



Fin Whales off Gibraltar

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Introduction

Most fin whales are believed to stay in the Mediterranean Sea all year round. The population of approximately 3000 individuals is genetically distinct from the North Atlantic population. Some fin whales have also been reported to migrate through the Strait of Gibraltar, possibly connecting both populations. Analysis of iodine content of blubber oil and of carbon isotopes from the baleen plates revealed that some individuals may feed on both Mediterranean and Atlantic krill. Satellite tagging exposed one individual migrating from the Ligurian Basin to northern Portugal. During the summer seasons from 1999 to 2006, an attempt was made to quantify the migration of the whales from the sighting data taken on board of a whale watching vessel from Tarifa. The first step was to estimate the number of migrating fin whales, which was done by extrapolating data from sightings, corrected for effort to 24 hours of whale watching activity. The second step was to calculate an absolute number of whales using the model of ship strikes developed by Dr Tregenza. Considering the resumption of Icelandic commercial whaling and the resulting potential catch of Mediterranean fin whales, it is important for management purposes to know the amount of migrating whales. This is especially true in view of the possibility that those fin whales might be the remaining animals of a former Gibraltar population.

Methodology

Sighting data was taken during regular whale-watching trips onboard two boats: one 9m long with observer eyes 3.15m above water surface, at an average speed of 13 knots and an average trip distance of 18km; the other 11m long with observer eyes 4.33m above water surface, at an average speed of 20 knots and an average trip distance of 28km. On each two-hour trip, weather conditions, time, position, behaviour and swimming direction of all sightings were recorded. A sighting was defined as a cohesive group of animals of the same species; adults, calves and newborns were counted separately. Observers experience was not taken into account since 20 different guides were involved. Maximal distance to detection was taken from literature: The sighting area until 2003 was 180km² and from 2004-2006 increased to 600km². The mathematical method developed by Dr. Tregenza to estimate **Ship strikes = (W + 1.27L)*D/1000*Y*T*P**

- W** | broad of ship = sighting band = 2* (75% of max. distance to detection considering average weather conditions)
- L** | length of whale = weighted mean of sighted whales and sizes of literature
- D** | trip distance inside the sighting area
- Y** | number of trips
- T** | fraction of time the whale spends at surface, mean of records and from Diaz López (2000), Lafortuna (2003) and Jahoda (2003).
- P** | animals / km² of the sighting area

Since the strikes can be considered as sightings, the unknown variable is the Density of the "population" (**P**) = **1000*S/(W+1,27L)*D*Y*T**, therefore **Migrating whales = P*Sighting area**



Results

Figure 1 shows the positions of the 103 Fin Whales sighted from 2000–2006, where swimming direction was recorded. A total of 121 Fin Whales were sighted in that period. Due to the fact that whale watching takes place in the Strait during the summer season when most of the whales swim out of the Mediterranean, there is not enough existing data about whales swimming east. The calculation of migrating whales refers to those leaving the Mediterranean every year.

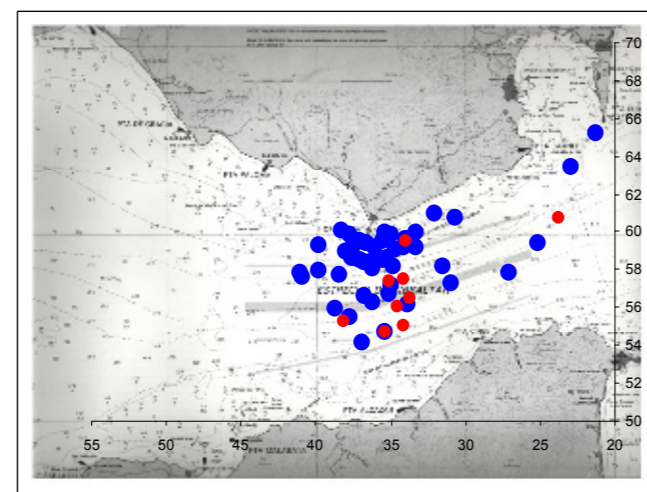


Fig. 1 Fin Whales migrating West (blue) and East (red)

