

Individual migration of fin whales (*Balaenoptera physalus*) through the Strait of Gibraltar

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ABSTRACT

Fin whales are known to be migrating from/to the Mediterranean Sea to/from the Atlantic Ocean through the Strait of Gibraltar. Westerly migrating whales swim towards the Atlantic Ocean mainly in summer but information about the easterly whales is scarce. The aim was to know more about individual migration through the Strait of Gibraltar. Data were collected from a research boat from 1999-2008, 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 towards the Atlantic Ocean and 8% to the Mediterranean Sea. Most sightings occurred in summer, mostly due 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 1-3 years). This study confirmed the evidences of bidirectional migration through the Strait, 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 the effort is lower. 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 where strikes may occur. Moreover, genetic analysis should help to understand the relation of the migrating whales to the distinct North Atlantic and Mediterranean populations.

INTRODUCTION

Fin whales are known to be migrating from/to the Mediterranean Sea to/from the Atlantic Ocean through the Strait of Gibraltar (de Stephanis *et al.*, 2001; 2005; Salazar Sierra *et al.*, 2004; Selling *et al.*, 2007). Genetic evidences suggest 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).

MATERIAL AND METHODS

Data were collected from a research boat from 1999-2008 using randomized transects, platforms of whale watching from April to October 2003-2008 and other opportunistic platforms from land and sea (fishermen or sailing boat). For each sighting basic information was recorded as date, hour, GPS location, number of animals as well as behaviour and photo-identification pictures were taken whenever possible. Searching effort was calculated as number of nautical miles monthly sailed by both the research boat and the whale watching boats.

RESULTS

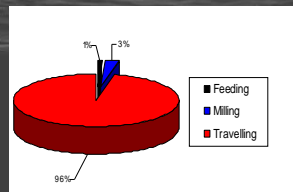


Figure 2: Behaviour of the whales

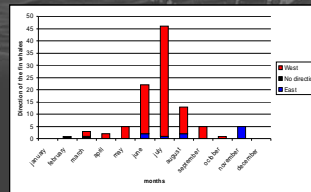


Figure 3: Direction of the whale per month 1999-2008

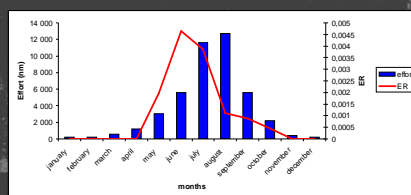


Figure 4: Encounter rate (n° sighting/nm) for fin whale and effort (research + whale watching)

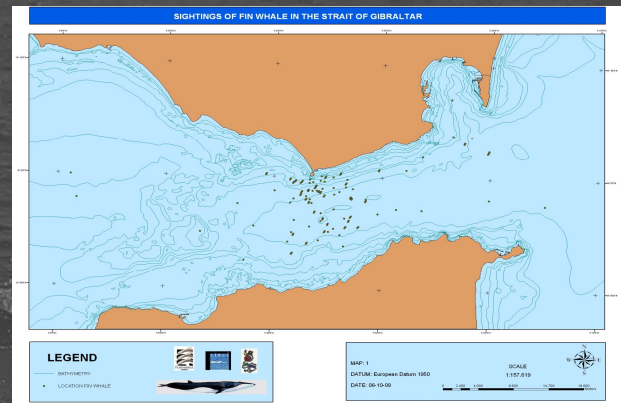


Figure 1: Sightings of fin whale in the Strait of Gibraltar 1999-2008

Between 1999 and 2008, a total of 118 sightings (see Fig. 1) 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.

In 92% of the sightings fin whales were observed travelling (Fig. 2), westerly during summer months and towards the Mediterranean Sea in winter (Fig. 3). This is probably related to the low effort in winter (Fig. 4).

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.



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 confirmed 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 the effort is lower.
- As the number of whales migrating to the Strait seems to be low, they could constitute a small subpopulation with the same individuals swimming back and forth between the Atlantic Ocean and the Mediterranean Sea.
- The Strait of Gibraltar is an area of high maritime traffic where collision risk may be important with more than 90,000 cargo ships and ferries using the area every year (de Stephanis *et al.*, 2005).
- 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).
- 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.

BIBLIOGRAPHY

- Bérubé, M., Aguilar, A., Dendato, D., Larsen, F., Notarbartolo Di Scara, G., Sears, R., Sigurjónsson, J., Urban, R. J. & Palsbøll, P. J. 1998. Population genetic structure of North Atlantic, Mediterranean Sea and Sea of Cortez fin whales, *Balaenoptera physalus* (Linnaeus 1758): analysis of mitochondrial and nuclear loci. *Molecular Ecology* 7: 585-599.
- de Stephanis, R., Cañadas, A., Villalba, M., Perez-Gimeno, N., Sagaminaga, R., Segura, S., Fernández-Casado, M., Guinet, C. 2001. Fin whale (*Balaenoptera physalus*) migration through the strait of Gibraltar? In *European Research on Cetaceans 15*. Proc. 15 th Ann. Meeting European Cetacean Society, Roma, Italia 6-10 May 2001.
- de Stephanis, R., Salazar-Sierra, J.M., Pérez-Gimeno, N., Verborgh, P., Tellé, E., Rueda, L. 2003. Collision between a sperm whale (*Physeter macrocephalus*) and a ferry in the Strait of Gibraltar. Poster at the ECS Congress in Las Palmas, Canary Islands 2003.
- de Stephanis, R., Verborgh, P., Pérez-Gimeno, N., Sánchez-Cabanes, A., Pérez-Jorge, S., Esteban Pavo, R., Sella, N., Uquiza, E. and Guinet, C. 2005. Impactos producidos por el tráfico marítimo en las poblaciones de cetáceos en el estrecho de Gibraltar. Situación actual y previsiones de futuro. Dirección General para la Biodiversidad del Ministerio de Medio Ambiente. 140 pp. (In Spanish).
- Forcada, J., Aguilar, A., Hammond, P., Pastor, X. and Aguilar, R. 1996. Distribution and abundance of fin whales in the Western Mediterranean Sea during the summer. *Journal of Zoology* (London) 238: 23-34.
- Palsbøll, P.J., Bérubé, M., Aguilar, A., Notarbartolo di Scara, G. and Nielsen, R. 2004. Discerning between recurrent gene flow and recent divergence under a finite-site mutation model applied to north Atlantic and Mediterranean Sea fin whale (*Balaenoptera physalus*) populations. *Evolution* 58, 670-675.
- Salazar Sierra, J., de Stephanis, R., Cañadas, A., Verborgh, P., Perez-Gimeno, N., Sagaminaga, R. and Guinet, C. Evidences of exchanges of fin whales through the Strait of Gibraltar. Poster at the ECS Congress in Kolmarden, Sweden 2004.
- Selling, J. 2007. Fin whales off Gibraltar. 21st Ann. Meeting European Cetacean Society, San Sebastian, Spain 22-25 April 2007.