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1 **The Mediterranean fishery management: a call for shifting the current paradigm from**
2 **duplication to synergy**

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39

40 **Abstract**

41 Independence of science and best available science are fundamental pillars of the UN-FAO code of conduct
42 for responsible fisheries and are also applied to the European Union (EU) Common Fishery Policy (CFP),
43 with the overarching objective being the sustainable exploitation of the fisheries resources. CFP is
44 developed by DG MARE, the department of the European Commission responsible for EU policy on
45 maritime affairs and fisheries, which has the Scientific, Technical and Economic Committee for Fisheries
46 (STECF) as consultant body. In the Mediterranean and Black Sea, the General Fisheries Commission for the
47 Mediterranean (FAO-GFCM), with its own Scientific Advisory Committee on Fisheries (GFCM-SAC), plays a
48 critical role in fisheries governance, having the authority to adopt binding recommendations for fisheries
49 conservation and management. During the last years, advice on the status of the main stocks in the
50 Mediterranean and Black Sea has been provided both by GFCM-SAC and EU-STECF, often without a clear

51 coordination and a lack of shared rules and practices. This has led in the past to: i) duplications of the
52 advice on the status of the stocks thus adding confusion in the management process and, ii) a continuous
53 managers' interference in the scientific process by DG MARE officials hindering its transparency and
54 independence. Thus, it is imperative that this stalemate is rapidly resolved and that the free role of science
55 in Mediterranean fisheries assessment and management is urgently restored to assure the sustainable
56 exploitation of Mediterranean marine resources in the future.

57 **1. Introduction**

58 The definition and adoption of measures for the sustainable management of fish stocks has
59 become a priority worldwide due to overexploitation [1,2] and the ongoing climate change
60 influence on fisheries resources [3,4]. The advisory process, which entails the assessment of
61 fishing impact on fish stocks and ecosystems, is the core aspect of the entire procedure for
62 identifying management measures aimed at the sustainable exploitation of fish stocks [5]. There
63 are three main actors actively taking part in fisheries management: i) the scientists, who provide
64 advices on fish stocks based on the most updated data, science and assessment methods, ii)
65 decision makers, which take tactical decisions based on additional considerations (e.g.
66 management objectives, economic aspects), and iii) stakeholders, such as fishers, industry
67 representatives and non-governmental organizations, which provide support to the other two
68 actors with additional data and different perspectives. With their constant interaction, the
69 different actors identify management measures for the sustainable exploitation of fish stocks.
70 However, this process could suffer from a number of pitfalls if clear rules are not established to
71 regulate the role of each actor. When fish stocks are shared among different countries, the
72 interaction among these countries further complicates the scene adding difficulties to the
73 application of an evidence-based decision-making process. These interactions are even more
74 complicated when countries involved are characterized by different levels of socio-economic
75 development or geopolitical organization, such as in the Mediterranean region [6].

76
77 Worldwide, the advisory process is structured in different ways both at country and regional level,
78 and generally relies on key principles highlighting the importance that conservation and
79 management measures are based upon the best scientific information available and that scientific
80 processes are free of undue non-scientific influences and considerations [see for example 7,8]. In
81 each management area, the status of a number of selected fish and shellfish stocks is expected to
82 be evaluated by expert working groups according to specific requests of the competent advisory
83 body. Usually, the evaluation is based on the best available data, knowledge and methods. Once
84 the advice on the status of the stocks is formally endorsed by the competent advisory body,
85 decision makers are responsible for the definition, evaluation and adoption of management
86 measures.

87
88 At regional level, States cooperate on fishery management through specific Regional Fishery
89 Bodies (RFBs) such as the General Fisheries Commission for the Mediterranean (GFCM), the
90 International Commission for the Conservation of Atlantic Tunas (ICCAT), the Northwest Atlantic
91 Fisheries Organization (NAFO), the International Council for the Exploration of the Sea (ICES) and
92 several others [9,10]. All RFBs provide scientific advice and support to fisheries management but
93 not all of them have the mandate to take binding measures for fisheries management. The ICES is
94 an example of this latter group. In ICES, all the steps leading to the advice, as well as the
95 responsibilities and interactions among the involved actors are generally clearly defined and
96 transparent. ICES advice, for example, is based on scientific recommendations subject to peer
97 review by independent experts and it is prepared in an advice drafting group and approved by the
98 Advisory Committee (ACOM) before being delivered to the advice recipients. On the contrary,

