University of Trieste: GLOBAL CHANGE ECOLOGY a.a. 2021-2022

Conservation & Management in Marine Protected Areas

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Main EU Directives on marine environments

Historical evolution of conservation purposes

Rough timeline	Framing of conservation	Key ideas	Science underpinning
1960–1970	Nature for itself 	Species Wilderness Protected areas	Species, habitats and wildlife ecology
1980–1990	Nature despite people 	Extinction, threats and threatened species Habitat loss Pollution Overexploitation	Population biology, natural resource management
2000–2005	Nature for people 	Ecosystems Ecosystem approach Ecosystem services Economic values	Ecosystem functions, environmental economics
2010	People and nature 	Environmental change Resilience Adaptability Socioecological systems	Interdisciplinary, social and ecological sciences

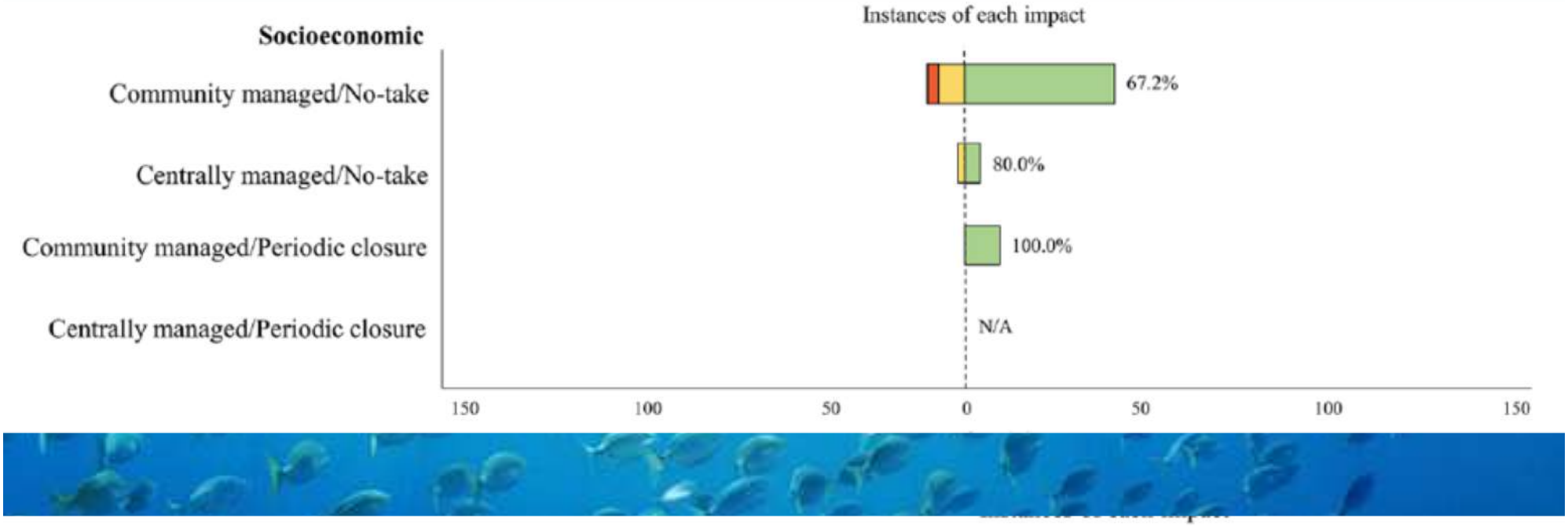
Modified from Mace, 2014

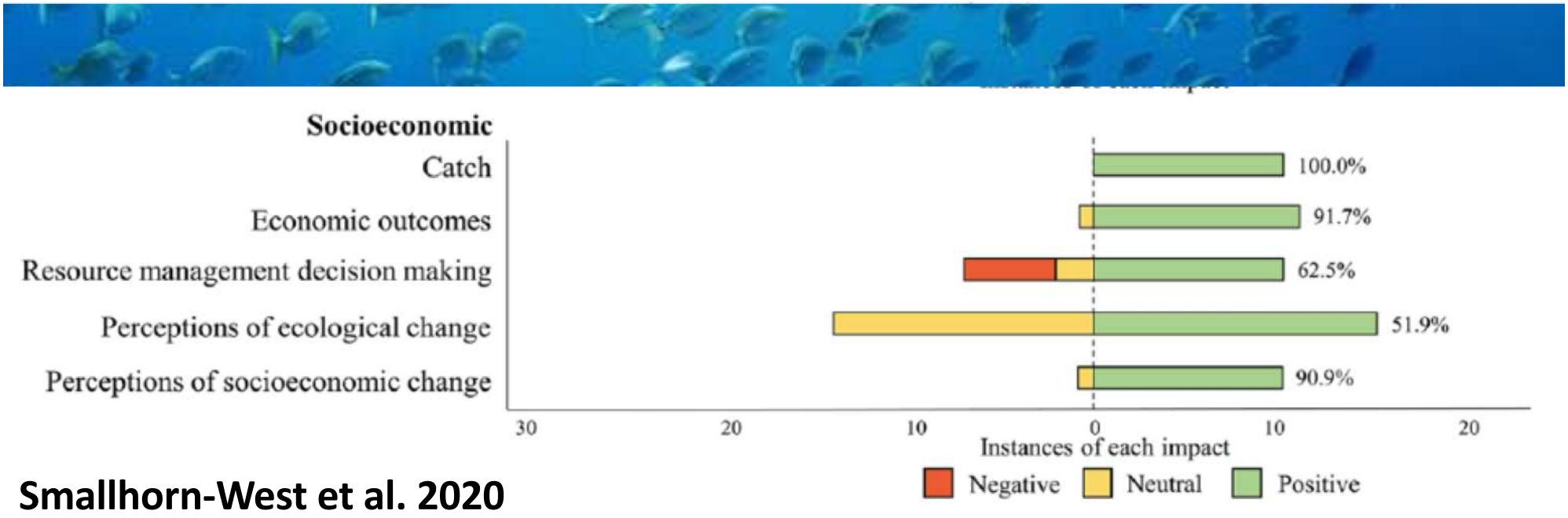
Impact on socio-economy

Type of Activity	Sub-type of Activities	Potential Positive Impacts on Users	Potential Negative Impacts on Users
Fisheries	Artisanal fisheries / small scale	Improved catch mix. Income and job increase, for professional and pleasure fisheries and for diving Exclusive access (less competence)	Closure of areas to fisheries If retention rates inside the MPA are high (dispersal ability is low comparing to MPA size) there might be no benefit for nearby fisheries
	Commercial fisheries / large scale	Improved catch mix Increased catch ("spillover effect" and also by the "recruitment effect") Income and job increase, for professional and pleasure fisheries and for diving Increased biomass (reserve effect) Increased fish size (reserve effect)	Closure of areas to fisheries If retention rates inside the MPA are high (dispersal ability is low comparing to MPA size) there might be no benefit for nearby fisheries
