

Mediterranean fin whales at risk from fatal ship strikes

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Abstract

This paper reviews and analyzes ship collision records for the relatively isolated population of fin whales in the Mediterranean Sea from 1972 to 2001. Out of 287 carcasses, 46 individuals (16.0%) were certainly killed by boats. The minimum mean annual fatal collision rate increased from 1 to 1.7 whales/year from the 1970s to the 1990s. Fatal strike events (82.2%) were reported in or adjacent to the Pelagos Sanctuary, characterized by high levels of traffic and whale concentrations. Among 383 photo-identified whales, 9 (2.4%) had marks that were attributed to a ship impact. The reported rates are unusually high for baleen whales. The high likelihood of unreported fatal strikes combined with other anthropogenic threats suggests an urgent need for a comprehensive, basin-wide conservation strategy, including ship strike mitigation requirements, like real-time monitoring of whale presence and distribution to re-locate ferry routes to areas of lower cetacean density, and reducing ship speed in high cetacean density areas.

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1. Introduction

Fin whales (*Balaenoptera physalus*) are common in the Mediterranean Sea, where they tend to concentrate in localized, highly productive areas for feeding purposes (Orsi Relini et al., 1994; Zanardelli et al., 1999; Notarbartolo di Sciara et al., 2003). One such aggregation area for fin whales is the Pelagos Sanctuary for Marine Mammals (Fig. 1); oceanographic features of this MPA support high levels of prey biomass (Jacques, 1990; Astraldi et al., 1995) and a large number of cetaceans (Notarbartolo di Sciara et al., 1993; Gannier, 2002).

Genetic evidence suggests that the Mediterranean Sea population, estimated in the western basin at around

3500 (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). This small and ecologically isolated population faces several threats, where widespread environmental degradation has taken place in recent years; acoustic pollution, presence of detrimental manmade compounds in the marine food web, increased human disturbance, interaction with fisheries, depletion of living resources and loss of biodiversity, are among the main problems that affect Mediterranean fin whales (Notarbartolo di Sciara and Gordon, 1997).

Ship strikes with odontocetes and mysticetes are regularly reported from all over the world's oceans, with evidence of ships collision described for 11 species of large whales, of which the fin whale is most commonly recorded as being hit by ships worldwide (Laist et al., 2001).

Every year, 220 000 ships of more than 100 tons cross the Mediterranean basin (Anonymous, 1999; SCOT, 2004). Furthermore, a total of 2000 vessels, including

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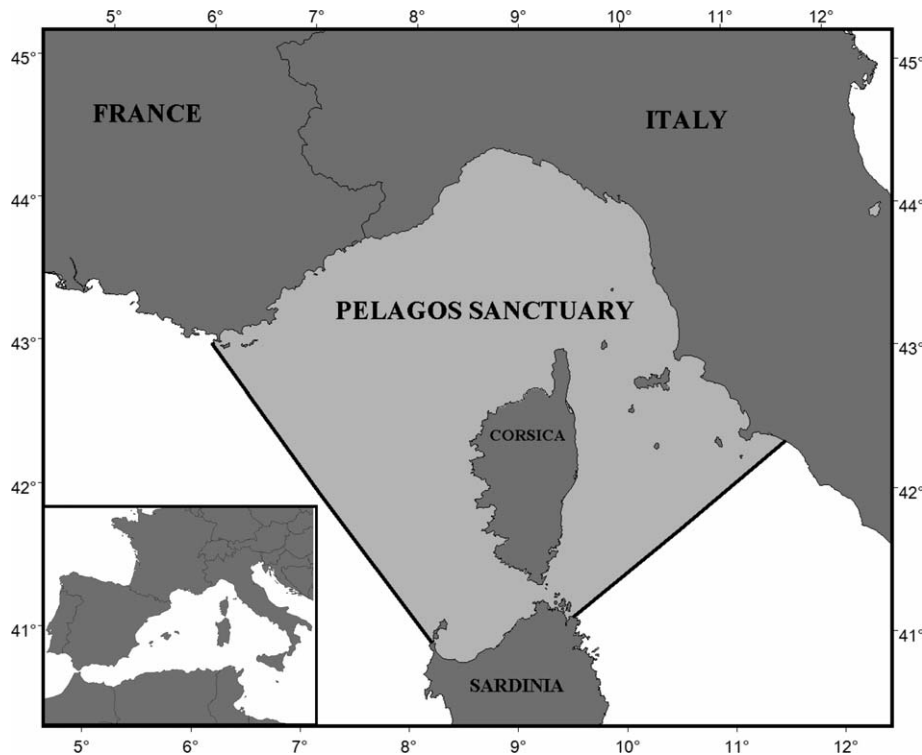


Fig. 1. Borders of the Pelagos Sanctuary for Marine Mammals. The location of the area in the Mediterranean Sea is shown in the inset.

ferries, fast ferries and hydrofoils, as well as military, fishing, pleasure and whale-watching boats, navigate these waters daily (Anonymous, 1999). This vessel traffic is highest during the summer months in areas where whales often aggregate (Notarbartolo di Sciara and Gordon, 1997; Zanardelli et al., 1999; Gannier, 2002).

The objective of this paper was to collect all the records documenting ship strikes between fin whales and different types of vessels in the Mediterranean Sea in order to assess the extent of ship collisions with Mediterranean fin whales, to assess necessary conservation measures, and to suggest further research activities aimed at reducing the potential for vessel collisions and to maintain mortality rates for the Mediterranean population at sustainable levels.

2. Materials and methods

2.1. Stranding data (dead whales)

Data regarding deceased individuals were initially extracted from existing stranding databases. In the Mediterranean Sea there are three cetacean stranding networks with accurate and complete datasets: Centro Studi Cetacei (CSC) in Italy, Groupe d'Etudes des Cétacés en Méditerranée (GCEM) and Centre for Research on Marine Mammals (CRMM) both in France. Data were extracted from the Italian and French stranding networks covering years 1986–2001 and 1972–2001, respectively. The National Archive of Cetacean Strandings and Sightings in Greece (1991–2001) was also reviewed. We also looked for histor-

ical and anecdotal records, such as early stranding records, newspaper articles, ferry companies' archives, Harbor Offices reports, and reports from marine biologists and ship captains.

For all the gathered records we verified the source and checked the contents in order to assess the possible causes of death. A dead animal was considered as being killed by a vessel when: (a) it was reported in a reliable stranding report; (b) it presented fractured heavy bones (Laist et al., 2001) and/or (c) the body presented large wounds or parallel and evenly spaced slashes derived by a ship hull or propeller (Lockyer and Morris, 1990; Bloom and Jager, 1994; Wells and Scott, 1997; Moore et al., 2004).

Accounts from unreliable sources and unclear reports were excluded from the confirmed struck fin whales (Table 1). Moreover, records of specimens possibly struck when already dead were rejected. The presence of hematomas (indicating a functioning circulatory system) was used to confirm that the whale was hit when alive, as were injuries located in the upper part of the body in otherwise intact animals (since dead whales generally float belly up (Laist et al., 2001)). All the reports not positively included among those confirmed were considered as doubtful collisions (Table 1).

For each ship strike we recorded the date, location, source, and, when available, the animal's sex and length, the type and position of injury, and the type of vessel involved (Table 1). To investigate whether some locations were more affected than others, we summarized collision locations and analyzed them by geographical areas.

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