99 GFCM has the authority to adopt binding recommendations for fisheries conservation and
100 management. Every year, the representatives of the contracting parties of the GFCM review and
101 adopt the recommendations developed on the basis of the advice provided by the GFCM
102 subsidiary bodies, including its Scientific Advisory Committee on Fisheries (SAC), which provides
103 technical and scientific advice for decisions related to fisheries management.
104

105 Although high variability in terms of governance exists both at the country and regional level, the
106 independence of experts participating in working groups on stock assessment is considered a core
107 principle of the process. Nevertheless, in some cases, such as GFCM, the interaction rules among
108 actors (in terms of roles and responsibilities) are not always clearly defined. In this regard, the
109 situation in the Mediterranean is further complicated by the occurrence of two different scientific
110 advisory bodies, GFCM-SAC and STECF (Scientific, Technical and Economic Committee for
111 Fisheries), the consultant body of DG MARE (the department of the European Commission
112 responsible for EU policy on maritime affairs and fisheries), each one having its own advisory
113 machinery, which has recently raised concerns on its efficiency on providing advice [11,12]. In this
114 context, it is important to highlight that GFCM has competence for all marine waters of the
115 Mediterranean and the Black Sea (<http://www.fao.org/gfcm/about/area-of-application/en/>) and
116 has the authority to adopt conservation and management measures for the fisheries under its
117 purview, which are binding on the contracting parties [13]. The EU as a contracting party is
118 therefore obliged to comply with GFCM management decisions and not vice versa. The mandate
119 of the GFCM-SAC is, among others, to provide independent advice in order to facilitate the
120 adoption of recommendations concerning the sustainable management of fisheries and
121 ecosystems at the regional and sub-regional levels. These recommendations encompass relevant
122 biological, environmental, social and economic aspects in compliance with the ecosystem
123 approach to fisheries, as well as aspects related to the impact of IUU (Illegal Unreported and
124 Unregulated) fishing and the assessment of biological and ecological implications under different
125 management scenarios (see: <http://www.fao.org/gfcm/about/structure/sac/en/>). Moreover, EU
126 and non-EU countries are involved in the assessment process of several shared stocks, which
127 means that only GFCM can deal with this additional complexity.
128
129

130 **2. Pitfalls in the Mediterranean fisheries advisory process**

131 *Duplication of advice on the status of the stocks*

132 The institutional forum for providing scientific advice on fisheries in the Mediterranean Sea is the
133 GFCM-SAC, where scientists from EU and non-EU countries meet during dedicated working groups
134 to provide advice on the status of Mediterranean and Black Sea stocks and ecosystems. The
135 selection of the models to be used in stock assessment is guided by the stock characteristics and
136 the type of data available to scientists. The assessments undergo a validation process and, once
137 endorsed by the SAC, are presented to the policy makers during the annual meeting of the GFCM
138 Commission, where specific management measures are discussed and eventually adopted.
139

140 In parallel, by means of a process similar to the one adopted by the GFCM-SAC, the same fish
141 stocks in the EU waters are assessed also by the STECF through specific expert working groups
142 (EWGs) [14]. EWGs work on official data prepared following DG MARE guidelines, and DG MARE
143 also decides the specific term of references of the EWGs. The resulting assessments are reported
144 to the STECF plenary where they are scrutinized by STECF members. The scientific advice of the
145 STECF is then made available to EU managers and can be used in a wide framework of policy
146 actions aimed to support the Common Fisheries Policy (CFP). Even if the work done by GFCM-SAC

