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Update on the interactions between killer whales and vessel along the Iberian Peninsula

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INTERNATIONAL WHALING COMMISSION

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Update on the interactions between killer whales and vessel along the Iberian Peninsula.

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Abstract

A total of 253 interactions between killer whales and vessels have been recorded mainly along the Atlantic coast of the Iberian Peninsula, although there have also been interactions in the nearby area. 14 individuals have been identified, mostly juveniles, and they are distributed in up to 4 interacting groups. Most of the vessels involved in interactions are medium-sized (<15m) sailboats, with spade rudder, sailing at an average of 6 knots, both under sail and motor. Interactions occur throughout the year, although they are mostly concentrated in the summer and autumn months. Interactions occur at all times of the day and night, although they are concentrated in the midday hours. These interactions last on average 35 minutes. The behaviour of killer whales when interacting with boats was not identified as aggressive. No clear motivation has been found for this new behaviour; however it seems like a curious and playful behaviour, which could be self-induced, or induced by an aversive incident. Some mitigation measures, such as a temporary ban of sailing for sailing vessels, were implemented when interactions intensified in certain areas, or advising the whale watching boats not to approach the animals all along the coast of mainland Portugal. A survey was designed to better understand the motivations of this behaviour and proposed to occur between spring and summer months. The survey should be conducted from a medium-sized sailing vessel, equipped with AIS, to monitor the behaviour of the killer whales, and to test different behaviours of the boats (i.e. stop, accelerate, reverse gear). Two different types of deterrents, metal tubes and pilot whale sounds will also be tested.

Introduction

A critically endangered subpopulation of killer whales (*Orcinus orca*) inhabit the Iberian Peninsula (Esteban & Foote, 2019). They are known to feed on bluefin tuna (*Thunnus thynnus*), either actively chasing them (Guinet et al., 2007) or catching them from the fishing lines in the Strait of Gibraltar (Esteban et al., 2016a). Since 2020 some individuals started to show a disruptive behaviour, interacting with boats

without an apparent motivation, ramming, pushing and turning the boats as they please (Esteban et al. in prep.). The aim of this report is to inform the scientific community about those interactions, to find mitigation actions for this unprecedented situation.

Methodology

A regional working group (WG) was created to compile the interaction cases since 2020 and information was gathered from several marine managers and stakeholders, namely sea rescue and maritime traffic control agencies, local sailing clubs, fishermen's associations and underwater activity companies. The WG also established channels of communication such as a webpage and social media. Interacted vessels were inspected underwater, or at shipyards whenever it was possible, looking for signs of contact by the animals. Every time an interaction was reported a questionnaire was sent to the crew, asking for basic information about the characteristics of the vessels (e.g. type of vessel and ruder, vessel length), the navigation conditions under which the interaction took place (e.g. speed, sailing/engine), the course of events and the final consequences (e.g. animals were previously observed, any damages). Damages were categorised as mild when the boat still maintained the steering capabilities, and severe when the steering was compromised and the boat needed to be towed to port. Videos and pictures taken by the crew in the moment of the interaction were also checked to describe the general pattern of killer whales behaviour and to allow for the identification of the individuals. Additionally, the ICG Strait of Gibraltar killer whale was created after the SC/68C to consult international experts about the situation.

Results and Discussion

A great effort has been put forward to obtain the maximum data for each interaction. However, we are aware that there are a lot of cases still missing, and that the information obtained are sometimes uncompleted and probably biased towards the most serious cases, mainly the ones that were towed by the sea rescue, having more impact on the media. There have been at least 253 interactions between vessels and killer whales, mainly located along the Atlantic coast of the Iberian Peninsula, but also in the nearby area: two interactions were registered in France and one offshore in the Atlantic Moroccan coast (Fig. 1).

The data source for the interactions varied widely. Only 19 vessels were directly inspected by members of the WG. 169 questionnaires were collected from the sailing crews. For the remaining cases, the information was recovered from press releases, social media or given by the Marine Authorities, with no direct contact with the crew. A total of 274 videos from 97 different interactions were reviewed, as well as 471 pictures, from 66 different interactions.

