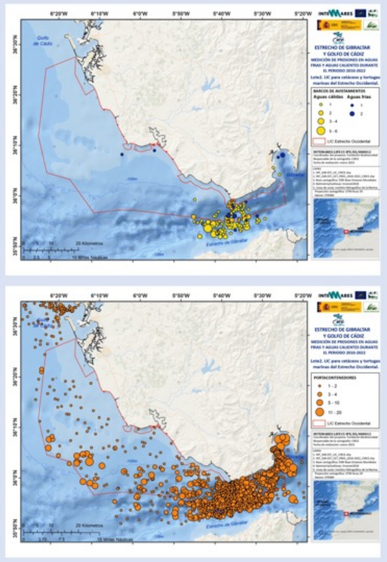
- The Strait of Gibraltar is a highly productive area that connects the Atlantic Ocean with the Mediterranean Sea. Its oceanographic characteristics make it a unique region that is home to numerous cetacean species and marine turtles.
- This zone is a critical area and a migratory route for numerous cetacean species, including bottlenose dolphins (*Tursiops truncatus*), common dolphins (*Delphinus delphis*), striped dolphins (*Stenella coeruleoalba*), long-finned pilot whales (*Globicephala melas*), sperm whales (*Physeter macrocephalus*), fin whales (*Balaenoptera physalus*) and killer whales (*Orcinus orca*), and also the loggerhead sea turtle (*Caretta caretta*).
- Here, we aim to identify critical areas for cetaceans and sea turtles in the Strait of Gibraltar in order to implement effective management measures for their conservation.

METHODS

- Standardised anthropogenic activity data during 2010-2022.
- Linear and aleatoric boat transects during 1999-2022.
- Distance Sampling to estimate the abundance of cetaceans.
- GAM to predict the spatial distribution of cetaceans and marine turtles.

RESULT 1. Anthropogenic activity

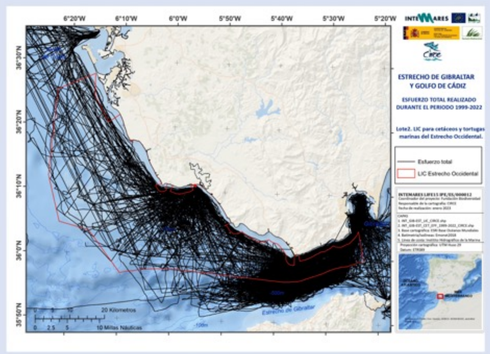
- Highly anthropic activities in the region with the presence of fishing vessels, merchant ships, oil and gas tankers, ferries, sailboats, military vessels and whale watching.



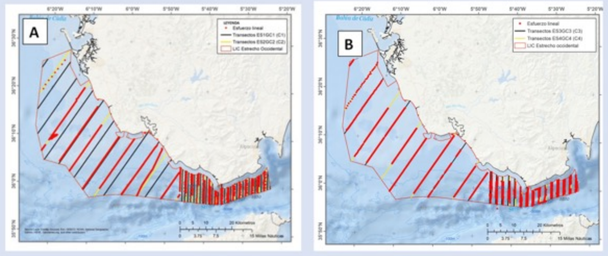
Whale-watching vessels (top) and merchant vessels (bottom) in the waters of the Strait of Gibraltar and adjacent Gulf of Cadiz.

RESULT 2. Effort

- 46.535 km of total effort during 1999-2022 to predict the spatial distribution.



- 847,23 km of linear transect during winter (A) and summer (B) of 2022 to estimate species abundance.



Spatial distribution of the effort in the waters of the Strait of Gibraltar and adjacent Gulf of Cadiz

