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DORSAL EDGE MARKS: AN INDIRECT METHOD TO INVESTIGATE SOCIAL STRUCTURE OF BOTTLENOSE DOLPHIN (*Tursiops truncatus*) IN THE EASTERN LIGURIAN SEA

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INTRODUCTION - Bottlenose dolphin live in fission-fusion societies[1] in which social structure plays a key role in many aspects of its ecology and biology. No data are available in respect to social organization of bottlenose dolphin populations living in the Pelagos Sanctuary protected area. This study is part of the 'Delfini Metropolitani' long term research programme.

AIM - The present study investigates group structure in relation to presence/absence of bottlenose dolphin calves using an indirect experimental method based on photo-identification data.

METHODS - Group sizes and composition of free-ranging bottlenose dolphins living in the coastal waters of the Eastern Ligurian Sea (fig.1), were studied using data collected during on-board surveys carried out from August 2005 to October 2007. Photo-identification and mark-recapture techniques were applied. In order to assess group composition, 5 categories (fig. 2) were defined according to body size and type/extent of permanent marks on the dorsal fin edge: (**C**) calf, (**J**) juvenile, (**A0**) adult/sub-adult without nicks, (**A1**) adult/sub-adult with few and little nicks, dorsal fin edge still recognizable, (**A2**) adult/sub-adult with a lot of and/or deep nicks, dorsal fin edge difficult to recognize. Tukey-HSD test, χ2 (chi-square test) and Cluster analysis statistics were applied.

RESULTS - 33 encounters within the study period provided data to be used for the group composition analysis: 220 dolphins were identified and catalogued, group sizes ranged from 2 to 39 animals and calf presence ranged from 0 to 5. Schools containing calves (excluding calves from the analysis) were significantly larger (mean = 19.8) than groups in which calves were absent (mean = 8.5) (fig. 3) ($p < 0.001$, Tukey-HSD test). Schools with calves presented a significantly higher number of categories 'A0' and 'A1' and a significantly lower number of 'J', compared to schools in which calves were absent ($\chi 2 = 11.40$, $p < 0.01$) (fig. 4, 5). Multivariate analysis highlights the similarity between the number of individuals representing each Dorsal Edge Category of groups presenting calves as well as groups without calves (fig. 6, 7).

Fig. 1

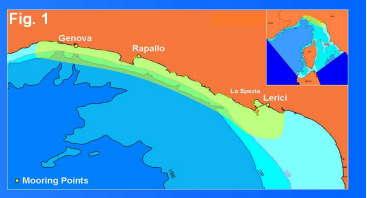
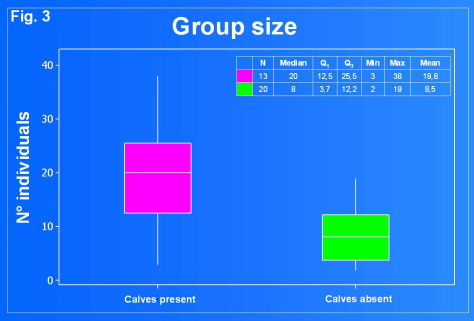


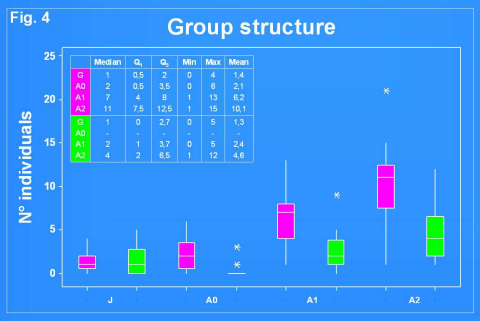
Fig. 2

Fig. 3



	N	Median	Q_1	Q_3	Min	Max	Mean
	13	20	12,5	25,5	3	38	19,8
	20	8	3,7	12,2	2	19	8,5

Fig. 4



	Median	Q_1	Q_3	Min	Max	Mean
C	1	0,5	2	0	4	1,4
A0	2	0,5	3,5	0	6	2,1
A1	7	4	8	1	13	6,2
A2	11	7,5	12,5	1	15	10,1
C	1	0	2,7	0	5	1,3
A0	-	-	-	-	-	-
A1	2	1	3,7	0	5	2,4
A2	4	2	6,5	1	12	4,6

Fig.1 Study area included in the Northeastern Pelagos Sanctuary protected area.

Fig.2 Dorsal Edge Categories considered in the study: (C) calf, (J) juvenile, (A0) adult/sub-adult without nicks, (A1) adult/sub-adult with few and little nicks, dorsal fin edge still recognizable, (A2) adult/sub-adult with a lot of and/or deep nicks, dorsal fin edge difficult to recognize.

Fig.3 Box-and-whiskers representing size of groups in relation to presence/absence of calves.

Fig.4 Box-and-whiskers representing number of individuals included in categories 'C', 'J', 'A0', 'A1', 'A2' in groups with and without calves.

Fig.5 Chi-square test.

Fig.6 Agglomeration graph representing different distribution of individuals 'A0 +A1' and 'A2' of groups in relation to presence/absence of calves.

Fig.7 Multivariate analysis: dendrogram representing different structure of groups with and without calves.

Fig. 5

χ^2	Category									tot
	J			A0+A1			A2			
	O	E	χ^2	O	E	χ^2	O	E	χ^2	
Calves present	18	27,02	3,01	108	96,07	1,48	131	133,90	0,06	257
Calves absent	27	17,98	4,53	52	63,92	2,2	92	89,09	0,09	171
tot	45			160			223			428

$\chi^2 = 11,40$ $p < 0,01$

Fig. 6

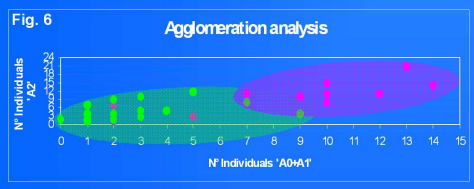
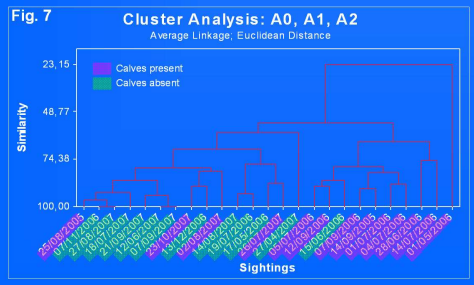


Fig. 7



DISCUSSION AND CONCLUSION - Group size and structure seem to be influenced by presence/absence of calves: groups with calves are significantly larger than those without calves and present a significant increase of poorly marked (categories 'A0' and 'A1') individuals. Assuming that poorly marked individuals are represented mainly by females[2], our results suggest that natal attraction[3] phenomena could take place during the first period of calves' life, producing herds of mothers, calves and non-mothers (immature females and mature females without calves). These herds do not include mothers with juveniles, which seem to prefer smaller groups with a lower number of poorly marked individuals. These results are confirmed by the multivariate analysis which pools in different clusters (identifying the characteristic social structure) groups with calves and without calves. The conclusions of this research agree with results from genetic studies on social structure conducted in other parts of the world. Dorsal edge analysis may represent an alternative method, indirect and non-invasive, to study social structure of free-ranging bottlenose dolphin.

References

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