

COMMON DOLPHINS (*DELPHINUS DELPHIS*) STATUS IN THE CENTRAL AND SOUTHERN MEDITERRANEAN AROUND THE MALTESE ISLANDS

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INTRODUCTION

Since 1997, a conservation biology research project focusing on cetaceans in the Central and Southern Mediterranean Sea around the Maltese Islands has managed to increase accurate information of the various species inhabiting these waters (Vella, 1998; 2000a; 2000b). Among the species studied, this paper focuses upon the common dolphin, *Delphinus delphis* in the Mediterranean. This species/subpopulation rated as endangered in the Mediterranean (EN A2abc - IUCN 2003 - <http://www.redlist.org>) necessitates particular conservation assessment, monitoring and management planning in this region (IUCN, 2003; Reeves *et al.*, 2003). This ongoing long-term research therefore also aims at contributing valuable information (Vella, 2000b) required in relation to the *Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area* (ACCOBAMS). Although Mediterranean cetaceans are legally protected by Maltese law, through specific legal notices, this field conservation research is, to date, the only scientific effort around the Maltese Islands that may furnish the required details for local conservation measures to be implemented. Common dolphin distribution, abundance, habitat preference, behaviour, and associations with fisheries that are exploited in the same area are among the parameters studied. Marine habitat degradation and resource over-exploitation are considerations that need to be addressed since both may affect cetacean survival in the region. Part of the study area, closer to the Maltese Islands is shown in Fig.1, and includes most of the fishing area utilised by Maltese fishermen.

Over-exploitation of cetacean food resources, and disturbance or by-catch during fishing are important factors affecting cetacean survival (Hall *et al.*, 2000), and thus the common dolphin in this region also needs to be investigated further to understand in greater detail the impacts of increasing regional fishing activities on the species' survival. Outside the 25 mile zone or "conservation zone" around the Maltese Islands, Maltese fishermen share the area with numerous other fishermen from other Mediterranean and Non-Mediterranean countries, particularly during the blue fin tuna (*Thunnus thynnus*) fishing and blue fin tuna penning season as well as during the dolphin fish (*Coryphaena hippurus*)/pilot fish (*Naucrates duclor*) fishing season (Vella, 2001). These activities are of particular importance to species such as the common dolphin that may be increasingly affected by the burgeoning fishing effort in this Mediterranean region. Local fisheries' statistics show declines in catch amounts for most exploited fish species in recent years. Knowledge of the impacts of these trends on common dolphins is necessary for both sustainable resource utilisation and effective preservation of legally protected species such as common dolphins. A first attempt to draw a picture of the status of this species in the Mediterranean Sea has been undertaken and points towards further research needs (Bearzi *et al.*, 2003). Ongoing long-term research efforts in Mediterranean areas would be required to continue to highlight and guide actions for conservation and monitoring targeting this species in the Mediterranean in the near future.

METHODS

This paper presents work from field research undertaken around the Maltese Islands year round between 1997 and 2003, including both boat (N=302) and plane (N=41) surveys. Results and observations were obtained after a total strip transect of 28,000 km² was covered using boat and

aerial surveys, using methods described in Vella (1998). During these field observations, the following parameters were recorded: overall numbers, group sizes, behaviour (feeding, mating, young rearing, diving-time sequence, etc.), and association with fishing activities and fish stocks in the area. Photo-identification studies are also in progress for common dolphins in the research area. Land-based surveying is another aspect of this research work, and although it is not the best method to study common dolphins, some groups have been observed from land with powerful binoculars. This method proved useful in monitoring the behaviour of the solitary young common dolphin in B'Bugia Port/Bay in October 2001.

Maltese fishermen's activities and problems out at sea have been considered as well (Vella, 1998), and another questionnaire was undertaken in 1999. Research on the associations of this cetacean species with fish species of economic value or exploited by local fishermen is another priority so as to look into the extent of influence on the common dolphins' behaviour and survival.

A record of common dolphin strandings and possible causes of death are noted, with a particular follow-up on what is seen out at sea during field trips, as well as considerations of the problems these species may be facing in their environment. These methods allow for the assessment of seasonal variation in both cetacean abundance and the possible associations between different cetacean species and the different fisheries exploited.

RESULTS

The overall group sizes for *D. delphis* in this region seem to vary according to the time of year, with summer and autumn being the seasons with greatest group sizes (Table 1). The benefit of aerial surveys was indeed felt much more during this time of year when groups were found to extend over a much greater area with sub-groupings also noted. Due to this, even density measures may have benefited from the use of aerial surveys (Table 2).

