DO NOT CITE WITHOUT PERMISSION FROM THE AUTHORS

An evaluation of common dolphin (*Delphinus delphis*) distribution, occurrence and conservation status in Madeira (Portugal), 2001 to 2008

FREITAS, L., DINIS, A., NICOLAU, C., RIBEIRO, C., CARVALHO, A. AND ALVES, F.

Museu da Baleia da Madeira, 9200-031, Caniçal, Madeira, Portugal
luisfreitas@museudabaleia.org

ABSTRACT

Assessment of population parameters is of primary importance to define a species conservation status and to apply management strategies. The waters around the Macaronesian archipelagos (NE Atlantic) bear common dolphin (*Delphinus delphis*) as one of the most abundant species, but apart from genetic studies that suggest a single population for this region, the available scientific information for this species in each archipelago is scarce. In order to evaluate the species distribution, occurrence and conservation status in Madeira archipelago we conducted a multiple assessment based on nautical (15,658km) and aerial (17,606km) monthly surveys and opportunistic sightings between 2001 and 2008 within predefined areas up to 40km off Madeira, Desertas and Porto Santo islands. Additionally, stranding reports taken from 1986 to February 2009 were analyzed in order to assess seasonality and anthropogenic threats. With a total of 526 records from surveys and opportunistic sightings, common dolphin was found to be among the most abundant species. Both nautical and aerial surveys showed that common dolphin annual average ranged between 12 and 35% of all *taxa*. Although common dolphin could be found year-round according to strandings and opportunistic records, the surveys indicated a clear seasonal pattern, defined as highly abundant in winter and spring and rare in summer and autumn. The number of sightings per 100km varied between 0 and 4.34 from January to May and was almost absent in the remaining months. When compared to the remaining observed species, common dolphin was mainly found inhabiting more inshore waters, up to 10 to 15km of the coast, which could explain the lower frequency observed in the more offshore predefined area (west of Madeira and between Madeira and Porto Santo). It was found mainly in groups of average of 16 to 38 individuals (min. 1, max. 200). No relevant change was observed in the frequency along the study period. The results of 27 *post-mortem* exams from 36 strandings of common dolphin (33% of all strandings) between 1994 and 2007 revealed that 30% of dead was related to anthropogenic origin (mainly incidental catches), 44% of natural causes and 26% undetermined. Due to this species high occurrence and since no direct threat was found to cause impact to population level, the define IUCN regional conservation status for common dolphin in Madeira, as Least Concern, is still valid. The common dolphin high occurrence, as well as birthing and feeding, in Madeira archipelago, makes these waters an important area for this species distribution within the Macaronesian region.

KEYWORDS: COMMON DOLPHIN, ATLANTIC OCEAN, INDEX OF ABUNDANCE, CONSERVATION, DISTRIBUTION

INTRODUCTION

The conservation of cetaceans has long been considered a priority issue at the international level as demonstrated by the constitution of international Conventions and Directives. The common dolphin (Delphinus delphis) is no exception and is listed on Appendix II of CITES, Appendix II of the Bern Convention, Annex IV of the EC Habitats Directive, Appendix 2 of the Bonn Convention, is covered by the terms of the ASCOBANS and is under the United Nations Convention on the Law of the Sea. Its global status is defined as 'Least Concern' according to the 2008 IUCN Red List of Threatened Animals. The conservation status of this species in Madeira archipelago is evaluated as "Least Concern" (Cabral et al 2005). Studies to assess the conservation status of common dolphin in an oceanic and pelagic environment like the case of this isolated Atlantic archipelago are scare.

The Madeira archipelago (Portugal, SE North Atlantic), which includes the main island of Madeira (57km long and 160km of coastline) and three groups of smaller islands, Desertas (at about 20km), Porto Santo (at about 40km) and Selvagens (at about 300km), lies on a warm temperate latitude about 670km directly west of Morocco and is characterized by the proximity to open-ocean habitats due to the absence of continental shelf. Despite the fact that the common dolphin is one of the most widely distributed and studied cetacean species in the world, occurring in both pelagic and coastal warm, tropical, sub-tropical and temperate waters (Brereton et al., 2005), in Madeira its knowledge is resumed to anecdotal records until the 90's. In order to fulfil the gap on cetological knowledge in these waters, the Madeira Whale Museum (MWM) established in the early 90's an opportunistic sighting and stranding networks, and in 2001 a scientific team started collecting data with dedicated effort. Even for the Macaronesia region, which also bears the neighbouring archipelagos of the Azores, Canaries and Cape Verde with biogeographic affinities (Beyhl et al., 1995; Stock, 1995), the scientific literature containing information on common dolphin and its conservation status is scarce. An exception is made to Azores

