An update on fin whales (*Balaenoptera physalus*) migration through intense maritime traffic in the Strait of Gibraltar

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ABSTRACT

Fin whales (*Balaenoptera physalus*) are known to migrate between the Mediterranean Sea and the Atlantic Ocean through the Strait of Gibraltar. Westerly migrating whales swim into the Atlantic Ocean mainly in summer but information about the easterly whales is scarce. The aim of this study is to know more about individual migrations through the high maritime traffic area of the Strait of Gibraltar. Data was collected from a research boat between 1999 and 2008, from opportunistic platforms of whale watching from April to October 2003-2008 and other opportunistic platforms. A total of 118 sightings of 185 animals were recorded, 59% being lone individuals. A mean of 17 (range 1-30) whales was sighted every year with 1.6 (1-6) animals per sighting. Mostly adults were sighted but 8 juveniles and 2 calves were also observed. In 92% of the sightings, fin whales were travelling, 88% swimming west, into the Atlantic and 8% east, into the Mediterranean Sea. Most sightings occurred in summer, in relation to the effort. A total of 1466 digital pictures and 312 slides were analyzed, representing only 35 sightings, and this enabled to identify 22 marked individuals. Unmarked whales represented 60% of the photographed animals. Three individuals (14%) were recaptured once, swimming to the Atlantic Ocean with different companions and different time intervals (range 1-6 years). The existence of recaptured individuals confirmed that the migratory movements observed in the Strait of Gibraltar must be done by the same individuals swimming back and forth between the Atlantic Ocean and the Mediterranean Sea, mainly to the Atlantic Ocean in summer and probably returning to the Mediterranean Sea in winter when the effort is lower. These migrating whales could represent only a small portion of the Mediterranean population. We recommend that observations be conducted all year long to better identify the migrating seasons and number of whales, especially in this high maritime traffic area. We also recommend real-time monitoring of potential fin whale strikes in the Strait of Gibraltar as well as further study on fin whales including photo-identification and genetic analysis to estimate the total number of individuals migrating through the Strait and the population they belong to.

KEYWORDS

MONITORING, SHIP-STRIKES, CONSERVATION, MIGRATION

INTRODUCTION

Fin whales (*Balaenoptera physalus*) are known to migrate between the Mediterranean Sea and the Atlantic Ocean through the Strait of Gibraltar (de Stephanis *et al.*, 2001; 2005; Salazar Sierra *et al.*, 2004; Selling *et al.*, 2007). Genetic evidence suggests that the fin whale population of the Mediterranean Sea, estimated in the western basin at around 3,500 individuals (Forcada *et al.*, 1996), is resident and characterized by only very limited gene flow with the North Atlantic population (Bérubé *et al.*, 1998; Palsbøll *et al.*, 2004). Catches of about 7,000 fin whales taken near the Strait of Gibraltar in the 1920s (Reilly *et al.*, 2008; Sanpera and Aguilar, 1992) apparently reduced the local abundance. The Strait of Gibraltar has the second heaviest maritime traffic in the world with more than 90 000 ships crossing every year and an increase in traffic is to be expected with the new Tangier-Med harbour in Morocco which started working in 2008 (de Stephanis *et al.*, 2005). Furthermore, Panigada *et al.* (2006) showed that ship strikes in the Mediterranean Sea are common and most likely represent the main anthropogenic threat for fin whales and sperm whales (*Physeter macrocephalus*), with unusually high fatality rates reported every year.

MATERIAL AND METHODS

Data was collected from a research boat from 1999-2008 using random transects, platforms of whale watching from April to October 2003-2008 and other opportunistic platforms from land and sea (fishermen or sailing boats). For each sighting basic information was recorded as date, hour, GPS location, number of animals as well

as behavior and photo-identification pictures were taken whenever possible. Effort was calculated as number of nautical miles monthly sailed by both the research boat and the whale watching boats.

