

Social structure of bottlenose dolphins (*Tursiops truncatus* Montagu, 1821) off Lampedusa Island (Strait of Sicily, Italy)

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INTRODUCTION

Social structure is an important attribute of marine mammal social system. This study was conducted to investigate the social structure of the local population of the common bottlenose dolphin (*Tursiops truncatus*) off Lampedusa Island (Fig. 1-2). The Pelagian Archipelago is isolated, in the middle of the Strait of Sicily between Sicily, Tunisia, and Malta (respectively about 200 km, 140 km, and 160 km away). This area has been recognized as an Important Marine Mammal Area (IMMA) particularly for the protection of the bottlenose dolphin (IUCN-MMPAIF, 2017).

MATERIAL AND METHODS

In the present study, we applied photo-identification methods to understand association patterns and community division through social network analysis. Data were recorded from 2013 to 2020 during 124 boat-based surveys. Analysis were carried out in SOCPROG 2.9 using the Half-Weight Index (HWI). Only individuals observed on at least 3 occasions ($n = 34$) were selected.

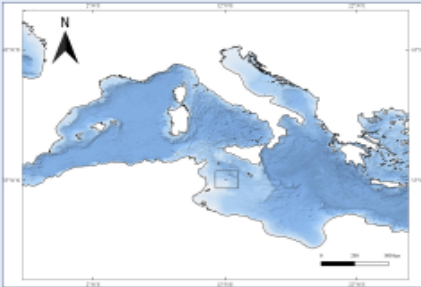


Figure 1. Location of the study area in the Strait of Sicily (Italy).



Figure 2. Dolphins group nearby Lampedusa coasts.

RESULTS

- > Groups ($n=117$) averaged 4.5 individuals, with a mode of 2.
- > Evidence for structure within the network was delineated from the estimate of social differentiation ($S = 0.72$) and data were representative of the true social system (correlation coefficient $r = 0.4$).
- > The HWI averaged 0.07 (± 0.03), including mainly weak bonds and few strong bonds (3%).
- > The sociogram (Fig.3) reveals a well-connected network with strong associations that reach up to 0.67.
- > Highly significant differences were found in mean and maximum association indices within the 5 clusters evidenced (Mantel test: $t = 12.4$; $p = 0$), in which 94% of maximum association rates were greater than 0.4 (Tab.1).
- > Temporal analysis of associations showed stable relationships over the study period.

Table 1. The numbers of bottlenose dolphins (34 individuals seen ≥ 3 times) grouped into five social clusters with averaged values (SD) of mean and maximum half-weight association indices (HWI) and values of overall, between and within clusters association indices.

	Social clusters					Overall	Between	Within
	#1	#2	#3	#4	#5			
No. of Individuals	6	6	8	9	5	34		
Mean HWI (SD)	0.05 (0.01)	0.06 (0.01)	0.09 (0.03)	0.06 (0.04)	0.08 (0.04)	0.07 (0.03)	0.04 (0.02)	0.20 (0.09)
Max HWI (SD)	0.41 (0.15)	0.46 (0.17)	0.51 (0.06)	0.39 (0.14)	0.45 (0.12)	0.44 (0.13)	0.29 (0.09)	0.43 (0.14)

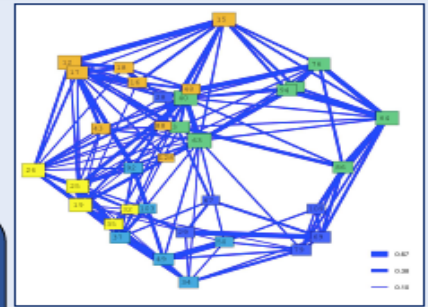


Figure 3. The sociogram of the 34 individuals seen ≥ 3 times with principal coordinates arrangement showing the five clusters with different colours.

CONCLUSIONS

Bottlenose dolphins that inhabit Lampedusa Island waters show social structure characteristics similar to other populations: a well-differentiated fission-fusion society with variable grouping patterns and stable relationships.

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