where the distribution and occurrence, as well as, tuna fisheries impact on this species were assessed (Silva et al., 2002, 2003). The record of opportunistic sightings and the necropsy of stranded animals in Madeira also suggest, as for the Azores, the common dolphin as one of the most common species, as well as, identified some level of interaction with the tuna fisheries. Additionally, a genetic study based on biopsies from Madeira and Azores suggests a single population of common dolphin for this region (unpublished data).

Therefore, since the distribution and occurrence of common dolphin is unknown for Madeiran waters, and the assessment of population parameters is of primary importance to define a species conservation status, in the present study we evaluated this species distribution and occurrence in Madeira archipelago combining several methodologies, such as, nautical and aerial surveys and opportunistic sightings between 2001 and 2008. Additionally, stranding reports taken from 1986 to February 2009 were analyzed in order to assess seasonality and anthropogenic threats. This was undertaken as part of a long-term programme created by the MWM and supported by the Madeira Regional Government, co-financed in specific projects (Project Life99 NAT/P/006432, MAC/4.2/M10 and 05/MAC/4.2/M10), in order to study and monitor the cetaceans of Madeiran waters and to apply adequate management strategies.

MATHERIAL AND METHODS

Field procedures

Nautical systematic surveys

Nautical systematic visual surveys were carried out monthly (with few exceptions due to weather and logistical constraints) around Madeira, Desertas and Porto Santo islands. These were performed from January 2001 to October 2002 using a 12m vessel with an average speed of 5kts and average observers eye height of 3m above the sea surface, and from September 2007 to October 2008 using the MWM 19m research yacht *Ziphius* with an average speed of 6.5kts and average observers eye height of 5.5m above the sea surface. Surveys were conducted over eight predefined areas (N1-8) that covered a total area of 4,818km^2, from the coastline up to 20km offshore (Fig. 1). In each area the starting point of the transect-line was randomly chosen, and transects followed "Equal Spaced Zig-Zag" pattern generated by Distance4 software. During transects three observers searched the area from the bow to 90º in each side and up to the horizon, by naked eye and using 7x50 binoculars. The front observer covered the central line up to 20º in each side. A fourth person recorded weather, effort and sighting information (species identity, number of individuals, presence of calves and behavior) on a laptop using Logger2000 software connected to a GPS (information collected every 10sec) and a fifth person was on the helm. All 5 observers changed position every hour. Two of the observers worked in all cruises. While on transects, searching effort was maintained from sunrise to sunset as long as sea states ≤ Beaufort 3. Surveys in 2002 were mainly to complete months and/or areas that were not covered in 2001.

Nautical random surveys with dedicated effort

Nautical random visual surveys with dedicated effort were carried out occasionally year-round from June 2004 to September 2007. These surveys were mainly for photo-id, tagging and to collect biopsies on several species, but also allow collecting valuable information for this study. These surveys were performed mainly using the MWM 6.5m (115hp) research-RIB *Roaz*, and a few using the research yacht *Ziphius*. Both boats departed from Machico for one day survey and were confined to the area between south and east Madeira (to west of Desertas) island, from the coastline up to 15km offshore. Dedicated effort started immediately when leaving Machico harbour and finished on arrival. During effort the transect-line was randomly chosen and (in most of the surveys) three observers (two min., four max.) searched the area by naked eye. Weather, effort and sighting information were recorded on printed data forms. While on transects, searching effort was maintained as long as sea state was ≤ Beaufort 3. Since July 2005 track courses were downloaded to a computer from a GPS carried on board.

Aerial surveys

Aerial systematic visual surveys were carried out monthly (with few exceptions due to weather and logistical constraints) around Madeira, Desertas and Porto Santo islands. These were performed from July 2002 to December 2008 using a helicopter that flew at an average speed of 100kts and 500ft altitude. Surveys were conducted over four predefined areas (A1-4) that covered a total area of 6,312km^2, up to 40km offshore (Fig. 1). The maximum number of flights per month was three, one for area A1, one for A2 and other for A3 and A4. In each area the starting point of the transect-line was randomly chosen, and transects followed "Equal Spaced Zig-Zag" pattern generated by Distance4 software. During transects three observers searched the area from the bow to 90º in each side and up to the horizon, by naked eye. The front observer covered the central line up to 20º in each side. One of the observers also recorded weather, effort and sighting information (species identity and

number of individuals) on a laptop using Logger2000 software connected to a GPS (information collected every 10sec). While on transects, searching effort was maintained as long as sea states was ≤ Beaufort 3.

