A brief reflection on the Mediterranean fisheries: bad news, good news and no news.

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Abstract

The Mediterranean Sea has been the cradle of Western civilization and its coastal communities have been exploiting all forms of marine life, since ancient times. Concerns regarding fishing and the effects of overfishing were hypothesized as far back as the 14th century. More significant in terms of employment than production, Mediterranean fisheries are characterized by high diversity of catches, relatively small size of specimens and numerous small scale vessels. About 85 percent of Mediterranean stocks, currently assessed, are fished at biologically unsustainable levels with exploitation rate steadily increasing, selectivity deteriorating, and stocks shrinking. The most encouraging message is that the state of knowledge on the fish stocks has improved rapidly and the number of assessed stocks has almost doubled recently. Due to the multinational status of the Mediterranean waters, a maze of management regulations is currently in place, varying among neighbouring countries. Given the special characteristics and 'peculiarities' of the Mediterranean Sea, an effort-regulating regime has been considered as the most appropriate management strategy, accompanied by licensing schemes, closed areas and technical measures. The effectiveness of this management approach is reflected on the alarming state of the stocks. Furthermore, Mediterranean fisheries have a notorious reputation as having an inherent 'culture of non-compliance' largely ignoring rules. Current levels of control and enforcement are insufficient to confront fleets with a large number of vessels and recent economic crisis has amplified the problem. It seems that the impacts of Mediterranean fisheries on fish stocks and marine ecosystems need to be reassessed based on new approaches, either shifting towards simple catch-based management or the more elaborate ecosystem based management. However, the ultimate goal should be to change the mind-set of fishers and motivate them to produce the right type of seafood without exposing themselves to bad practices and exposing the ecosystem to unsustainable exploitation.

Keywords: Mediterranean, Fisheries, Management, Historical, Assessment.

Historical Review

The Mediterranean Sea has been probably exploited by humans earlier than any other marine region of the world. A captivating account on the historical abundance of Mediterranean marine resources, based on past records, is provided by Osio. Vibrant description of numerous monk seal colonies regularly attacked by 'sea monsters' (killer orcas) is given by Roman author Aelianus (circa 175-235 A.D.) [1]. Ancient Greek historian Herodotus [2] colourfully describes how the sailors of the Persian fleet, wrecked on the rocks of Athos peninsula, were seized by numerous sharks once infesting the Aegean Sea.

The declining trend or even extinction (e.g. sturgeons) of such top predatory species in the Mediterranean may have probably altered predation pressure on different fish species via behavioural responses of meso-consumers released from predator intimidation and these declines might have stronger ecological consequences than previously recognized [3-5].

Fishing has apparently had its share in the degradation of the marine environment, with concerns been raised many centuries ago. Surprisingly, fishing and the effects of overfishing were hypothesized as far back as 1337 A.D. in medieval Italy and seasonal ban of trawling has been introduced in France (1793) and Greece (1825) almost two centuries ago [6]. Moreover, evidence shows that the effects of fishing in the Mediterranean

go far beyond the isolated impacts on overfished target species, vulnerable non-commercial groups or sensitive habitats [7].

Reliable assessment of stock status requires as input an initial reference point (baseline), which has to be set, so far back in time to coincide with the period when the stocks were at a pristine, unexploited status. All Mediterranean fisheries assessments lack this reference point, suffering from the so-called “shifting baseline syndrome,” since marine resources have been exploited for millennia. The status of the pristine/ unexploited biomass of Mediterranean fish stocks before human exploitation poses a challenge which is not expected to be solved soon, if ever.

The development of the Mediterranean fisheries has followed the rapid expansion observed worldwide during the 20th century. Steam powered vessels started gradually replacing the sailing vessels in the beginning of 1900s; after WWII almost all trawlers were equipped with motor engines. A conspicuous increase of fishing capacity indicators, such as engine power and fishing depth range was more evident after the 1960's. Gradually, this led to a decreasing pattern in catches, which is a notable finding taking into account the steep escalation of fishing efficiency during the past century. Most probably, ‘‘nominal” effort in conventional terms (days at sea, engine capacity, gross tonnage) yields estimates far lower from the ‘‘effective’ effort exerted by the fleet, which is unnoticeably escalating [8].