The very interesting associations of this species with various fisheries, especially in this southern and central part of the Mediterranean, should not be underestimated, particularly considering the economic importance of two of the fisheries (blue fin tuna and dolphin fish). Ongoing work on this aspect may assist in increasing our knowledge on these relationships and their direct impacts on common dolphin survival. Tables 6 and 7 summarise preliminary findings in this field.

Coverage of the relatively large research area forming part of this study is also possible due to the aerial survey work. It would be useful to sustain this effort, concurrent with the ongoing boat surveys. The overall distribution of sightings around the Maltese Islands is shown in Figure 1, which also indicates the preference for deep and offshore waters, except during the summer and autumn months when these dolphins may also be found closer to shore.

As part of the cetacean conservation research project, this paper also provides a list of suggested requirements and recommendations (see discussion) for the conservation of *Delphinus delphis* in this part of the Mediterranean.

Largest group sizes (150-250) were observed in the months of September and October (75% of sightings during this period were of large groups), indicating seasonality and migrations in a south-easterly or easterly direction in the region at this time. Very often the only way of obtaining a reasonable group size estimate in these cases was through aerial surveys, due to the spread of numerous groups of 25 to 50 individuals travelling together.

Table 1: Group size of common dolphins *Delphinus delphis*

From field sessions with common dolphin observations:

Average Group Size: **25 (N=95)** St. Dev.: **30** Group Size Range: **1 to 250**
 Average sighting frequency per hour in research area: **0.015/hr**

Table 2: Density of common dolphins in Central-Southern Mediterranean

Combined distance strip transect estimates of the parameters used to obtain an overall estimate of the number of Common dolphins in the research area around the Maltese Islands.

Parameter	Estimate	%CV	95% Conf. Interval
Group density/km ²	0.006	11.5	0.003 - 0.016
Dolphin density/km ²	0.140	29.5	0.068 - 0.295

Table 3: Associations of common dolphins with fisheries of economic importance in this region

The following interactions are noted to be seasonal in the research area:

Blue fin tuna are in the research area between May and July: 35% of common dolphin sightings during this period were in association with this species.

Dolphin fish are in the research area between August and January: 40% of common dolphins sightings during this period were in association with this species.

Table 4: Cases of solitary common dolphins close to the Maltese coasts.

In 2001, two cases of solitary common dolphins were recorded for the first time in this region, since prior to this, the smallest group size recorded was of two individuals. Both lone individuals were observed close to the Maltese coasts.

First case on 27th June 2001 the individual was an adult. It was observed in the same area for two days.

Second case observed from the 11th to 23rd October 2001: the dolphin was young observed in the polluted B'Bugia Port/Bay area. The individual remained in the area until it was found dead and in an advanced stage of decomposition. No evidence of infections or parasitic infestation was detected in the examinations undertaken by Dr. A. Casha (vet) who was asked to undertake a post-mortem autopsy by the Environment Protection Department in Malta. The autopsy showed that the animal had no food in its stomach and intestines, and that water may have penetrated part of her lungs. Vital organs were found to be in functional order. The animal's teeth were very small, nearly transparent and hollow, aging this young female dolphin at less than one year.

Table 5: Stranding records of common dolphins between 1997 and 2001 in the Maltese Islands

1. October 1997	Young dolphin with tail wound (nearly cut off)
2. June 1999	Adult decomposed - DNA identification
3. June 1999	Adult with wound in head
4. October 2001	Young lone dolphin found dead after observed alive for days in the harbour

Table 6: Major Exploited Fisheries	Summer	Autumn	Winter	Spring	<i>Common dolphins' association</i>
Blue fin tuna long-line fishing activities off shore	*			*	yes
Foreign purse-seine tuna fishing off shore	***			**	yes
Dolphin fish fishing activities off shore	**	***	*		yes
Coastal fishing with trammel nets					no
Trawlers and dredge nets from close to off shore	*	*		*	yes (offshore)
Foreign illegal drift nets for swordfish offshore	**	**			yes
* <i>Low degree of association = 1 to 5% associated sightings/reports</i>					
** <i>Moderate association = 6 to 30% associated sightings/reports</i>					
*** <i>Strong association = 35 to 50% of associated sightings/reports</i>					

Table 7: Maltese seasonal fishing activities (excluding foreign purse-seining)	Summer	Autumn	Winter	Spring
Long-line for blue fin tuna - <i>offshore</i>	***			***
Long-line for swordfish - <i>offshore</i>	***	**	*	**
Deep Longline for deep dwelling fish and squid - <i>offshore</i>	**	*	**	**
Trammel nets for <i>coastal</i> cuttlefish, red mullet, squid, bogue, octopus	***	**	***	***
Net – dolphin fish, pilot fish and mackerel - <i>offshore</i>	*	***	***	
Trolling – dolphin fish, frigate mackerel – <i>coastal and offshore</i>	**	***		
Trawling – squid, shrimps, prawns, red mullet, bogue – <i>close to offshore</i>	**	***	**	***
* <i>Low catch; ** Medium catch; *** Maximum catch</i>				



Figure 1. Map of the sighting distribution of common dolphins (*this map is a subset of the entire research area. The area, between the two blue contours, indicates the region with the greater frequency of common dolphin sightings*).