RESULT 3. Abundance

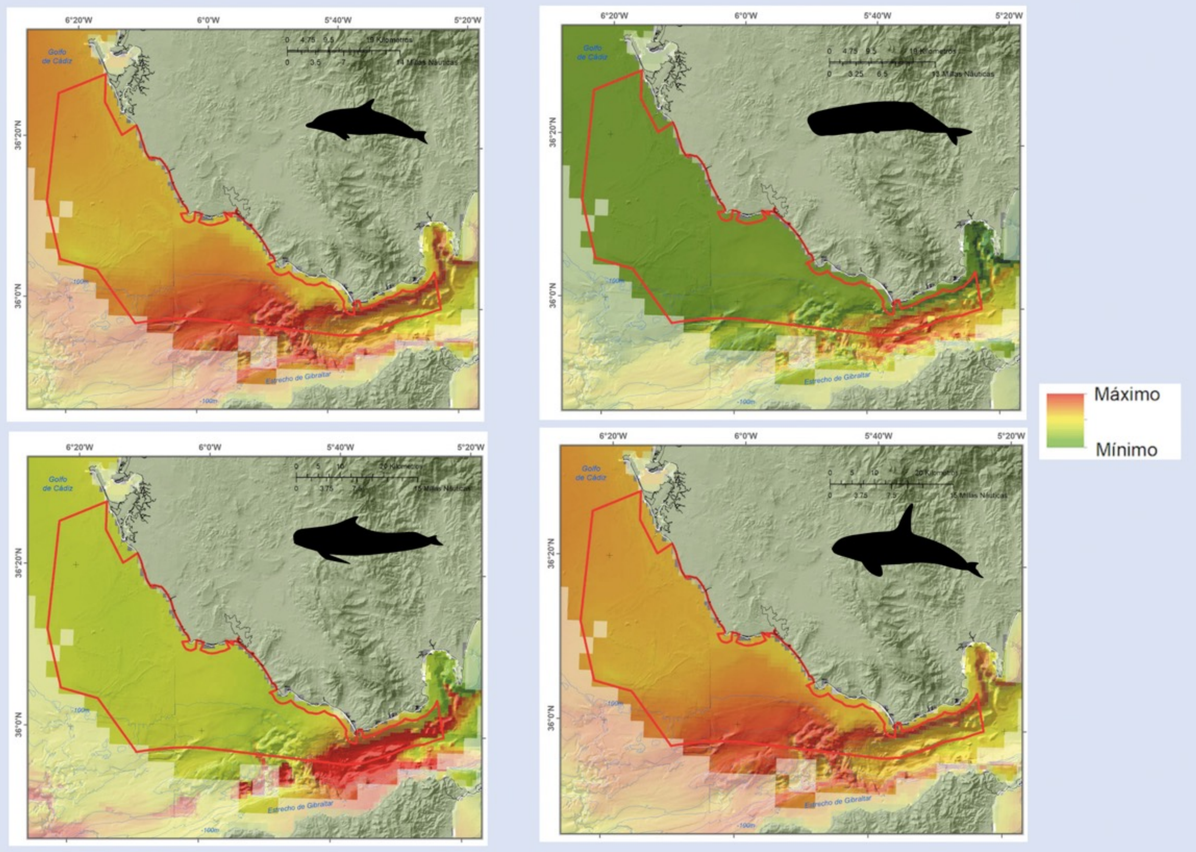
- Abundance estimates by line transect are higher than the ones obtained by photo id in some species. Further research is needed to understand these differences.

Especie	Aguas frías			Aguas calientes			Anual		
	Min	Point	Max	Min	Point	Max	Min	Point	Max
Balaenoptera physalus	8	10	12	13	15	19	11	13	16
Delphinus delphis	795	1 040	1 505	2 548	3 334	4 824	1 662	2 175	3 147
Globicephala melas	245	324	475	209	276	405	227	300	440
Orcinus orca	135	173	242	92	118	165	114	146	204
Physeter macrocephalus	0	0	0	16	20	28	8	10	14
Stenella coeruleoalba	485	630	896	2 478	3 216	4 579	1 471	1 909	2 718
Tursiops truncatus	479	599	800	708	886	1 183	592	741	989

Abundance estimation from distance sampling

RESULT 4. Species prediction model

- Spatial distribution is along the Western Strait LIC, with numerous cetacean species and spatial segregation of the most abundant ones. (Ongoing work)



Spatial distribution of striped dolphin (*Stennella coeruleoalba*) (top left), sperm whale (*Physeter macrocephalus*) (top right), long-finned pilot whale (*Globicephala melas*) (bottom right) and killer whale (*Orcinus orca*) (bottom right) in the Strait of Gibraltar and adjacent Gulf of Cadiz

DISCUSSIONS & CONCLUSIONS

- Spatially explicit abundance estimates in the Strait of Gibraltar obtained in the present study can guide the creation of a **marine protected area between Cadiz and Getares**, extending to the territorial zone.
- For proper management of this area, we propose the presence of qualified **Marine Mammal Observers** (MMO) on ferries and fast ferries, as well as on whale-watching boats with more than 15 passengers. In addition, it is also important to implement **education and awareness programmes** aimed at the local population and tourists, on the conservation of both cetaceans and sea turtles in the Strait of Gibraltar.
- In conclusion, the delimitation of this marine protected area, together with strong management actions, can **assure the conservation and survival** of the resident as well as the migratory cetacean species and sea turtles inhabiting this marine area.

Special thanks to Aventura Tarifa (Sea Observer) and to all the people who have participated in the campaigns at sea.