More significant in terms of employment (250,000 fishermen; 92,700 vessels) than production (~1 million tons-FAO, 2016), fishing is mainly on a small scale. Although landings have been fluctuating, there is a conspicuous overall decline. FAO official statistics estimated Mediterranean capture production at around 2,000,000 tons in 1985, 1,600,000 tons in 2006 and 1,000,000 tons.

Currently, Mediterranean fisheries are characterized by certain distinct features: (i) high diversity of the catches, (ii) high number of marketable and non-marketable species (as many as 115 species), (iii) absence of large single stocks, (iv) a relatively small body size of specimens (known as Mediterranean nanism (dwarfism) [9] and (v) small scale vessels (>80% of the vessels, are smaller than 12 m in length). Moreover, fishing activity in the Mediterranean is concentrated along coastal areas, where biodiversity is greatest, targeting small species, or larger juvenile finfish prior to maturity [10]. Briand [11] has aptly defined Mediterranean fisheries as “fisheries for juveniles”. More recently, Vasilakopoulos et al. [10] concluded that the deteriorating trend of Mediterranean fisheries is due to the long-lasting exploitation rate and reliance on juveniles, which have both been continuously increasing, leading to the "shrinking" of Mediterranean stocks both in terms of biomass and body size.

Besides the direct impact of fishing, the Mediterranean fisheries are also affected by the phenomenon of "meridionalization": an Increasing success of thermophilic biota colonizing the Mediterranean Sea and a number of native species moving towards the northern and colder sectors, inducing rapid changes in fish distribution and local abundance [8,11,12].

Bad News

About 85 percent of Mediterranean stocks currently assessed are fished at biologically unsustainable levels with exploitation rate steadily increasing, selectivity deteriorating and stocks shrinking [9,13]. Demersal stocks experience higher fishing mortality rates, while small pelagic stocks show average fishing mortality rates close to the target. Hake stocks in the Mediterranean Sea show the highest fishing pressure, with a fishing mortality rate that is on average 5 times higher than the target, and for some specific stocks, up to 12 times higher than the target [14]. Regarding the status of top predatory species or long lived marine species interacting with fisheries in the Mediterranean, it seems that the situation is more dramatic. Ferretti et al. [15] report declines of over 96% for large pelagic sharks during the last century, while Maynou et al. [16] concluded that sharks, dolphins, monk seals and whales were at very low levels in the second half of the 20th century, supporting rapid disappearance of marine fauna. Currently the Mediterranean is threatened by habitat loss and degradation, pollution, climate change, eutrophication and the establishment of alien species.

The introduction of many technological innovations which in turn produce a progressive increase of fishing capacity, technology and catchability is still occurring at an accelerating pace. The phenomenon, also known as “technological creep”, is related to the increasing skipper skills, investments in auxiliary equipment and more efficient gear, vessel replacement and more powerful engines [17]. In the Mediterranean fisheries this annual 'technological creeping' rate has been estimated between 1.0% and 2.24%. Damalas et al. [18], accounting for this rate of improving fishing efficiency, concluded that a number of eastern Mediterranean demersal stocks were found to decline at a faster pace than previously believed, while others giving the impression of rapid growth should be considered at a stable status.

The fisheries sector should not be disassociated from the general geopolitical instability of the region. The current economic crisis and declining importance of environmental issues in public perception, presumably affects conservation efforts and among others increase illegal fishing activities [19]. Many fisheries are no longer self-sustainable, as they largely rely on loaning (subsidies) for their survival because of spending beyond their means (overexploitation). Economic crisis intensified the problems of the fishing industry not only due to negative economic growth, as a result of decline in fish abundance, but also because of corruption of the fishery managers, failure to provide timely scientific support, lack of political will and the willingness of the industry to avoid taxes. This reflects in the average age of fishers and vessels, constantly aging since there are no incentives for younger people to enter this business. Official data on the EU Mediterranean fishing fleet show a sharp drop in number of vessels during the last decades. It comes as no surprise that, on average, a strongly negative standardized trade balance is

emerging in the Mediterranean fisheries, indicating that most Mediterranean and Black Sea States are becoming net importers of fish products [14].

