Use of non-dedicated ferry as a platform to monitor cetacean populations over 15 years in Central Tyrrhenian Sea

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INTRODUCTION

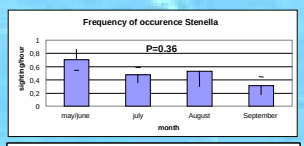
Italy has taken several commitments in terms of monitoring Cetacean populations, in accordance with several international Conventions, Agreements, European Directives, Regulations and Strategies including the CBD, ACCOBAMS, Sanctuary, the Habitats Directive and Regulation (EC) 812/2004. Moreover, monitoring cetacean presence, distribution and migration timing is an effective indicator to detect environmental changes and habitat degradation and to recommend appropriate conservation planning.
At date, it is not been established yet a successful standard practice to monitor Mediterranean cetacean populations. Type of observation platform and research cost have been the main problems on the development of an effective and cost efficient protocol to survey cetacean population over time. Given the low cost, the standard route, speed and height of the observer, ferries are an efficient platform of opportunity to monitor cetaceans over time.
The geographical and ecological characteristics of the Central Tyrrhenian Sea makes it strategic for monitoring the presence of animals, also because intercepts perpendicularly the marine corridor that connects the Northern-Pelagos Sanctuary to the Southern-Mediterranean Sea where the Italian Ministry of Environment of the Land and the Sea establishing a new protection zone.

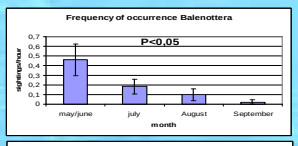
Species	Presence in Mediterranean sea	Sighted in Central Tyrrhenian Sea during summer '90 and 2007 (in red)	
		Frequent	Beatwin 1 and 4 sightings
Balaenoptera physalus (Lacépède, 1804)	Regular	X X	
Globicephala melas (Traill, 1809)			X X
Physeter macrocephalus (Linnaeus, 1758)		-	-
Ziphius cavirostris (Cuvier, 1823)		X X	
Tursiops truncatus (Montagu, 1821)		X X	
Zophius cavirostris (Cuvier, 1823)			X X
Delphinus delphis (Linnaeus, 1758)			-
Grampus griseus (Cuvier, 1812)		X	-
Balaenoptera acutorostrata (Lacépède, 1804)	Occasional	X	X?
Pseudorca crassidens (Owen, 1846)		-	-
Steno bredanensis (Cuvier in Lesson, 1828)		-	-
Orcinus orca (Linnaeus, 1758)		-	-
Mesoplodon mirus (Trouessart, 1781)		-	-
Eubalena glacialis (Müller, 1776)	Accidental	-	-
Kogia simus (Owen, 1866)		-	-

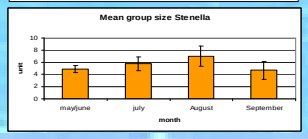
METHODS

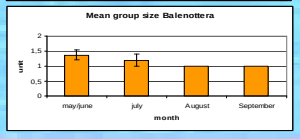
From 1989 to 1991 weekly observations on cetacean were undertaken from non-dedicated ferries (18 knots) along the "line transect" from Civitavecchia (Rome district) to Golfo Aranci (Sardinia). In 2007 research restarted with same protocol and under supervision of same investigators. We compared summer data of the three years in the 1990's (87 ferry runs-590 hours of observations) with the study conducted from May to September 2007 (31 runs-160h). Each transect was considered as an independent statistical unit and we primarily analysed frequency of occurrence (number of sightings per unit of time of observation in good weather condition - f.o.), mean group size (g.s.) and distribution. Even if data on radial distance and angle from the detected group and the trackline have been taken, in order to apply the line transect sampling methods, these have not been used in this preliminary study.

FREQUENCY AND GROUP SIZE DURING SUMMER 2007 OF *Stenella coeruleoalba* AND *Balaenoptera* sp.