	Recreational fisheries	Income and job increase, for professional and pleasure fisheries and for diving	Closure of areas to visitors If retention rates inside the MPA are high (dispersal ability is low comparing to MPA size) there might be no benefit for nearby fisheries

Navigation and Communications	Commercial shipping	NA	Effect on shipping lanes Increase transport time by reducing speed limits
	Ports & harbour service area	NA	Negative effects of anchoring on seabed (e.g. seagrass)
	Communication cables	NA	Limitation of allocation
Mineral, Water and Energy Resources	Offshore oil/gas platforms, resources extraction, pipelines and cables	NA	Limitation of extraction and allocation
	Offshore wind-farms	NA	Limitation of allocation
	Sailing	Increase sailing visitation; increase in tourism demand	Damage to ecosystem from tourist congestion (e.g. anchoring)
	Marine cruising	Increase in marine cruises relating to cetaceans or seabirds sightseeing	Negative effects of anchoring on seabed (e.g. Seagrass)
	Diving, snorkelling, nautical activities	Increase in divers' visitation. Income and job increase, for professional and pleasure fisheries and for diving	Damage to ecosystem from tourist congestion Negative non-consumptive divers impacts on the natural environment Closure of areas
	Cetacean and seabird watching	Increase in demand	Negative effects on cetaceans
Management	MPA management	Economic benefits to scientists and biologists (budget for their research, projects, etc.)	Economic cost for public finances of administration, supervision, monitoring, scientific information policies, prohibitions with financial compensation

Effects on socio-economy

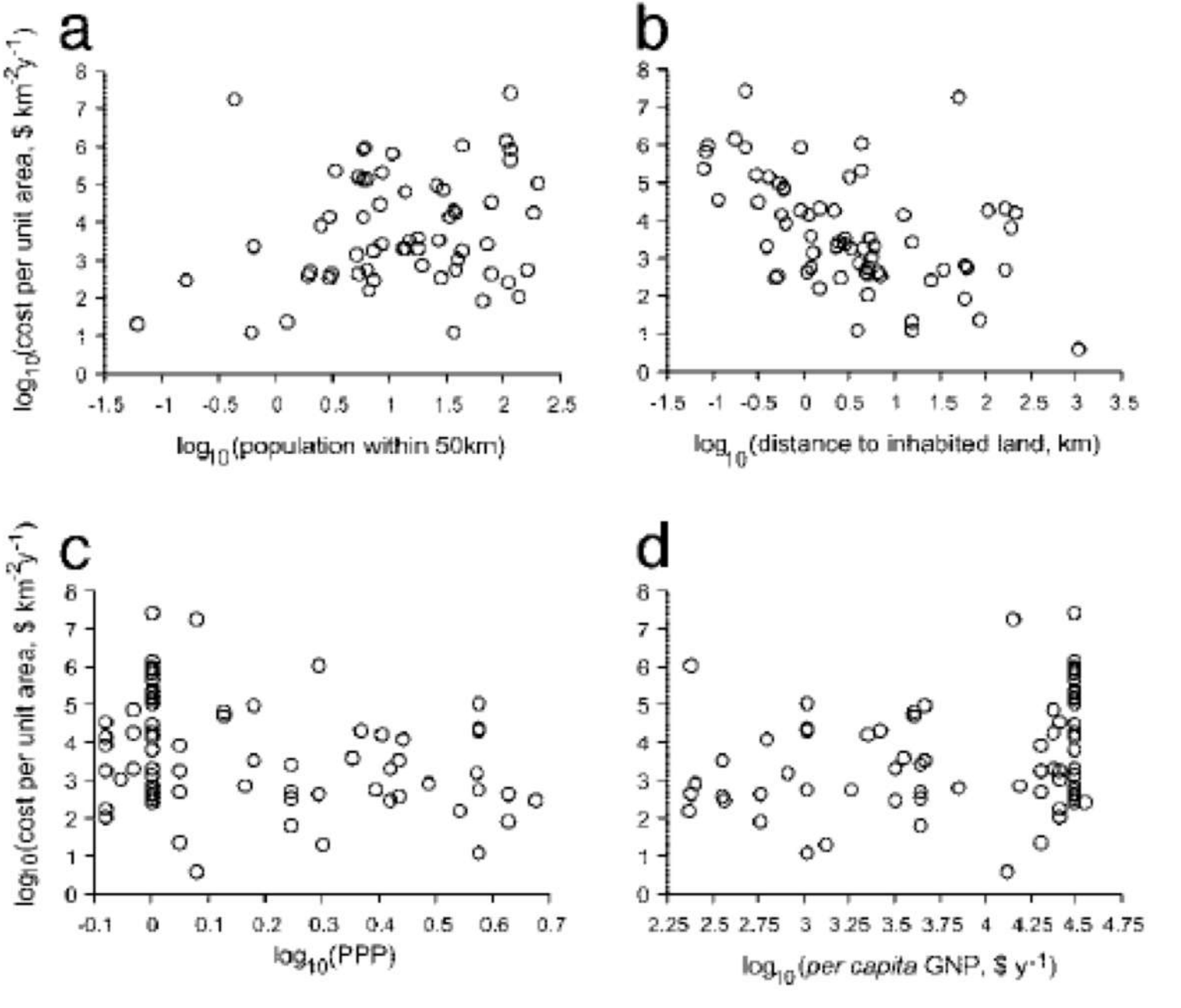




Smallhorn-West et al. 2020

How much does conservation cost?