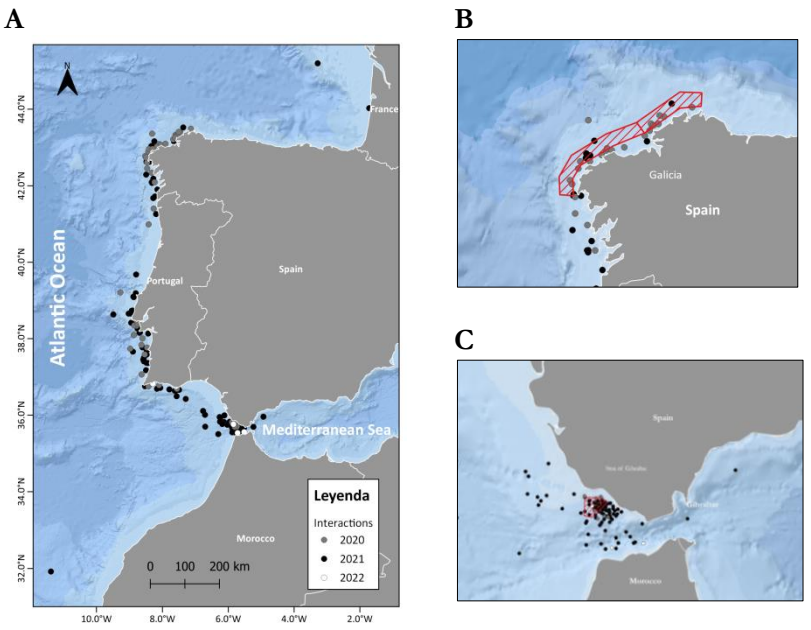


Fig. 1 A: Map of interactions registered along the Atlantic coast of the Iberian Peninsula and nearby areas since 2020. Details on specific areas are given where navigation for small sailing vessels were restricted (red transverse lines) at northern (B) and southern (C) Spain.

The interactions lasted 35 minutes on average, but an interaction of up to 2 hours was reported. Interactions were registered throughout the year (Fig. 2A), but concentrated between June and October, which could be related with better weather conditions, so more recreational boats at sea, but also those are the typical months when this subpopulation is observed (Esteban et al., 2016b). A few interactions occurred during the night, but most of the cases were concentrated between 6-18 hours, with a peak at midday (Fig. 2B).