Sightings from platforms of opportunity

The MWM started recording opportunistic sightings of cetaceans in Madeiran waters in 1995 on an occasional basis, either by its team when onboard platforms of opportunity or by other scientific teams, as well as by experienced skippers, mainly from whalewatching boats. Only from 2003 onward these sightings were systematically received, especially due to a voluntary protocol established with the whalewatching operators. Therefore, in this study we used data from 2003 to 2008. Specific printed data forms were given to the more experienced skippers, which collected sighting information (see systematic surveys). After a sorting process, each individual sighting was included on a database. The whalewatching industry in Madeira, which constitute the majority of the opportunistic sightings of the MWM, have been growing since 2003 and, in general, each of the seven platforms that were considered to provide viable data perform trips that actively search for cetaceans. These trips are made twice a day year-round (with a higher effort in the summer) and their main area of search is in the south Madeira island, from the coastline up to 15km offshore.

Strandings and post-mortem exams

The MWM started collecting data from cetaceans found stranded along the coast of Madeira archipelago occasionally in 1991 and systematically in 1995. Additionally, data related to strandings from years 1986 and 1987 collected from the Funchal Natural History Museum were also included in the MWM stranding database. In the present study we used stranding reports taken from 1986 to February 2009. When a stranded was reported the MWM conducted a *post-mortem* exam whenever possible in order to determine cause of death. Since 1995 that a stranding network covering all islands of the archipelago was established and since 2000 that a veterinary participated in the necropsies.

Data analysis

In order to determine temporal distribution of common dolphin in Madeiran waters we used data with dedicated effort collected year-round, *i.e.*, both systematic and random nautical surveys and also aerial surveys. Since nautical systematic surveys included two periods (2001-2002 and 2007-2008) that were spaced five year apart and have different observers and different platforms (with different average speed and observers eye height) the data from each period was treated independently. Data from strandings and opportunistic platforms were also used for presence within the seasonal analysis. In order to determine spatial distribution we used data with dedicated effort collected within predefined areas, *i.e.*, nautical and aerial systematic surveys. Since the predefined areas of the nautical and aerial surveys covered different distances from shore, the data from each platform was treated independently. Mean sighting rate was number of sightings per 100km surveyed. Since effort was not equally distributed (over months and areas) and is not enough to allow comparing between years, data from nautical random surveys with dedicated effort, as well as data from aerial surveys, were pooled in order to increase and standardize effort in the spatial and temporal analysis. For group size analysis we used data from nautical surveys, including both systematic and random, aerial surveys, and from platforms of opportunity. However, data was treated independently for each type of survey / platform since estimating group size from nautical or aerial platform can provide different values, and also because data collected from platforms of opportunity were not probably collected with the same accuracy than data collected on the dedicated surveys. For this analysis we also used sightings recorded both during effort and off effort mode. The stranding reports were analyzed in order to assess seasonality and anthropogenic threats.

RESULTS

A total of 33,264km of transect-line was surveyed, being 4,118 and 3,077km from systematic nautical surveys in 2001-2002 and 2007-2008 periods, respectively, 8,463km from nautical random surveys with dedicated effort and 17,606km from systematic aerial surveys. One hundred and fifty-three sightings of common dolphin were recorded during search, being 44 and 17 from the systematic nautical surveys in 2001-2002 and 2007-2008 periods, respectively, 41 from nautical random surveys with dedicated effort and 51 from systematic aerial surveys, which corresponded to a mean sighting rate of 1.07, 0.55, 0.48 and 0.29, respectively (Table 1). In all types of surveys, as well as in strandings and platforms of opportunity, the common dolphin was within the most sighted species. It was the most sighted species in the 2001-2002 systematic nautical surveys (34.9% in relation to all species), in strandings (33.0%), and in the systematic aerial surveys (24.4%). It was the second most sighted species in the opportunistic platforms (16.5%), the third in the 2007-2008 systematic nautical surveys (15.6%), and the fourth in the nautical random surveys (11.5%).