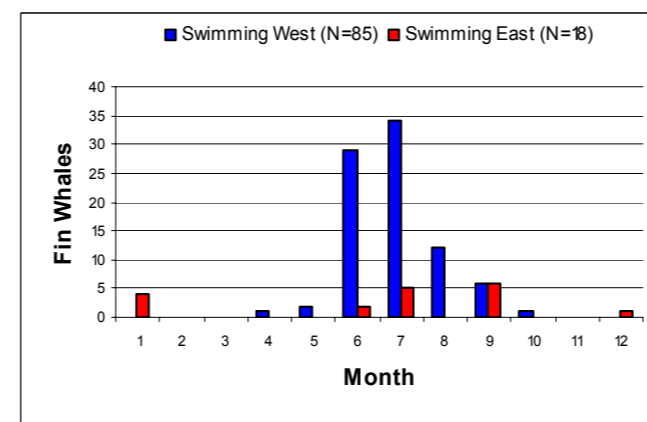


Fig. 2 Total sightings of years 2000-2006

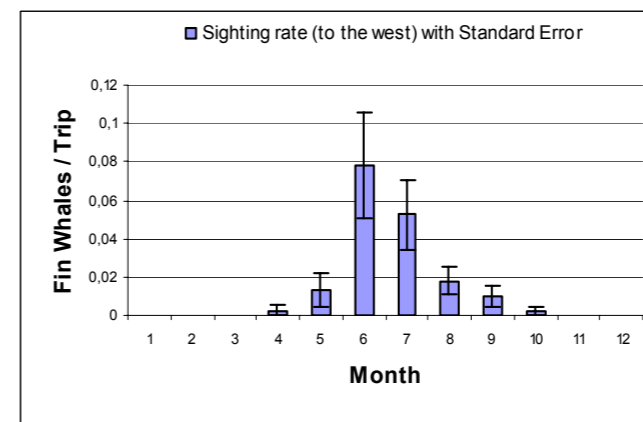


Fig. 3 Mean monthly sightings corrected for Effort

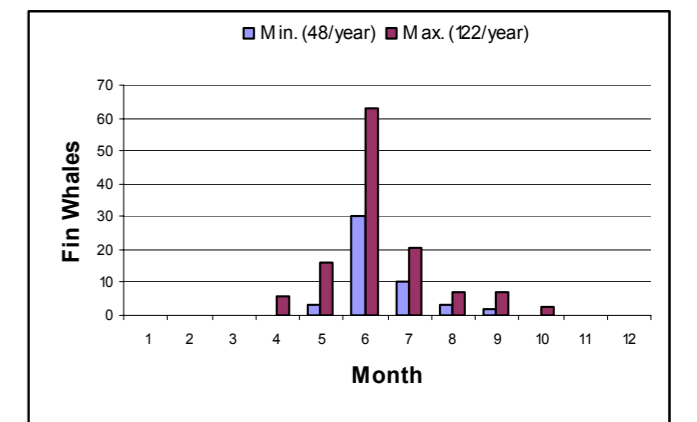


Fig. 4 Fin Whales to the west (Mean = 85/year)

Figure 2 shows the number of sighted whales and their swimming direction. Even in the summer season a small amount of east swimming whales can be observed. Fin Whales clearly leave the Mediterranean at the beginning of summer and despite the lack of data "to the east" it seems that they return in autumn. Mean group size = 1.5 (SD=0.8), biggest group = 5. **Figure 3** demonstrates the whale migration pattern to the west since sightings have been corrected for effort (number of trips). The mean sighting rate shows a clear peak at June followed by an exponential decrease of migration to the west. A first extrapolation to 24 hours of whale watch activity results in 38–91 whales leaving through the Strait every year (mean = 65). **Figure 4** represents the magnitude of mean monthly migration calculated with the formula for ship strikes of Dr. Tregenza. According to this method 48–122 Fin Whales leave the Mediterranean every year (mean = 85).

Discussion and conclusions

By 1996, 3500 Fin Whales were believed to live in the Mediterranean Sea, about 900 of them in the Ligurian Basin where they concentrate to feed on *Meganyctiphanes norvegica* (Panigada *et al.*, 2005). Around Ischia they feed on ichthyoplankton as well (Mussi *et al.*, 1999). Average group size is 1.3-1.7, births occur mainly in November. Genetic analysis reveals that populations of North Atlantic and Ligurian Basin are distinct with limited gene flow (Bérubé *et al.* 1998). In the Alborán Sea (western Mediterranean) 95.5% of the Fin Whales move out into the Atlantic during spring and summer, while 77.8% move eastwards during autumn and winter (Sierra *et al.*, 2004). The Central Alborán Sea might be a feeding ground for them (De Stephanis *et al.*, 2001). The comparison of 13C/12C isotopic patterns of baleen plates and the whale's krill prey suggests that whales sampled in the Mediterranean Sea exhibited two different migratory behaviour: 8 whales appeared to be resident to the Mediterranean while 3 exhibited large variation of their 13C/12C ratio, consistent with regular migrations to the Atlantic (Guinet *et al.*, 2005). The mathematical model of Dr. Tregenza to calculate ship strikes might be suitable for migration estimate if accurate trip distance and distance to detection data is available (48–122 Fin whales/year swimming out). This migration (probably under-estimated) is not correlated with seasonal abundance estimates for the Ligurian Basin and there is evidence for migration in both directions in summer. Is it possible that these whales are remnants of a former Gibraltar population? In 1921, a whaling station was established in Getares. From Notarbartolo *et al.*, (2003): "By 1926, with a minimum of 4149 fin whales killed in only 6 years, the population had collapsed... Such circumstantial evidence supports the hypothesis that the Gibraltar Fin Whales formed a population of limited range and size, which barely trespassed into the Mediterranean and thus did not interbreed with, whales residing in the central-western Mediterranean (Clapham & Hatch, 2000). The remnant of the local fin whale population was exploited until the late 1970's by pirate whaling, which harvested hundreds of animals off the coast of the Iberian Peninsula (Best, 1992). Fin whales were likely extirpated from the Strait area... as proposed by Clapham & Hatch (2000), this probably occurred because the cultural memory of the existence of that habitat was lost within the population."

Only 5 calves and 2 sub adults have been sighted by firmm® from 2000-2006. Perhaps only some great whales of the Mediterranean population take the long trip to feed on krill because of high-energy need. The small number of Fin Whales migrating through the Strait can belong to any of the populations of Mediterranean, Gibraltar or Iceland. There is a possibility of an overlap of migrations occurring in the Strait of Gibraltar.

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