Although, there is a long history of biological research in the region [20], due to the poor performance of local economies, marine research was never considered a top priority. This fact is confirmed by the low percentage of Gross Domestic Product (GDP) spending on Research [21]. Most countries Research and Development (R&D) expenditure oscillates around 1% of GDP. As a measure of comparison, these figures are more than 3% in Scandinavia or North America. Since scientific support to fisheries management is largely depended on public research funding, it seems that the difficulties associated with fund raising for conducting research in the Mediterranean manifested into poor data collection and very low levels of application of science based management recommendations.

Good News

Conversely, there is also a bright side in this Mediterranean fisheries storytelling. The most encouraging message is that the state of knowledge on the fish stocks has improved rapidly and the number of assessed stocks has increased from 20 in 2009, up to almost 50 in the most recent assessments [9,22]. The percentage of landings assessed has nearly doubled in recent years, rising from about 20% in 2013 to around 45% in 2014 and 2015 [14]. Damalas et al. [8] have gone a step further and explored the status of un-assessed stocks through the application of Productivity Susceptibility Analysis (PSA), increasing the total number of 'assessed' Mediterranean stocks to 151.

Another encouraging signal is the uninterrupted reduction of fishing effort, confirmed in the most recent assessments [23,24]. Both the General Fisheries Commission for the Mediterranean (GFCM), as well as the European Commission, have pledged to control fleet capacity imposing certain restrictions, either through specific controls on effort [25] or through multiannual guidance programmes targeting into a structural adjustment of the EU fishing fleet. This structural policy has been in force since 1983 and it includes fishing fleet capacity ceiling, vessel decommissioning, effort reduction, export to third countries and various social support [26].

From a socio-economic point of view, major economic indicators show a recent recovering trend: revenues and GVA generated by the fleet in 2015, as well as average labour wage, showed significant improvement mostly attributed to higher first sale prices and reduced fuel costs [14].

Another significant difference setting apart contemporary Mediterranean fisheries from the earlier period, is how the past lack of systematic data collection has given its place to a standardized scheme, coupling fisheries dependent and independent surveys, biological data collection and socio-economic enquiries. The MEDITS bottom trawl survey from the beginning of 1990s [27] and the more recent MEDIAS pelagic acoustic survey since 2008 [28], corroborated the EU Data Collection Regulation (DCR, EU Reg. 1543/2000) enforced in all EU Mediterranean Member States since 2002. More recently, GFCM introduced its first comprehensive framework for the collection and submission of fisheries-related data (Data Collection Reference Framework-DCRF). DCRF is considered instrumental in achieving more efficient data collection in the whole Mediterranean region in a standardized way, and providing the minimum set of data needed to support fisheries management decision-making processes [14].

Bluefin tuna, being the sole species managed under quotas in the Mediterranean for more than a decade, is now considered a success story approaching an historical high of stock status [29]. More recently [30], a multi-annual recovery plan for Mediterranean swordfish has been established, introducing a Total Allowable Catch for 2017.

No news: the management conundrum.

Although the English King James I wrote in 1616 that 'No news is better than evil news [31], the stagnant regulatory scheme and sluggish decision making process in the Mediterranean fisheries is actually bad news and serious reason for concern.

Due to the multinational status of the Mediterranean waters, a maze of management regulations is currently in place, varying among neighbouring countries. GFCM has established a system of numerous recommendations and resolutions to which the member states are legally bound [32]. This legal framework is subject to frequent revision. The GFCM scheme focuses on three main issues: (1) Access regimes to fisheries resources, (2) management of fishing Effort and (3) management of fishing Capacity.