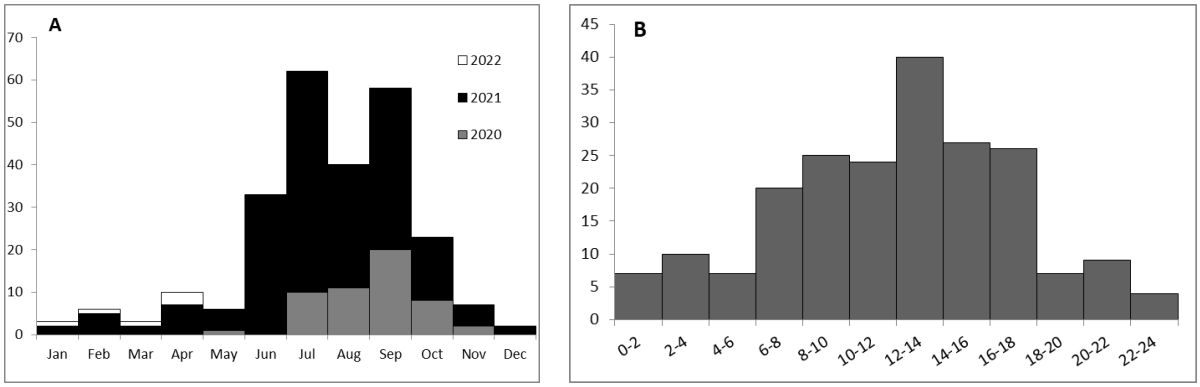
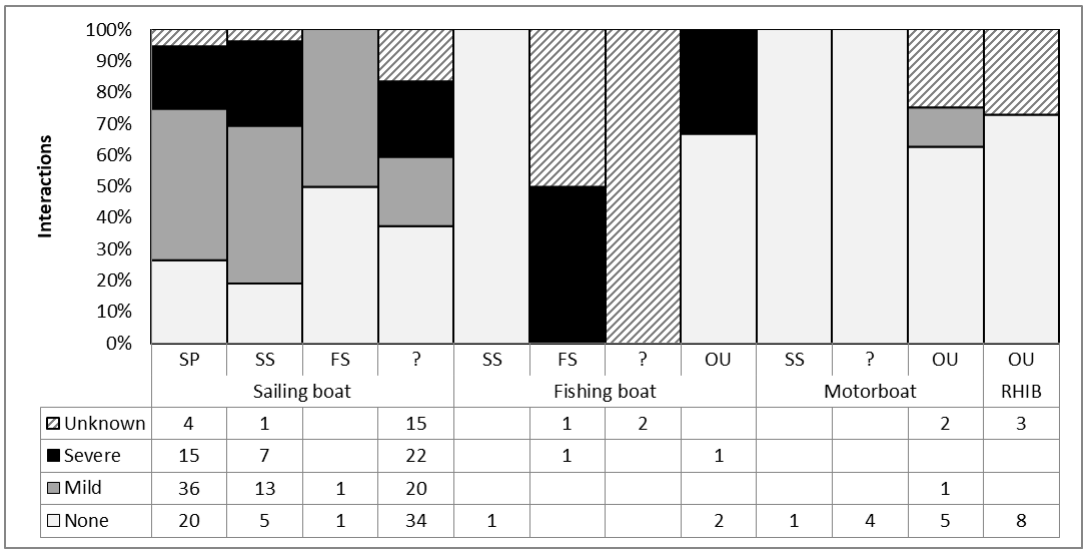


Fig. 2 A: cumulative number of interactions between killer whales and vessels along the months by the different years. B: frequency of interactions by the time of day.

Medium-sized sailing boats were the most interacted (average: <15m, range: 5-38m), although there were also fishing boats, rigid-hull inflatable boat (RHIB) and motoroboats interacted (Fig. 3). The most common type of rudder interacted was the spade one, which is only found on sailing vessels, followed by the semi-supported. Interacted vessels were navigating at an average speed of 6 knots, both under sail and motor. Not all of the interactions ended with material damages, and it mainly happened with sailing vessels where damages were mostly mild (still being able to control the steering), and with some fishing boats, but in these last cases damages could be related with the bad preservation of the hull. RHIBs and motorboats were mostly not damaged (Fig. 3). Some type or rudders and/or of the damages were not fully reported (mostly mild damages).



	SP	SS	FS	?	SS	FS	?	OU	SS	?	OU	OU
	Sailing boat				Fishing boat				Motorboat			RHIB
Unknown	4	1		15		1	2				2	3
Severe	15	7		22		1		1				
Mild	36	13	1	20							1	
None	20	5	1	34	1			2	1	4	5	8

Fig. 3 Summary of the type of vessels with their corresponding rudders, and the consequences of those interactions. When the boats lost steering, and had to be towed to port, damages were categorised as severe. Mild damages were considered when the boat still maintained its steering. None correspond to no damages. Types of rudders are designated by its initials as follow: SP-Spade; SS-Semi supported; FS-Fully supported; OU-Outboard engine; ?-Unknown