Balmford et al. 2004



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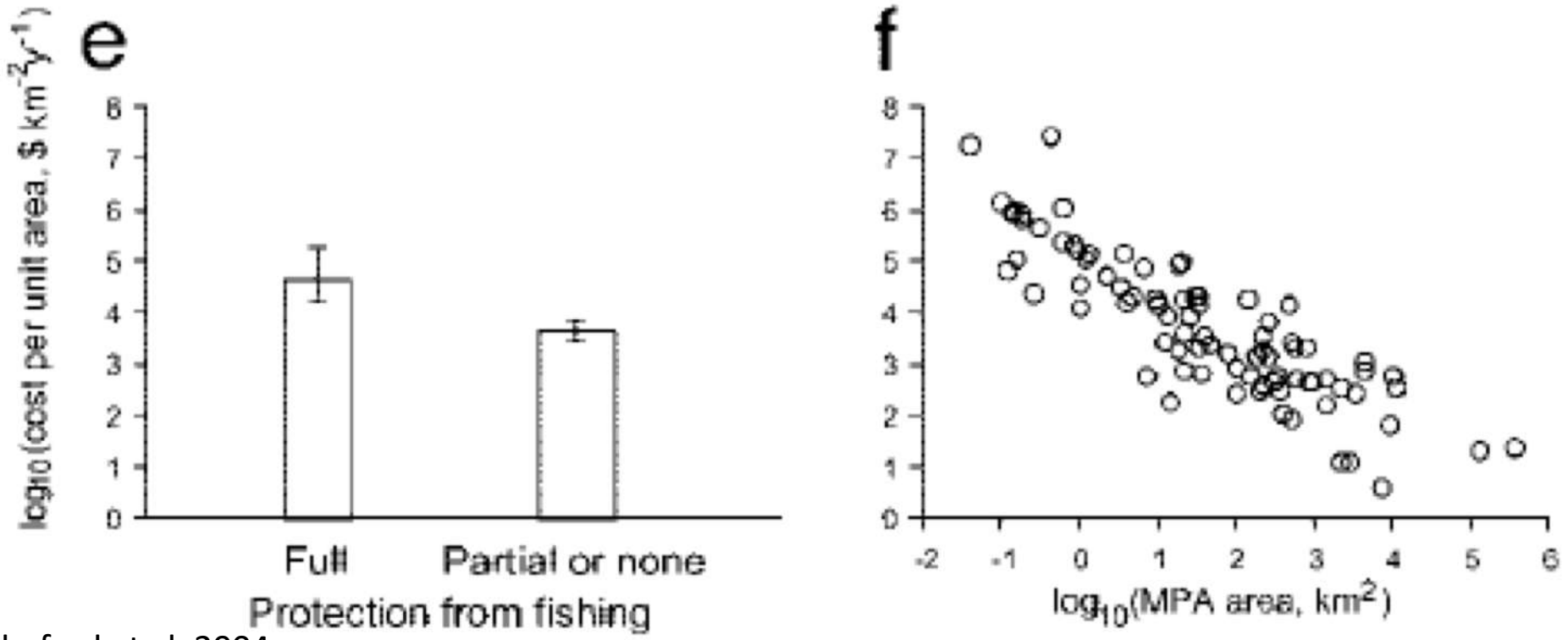
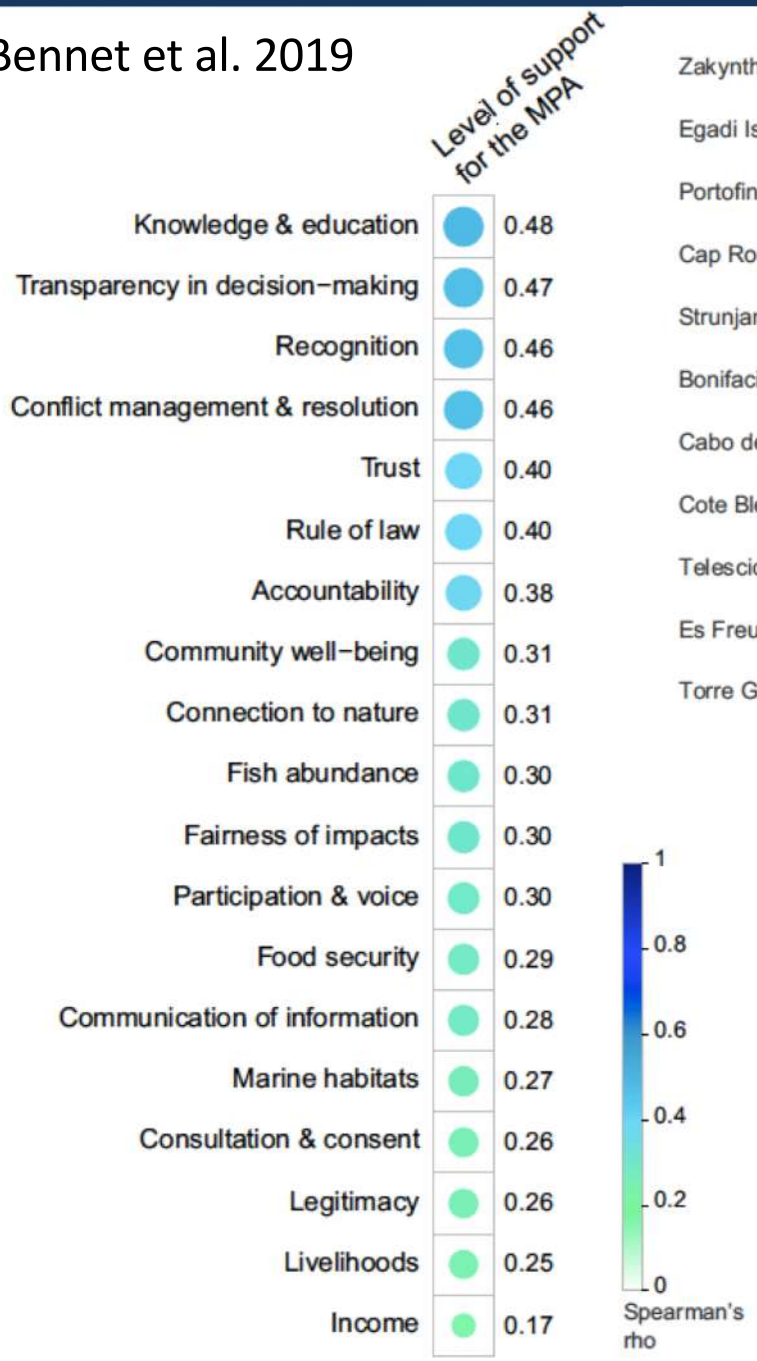