147 and STECF should theoretically results in an efficient fisheries resources management,
148 complications arise because of the large overlap between the work done by the two bodies and
149 because of the absence of a clear distinction of their respective roles during this process.
150 As a matter of fact, lack of coordination in the advisory process has often led to the duplication of
151 GFCM-SAC work by the STECF, which has raised criticisms and debate within the scientific
152 community [11,12,15]. In 2019, such situation has not changed and two competing assessments
153 were performed for 15 stocks: one produced by the STECF and another one submitted by the
154 national experts under the GFCM umbrella. Those included for example sole and cuttlefish in
155 Geographical Sub Area (GSA) 17, red mullet in GSA 1 and 6, striped red mullet in GSA 5, Norway
156 lobster in GSA 5 and blue and red shrimp in GSA 1. As a result, the GFCM Working Group on
157 Demersal Species (WGSAD) held in Rome (Italy) on December 2019 [16], had to review all these
158 duplicated 15 stock assessments to provide a sort of consensus report, a situation that not only
159 has created a general sense of impasse, but also represents a waste of human resources and
160 taxpayer money, as suggested by [11,12]. For example, several of those stock assessments (e.g.
161 common sole), considered valid by STECF, were rejected by GFCM. Indeed, some attempts of
162 developing common assessments between GFCM-SAC and STECF were carried out, i.e. the Adriatic
163 hake benchmark in January 2019 and the evaluation of small pelagics (i.e. sardine and anchovy) in
164 the Adriatic Sea, but with limited results, since STECF, for example, performed again in October
165 2019 the assessment of Adriatic hake. Moreover, in the case of shared stocks, STECF assessments
166 have often failed to include all the available data and expertise since not all countries bordering
167 the Mediterranean are EU Members [11]. It is important to note that while the development and
168 production of alternative assessments would improve the science and the quality of the resulting
169 advices, it raises two important issues. First, in the case of limited manpower, duplicating the work
170 might be seen as a waste of human resources and a hinder to the provision of more assessments.
171 Second, to actually improve the quality of the advice, it would require confronting the different
172 models and assessments. This is generally done at GFCM benchmark assessment meetings in
173 which one or more models are proposed and peer-reviewed by external referees (e.g. Adriatic
174 hake (<http://www.fao.org/gfcm/technical-meetings/detail/en/c/1194087/>) and Sicilian Strait
175 hake; (<http://www.fao.org/gfcm/technical-meetings/detail/en/c/1274921/>), and the best case
176 model is chosen, based on scientific and technical basis agreed upon by experts, and then used for
177 advice. However, this is not routinely happening for the Mediterranean stocks, as two different
178 bodies (i.e. GFCM and STECF) provides two parallel stock assessments of the same stock resulting
179 in two different advices, which we believe is an important obstacle for fisheries management.
180 Differences in assessment results (even if the resulting stock status is the same) yield doubts for
181 managers and discredit the advice, making the decision process more complicated.

182
183

184 *Managers' interference in the scientific process*

185

186 The independence of science and the adoption of decisions based on the best available science are
187 fundamental principles both in UN-FAO and EU frameworks. In particular, according to the
188 European Charter for Researchers (<https://euraxess.ec.europa.eu/jobs/charter/european-charter>),
189 "Researchers should focus their research for the good of mankind and for expanding the frontiers
190 of scientific knowledge, while enjoying the freedom of thought and expression, and the freedom
191 to identify methods by which problems are solved, according to recognized ethical principles and
192 practices". In EU countries these principles are observed in all sectors of science, technology and
193 innovation, and clearly should also apply to the CFP. Unfortunately, those fundamental principles
194 have been violated in recent years by DG MARE, intruding the scientific debate of GFCM-SAC
195 working groups regarding to matters strictly related to research, such as the quality of the data

196 and the models applied, thus going well beyond their institutional role [11,12]. This has happened
197 also in STECF meetings, like the 2019 stock assessment working groups, where stocks were only
198 assessed using a certain model and any other options was disregarded. Also within the GFCM-SAC
199 working groups, there has been in several occasions the attempt of DG MARE to drive the
200 scientific process, providing opinions on technical matters and trying to impose their views. A
201 tendency culminated in the rejected proposal made by the EU-DG MARE delegation at the 43rd
202 Plenary Session of the GFCM to ban the use of “complex stock assessment models” in
203 Mediterranean and Black Sea, insinuating that those models are too difficult for Mediterranean
204 scientists to be used [17; points 133 and 134].
205