A more comprehensive and uniformly applied set of rules is the one introduced by the Common Fisheries Policy (CFP) of the European Union (EU) applying only in the northern Mediterranean waters and its European bordering states. The CFP is a set of rules for managing European fishing fleets and for conserving fish stocks. Designed to manage a common resource, it aspires to give all European fishing fleets equal access to EU waters and fishing grounds and to allow fishermen to compete fairly. The CFP was first introduced in the 1970's and went through successive updates, the most recent of which took effect on 1 January 2014 (COM 1380/2013). Application of the EU Common Fishery Policy in the Mediterranean waters is currently realized through Regulation EC 1967/2006 or most widely known as the "Mediterranean Regulation". It has replaced the previous EC 1626/1994 Regulation. Its' 11 chapters, 32 articles and 6 annexes cover a wide variety of topics. In brief, given the special characteristics and 'peculiarities' of the Mediterranean Sea, an effort-regulating regime has been considered as the most appropriate management strategy [13,33], which was in line with the advice of most international fisheries agencies, particularly the General Fishery Commission for the Mediterranean. The EU CFP, through the 'Mediterranean regulation', has given a privileged treatment to the Mediterranean region. In a nutshell, instead of an output control system (e.g. landing quotas, TACs), it considered that input control through an effort-regulating regime is the most

appropriate management strategy. Complementary to effort control tools the management toolbox included also licensing schemes, closed areas and technical measures. As a striking example, since the 1980's the EU has introduced more than a hundred technical measures regulations with the aim to tackle the issue of low selectivity and the resulting discards [34] and to make the situation worst, numerous derogations may apply to these general or specific rules. The effectiveness of this management approach was recently evaluated: 85% of currently assessed Mediterranean stocks are considered overexploited and an overall reduction of almost 50% in fishing mortality is needed to reach sustainable levels of harvesting [13,22,35].

Mediterranean fisheries have a notorious reputation as having an inherent 'culture of non-compliance' largely ignoring rules [36,37]. A recent study estimated unreported catch and discards as high as 43% of total removals from 1950s to 2010 [38]. Moreover, the General Fisheries Commission for the Mediterranean reviewing the status of logbook data collection in Mediterranean EU countries. Coll et al. [39] concluded that information in the logbooks suffers from falsification, misreporting, incompleteness and ineligibility. This results into damaging marine resources, giving merit to illegal practices, belittling the image of control authorities, causing reputational damage to the fishing community, and most of all penalising fishers who play by the rules by giving an unfair advantage to those who ignore rules. It is documented that compliance in European fisheries is worst when fishers have no faith in the science underpinning management decisions and particularly when catches are plummeting [40,41].

It must be admitted that the true level of catches (landings and discards) for Mediterranean fisheries is currently unknown. Regulation (EC) No. 1224/2009 requires that “Masters of Community fishing vessels of 10 metres’ length overall or more, shall keep a fishing logbook of their operations, indicating specifically all quantities of each species caught and kept on board above 50 kg of live-weight equivalent". This practically excludes the Mediterranean fleet from the obligation to keep an official logbook. A typical Mediterranean vessel (>80% less than 12 m of length — classified under small scale coastal fisheries) will rarely make a daily catch of 50 kg per species. STECF [42] identified that EU logbook records reported a minor 0.06% of the actual amount estimated from scientific observer trips.

Current levels of control and enforcement are insufficient to confront fleets with a large number of vessels; likelihood of facing an inspection is extremely low (e.g. for reasons related to discarding, this probability is as low as one inspection every four years for the average Greek vessel [43].Wallis and Flaaten calculated Monitoring Control and Surveillance (MCS) costs as a fraction of revenues in the EU fisheries (on average 6%). Germany, Sweden and Ireland displayed values above 20%, while Mediterranean countries exhibited very low values, apparently investing little in regulation enforcement (France 10%, Greece 9%, Italy 4%, Spain 1%). Recent economic crisis seems to amplify the problem due to reduced funds for efforts related to conservation of marine resources and the fight against illegal fishing [19]. Absence of multilaterally agreed Exclusive Economic Zones (EEZ) in the Mediterranean could be considered as an obstacle in the way of efficient monitoring and control. However, the small sized, limited capacity Mediterranean fleet has a very low likelihood of exerting its activities beyond territorial waters. Nevertheless, a recent feasibility study on the costs and benefits of EEZs in the Mediterranean [44] concluded that besides Italy, most countries' fisheries will be influenced positively, with monitoring, control and surveillance costs significantly reduced.