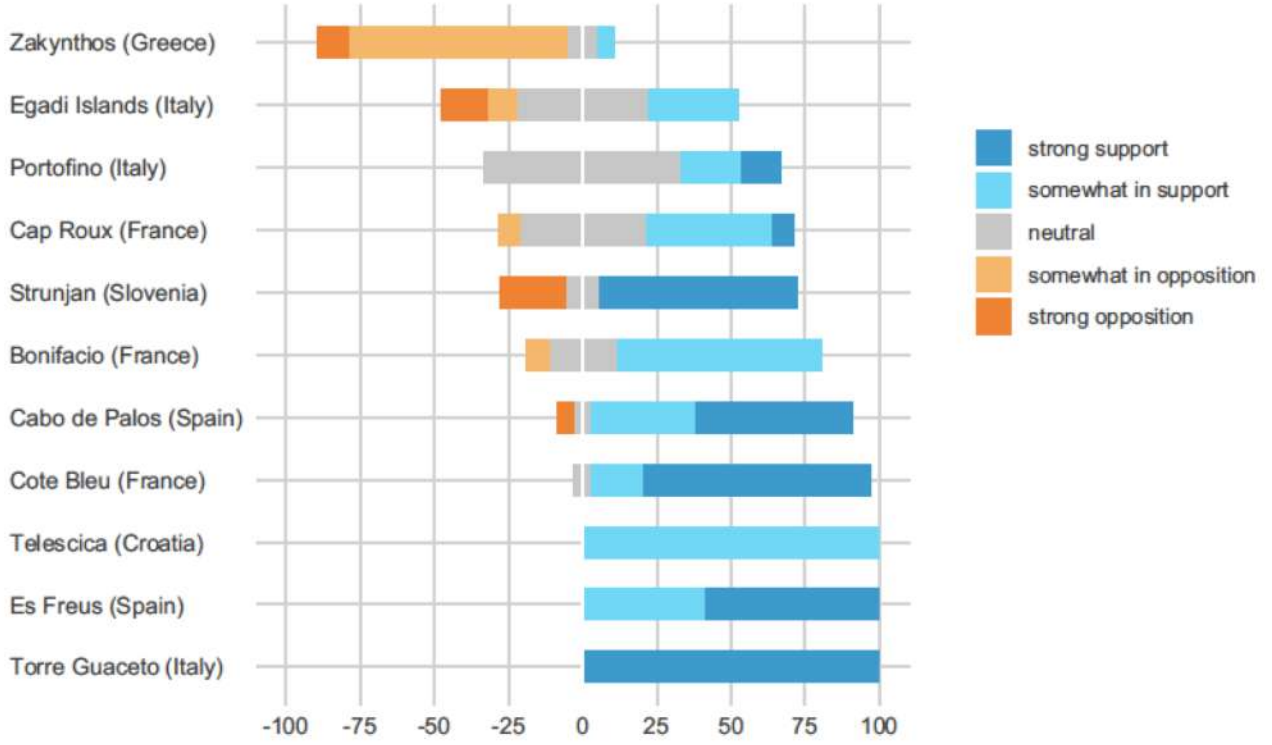
Balmford et al. 2004

Cost ranges between 0 and about 30 millions US dollars per square km year , depending significantly on the size of the MPA and the level of anthropization (population and urbanization)