The temporal distribution analysis showed that common dolphin displays a highly seasonal occurrence in Madeiran waters. In Table 1, where mean sighting rate are shown, it is possible to observe that sightings were only recorded between December and June, but with a higher occurrence between January and May (there was a single sighting in December and three in June). The higher mean sighting rate values were observed during systematic nautical surveys 2001-2002, followed by nautical random surveys with dedicated effort. Contrarily, the aerial surveys presented the lower values. The analysis of the number of stranded individuals (*n*=36) per month showed that these were recorded from January to September, and with higher occurrence in February (31%) and April (25%) (Fig. 2). Additionally, sightings from platforms of opportunity (*n*=373) showed that common dolphin were observed in every month within the 6 years-period, but with more records between December and June (especially between January and May) and less during the remaining months (*n*= 3, 1, 2 and 5 for August, September, October and November, respectively) (Fig. 2).

The spatial distribution analysis showed that common dolphin was observed in all sampled coastal and offshore areas, between approximately 3 and 40km of the coast. (Fig. 1). The analysis showed higher mean sighting rate values in areas N7 (except during 2007-2008 survey), N8 and A4 (Fig. 3), which corresponded to the surrounding waters of Porto Santo island (Fig. 1). Zero sightings were recorded in the areas N2 and N6 during the 2007-2208 systematic nautical surveys, and the lower mean sighting rate are presented in N6 and A1 during the 2001-2002 systematic nautical surveys and during aerial survey, respectively (Fig. 3). The area N2 corresponded to west Madeira and N6 to the area between Madeira and Porto Santo. Even sightings recorded during aerial surveys in the area west of Madeira (west section of north Madeira A2 and south Madeira A1) are lower than in the remaining offshore areas (Fig. 1).