RESULTS

Between 1999 and 2008, a total of 118 sighting of 185 animals were recorded. Lone individuals represented 59% of the sightings, the remaining 41% being groups of 2 to 6 individuals. A mean of 17 (range 1-30) whales was sighted every year with 1.6 animals recorded per sighting. Mostly adults were sighted but 8 juveniles and 2 calves were also observed accompanying the adults. No information about the sex of the whales was available at this stage from observation or genetics, but it is assumed that adults accompanied by calves were female.

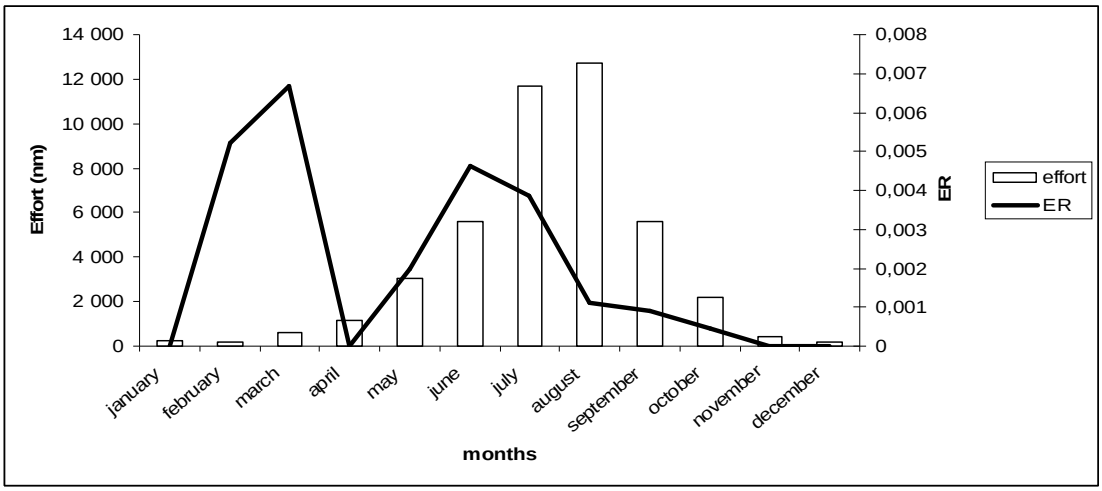

Figure 1 : Encounter rate for fin whale and effort (research + whale watching)

Fin whales were mostly sighted in June-July as described by Fig. 1; we consider that the high encounter rate in February-March can be explained by the very low effort sailed during these months.

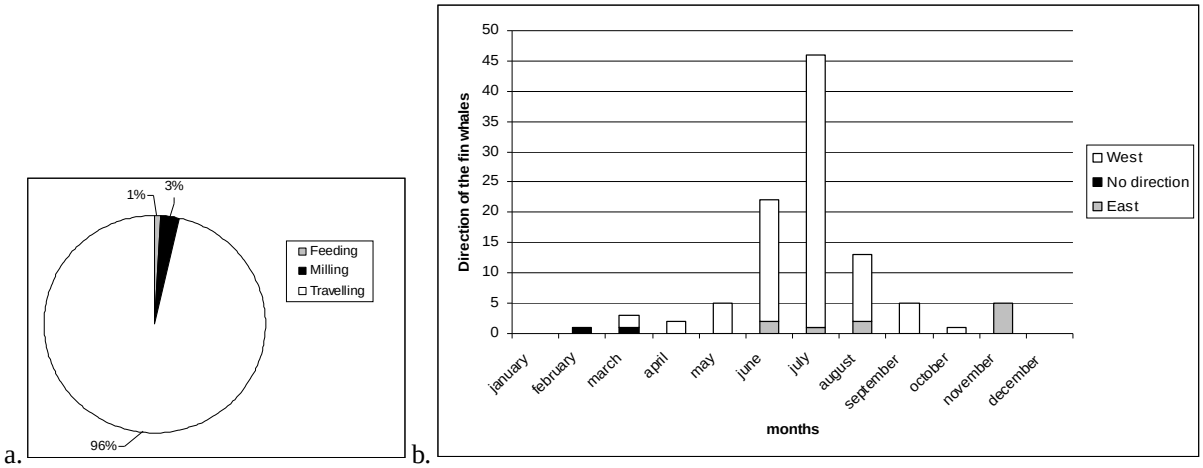

Figure 2: a. Behaviour of the whales. b. Direction of the whale per month 1999-2008