Compliance

Bennet et al. 2019





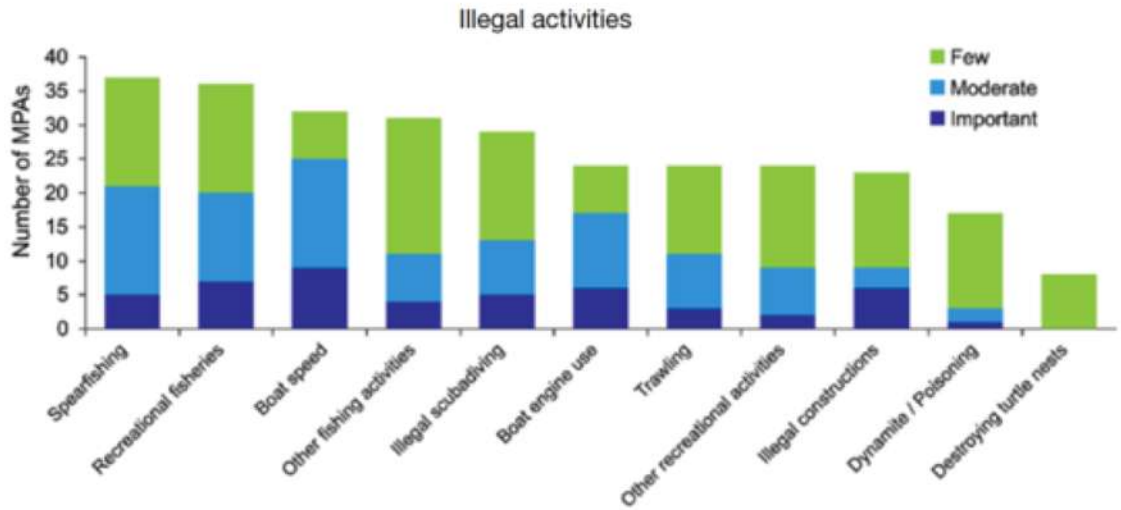
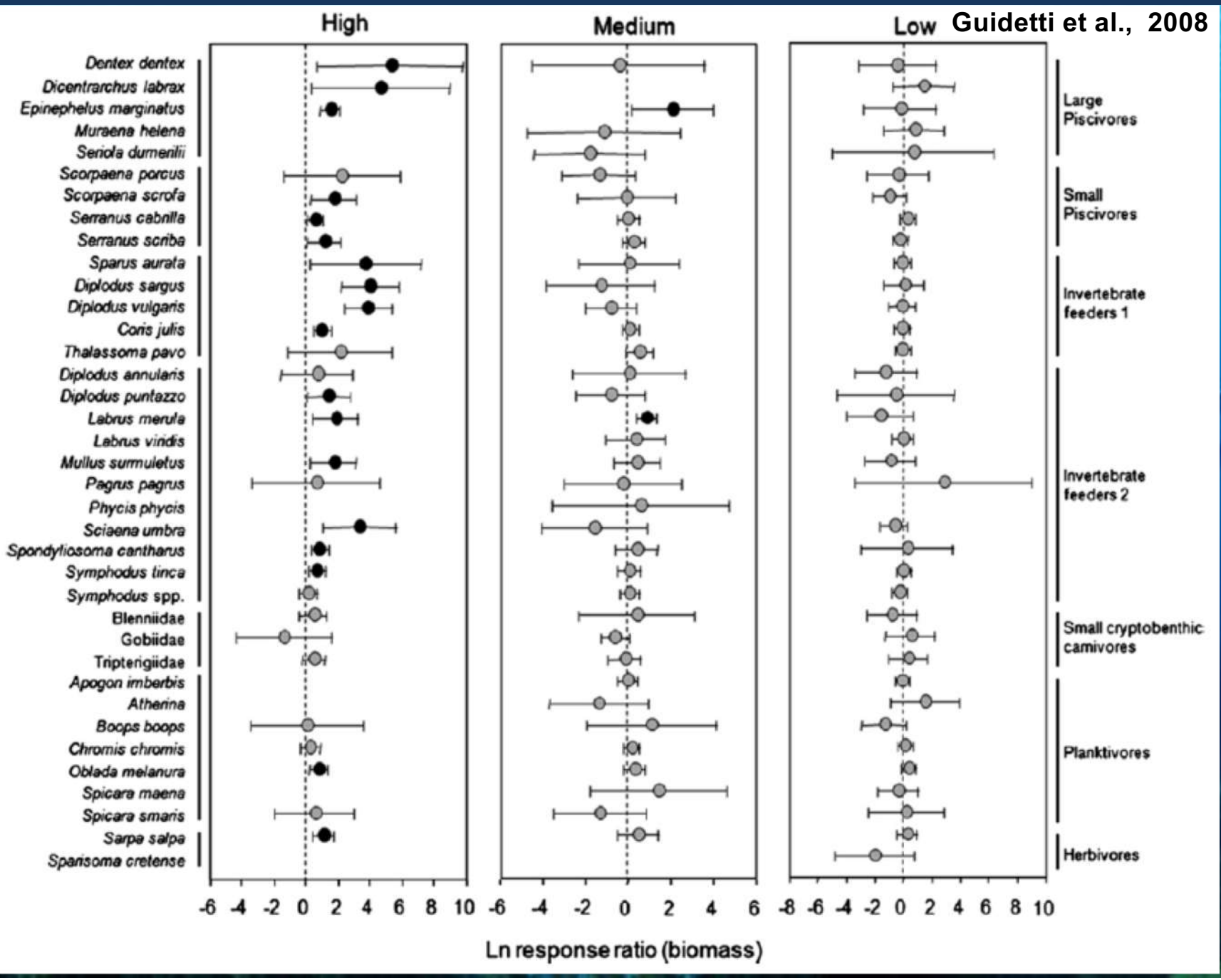
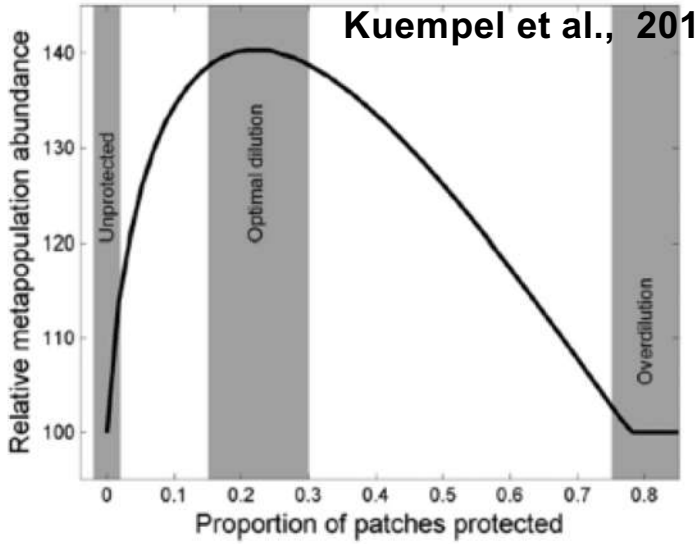