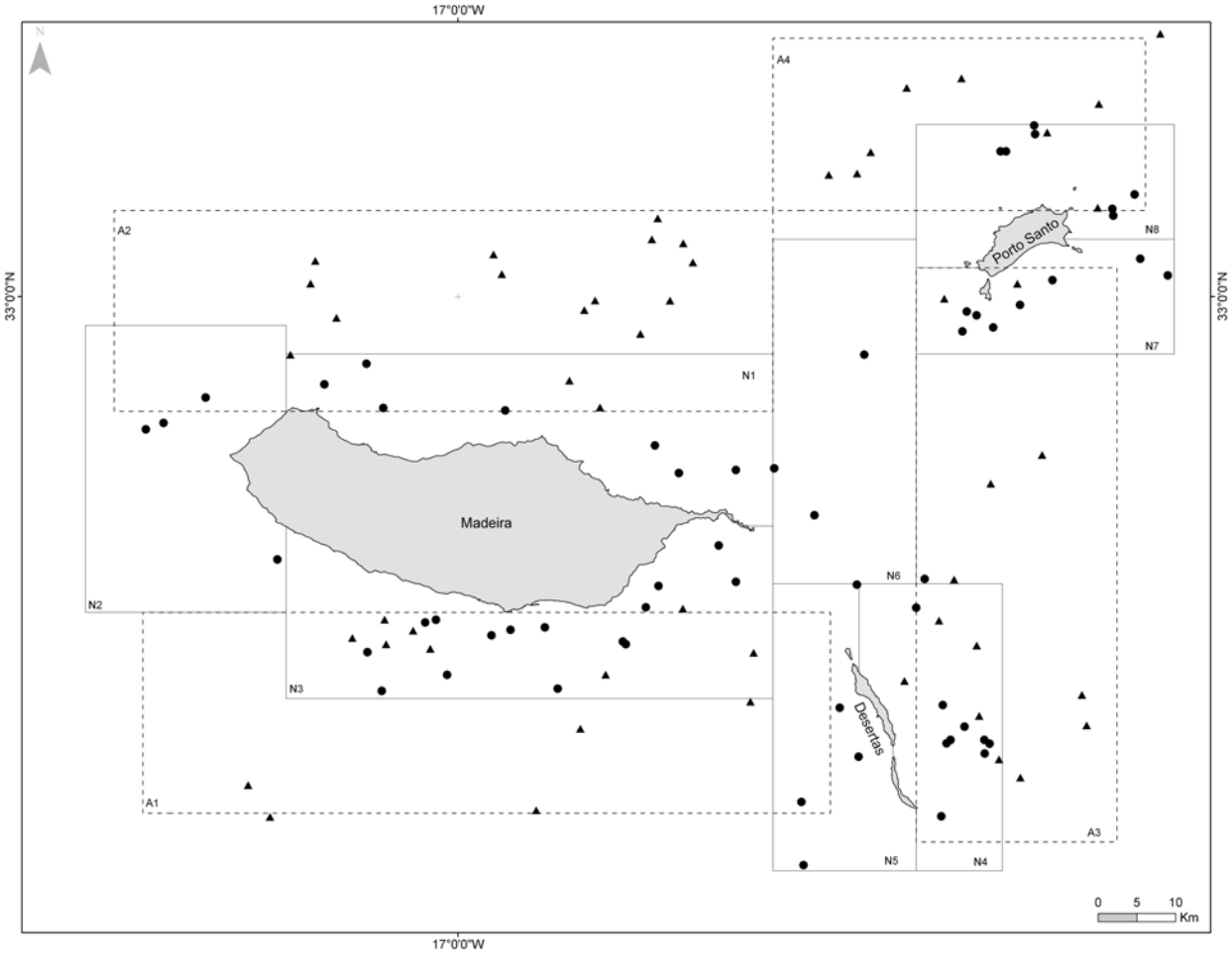

Figure 1. Localization of the study area for the nautical (N1-8) and aerial (A1-4) systematic surveys, and localization of sightings of common dolphin observed during nautical (●) and aerial (▲) systematic surveys. The km^2 of each area is presented in figure 3.

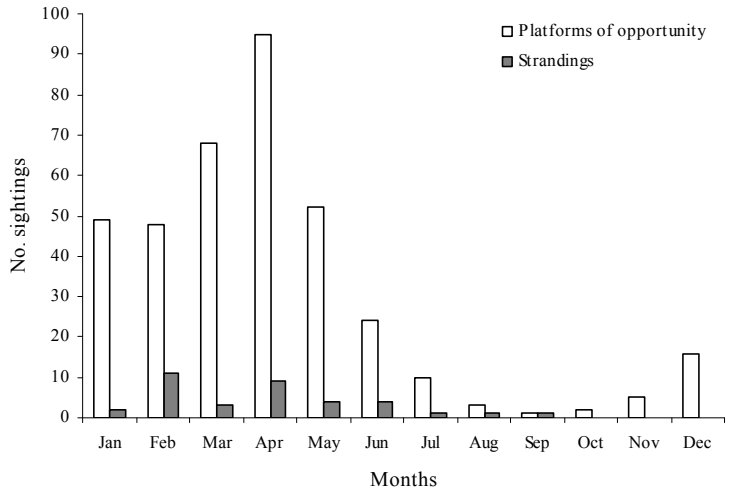

Figure 2. Total number of sightings recorded from platforms of opportunity (2003-2008) and of stranded individuals (1986-February 2009) of common dolphin per month.