The general behaviour of the animals during the interaction was described in phases (Esteban et al. in prep): i) Approach: normally the crew was unaware that the animals arrived, killer whales must have approached from the stern quickly and stealthily. (ii) Contact: once beneath the stern of the boat, the animals began a series of moves that indicated curiosity, such as placing itself sideways or with the ventral region upwards. Then they usually started touching the boat, and sometimes the whales bubbled powerfully or tail slapped. (iii) Steering: when the contact focuses mainly on the rudder, the animals either rammed the rudder with its head or made a lever movement with its body, turning the rudder. Normally killer whales pushed harder, when the crew tried to keep the steering or increased/maintained a high speed. (iv) Stopping: the repeated strokes or a heavy hit by the killer whales caused the skipper to slow down/stop the boat. On other occasions, the vessel was stopped only when the steering wheel or internal steering system failed. However the animals can sometimes continue with the interaction. (v) Disinterest: when finally the animals lose interest and leave the boat after it was stopped. In a few reported cases the excessive acceleration caused the animals to stop the interaction. Other deterrent devices/actions were used such as throwing diesel, hitting the animals with poles, using of fire flares and engage in reverse. However frequently the animals did come back within minutes and repeated the action.

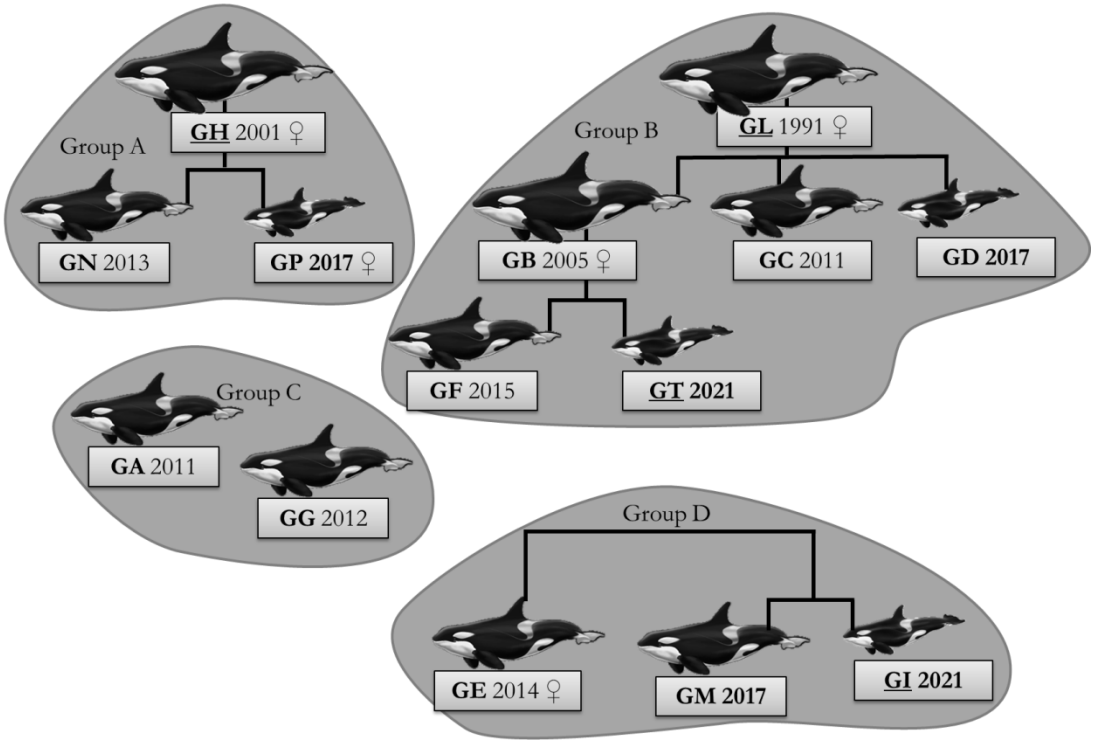


Fig. 4 Group organization of the killer whales identified during the interactions with vessels along the Iberian Peninsula. Individuals' names are shown with their initials, followed by year of birth, which was mainly estimated by their size. Year marked in bold when means the actual year of birth. Sex is indicated when confirmed by underwater images, or when the animal is accompanied by a calf. Individuals underlined where present in the group but did not take an active role during the interactions.