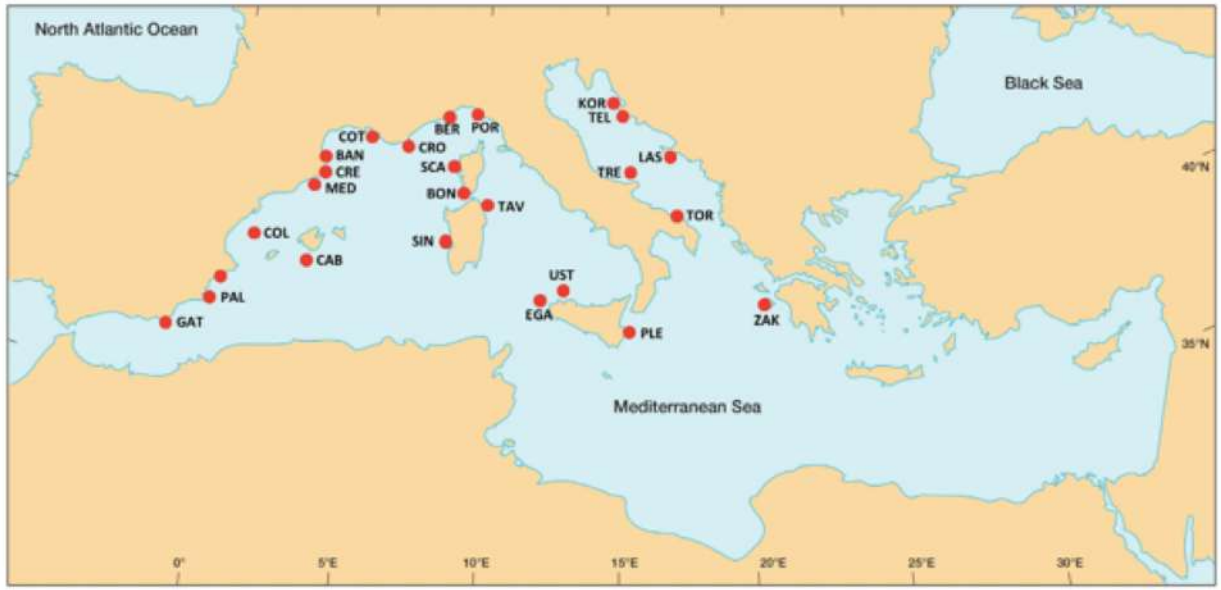
Figure 12. Illegal activities reported to occur in Mediterranean MPAs (n = 45).

The role of enforcement

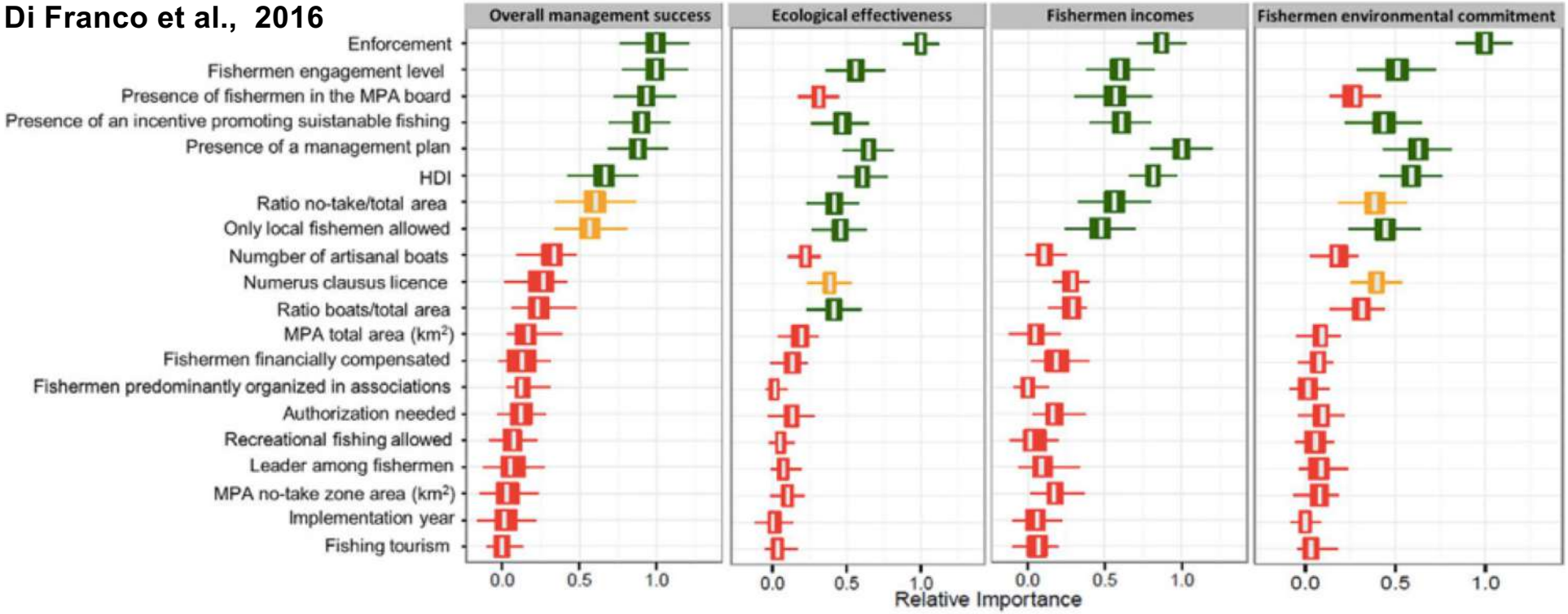


Key factors in MPA effectiveness





Di Franco et al., 2016



Main international regulations and agreements

- BD EU Bird Directive (EU Parliament and Council Directive 2009/147/EC on the conservation of wild birds)
- CBD Convention of Biological Diversity
- CFP Common Fisheries Policy (EU Parliament and Council Regulation No. 1380/2013 on the Common Fisheries Policy)
- EUSAIR Union Strategy for the Adriatic and Ionian Region
- HD EU Habitat Directive (EU Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora)
- HELCOM Baltic Marine Environment Protection Commission
- MSFD EU Marine Strategy Framework Directive (EU Parliament and Council Directive 2008/56/EC establishing a framework for community action in the field of marine environmental policy)
- MSPFD EU Framework Directive on Maritime Spatial Planning (EU Parliament and Council Directive 2014/89/EC establishing a framework for maritime spatial planning)
- OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic
- WFD EU Water Framework Directive (EU Parliament and Council Directive 2000/60/EC, establishing a framework for Community action in the field of water policy)