DISCUSSION

Through this research project, the estimate of abundance of common dolphins in this region of the Mediterranean was found to compare well with the higher densities and abundance estimates in certain southern parts of the Mediterranean (Tables 1 & 2). Indeed, several authors have indicated that this species appears to increase in abundance as one goes southward of the 38°00' N latitude (Politi *et al.*, 1992, 1994; Notarbartolo di Sciara, 1993; Frantzis, 1996; Pulcini & Pace, 1998; Sagarminaga & Cañadas, 1998). However, since few studies have been undertaken year-round in the Mediterranean, it is also important to consider possible differences in abundance and distributions due to seasonal changes. Especially when planning protected areas or management programmes for long-term conservation of common dolphins, it is vital to establish the locations and sizes of home ranges, the extent of seasonality in home range use, and the extent of fidelity to any migration paths taken by the species between areas used. The common dolphins in this region appear to show large home ranges, with a marked increase in group sizes and abundance close to the Maltese Islands during the September and October period. During this period, common dolphins are also observed to travel closer to land than is typical of the species at other times of the year in this region. Thus the Maltese Islands may either be positioned in the middle of the travel path of common dolphins during these months, or due to its position on a continental shelf, they may be situated at an important location for the species during the summer/autumn period of the year. The association between *D. delphis* and local fisheries of economic importance (such as blue fin tuna and dolphin fish) indicate clear seasonal movements in relation to prey availability.

The greater exploitative competition for natural resources in the Central/Southern Region of the Mediterranean may be seriously jeopardising the survival of this species (Table 3) as is suggested by the number of strandings and possible increasing incidence of solitary dolphins in this region (Tables 4 & 5), especially during peaks in fishing effort offshore between May and December. The strandings of common dolphins in June and October, together with the incidence of lone individuals in June and October may be pointing further to serious conflicts and distress between fishing activities and this species during these periods. The fact that fishing activity for blue fin tuna and dolphin fish peaks in these two months may need to be considered in the near future for the survival of the species in this region of the Mediterranean. It is hoped that ACCOBAMS (ACCOBAMS, 2000) may assist and promote long-term monitoring and management programmes in the various regions, where work is already ongoing, so as to reinforce environmentally sustainable fishing practices and promote areas for common dolphin survival in the Mediterranean. Since the Maltese Islands are situated in an area of the Mediterranean where common dolphins are relatively abundant, it is essential that plans to effectively protect the species in this area be given urgent consideration, possibly through the setting-up of a marine conservation area.

Requirements and recommendations for conservation of common dolphins

The following are the Maltese Islands Cetacean Research Project's recommendations for actions to be taken for the conservation of the local short-beaked common dolphin population, especially in this region of the Mediterranean.

Common dolphin (*Delphinus delphis*) research is far from saturated, as our knowledge of this species in the various Mediterranean regions still needs to be tackled in detail if we really wish to be able to plan any comprehensive and long-term conservation strategy (Vella 1998; 2000a; 2001; Bearzi *et al* 2003).

Differences in behaviour, habitat and prey species preferences in different Mediterranean regions need to be understood and appreciated prior to the consideration in any realistic long-term conservation plan.

Comparison of the various research techniques adopted to date to study this species need to be addressed, considering both their weaknesses and advantages. One clear weakness of small boat surveys includes possible inaccuracies with regard to the number and population structure due to the tendency of common dolphins to travel in large groups and spread themselves over a wide area, as has been observed in aerial surveys. Planning management strategies on inaccuracies or incomplete information has its risks. A precautionary approach needs to be adopted in immediate conservation plans while working towards more accurate data collection. Photo-ID work (which is also undertaken locally) also assists in understanding the population in detail but this takes time and effort, especially with offshore groups.

We need to increase our understanding of the association between common dolphins and their prey species. The impacts of these associations arise from human exploitation of the dolphin prey species/fisheries in each region of the Mediterranean and Black Sea. This has different direct and indirect effects on the common dolphins in different areas. Locally, both the bluefin tuna and the dolphin fish fishing seasons play important roles in the lives of common dolphins. The increasing sophistication of fishing gear must also be considered in the light of possible advantages or disadvantages to the natural ecology of cetacean species. The impacts of increased large-scale purse-seining in the Southern-Central Mediterranean region need to be addressed through sustained research and monitoring (Vella, 2001).

