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*Original Citation:*

*Availability:*

This version is available <http://hdl.handle.net/2318/19096> since

*Publisher:*

-

*Published version:*

DOI:SC/58/BC1-27

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# Human-Induced Mortality in Cetaceans Found Stranded on the Italian Coastline (1995-2005)

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KEYWORDS: *Strandings, ship strikes, incidental catches, Europe.*

## ABSTRACT

A survey aimed at evaluating the impact of human-induced mortality (HIM) was carried out on 111 cetaceans (109 odontocetes and 2 mysticetes) found stranded between 1995 and 2005 on the Italian seaboard. Natural death causes and HIM factors accounted for 53% and 17% of all the lethality cases, respectively, while the cause of death could not be established in 30% of the cetaceans under investigation. Collision with ships or boats, together with entanglement in fishing gears, represented the two most frequently encountered HIM factors. This study should be regarded as a preliminary evaluation of the impact of anthropogenic factors on the health status of cetaceans stranded on the coast of Italy and, more in general, of cetacean populations living in the Mediterranean Sea.

The Mediterranean Sea may be regarded as a basin rich in biodiversity and endemic cetacean species. At the same time, this peculiar geographic and environmental context is particularly vulnerable to the heavy pressure exerted by a relevant number of human activities taking place throughout its territorial extension.

Among Mediterranean Countries, Italy has a remarkable coastal development, with its shores length being over 8,000 Km.

Nevertheless, with the only exception of toxic environmental contaminants, there are very few published data concerning the impact of human-induced mortality (HIM) factors on the health status of cetaceans found stranded along the coast of Italy.

Apart from the effects of a wide range of chemical pollutants, which will not be considered in the present report, HIM may result from several different factors, such as direct killing, entanglement in fishing gears, collision with ships and boats, foreign body (for example plastic bags) or floating debris ingestion, habitat loss, as well as overfishing and competition for food. An additional HIM factor of increasing concern is represented by mid-frequency waves released by military sonars, which have been causally linked to the development of “*gas and fat embolic syndrome*”, a new disease condition recently described in 14 beaked whales (family *Ziphiidae*) found stranded in September 2002 in the Canary Islands (Fernandez *et al.*, 2005).

The present survey was carried out on a total number of 111 cetaceans, stranded between 1995 and 2005 on the Italian coastline, in order to provide a preliminary assessment of the impact of both HIM factors and natural death causes on their health status (Table 1).

More in detail, the above cetaceans (109 odontocetes and 2 mysticetes) were found stranded on the coast of 11 Italian Regions (from north to south: Friuli-Venezia Giulia, Veneto, Emilia-Romagna, Marche, Abruzzo, and Molise, as far as the Adriatic Sea is concerned; Liguria, Tuscany, and Latium, as far as the Tyrrhenian Sea is concerned; Sardinia and Sicily) and included the following species:

- 1) Striped dolphin (*Stenella coeruleoalba*): 49 animals;
- 2) Bottlenose dolphin (*Tursiops truncatus*): 41 animals;
- 3) Risso’s dolphin (*Grampus griseus*): 9 animals;
- 4) Long-finned pilot whale (*Globicephala melas*): 2 animals;
- 5) Rough-toothed dolphin (*Steno bredanensis*): 2 animals;
- 6) Common dolphin (*Delphinus delphis*): 1 animal;
- 7) Cuvier’s beaked whale (*Ziphius cavirostris*): 1 animal;
- 8) Dwarf sperm whale (*Kogia sima*): 1 animal;
- 9) Common whale (*Balaenoptera physalus*): 2 animals;
- 10) Unidentified delphinids: 3 animals.

Mortality records of all the cetaceans investigated here are specified in Table 1.

**Table 1:** Number of stranded cetaceans (n=111) included in the survey, grouped in relation to their general (HIM factors, natural causes, unknown causes) and specific causes of death.

General cause of death	Specific cause of death								Total (%)
	Collision with ships or boats		Entanglement in fishing gears		Direct killing			Foreign body ingestion	
<b>HIM factors</b>									<b>19</b> (17%)
	9		7		2			1	
<b>Natural causes</b>	<i>Pneumonia</i>	<i>Encephalitis</i>	<i>Septicemia</i>	<i>Enteritis</i>	<i>Hepatitis</i>	<i>Heart failure</i>	<i>Kidney failure</i>	<i>Pancreatitis</i>	<b>59</b> (53%)
	27	14	5	3	3	3	2	2	
<b>Unknown causes</b>	33								<b>33</b> (30%)

HIM factors = human-induced mortality factors

The probable cause of death was established in 78 out of the 111 animals under study (70%), with natural causes accounting for 53% and HIM factors for 17% of all the lethality cases, respectively.

Among natural causes, pneumonia (27 cases) and encephalitis (14 cases, one of which with fungal etiology) were by far the two most commonly detected pathological conditions. In this context, it is also worth mentioning that evidence of morbilliviral infection could not be immunocytochemically obtained in any case, although specific laboratory investigations were carried out just on a limited sample of the examined cetaceans.

Among HIM factors, it should be first of all emphasized that also certain environmental pollutants (not dealt with in this report), such as organochlorines (PCBs, 4-4'DDE, etc.) and heavy metals (Hg, Pb, Cd, etc.), may have partially contributed to the mortality of the cetaceans included in the present survey. In this respect, a remarkable contributing effect - though indirect - could be the one exerted on the animal's immune system, the impairment of which may have formed the plausible basis for an increased susceptibility toward the subsequent development of pneumonia and encephalitis, as well as of other disease conditions reported herein (Table 1).

Anyway, collision with ships or boats, together with entanglement in fishing gears, represent the two most frequently encountered HIM factors in the 111 cetaceans, with their number (16 cases in total) accounting for the 80% of such death causes (Table 1).

The cause of death could not be established in 33 out of the 111 cetaceans under investigation (30%). This may be due to different factors, including diagnostic difficulties related to the intrinsic complexity of some cases, lack of detailed histopathological examinations, which were not performed on all animals, and - last, but not least - *post-mortem* autolysis, an undesirable condition often observed in stranded cetaceans.

In conclusion, despite a number of more or less relevant limitations, the present study should be regarded as a preliminary survey aimed at evaluating the impact of anthropogenic factors on the health status of cetaceans found stranded on the coast of Italy over a 10 years period (1995-2005) and, in general, of cetacean populations living in the Mediterranean Sea.

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#### **ACKNOWLEDGEMENTS**

The outstanding technical assistance provided by the "Italian National Stranding Network" ("*Centro Studi Cetacei*") is gratefully acknowledged.