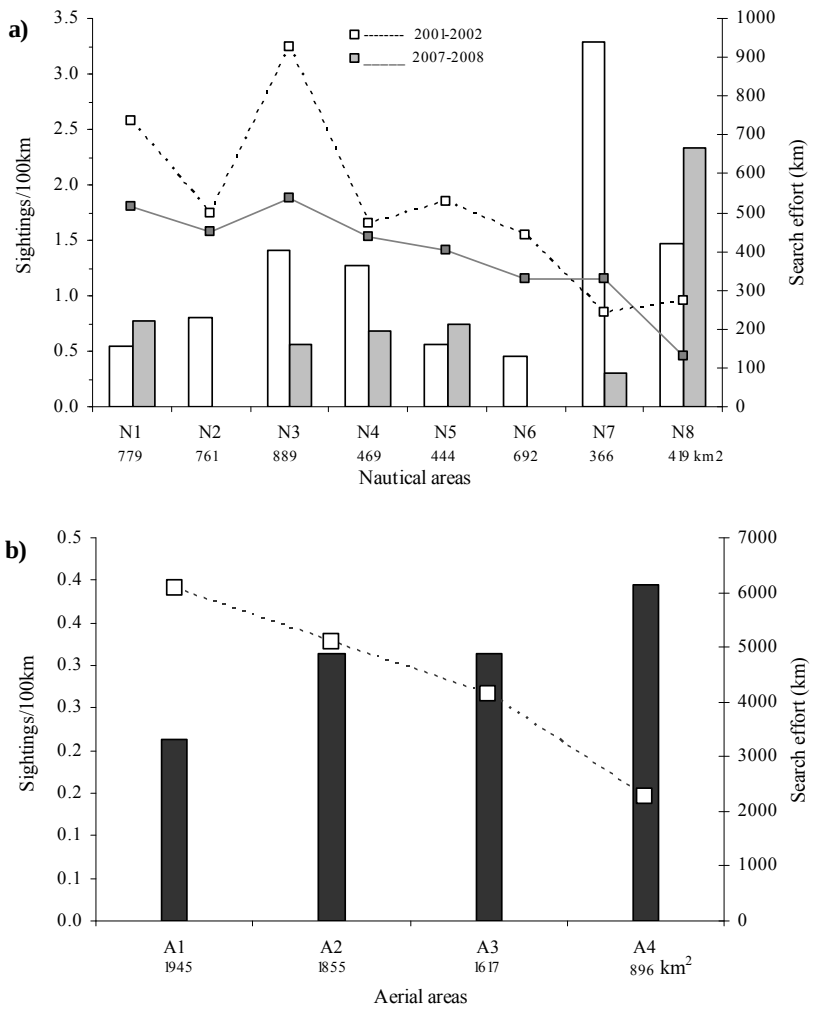

Figure 3a). Mean sighting rate (bars) and search effort (lines) for nautical and b) aerial areas during nautical (2001-2002 and 2007-2008) and aerial (2002-2008) systematic surveys, respectively. The area of each coastal and offshore area is also presented, in km^2.

Table 1. *Mean sighting rate, number of sightings and search effort per month for different types of survey / platform and years.*

	Type of survey							
	Nautical systematic 2001-2002		Nautical systematic 2007-2008		Nautical random 2004-2007		Aerial systematic 2002-2008	
Months	Sighting rate	No. sight. Search (km)	Sighting rate	No. sight. Search (km)	Sighting rate	No. sight. Search (km)	Sighting rate	No. sight. Search (km)
Jan	0.00	0 217.4	0.87	3 346.6	2.18	5 228.9	0.42	7 1,673.0
Feb	2.27	5 220.3	1.65	9 546.8	2.24	10 447.1	0.54	8.00 1,471.3
Mar	2.39	9 376.5	0.00	0 24.1	2.07	9 435.2	1.20	16 1,330.9
Apr	4.34	22 506.7	1.55	5 322.3	0.90	4 446.3	0.47	11 2,356.7
May	2.00	8 401.0	0.00	0 250.9	3.14	10 318.7	0.77	8 1,043.5
Jun	0.00	0 81.6	0.00	0 308.4	0.16	3 1,886.3	0.00	0 1,029.0
Jul	0.00	0 340.6	0.00	0 79.4	0.00	0 1,017.6	0.00	0 1,751.9
Aug	0.00	0 762.1		0.0	0.00	0 417.4	0.00	0 1,775.2
Sep	0.00	0 706.7	0.00	0 418.1	0.00	0 1,910.7	0.00	0 1,308.2
Oct	0.00	0 282.7	0.00	0 515.6	0.00	0 591.3	0.00	0 1,139.6
Nov		0.0	0.00	0 173.4	0.00	0 587.1	0.00	0 1,778.3
Dec	0.00	0 222.2	0.00	0 91.6	0.00	0 176.4	0.11	1 948.1
Total	1.07	44 4,117.8	0.55	17 3,077.3	0.48	41 8,463.1	0.29	51.00 17,605.7

The group size of common dolphin presented a wider range in the number of individuals, from 1 to 200. Mean (SD) was different according to survey type / platform, being 16.49 (24.15) for nautical surveys, 37.81 (32.13) for aerial surveys and 28.03 (27.79) for platforms of opportunity (Table 2).

Table 2. *Group size (mean, standard deviation (SD), range and n) of common dolphin in Madeira archipelago, 2001-2008, according three different types of survey / platform.*

	Nautical survey	Aerial survey	Platforms of opportunity
Mean	16.49	37.81	28.03
SD	24.15	32.13	27.79
Range	1-200	1-150	1-200
n	125	64	358

A total of 36 strandings of common dolphin were recorded between May 1994 and May 2007. The year with a highest number of strandings was 1996 (*n*=12), followed by 1995, 1998 and 2001 (*n*=4), then by 1997, 2003, 2004 and 2006 (*n*=2), and one in the each of the remaining years, with the exception of 1999 and 2002 that no strandings were recorded. Strandings were recorded from January to September (Fig. 2), and in all coastal areas

of Madeira (67%; 31% in south, 22% in North, 11% in east and 3% in west), Desertas (11%) and Porto Santo (22%) islands, with a higher occurrence in south Madeira. From the 36 stranded common dolphins it was only possible to perform 27 *post-mortem* exams; the remaining ones were taken by the sea, were in an advance state of decay or were not yet analyzed. These exams revealed that 30% of deaths were related to anthropogenic origin, 44% were related to natural causes and 26% were undetermined. Causes of death from anthropogenic origin included confirmed human killing (11%), from bycatch (*n*=2) and direct killing (*n*=1), and suspicion of human killing (19 %, *n*=5), from bycatch.