Political agendas (e.g. stakeholder pressure, lobbying, corruption), are not to be left out of the equation. Some small scale fishers' organizations have recently expressed their 'discomfort' on the legal framework establishing fish producers organisations, talking openly of 'Fishy Business' [45] 50 kg per species [42]. In another case, certain EU Mediterranean fisheries, requesting derogations from the obligation to land all catches through Joint Recommendations (JRs), were surprisingly granted the right to do so. Despite the fact that the competent authority (STECF) for reviewing the Mediterranean JRs concluded that none of them can be assessed, due to lack of information regarding the volumes of landings and discards, the European Commission not only adopted the discard management plans, but went a step further officially promoting in an online newsletter that they were assessed by the STECF "to ensure that they meet the CFP's high sustainability standards" [37].

It seems that the impacts of Mediterranean fisheries on fish stocks and marine ecosystems need to be reassessed based on new approaches, either shifting towards simple catch-based management or the more elaborate ecosystem based management. However, the ultimate goal should be to change the mind set of fishers and motivate them to produce the right type of seafood without exposing themselves to bad practices and exposing the ecosystem to unsustainable exploitation.

References

1. Aelianus C. De natura animalium: On the characteristics of animals. Cambridge, MA: Harvard University Press. 1958.
2. Herodotus. The Histories. Oxford World's Classics, OUP Oxford. 2008;848.
3. Abrams PA. Implications of dynamically variable traits for identifying, classifying and measuring direct and indirect effects in ecological communities. Am Nat. 1995;146:112134.
4. Scheffer M, et al. Cascading effects of overfishing marine systems. Trends Ecol Evol. 2005;20:579-81.
5. Frid A, Baker GG, Dill LM. Do shark declines create fear released systems? Oikos. 2008;117:191-201.
6. Fishing in the Greek Seas (in Greek). 2010.
7. Tudela S. Ecosystem effects of fishing in the Mediterranean: An analysis of the major threats of fishing gear and practices to biodiversity and marine habitats.

Studies and Reviews. General Fisheries Commission for the Mediterranean. 2004;44.