In 92% of the sightings, fin whales were observed travelling (Fig. 2a). During summer months, most of the individuals were observed swimming west towards the Atlantic Ocean, while swimming towards the Mediterranean Sea in winter (Fig. 2b), even though only 8% of all sightings were recorded travelling East. This is probably related to lower effort in winter.

A total of 1,466 digital pictures and 312 slides were analyzed, representing only 35 sightings, and allowed to identify 22 marked individuals. Unmarked whales represented 60% of the photographed animals.

Table 1 : Details of the recaptures of fin whale individuals

Name	Capture Date	Group size	Direction	Recapture Date	Group Size	Direction
Juan	22/09/2006	1	W	20/06/2007	2	W
Pitufo	25/07/2005	5	W	17/07/2008	3	W
Giorgio	19/08/2002	1	W	02/07/2008	1	W

Three individuals (14%) were recaptured once, swimming to the Atlantic Ocean with different companions and different time intervals (range 1-6 years). This confirmed that the migratory movements observed in the Strait of Gibraltar must be done by the same individuals swimming back and forth between the Atlantic Ocean and the Mediterranean Sea.

DISCUSSION AND CONCLUSION

This study confirms the evidences of bidirectional migration through the Strait of Gibraltar, mainly to the Atlantic Ocean in summer. However, the existence of recaptured individuals suggested that more whales than sighted must return to the Mediterranean Sea, probably during winter period when observer effort is lower. These migrating whales could be a small subpopulation of the Mediterranean population. We recommend that observations be conducted all year long to better identify migrating seasons and number of whales.

Besides, catches of about 7,000 fin whales were taken near the Strait of Gibraltar in the 1920s (Reilly *et al.*, 2008; Sanpera and Aguilar, 1992), thus the whales could still be recovering from the hunting period. As the number of whales migrating to the Strait seems to be low, they could constitute only a small portion of the Mediterranean population with the same individuals swimming back and forth between the Atlantic Ocean and the Mediterranean Sea; therefore genetic analysis on the migrating whales should help to understand the relationship of these specific whales to the distinct North Atlantic and Mediterranean populations. This would follow ACCOBAMS recommendation that genetic analyses be undertaken to compare fin whales in the eastern and western parts of the Mediterranean and thus to allow evaluation of the single-subpopulation hypothesis (Reeves R. and Notarbartolo di Sciara G., 2006).

With more than 90,000 cargo ships and ferries using the area every year the Strait of Gibraltar is an area of high maritime traffic where collision risk may be important (de Stephanis *et al.*, 2005). The Mediterranean fin whale subpopulation was estimated at fewer than 10,000 mature individuals and is subject to ongoing threats that may be causing a decline (Reeves and Notarbartolo di Sciara, 2006). The main threat, ship collision was described for 11 species of large whales, of which the fin whale was most commonly recorded as being hit by ships worldwide (Laist *et al.*, 2001). Besides, Panigada *et al.* (2007) found that 16% of fin whale carcasses were certainly killed by ship strikes in the western Mediterranean Sea. Finally, to date two strikes with fin whales and two with sperm whales have been reported in the Strait of Gibraltar (de Stephanis *et al.*, 2003; 2005). ACCOBAMS recommended sustaining effort to document fin whale mortality from ship strikes (Reeves R. and Notarbartolo di Sciara G., 2006). Hence we recommend real-time monitoring of potential fin whale strikes in the Strait of Gibraltar as well as further study on fin whales including photo-identification and genetic analysis to estimate the total number of individuals migrating through the Strait and the population they belong to.

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