

The impacts of coastal defense systems on *Caretta caretta* nesting activity

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Coastal erosion is not merely a geological problem but a threat to the conservation of marine biodiversity, particularly for charismatic and vulnerable species such as the loggerhead sea turtle (*Caretta caretta*). In recent years, coastal interventions have mainly focused on defending and protecting beaches from coastal erosion, to keep the shoreline unaltered but, in some cases, they could also be an obstacle or the loggerhead turtle nesting females to reach the beach or pose a risk for the successful nesting activities. For example, an inadequately designed beach nourishment intervention can have significant effects on embryonic development due to a possible change in grain size or an alteration of the geomorphological characteristics of the coastline involved. This study, which is part of the Life TURTLENEST project—co-funded by the European Union through the LIFE program and aimed at improving the conservation of the loggerhead sea turtle (*Caretta caretta*) in the Mediterranean—examines how different coastal defence strategies would affect habitat suitability and the reproductive success of sea turtles, integrating recent regional regulations with data from the international literature. The environmental impacts of coastal defence works are adapted from the ISPRA manual (Paganelli et al., 2014)*, which provides a matrix system for identifying potential effects on habitats and species.

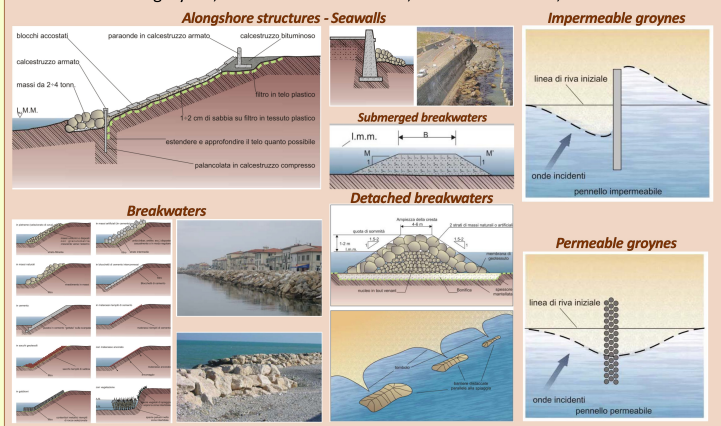
*Paganelli D., La Valle P., Ercole S., Lisi I., Teofili C., Nicoletti L., 2014 - Guidelines for environmental studies related to the construction of coastal defence works. ISPRA, Handbooks and Guidelines 105 bis/2014: 69 pp.



Measures to prevent coastal erosion involve the construction of various types of coastal defence structures

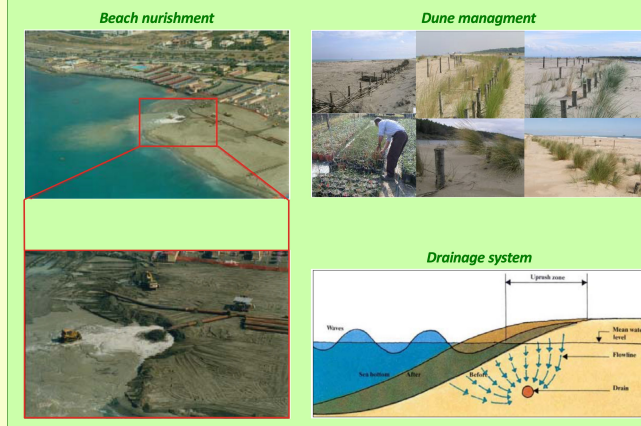
HARD

artificial barriers parallel to the coast, works perpendicular to the coast, groynes, adherent defence works, seawalls and dikes, ...



SOFT

beach nourishment, beach reprofiling, fencing, planting of vegetation barriers, ...



... but how coastal defences can threaten *Caretta caretta* nesting activity at submerged and emerged beaches?

TYPE OF COASTAL DEFENCE	MAIN PHYSICAL EFFECTS					
	SUBSTRATE VARIATIONS LINKED TO THE CHANGED HYDRODYNAMIC CONDITIONS	TURBIDITY AND SUSPENDED LOAD LINKED TO MOVEMENT OF SEDIMENTS	NOISE	REDUCED WATER EXCHANGE	ACCESS DENIAL (STRUCTURES PRESENCE)	
SUBMERGED						
ALONGSHORE STRUCTURES	O	C/O	C		C/O (totally)	
DETACHED BREAKWATERS and ARTIFICIAL REEFS (offshore)	O	C/O	C	O	C/O (partially)	
GROYNES (permeable and impermeable) and ARTIFICIAL REEFS (onshore)	O	C/O	C	O	C/O (possibly)	
BEACH NOURISHMENT		C	C		C	
BEACH DRAINAGE SYSTEMS		C	C			
DUNE REPROFILING			C			

WHAT:	
	nesting crawl
	nesting
	sea finding
	hatching
WHEN:	
C: Construction	
O: Operative phase/stage	
C/O: Construction and Operative	

TYPE OF COASTAL DEFENCE	MAIN PHYSICAL EFFECTS					
	LOSS OF SUBSTRATE LINKED TO STRUCTURE PRESENCE	SUBSTRATE VARIATIONS LINKED TO POSSIBLE EROSION PHENOMENA	NOISE	TRAMPLING	VARIATIONS IN SEDIMENT GRAIN SIZE DISTRIBUTION	ACCESS DENIAL (STRUCTURES PRESENCE)
EMERGED						
ALONGSHORE STRUCTURES	C/O	O	C	C		C/O (totally)
DETACHED BREAKWATERS and ARTIFICIAL REEFS (offshore)		O	C	C		C/O (partially)
GROYNES (permeable and impermeable) and ARTIFICIAL REEFS (onshore)	C/O	O	C	C		C/O (possibly)
BEACH NOURISHMENT			C	C	C	C
BEACH DRAINAGE SYSTEMS			C	C		
DUNE REPROFILING			C	C		



Long-term protection of *Caretta caretta* requires an inseparable balance between the coastal erosion defence works and the biological and functional preservation of the beach. This study, therefore, represents a useful tool to support administrators to make appropriate choices based on different management priorities.