







Vulnerability assessment of Mediterranean fisheries to climate change

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BACKGROUND

Expert meeting on Climate Change implications for Mediterranean and Black Sea Fisheries (December 2017, GFCM headquarters, Rome)









Mid-term strategy (2017-2020) towards the sustainability of the Mediterranean and the Black Sea fisheries (Res. GFCM/40/2016/2)

Development of an **adaptation strategy** to cope with the effects of **nonindigenous species** and **climate change** on fisheries



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VULNERABILITY is the degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change (IPCC)









AIMS OF THE VULNERABILITY ASSESSMENTS

- 1. To understand the **potential risks to the fisheries sector** in the Mediterranean of the ongoing and projected (<u>until 2050</u>) **climate-driven environmental changes**
- 2. To **identify areas and/or sectors more vulnerable** and in need of adaptation options
- 3. To contribute to a **regional (GFCM) adaptation strategy** to cope with the potential effects of climate change in the Mediterranean Sea









SOCIO-ECONOMIC AND INSTITUTIONAL DRIVERS

Affect how fisheries operate and influence the profitability of the activity

Small Pelagic Fishery

FISHERIES PRODUCTION SYSTEMS

Resource base (stocks) and supporting ecosystems, the fishers, the fishing technologies and practices used in the capture production and the fisheries value chain ANTHROPO-GENIC DRIVERS

Affect the productivity and resilience of the stocks

CLIMATE CHANGE DRIVERS

Direct or indirect impacts on fisheries



Demersal Fishery







Climate Anthropogenic

Increase in SST

Increase in SSS

Increase heat waves

Changes in the precipitation/runoff

Sea level rise

Vertical mixing/stratification

Extreme weather events

Mesoscale circulation

Pollution

Fishing

Biotoxins



Impacts on

Catches composition Production Geographic distribution Species phenology Presence of NIS Etc

Working conditions Days at sea Operational costs Cost of post harvesting Etc

Landing value Employment Safety of communities Market opportunities Culture and heritage Etc

Health issues Food security National income Tourism activities Recreational fisheries

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Effects on



Adapted from Badjeck et al. 2010

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VULNERABILITY/RISK MATRIX

(<mark>`</mark> (L)ikel	V)ulnerability (l ihood * (C)ons	Consequences level of impacts										
(_)		04000000	Minor (1)	Moderate (2)	Major (3)	Extreme (4)						
	l ikelihood	Remote (1)	1									
	probability that the consequence will occur	Unlikely (2)	2	4								
		Possible (3)	3	6	9							
		Likely (4)	4	8	12	16						

Risks with scores 6 or above should be further considered for the **design of adaptive measures**



VULNERABILITY ASSESSMENT FOR THE W MED



M. Hidalgo, M. Vasconcellos and M. Bernal

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VULNERABILITY MATRIX: EXAMPLE FROM W MED

NORTH/ SOUTH WESTERN MEDITERRANEAN		Climate change drivers																
Observed/ Expected impacts and implications	Increase in SST Increase in salinity		Increase frequency of heat waves		Change in precipitation- runoff		Sea level rise		Vertical mixing/ stratification		Extreme weather events		Mesoscale circulation					
	z	S	Z	S	Z	S	z	S	z	S	z	S	Z	S	Z	S		
Fisheries resource	es																	
Catches composition	16	16	1	1	4	6	4	1	1	1	6	4	4	4	4	4	1	
Species geographic distribution	16	16	1	1	4	6	9	1	1	1	6	6	9	6	9	9		
Species bathymetric distribution	12	12	1	1	1	1	9	1	1	1	4	4	12	6	9	9		
Trends in abundance/biomass	12	12	1	1	1	1	9	1	1	1	9	9	6	6	4	4		
Abundance variability/changes year-class strength (including larval survival)	16	16	1	1	4	4	12	1	1	1	16	16	12	8	.9	9		
Species phenology	6	6	1	1	4	4	4	1	1	1	4	4	4	4	4	4		

Vulnerability (risk): Negligible (1-2); Low (3-4); Medium (6-8); High (9-16)





Vulnerability Assessment of SPF in the North W Med



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Vulnerability Assessment of SPF in the South W Med



• Landing value

Impacts

- Contribution of fish products to food security
- Catches composition

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Vulnerability Assessment of SPF in the Adriatic Sea

Sistema Nazionale per la Protezione

dell'Ambiente



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Higher fisheries portfolio diversity



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Italy landed the 60% of Adriatic anchovy in 2017





Some Like It Hot (and some not)



Tzanatos et al. 2014; Stergiou et al. 2016

Increasing water temperature, particularly during winter when sardine reproduces, may decrease breeding performance and cause population declines

Warming may have resulted in an improvement of the spawning success or period duration (summer) for anchovy











NEXT STEPS FORWARD

- Results will **need validation** based on available knowledge 1. and expert judgment (species and area)
- 2. Validation step should also start **identifying adaptation options** for priority issues (higher risk)
- 3. Complete the assessments to identify the risk factors that affect the vulnerability of fisheries to climate change in other sub-regions (i.e. Central Mediterranean)
- 4. To **identify a set** of cost-effective and robust **adaptive** options for long-term fisheries management





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