

# Evolution of a unique and ambiguous relationship between Orcas, Pilot Whales and Tuna-fishermen in the Strait of Gibraltar



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## Introduction

Every summer killer whales come into the Strait of Gibraltar to interact with fishermen in order to get tuna fishes from the hooks. This interaction evolved two decades ago, when fishermen started to use drop-lines. Sighting-data taken from whale-watch boats from 1999 – 2010, show that the arrival of the orcas correlates with a reduction in sightings of pilot whales, as if they panic. The pilot whales return, but their group-size increases simultaneously when orcas are sighted more regularly between the fishermen in the Strait. There are two spots where fishermen use to gather for tuna fishing. The southernmost is only used by Moroccan boats. At the end of the summer the pilot whales can be observed there starting to chase the orcas out of what they consider their territory. This unique behaviour has been documented in the movie "The Last Giants". Due to reduced quota given to the drop-line fishermen, that take tuna when it comes back from the Mediterranean after spawning, the season for the orcas is getting shorter. In order to conserve this unique interaction between killer whales, pilot whales and fishermen, it is suggested to increase the quota for drop-line fishermen and instead reduce it for other more harming techniques like purse seines or Almadrabas (pound nets), the latter taking tuna on their way to their spawning grounds in the Mediterranean. This will improve the situation of killer whales, local fishermen and whale watching operators and at the same time reduce the pressure on the spawning stock of Mediterranean bluefin tuna.

## Methodology

Sighting data was taken during regular whale-watching trips of two and three hours, during the summer seasons of 1999-2010 (April–October), onboard four boats. On each trip, time, position, behaviour and number of animals were recorded. A sighting was defined as a cohesive group of animals of the same species; adults, calves and newborns were counted separately (only since 2001 in the case of long-finned pilot whales). If possible, individual orcas were identified in order to assess their affiliation to a certain pod. 6804 sightings of pilot whales and 273 sightings of killer whales have been registered on 4815 whale watching trips from 1999-2010. Data of the amount of tuna taken by the drop-line fishery and their quota introduced at 2008 was taken from the official government web sites, but data of the years 1999, 2000 and 2003 were not available. According to the sighting-rate of killer whales, the study period was divided into a first period from 1999-2008 with introduction of the tuna fishing quota at 2008 and a second from 2009-2010.

## Results

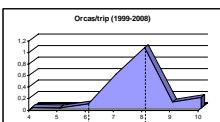


Fig. 1: When the orcas arrived in June during the first period (1999-2008), a sharp decline in sightings of pilot whales could be observed. This was conspicuous especially for their calves. The mean group size of pilot whales increased significantly ( $P=0,70$ ) along with the increased sightings of orcas, reaching the top in August, when the presence of Orcas was strongest.

From 1999-2006 the increasing experience in locating the Orcas led to an increase in sightings (fig. 3). In 2004 and 2005 the decrease of sightings may be explained by less fishing of tuna (fig. 4). Since 2006 we also started to look for Orcas around the Moroccan tuna-fishing grounds, where we observed primarily in 2007 and later in 2008 how orcas fled south or west from the pilot whales.

Fig. 2: In the second period since 2009, orcas arrived in July, again associated with a sharp decline in sightings of pilot whale calves. The calves, as well as the adults (not shown here), returned in August and left again in September, as opposite to the orcas.

Fig. 1 Sighting rate of killer whales and pilot whale calves per month corrected for effort and group size of pilot whales per month with SE, for the first period.

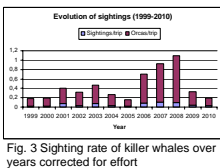


Fig. 3 Sighting rate of killer whales over years corrected for effort

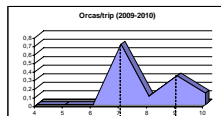


Fig. 2 Sighting rate of killer whales and pilot whale calves per month corrected for effort and group size of pilot whales per month with SE, second period.

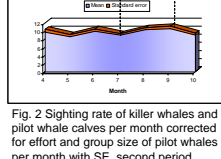


Fig. 4 Tuna fished with drop lines, with missing data of three years.