DISCUSSION

The common dolphins were observed in surveys in Madeira waters only in winter and spring months, with the mean sighting rate of 1.07, 0.55, 0.48 and 0.29 for the systematic nautical surveys of 2001-2002 and 2007-2008 periods, for the nautical random surveys and aerial surveys, respectively. The sighting rates were calculated based on the total number of sightings divided by the total search effort (total nº of km of transect-line done year-round), rather than just the search effort from the period where sightings were made. This is an important factor to have in consideration when comparing with other regions. For example Silva *et al.* (2003), using the same methodology as the systematic nautical surveys in Madeira, found a mean sighting rate (also number of sightings per 100km) of 0.61 for common dolphin in the neighboring archipelago of the Azores in years 1999-2000. However, in that study the surveys were carried-out from July to December in 1999 and from May to September in 2000. Thus, looking at Table 1 it is possible to observe that the number of sightings per 100km for the period surveyed in Silva *et al.* (2003), is much lower for Madeira than the 0.61 obtained for that archipelago. This indicates that Madeira presents a much lower occurrence of common dolphins than Azores during summer and autumn. During winter and spring Madeira presents a higher occurrence of this species, but for these seasons there is no data for the Azores. As for Azores (Silva *et al.*, 2003), the present study confirms common dolphin as one of the most common cetacean species in Madeira.

The higher mean sighting rate values obtained for 2001-2002 systematic nautical surveys in comparison with the 2007-2008 systematic nautical surveys may result from differences in the application of the same methodology (different observers and platforms, with different average speeds and observers eye height) and/or may reflect annual fluctuations in the common dolphins occurrence in these waters. The absence of sightings during March in the 2007-2008 nautical systematic survey, in the peak of the common dolphin expected occurrence, is probably related with the extreme low survey effort (24.1km) for that month. On the other hand the relative high values found for nautical random surveys, when compared for example with the 2007-2008 systematic nautical surveys, are certainly biased as a result of information on cetaceans presence given by whalewatching operators to the survey boat when operating in the same area. Aerial surveys presented much lower mean sighting rate values than nautical surveys, reflecting possibly the fact that common dolphin are present closer to shore (as discussed ahead) and the aerial surveys cover mainly the offshore waters (see figure 1). On the other hand, being an aerial survey were the search platform travels much higher speeds, it is possible that more sightings were missed contributing to an underestimating the sighting rates. This is in accordance with Heide-Jørgensen *et al.* (2008) that stated that the estimate from aerial survey is negatively biased because some animals will have been underwater and hence undetectable during passage of the craft. No corrections were made for individuals missed by the observers.

The spatial distribution analysis showed that common dolphin was observed in all sampled nautical and aerial areas, which generally corresponded to coastal and offshore areas (despite part of these areas overlap), respectively. Although common dolphins were sighted from approximately 3 to 40km off-shore, they were sighted more within the first 10 to 15km off the coast. The suggested common dolphin preference for more coastal waters explains the lowest sighting rate values in the offshore area between Madeira and Porto Santo (N6). Additionally, the waters around west Madeira (N2, west section of north Madeira A2 and west section of south Madeira A1; Fig. 1) is overall an area of low occurrence of common dolphin, inshore and offshore. There is presently no explanation for such odd distribution. On the contrary, the highest mean sighting rates were recorded for areas N7 (except during 2007-2008 survey), N8 and A4 (Fig. 3). These areas correspond to the surrounding waters of Porto Santo island (Fig. 1), suggesting these waters are an important area for this species.

When we look at the common dolphin mean group size, the results varied according to survey type / platform, with estimates from nautical surveys being almost half of the estimates from aerial surveys and from platforms of opportunity. The differences in mean group size between nautical surveys (except from platforms of opportunity) and aerial surveys, may result from a better view of the group (including underwater animals) from air in comparison with the view from the boat, but may reflect also changes in group size in relation to distance from coast. It seems that common dolphins, close to shore form more groups of smaller size in relation to the fewer and larger groups off shore. This means higher sighting rates of smaller size groups inshore (as observed in nautical surveys) in comparison with lower sighting rates of larger size groups in offshore waters (as observed

in aerial surveys). The the results from the platforms of opportunity seem to be overestimate the mean group size when compared with the results obtained in the nautical surveys, specially because both methodologies cover inshore waters.