Interacting individuals are mostly young animals. In total 14 killer whales have been identified during the interactions, either only observing and not touching the boats, or actively interacting, pushing and ramming the boats (Fig. 4). They were normally separated in up to four groups, but sometimes they were observed together during the interactions, mostly in the Strait of Gibraltar. Consequently sometimes in the same day, there are several interactions in different locations (up to 6 interactions in a day, and up to 720 miles away). Group C is formed by no family related individuals, the individual GG was often observed participating in interaction events within Group A. Group D is composed by young individuals, which only interacted with small vessels (RHIBs and motorboats) (Fig. 4).

Fig. 5 Evolution of the wounds of GN in 2020 and 2021.

After the interactions started in 2020 GN had an open wound in the head, and in 2021 another wound was observed behind the dorsal fin. Fortunately, in both cases the wounds have healed quite fast (Fig. 5). However, we were not able to determine the origin of those injuries.

Other remarkable facts that happened since the interactions started were the death of two individuals. On the 7th of March 2020, a juvenile male was found dead floating in the waters of the Strait of Gibraltar. The fall of a large part of the epidermis, the prolapse of the penis and tongue due to the pressure of internal decomposition gases indicated that it had been dead for several days (Fig. 6A). The difficulties of access to the carcass and its drift towards Moroccan waters led to the loss of the carcass, which could not be examined. Recently on the 17th of March, 2022 an adult female named "Corsica" was observed floating dead in the Algarve, southern Portugal. This female had not been identified during the interactions, but it was the mother of two interacting individuals, GM and GI (Fig. 4 & 6B). The necropsy revealed the absence of external signs pointing to the cause of death, with apparent normal health and low parasitic load, abundant and undigested stomach contents and pulmonary edema, all of which indicate a traumatic death of unknown cause, compatible with immersion asphyxia

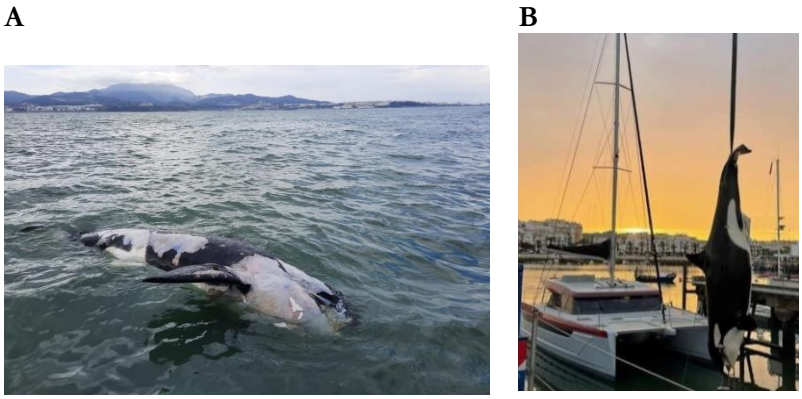


Fig. 6 Stranded killer whales in 2020 (A) and 2021 (B)

Some mitigation actions have been implemented. Several navigational restriction areas were defined for medium-sized vessels in southern and northern Spain (Fig. 1B and 1C). Radio alerts warning of the presence of killer whales suggested alternative routes away from the killer whales. In Portugal, whale-watching vessels were advised not to approach the killer whales, as RHIBs were mostly interacted in southern Portugal.

Also a safety protocol was designed for recreational boaters in the case of an interaction with killer whales. Evidence from previous interactions suggested that any change in the boat's performance seems to be interpreted by the whales as positive reinforcement of their behaviour. Additionally, because the steering and speed can be dangerous for the boaters (wheel turns uncontrollably when rammed), and any other aggressive solution may have negative consequences for this endangered subpopulation, the best option was to 'play dead'. In case the weather conditions allow it the sailors were advised to stop the

vessel, leave the wheel loose, and try not to interact with the animals.