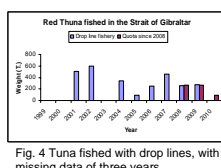


Fig. 7 Shrinking quotas given to the drop line fishermen of the Strait of Gibraltar



The reaction of pilot whales through group size increase was less significant ( $P=0,64$ ) in the second period, a small peak in group size could be observed in September, when the orcas returned.

In the last two seasons of the first period (fig. 6), pilot whales were observed chasing orcas out of the area where the Moroccan tuna fishers use to gather. This could be observed repeatedly and especially in 2008, with the longest chase distance of 2 miles at day 23.08.2008 (fig. 5). In 2009 no more of such events were observed and in 2010 the orcas avoided completely the Moroccan tuna fishing ground.



Screenshot of the movie 'The Last Giants', 'Watch how the Orcas flee.'

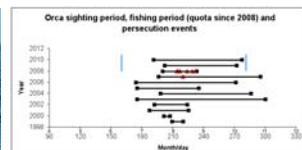


Fig. 6 Period between first and last sighting of every season, with persecution events in 2007 and 2008

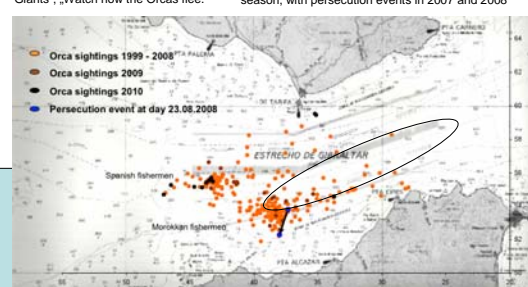


Fig. 5 The two tuna fishing grounds where orcas can be found, the main area of pilot whale presence and the longest chase (arrow) of pilot whales on killer whales.

## Discussion and conclusions

Every summer 147-265 long-finned pilot whales reside in the Strait of Gibraltar (Verborgh, 2009). Generally it has been speculated, that such a big number of individuals should not fear the orcas but we observed a decline in pilot whale abundance every time the orcas arrived. This is evident especially for the sightings of pilot whale calves, suggesting some kind of protecting behaviour by the pilot whales. The number of fish eating killer whales, which belong to at least two pods, varies from 3-26 individuals. Instead of pushing tuna (up to 1,5m in size) beyond their aerobic limits, to exhaust and capture them as the Barbate pods do (Guinet, 2007) these pods take also bigger tuna from the fishermen drop line hooks. This interaction might allow them to increase their energetic gain and invest it in reproduction (Esteban, 2008). They do it in two areas: one belonging to international waters in the middle of the Strait, where both Spanish and Moroccan fishermen gather for drop line fishing and a southern area under Moroccan jurisdiction. The southernmost area is in range of the pilot whales habitat, especially during high tide (Casanova, 2007), when fishermen are still taking tuna but slowly starting to leave the area. Then it is more likely to come to persecution events of pilot whales on orcas. The orcas use to flee in directions of south or west. These pursues have never been observed in the first weeks of the arrival of the orcas. Only later, when the killer whales seem to have fed a couple of weeks, persecution events took place. Regarding this it has been speculated a lot. Esteban (2009) argues that one possible reason could be a conflict from a territorial point of view, maybe due to the reproductive strategy of pilot whales. However, the true nature of this interaction is difficult to interpret. Considering the possible universality of the V4 call (or 'excitement' call) in Pacific killer whale populations (Rehn, 2011), pilot whales in the Strait might also be aware of a possible danger. Probably they can't get used to the presence of killer whales, since the orcas appear only seasonally. Once they realize there is no danger after a couple of weeks, they return and stay more confident, but still wary. The increased group size may be a result of this precaution. There is no possible avoidance for the fishermen, like traveling away from the orcas (Tixier, 2010), neither critical habitat protection like suggested by Williams (2009), that ensures meaningful protection for the orcas in the heavily transited Strait of Gibraltar. In order to mitigate the conflict between orcas and fishermen, it is suggested to establish a bigger quota for the drop-line fishermen and link it to the protection of the orcas, conserving this unique relationship also for the delight of future whale watch generations.

## References

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