RESULTS

Frequency of occurrence

Of the 7 species of cetaceans sighted in 1990's only 6 were recorded in 2007.
In 2007 f.o. of Balaenoptera sp. was 0,18h-1±0,06 with g.s. of 1,3±0,11 while, for Stenella coeruleoalba, f.o. was 0,51h-1±0,08 with 5,4±0,57 g.s. There was a significant difference of monthly f.o. of Balaenoptera sp. (P<0.05), with higher values at beginning of summer, strengthening the migratory behaviour trend recorded for the first time in the 1990's. Monthly f.o. of S. coeruleoalba, instead, was similar during the summer period in 2007 (P=0.36) as it was in the 1990' study. Compared with 1990's there was an increase of f.o. of Balaenoptera sp. (78%) and of S. coeruleoalba (29%), for the latter g.s. decreased (18%).
Tursiops truncatus f.o. in 2007 was 0,051h-1±0,01 and g.s. was 2,55±0,6. Compared with the 1990's there was a 30% increase of f.o. and a 39% decrease in g.s.

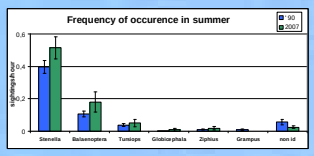
Distribution

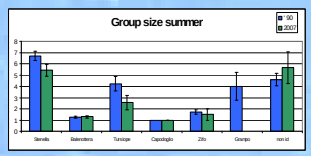
In both the investigated periods, distribution pattern of Balaenoptera sp. was aggregated with a large number of sightings occurring between 50 and 90 NM from the Lazio coastline and within the bathymetry of 1000 and 1500 m.
S. coeruleoalba had a casual distribution pattern with sightings occurring between 40 and 110 NM from the Lazio coastline within the deep sea bottom.
Most of the sightings of Tursiops truncatus occurred towards the Sardinian coastline, within the continental shelf. However, some sightings occurred also within the deep sea bottom .

Ferry-whale collision

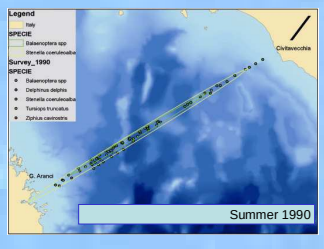
No Ferry-whale collision was recorded in the investigated periods (n=139) which included also ferry runs undertaken in bad weather (n=21).

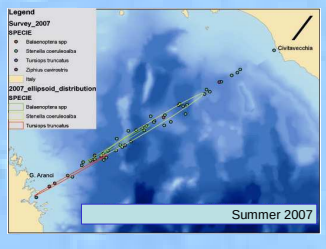
COMPARISON BETWEEN SUMMER '90 AND SUMMER 2007 of frequency of occurrence and mean group size





DISTRIBUTION





SUMMARY OF MAIN RESULTS

	F.O. 2007	Difference 90'	G.S. 2007	Difference 90'	Distribution 2007 >80% sightinghs	Distribution 1990 >80% sightinghs
Balaenoptera sp	0,18h^{-1}±0,06	> 78%	1,3±0,11	> 5%	50-90 MN from the Lazio coastline. Bathymetry 1000-1500	50-90 MN from the Lazio coastline. Bathymetry 1000-1500
S. coeruleoalba	0,51h^{-1}±0,08	>29%	5,4±0,57	<18%	40 -100 MN from the Lazio coastline. Bathymetry > 400	40 -110 MN from the Lazio coastline. Bathymetry > 400
T. truncatus	0,051h-1±0,01	>30%	2,55±0,6	<39%	10-20 MN from the Sardinian coastline. Bathymetry 0-200	0-20 MN from the Sardinian coastline. Bathymetry 0-200

CONCLUSION

Preliminary results of comparisons over 15 years showed some differences in frequency and distribution and confirmed the migratory behaviour of *Balaenoptera* sp.
Re-surveying confirmed how effective and cost efficient is such a programme for monitoring cetaceans distribution and, consequently, environment quality. More research, however, is required to increase knowledge on cetaceans presence, distribution and migration pattern to control the effectiveness of conservation actions already undertaken, such as the Pelagos Sanctuary, and to support the require of further new conservation effort such as the proposed new Sanctuary in the Southern-Mediterranean.
From spring 2008 different research organizations, such as Genova University, Pisa University and Ketos NGO, agreed to undertake a similar monitoring programme in other areas of the Tyrrhenian sea, allowing the development of a wider survey, from the Ligurian basin to the Sicily channel, using this established research protocol.

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