Water Framework Directive

DIRECTIVE 2000/60/EC (D.Lgs. 152/2006)

The purpose of this Directive is to establish a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater which:

(a) prevents further deterioration and protects and enhances the status of aquatic ecosystems and, with regard to their water needs, terrestrial ecosystems and wetlands directly depending on the aquatic ecosystems;
(b) promotes sustainable water use based on a long-term protection of available water resources;
(c) aims at enhanced protection and improvement of the aquatic environment, inter alia, through specific measures for the progressive reduction of discharges, emissions and losses of priority substances and the cessation or phasing-out of discharges, emissions and losses of the priority hazardous substances;
(d) ensures the progressive reduction of pollution of groundwater and prevents its further pollution, and
(e) contributes to mitigating the effects of floods and droughts

Monitoring the status of waters every six years to achieve a good quality status
Operational monitoring: water bodies at risk or not in good status (3 years)
Surveillance monitoring: water bodies (every six years)
Investigative monitoring: water bodies not in good status to understand and clarify causes

Habitat Directive

Directive 92/43/EEC
D.P.R. 357/1997

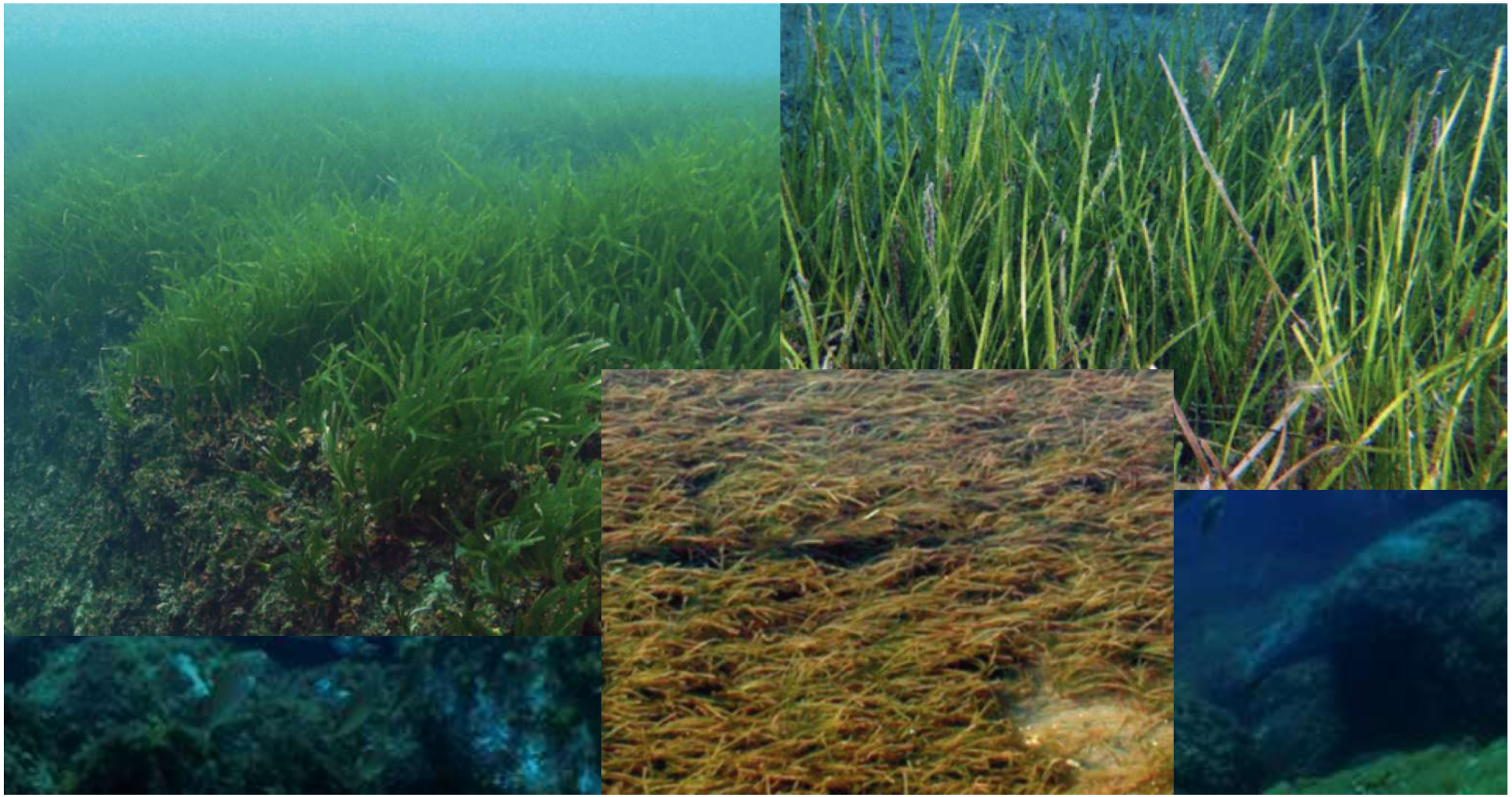
The aim of this Directive shall be to contribute towards ensuring biodiversity through the conservation of natural habitats, and species of particular relevance. Report every six years. A coherent European ecological network of special areas of conservation shall be set up under the title Natura 2000. This network, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range . The Natura 2000 network shall include the special protection areas classified by the Member States pursuant to Directive 79 /409 /EEC.