The south part of the Madeira Island registered the highest number of stranded animals. These values could be due to the fact that in the south cost of the Madeira Island there are more people using the coast and sailing at sea (*e.g.*, whalewatching boats, fishing boats). Thus this may underestimate the number of stranded individuals in the less surveyed coasts such as north or west Madeira. The *post-mortem* exams revealed that 30% of deaths were related to anthropogenic origin, however this corresponded to eight individuals in an almost 20 year period, indicating a low threat level. However, further studies should directly assess the interactions between tuna fisheries and cetaceans.
The present study showed the common dolphin as one of the most sighted species in Madeira, with a high mean sighting rate and presently with few threats, which makes the IUCN regional status (Least Concern) defined in 2005 (Cabral *et al.*, 2005) still valid. The common dolphin relatively high seasonal occurrence in Madeira waters, together with the use of these for birthing and feeding, makes it an important area for this species within the Macaronesian region.

Acknowledgements

The crew members of the Madeira Whale Museum boats for their enthusiasm and commitment in the logistical support, namely Hugo Vieira, João Viveiros and Miguel Silva. To the skippers of whale-watching boats as well as to the tour operators for providing information. The Museu Municipal do Funchal for providing very useful information, logistical support and access to their records and collections. The veterinary Isabel Quaresma of Direcção Regional de Pescas. Finally, the acknowledgment to Machico Town Hall for their financial support, as well as, the EU programs LIFE and FEDER/INTERREG III-B for funding the "Projecto para a Conservação dos Cetáceos no Arquipélago da Madeira" (LIFE99 NAT/P/006432), the "Projecto MACETUS" (MAC/4.2/M10), respectively and the project "EMECETUS" (05/MAC/4.2/M10)

REFERENCES

Beyhl, F.E., Mies, B. and Ohm, P. 1995. Macaronesia - a biogeographical puzzle. *Bol. Mus. Mun. Funchal*, Supplement 4:107-13.

Borcard, D., Legendre, P. and Drapeau, P. 1992. Partialling out the spatial component of ecological variation. *Ecol.* 73:1045-55.

Brereton, T., Williams, A. and Martin, C. 2005. Ecology and status of the common dolphin *Delphinus delphis* in the English Channel and Bay of Biscay 1995-2002. pp. 17-25. *In*: Stockin, K., Vella, A. and Evans, P.G.H. (eds.) *Common dolphins: current research, threats and issues*. Proceedings of the workshop held at the 18th annual conference of the European Cetacean Society, newsletter no. 45 – special issue. 44pp.

Cabral, M.J. (coord.), Almeida, J., Almeida, P.R., Dellinger, T. Ferrand de Almeida, N., Oliveira, M.E., Palmeirim, J.M., Queiroz, A.I., Rogado, L., and Santos-Reis, M (eds.). 2005. *Livro Vermelho dos Vertebrados de Portugal*. Instituto da Conservação da Natureza, Lisboa. 660pp.

Heide-Jørgensen, M.P., Borchers, D.L., Witting,L., Simon, M.J., Laidre, K.L., Rosing-Asvid, A., and Pike, D.G. 2008. Estimates of large whale abundance in West Greenland waters from an aerial survey in 2005. *Journal of Cetacean Research and Management* 10:119-129.

IUCN 2008. 2008 IUCN Red List of Threatened Species. <www.iucnredlist.org>. Downloaded on 19 May 2009.

Silva, M.A., Prieto, R., Magalhães, S., Cabecinhas, R., Cruz, A., Gonçalves, J.M. and Santos, R.S. 2003. Occurrence and distribution of cetaceans in the waters around the Azores (Portugal), Summer and Autumn 1999-2000. *Aquat. Mamm.* 29(1):88-98.

Silva, M.A., Feio, R., Prieto, R., Gonçalves, J.M. and Santos, R.S. 2002. Interactions between cetaceans and the tuna-fishery in the Azores. *Mar. Mamm. Sci.* 18(4):893-901.

Stock, J.H. 1995. Biogeography and evolutionary scenario of aquatic organisms in Macaronesia. *Bol. Mus. Mun. Funchal* 4:729-45.