Associations of common dolphins with other cetaceans in areas where these associations exist also need consideration, since cetacean monitoring should whenever possible be considered holistically, due to the resources required in time, human effort, equipment, and funds to sustain such vital assessments. Occasional associations, including possible competition, with offshore bottlenose, striped and Risso's dolphins, and sperm whales may need further study.

Environmental factors affecting common dolphin movements and distribution need to be addressed and compared among different Mediterranean regions. Human activities affecting dolphins include chemical, plastic and sound pollution and increasing boat traffic, whilst natural factors include climate change and introduced species (also influenced by man), which may be altering Mediterranean food chains.

The Maltese Islands are situated in a region of the Mediterranean Sea where common dolphins are relatively abundant, and the islands are situated at the centre of the Mediterranean making research in this crucial area possible. It is therefore essential that ongoing research and monitoring receive ACCOBAMS' support with the aim of effectively promoting protection of the species in this area. The project, which has been undertaken since 1997; has encompassed a very large area extending beyond Maltese territorial waters; it has sampled information throughout the year; and utilised both sea and aerial surveys. It should be taken advantage of by ACCOBAMS as a project to assist in efforts towards practical common dolphin conservation (Vella, 2000b).

This workshop, dedicated to *Common Dolphins: Research and its Conservation* at the European Cetacean Society's Conference in Sweden (April 2004), represents an important step towards gathering feedback from all those persons in a position to do so. The workshop has indicated how different and unique are common dolphin groups/populations in each region. Molecular genetics of the various groups may assist in the verification of the extent of differences between dolphin groups found in each region. Such workshop/conference activity should be considered on a regular basis for species considered to be vulnerable, such as the common dolphin. ACCOBAMS may enjoy the benefits of such sustained cumulative scientific assessment of conservation research and activities.

ACCOBAMS needs to insist that the countries that are signatories to this agreement take responsibility for supporting scientific research to assist towards effective monitoring, and updating policy and management on a national, regional, and Mediterranean-wide level. One effective way would be to insist in having a research and a policy representative/entity from each country, and to have both actively involved in ACCOBAMS meetings, assessments, and actions. Research and conservation recommendations, without policy and implementation to back them up, are as weak as policy and action plans without research and up to date knowledge.

The previous point may not be reached unless local field researchers in each country are kept fully informed by ACCOBAMS of ongoing objectives, and are also encouraged to continue their research and their vital contribution to increasing knowledge on how common dolphins are doing, and what activities or factors present in the environment may negatively affect their distribution, numbers, and survival. The upcoming website on common dolphins will surely assist towards increasing awareness on the research efforts undertaken, and knowledge in various parts of the Mediterranean and Black Sea.

One needs to encourage the study of mother-infant separation problems in this vulnerable Mediterranean species. Also important is the need to understand the pathology and parasitology associated with this species, and the best or most effective way to intervene in situations when live common dolphins find themselves at risk of dying unless assisted in care for a short period before release again. This is particularly relevant to the local situation since lone common dolphins have been observed. One case was indeed an infant separation which remained unattended until the animal died in October 2001 (Vella, 2002). Thus a network of effective Mediterranean specialised cetacean veterinary assistance, working in collaboration with local cetacean researchers (who may

assist with up to date information of the species' group/population in the area) and local authorities (for coordinated action to be encouraged), needs to be considered locally in case of live stranding emergencies. At present, the national action plan for stranded cetaceans only focuses upon dead stranded dolphins.

Last but not least, one should consider a network of Marine Protected Areas in the Mediterranean, large enough to allow common dolphins to survive in the future. The planning and management of such MPAs would need detailed consideration of updated and local/regional information. Potential sites for marine conservation areas assisting common dolphin population conservation are being formally recommended to ACCOBAMS as a result of this ongoing Central and Southern Mediterranean Research project, which highlight alternative areas also around the Maltese Islands.

ACKNOWLEDGEMENTS

My thanks for making all the above work possible go to: The Maltese Maritime Authority, the Civil Protection of Malta, the Armed Forces of Malta, the University of Malta, research sponsors, BICREF volunteer assistants, IFAW's Logger program, and Tethys for providing the software, and all cetacean researchers abroad that have encouraged this conservation project.

Thanks go to M. Dalebout and G. Lento of the University of Auckland for identifying the decomposed specimen found on the 15th of June 1999 as common dolphin.

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