Marine habitats of community interest included:

Sand banks which are slightly covered by sea water all the time
*Posidonia beds
Submerged or partly submerged sea caves
Estuaries
Mudflats and sandflats not covered by seawater at low tide
*Lagoons
Large shallow inlets and bays
Reefs
Marine 'columns' in shallow water made by leaking gases

Protected or regulated species

Magnoliophyta			
Posidonia oceanica	(Linnaeus) Delile	P2	B1
Zostera marina	Linnaeus	P2	B1
Zostera noltii	Hornemann	P2	
Cymodocea nodosa	(Ucria) Ascherson		B1



Protected or regulated species

Phaeophyta			
Cystoseira amentacea and var. *spicata*	(C.Agardh) Bory including var. *stricta* Montague (Ercegovic) Giaccone	P2	B1
Cystoseira mediterranea	Sauvageau	P2	B1
Cystoseira sedoides	(Desfontaines) C.Agardh	P2	B1
Cystoseira spinosa	Sauvageau including *C. adriatica* (Ercegovic) Giaccone	P2	B1
Cystoseira zosteroides	C. Agardh	P2	B1
Laminaria rodriguezii	Bornet	P2	B1
Laminaria ochroleuca	Pylaie		B1

Protected or regulated species

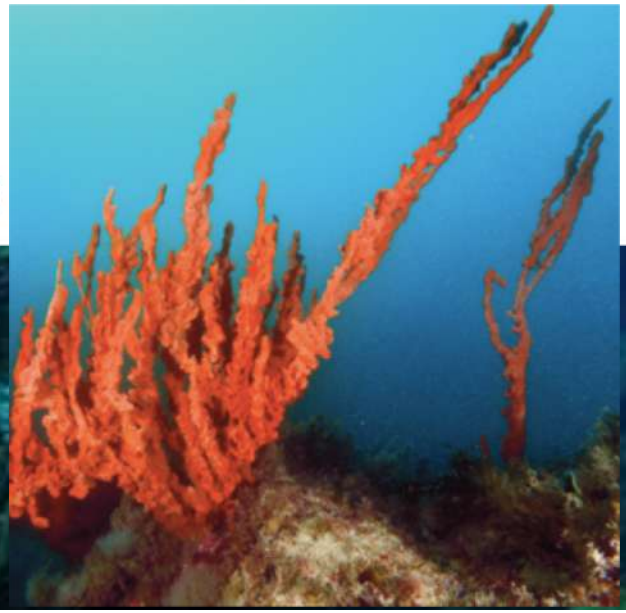
Rhodophyta

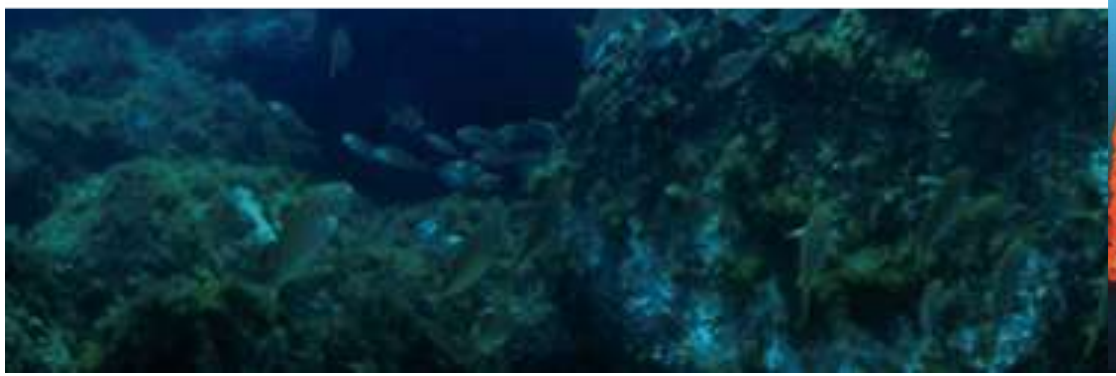
Goniolithon byssoides	(Lamarck) Foslie (nomenclatura non aggiornata) (3)	P2	B1
Lithophyllum lichenoides	Philippi (3)	P2	B1
Ptilophora mediterranea	(H. Huvé) Norris	P2	B1
Schimmelmannia schousboei	(= *S. ornata*)	P2	B1

Protected or regulated species

Porifera

Petrobiona massiliana	Vacelet & Lévi, 197		P2	B2
Axinella polypoides	Schmidt, 1862		P2	B2
Axinella cannabina	(Esper, 1794)		P2	
Spongia agaricina	Pallas, 1766		P3	B3
Spongia officinalis	Linnaeus, 1759		P3	B3
Spongia zimocca	Schmidt, 1862		P3	B3
Aplysina cavernicola	Vacelet, 1959		P2	B2
Aplysina aerophoba	Schmidt, 1862		P2	
Asbestopluma hypogea (1)	Vacelet and Boury-Esnault 1995		P2	
Geodia cydonium	(Jameson, 1811)		P2	
Hippospongia communis	(Lamarck, 1813)	Spugna equina	P3	B3
Ircinia foetida	(Schmidt, 1862)		P2	
Ircinia pipetta	(Schmidt, 1868)		P2	
Tethya aurantium	(Pallas, 1766)		P2	
Tethya citrina	Sarà e Melone, 1965		P2	





Protected or regulated species

Cnidaria				
Corallium rubrum	(Linnaeus, 1758)	Corallo rosso	P3	B2H5
Antipathes dichotoma	Pallas, 1766		P3	B3CB
Antipathes fragilis	Gravier, 1918		P3	B3CB
Antipathes subpinnata	(Ellis & Solander, 1786)		P3	B3CB
Astroides calycularis	(Pallas, 1766)		P2	B2
Gerardia savaglia	(Bertoloni, 1819)		P2	B2
Errina aspera	(Linnaeus, 1767)		P2	
Bryozoa				
Hornera lichenoides	(Linnaeus, 1758)		P2