8. Damalas D, Maravelias CD, Osio GC, et al. "Once upon a time in the Mediterranean" long term trends of Mediterranean fisheries resources based on fishers' traditional ecological knowledge. PLoS ONE. 2015;10(3):e0119330.
9. Tortonese E. I caratteri biologici de Mediterraneo orientale e i problemi relativi. Archivio Zoologico Italiano. 1951;7:205-51.
10. Vasilakopoulos P, Maravelias CD, Tserpes G. The alarming decline of Mediterranean fish stocks. Curr Biol. 2014;24(14):1643-8.
11. Briand F. CIESM. Climate warming and related changes in Mediterranean marine biota. N° 35 in CIESM Workshop Monographs. 2008;152.
12. Azzurro E, Moschella P, Maynou F. Tracking signals of change in Mediterranean fish diversity based on local ecological knowledge. PLoS ONE. 2011;6(9):e24885.
13. Colloca F, Cardinale M, Maynou F, et al. Rebuilding Mediterranean fisheries: A new paradigm for ecological sustainability. Fish Fish. 2013;14:89-109.
14. FAO. The State of Mediterranean and black sea fisheries. General Fisheries Commission for the Mediterranean. 2016.
15. Ferretti F, Myers RA, Serena F, et al. Loss of large predatory sharks from the Mediterranean Sea. Conservation Biology. 2008;22:952-64.
16. Maynou F, Sbrana M, Sartor P, et al. Estimating trends of population decline in long-lived marine species in the Mediterranean Sea based on fisher's perceptions. PLoS ONE. 2011;6(7):e21818.
17. Rijnsdorp AD, Daan N, and Dekker W. Partial fishing mortality per fishing trip: A useful indicator of effective fishing effort in mixed demersal fisheries. ICES J Mar Sci. 2006;63:556-66.
18. Damalas D, Maravelias CD, Kavadas S. Advances in fishing power: A study spanning 50 years. Rev Fish Sci Aquacult. 2014;22(1):112-21.
19. Katsanevakis S, Levin N, Coll M, et al. Marine conservation challenges in an era of economic crisis and geopolitical instability: the case of the Mediterranean Sea. Mar Policy. 2015;51: 31-9.
20. Farrugio H, Oliver P, Biagi F. An overview of the history, knowledge, recent and future research trends in Mediterranean fisheries. Sci Mar. 1993;57(2-3):105-19.
21. Gross domestic spending on R&D (indicator). 2017.
22. Cardinale M, Osio GC. Status of Mediterranean and Black Sea resources in European waters in 2013. Results for Stocks in GSA (Mediterranean and Black Sea). 2013;1-29.
23. Scientific, Technical and Economic Committee for Fisheries (STECF). 2016a.
24. Scientific, Technical and Economic Committee for Fisheries (STECF). 2016b.
25. GFCM. Resolution GFCM/37/2013/2 on Guidelines on the management of fishing capacity in the GFCM area. 2013.
26. Pascoe S, Gréboval D. Measuring capacity in fisheries. 2003;314.
27. Bertrand JA, Gil De Sola L, Papacostantinou C, et al. The general specifications of the Medits survey. Scientia Marina. 2002;66:9-17.
28. MEDIAS. Report of 3rd meeting for Mediterranean acoustic surveys (MEDIAS) in the framework of European Data Collection Framework, Capo Granitola. 2010.
29. ICCAT. Report of the 2014 Atlantic Bluefin tuna stock assessment session. 2014.
30. ICCAT. Recommendation by ICCAT replacing the recommendation and establishing a multi-annual recovery plan for Mediterranean swordfish. 2017.
31. Flexner S and Flexner D. Wise words and wives tales: The origins, meanings and time-honored wisdom of proverbs and folk sayings old and new, New York, NY: Avon Books. 1993.
32. Cacaud P. Fisheries laws and regulations in the Mediterranean: A comparative study. Studies and reviews. General Fisheries Commission for the Mediterranean. 2005;75:40.
33. Spagnolo M. What kind of management for Mediterranean fisheries? 2012;52.
34. Santurtun M, Prellezo R, Arregi L, et al. Characteristics of multispecific fisheries in the European Union. 2014.
35. Merino G, Quetglas A, Maynou F, et al. Improving the performance of a Mediterranean demersal fishery toward economic objectives beyond MSY. Fish Res. 2015;161:131-44.
36. Mikhailov K, Papaconstantinou C, Lukousis, V. Report on pressures and potential hazards on the marine resources of the system, emanating either from natural variation or from anthropogenic activity. 2006.
37. Damalas D. Mission impossible: Discard management plans for the EU Mediterranean fisheries under the reformed common fisheries policy. Fish Res. 2015;165:96-9.
38. Coll M, Carreras M, Cornax MJ, et al. Closer to reality: reconstructing total removals in mixed fisheries from Southern Europe. Fish Res. 2014;154:179-194.
39. GFCM. Report of workshop on the GFCM regional logbook for the Mediterranean and Black Sea. 2009.
40. Young OR. Institutional uncertainties in international fisheries management. Fish Res. 1998;37:211-24.
41. Wilson DC, Nielsen JR and Degnbol P. The fisheries co-management experience: Accomplishments, challenges and prospects. Fish Fish Series. 2003;348.
42. Scientific, Technical and Economic Committee for Fisheries (STECF). Landing Obligation in EU Fisheries (STECF-13-23). 2013.
43. Damalas D, Vassilopoulou V. Slack regulation compliance in the Mediterranean fisheries: A paradigm from the Greek Aegean Sea demersal trawl fishery, modeling discard ogives. Fish Manage Ecol. 2013;20(1):21-33.
44. MRAG/IDDRA/LAMANS. Costs and benefits arising from the establishment of maritime zones in the Mediterranean Sea. Final Report. 2013.

45. Low impact fishers of Europe-LIFE. Fishy Business: Fish POs in the EU. 2017.