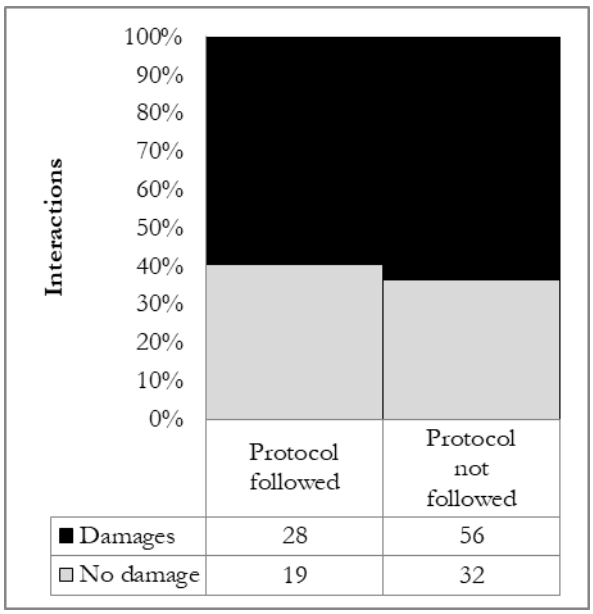


Fig. 6 Damages on interacted vessels according to the decision of following (or not) the proposed safety protocol.

In some cases boaters have tried different approaches: firing flares, spilling diesel at sea, using sticks/hooks, had even throwing objects at the animals, or engaging in reverse. For the moment all the aforementioned attempts were not fully successful (Fig. 6). However, a proper study should be implemented to test the efficiency of different techniques/boat's performance that could help to avoid damages and/or end the interactions.

Within the ICG, it was suggested that not only those attempts failed at repelling the whales, but they also most likely acted as 'positive reinforcements' which actually may promote these interactions further. The ICG Strait of Gibraltar killer whale was created to discuss ways forward for a research project that would help implement mitigation solutions, and to track the evolution of those interactions. The use of acoustic deterrents was discouraged, due to the easy habituation that this species had shown to such devices (Tixier et al., 2015). A research survey was designed, aiming at a constant monitoring of the killer whales' behaviour, testing different boat's performance (stop/acceleration/reverse gear...), as well as trying the use of two deterrents: Oikomi pipes and pilot whale sounds.

References

Esteban, R., & Foote, A.D., (2019). Orcinus orca (Strait of Gibraltar subpopulation). The IUCN Red List of Threatened Species 2019: e.T132948040A132949669. https://doi.org/10.2305/IUCN.UK.2019-3.RLTS.T132948040A132949669.en

Esteban, R., Verborgh, P., Gauffier, P., Giménez, J., Guinet, C., & de Stephanis, R., (2016a). Dynamics of killer whale, bluefin tuna and human fisheries in the Strait of Gibraltar. Biol. Conserv. 194, 31–38. https://doi.org/10.1016/j.biocon.2015.11.031

Esteban, R., Verborgh, P., Gauffier, P., Alarcón, D., Salazar-Sierra, J.M., Giménez, J., Foote, A.D., & de Stephanis, R., (2016b). Conservation Status of Killer Whales, Orcinus orca, in the Strait of Gibraltar, in: Advances in Marine Biology. (pp.141–172). https://doi.org/10.1016/bs.amb.2016.07.001

Esteban, R, López, A., Garcia de los Rios A., Ferreira, M., Martinho., F., Méndez-Fernandez, P, Andréu, E., García-Gómez, J.C., Olaya-Ponzone, L., Espada-Ruiz, R., Gil -Vera, F.J., Martín Bernal, C., Garcia-Bellido Capdevila, E., Sequeira, M., Martínez-Cedeira, J.A. Killer whales of the Strait of Gibraltar, an endangered subpopulation showing a disruptive behavior. Submitted to Marine Mammals Science.

Guinet, C., Domenici, P., De Stephanis, R., Barrett-Lennard, L., Ford, J.K.B., & Verborgh, P., (2007). Killer whale predation on bluefin tuna: Exploring the hypothesis of the endurance-exhaustion technique. Mar. Ecol. Prog. Ser. 347, 111–119. https://doi.org/10.3354/meps07035

Tixier, P., Gasco, N., Duhamel, G., & Guinet, C., (2015). Habituation to an acoustic harassment device (AHD) by killer whales depredating demersal longlines. ICES J. Mar. Sci. 72(5), 1673–1681. https://doi.org/10.1093/icesjms/fsu166