206 During the last two decades, knowledge about the impact of fishing exploitation and the status of
207 fisheries resources and exploited ecosystems in the Mediterranean and Black Sea has improved
208 consistently thanks to the effort done by both GFCM and EU in promoting data collection on
209 fisheries, and application of models of increasing complexity [18,19], but also promoting capacity
210 building initiatives, such as the summer school in stock assessment organized in 2017-2019 by
211 GFCM and STECF jointly. Stock assessment models, which are applied to achieve the GFCM and
212 CFP objective to advance towards an Ecosystem Approach to Fisheries Management can range
213 from single species models to multispecies or even holistic types of ecosystem models. In the
214 Mediterranean, the provision of scientifically sound advice and the improvement of national
215 capacity to provide assessment and management of fisheries, which also encompasses
216 neighboring countries, are pillars of the GFCM mid-term strategy. In recent years, the GFCM has
217 been moving towards increasingly complex models. The shift, which has also taken place in other
218 regions of Europe such as the Northeast Atlantic, is driven by several objectives, among which the
219 main are: i) to provide confidence intervals of the estimates; ii) to account for the complexity of
220 the fishery system, which is often multispecies, multi-gear and multinational, and iii) to take into
221 account other parts of the ecosystem and include environmental variables in the models as well as
222 socio-economic aspects. In particular, this shift is progressively occurring in those Mediterranean
223 fisheries where Multiannual Management Plans are in place or are expected to come into force in
224 the near future. The shift towards more complex stock assessment models has been associated
225 with a more thorough peer-reviewed benchmark assessment process within GFCM-SAC,
226 conducted by highly qualified experts from outside the GFCM area, also with a view to adjust to
227 practices that are commonly adopted all over the world. This is not the case for STECF, where
228 assessments are not formally peer-reviewed and often accepted without consulting the regional
229 experts.
230

231 232 **3. Moving toward a more effective and transparent advisory process**

233 The overarching objectives of the GFCM and CFP are to achieve the sustainable exploitation of
234 fishing resources through the definition of a common target: the Maximum Sustainable Yield
235 (MSY) and the Good Environmental Status (GES) of marine ecosystems. In the Mediterranean,
236 these objectives have been adopted and are applied through the work carried out in the
237 framework of the GFCM Mid-Term Strategy as well as through commendable EU initiatives like the
238 MedFish4Ever declaration [20]. Particularly, the first pillar of the GFCM mid-term strategy (2017-
239 2022) states: “Reverse the declining trend of fish stocks through strengthened scientific advice in
240 support of management; (<http://www.fao.org/gfcm/activities/fisheries/mid-term-strategy/en/>)”.
241 The GFCM mid-term strategy was agreed by all member countries with the signature of the
242 MedFish4Ever declaration
243 (<https://gfcmsitestorage.blob.core.windows.net/website/MedFish4Ever/2017-03-30-declaration->

244 malta.pdf). However, in latest years the process necessary to achieve the overarching objectives of
245 the CFP has been hindered by the lack of coordination between GFCM and DG MARE [8,9]. Thus, it
246 is crucial to define a clear coordination process of the activities carried out by STECF and GFCM-
247 SAC, in order to shift from “duplication of working groups” to “synergy between working groups”
248 [11,12].
249

250 The possible solutions are numerous but in principle, STECF and GFCM-SAC should work under the
251 same guidelines and according to common standardized and transparent procedures, with respect
252 to the way stock assessments are conducted as well as how each advice is formulated. This would
253 not only avoid duplication of work but also would strengthen the capacity of the whole advisory
254 system towards the sustainable exploitation of marine resources and ecosystems, which is the
255 ultimate objective of the CFP and of the GFCM following the United Nations Fish Stocks
256 Agreement, and in line with the FAO Code of Conduct for Responsible Fisheries. Furthermore, the
257 coordination process should be assisted by clearly defining the role of stakeholders (as for
258 example DG MARE) in scientific and technical meetings such as stock assessment and benchmarks
259 working groups of GFCM-SAC, through an *ad hoc* “policy document” (hereafter defined as the
260 “GFCM policy document”). Institutions such as ICES (and, notably, DG MARE itself) have clear
261 guidelines defining the role of participants in this kind of meetings. For instance, ICES assigns to
262 advice recipients (such as DG MARE) very clear roles in stock assessment and benchmarks. In
263 particular, they can participate as observers and can explain the meaning of their requests and
264 intervene for policy-related matters, but have no say in methodological, technical or scientific
265 questions, which are a prerogative of scientists (Mark Dickey-Collas, ICES ACOM Chair, personal
266 communication). In particular, the “GFCM policy document” should clearly state which are the
267 actors allowed to participate in the expert working groups, together with their roles, duties and
268 responsibilities. Furthermore, the “GFCM policy document” should also single out that the
269 advisory process has to meet criteria such as: i) scientific processes should be free of non-scientific
270 influences and/or considerations; ii) all the documents, data and models should be made available
271 to all actors for the sake of transparency; iii) scientific group results should be peer-reviewed by
272 independent experts, possibly outside the Mediterranean area and, even best, outside Europe.
273 This should hopefully end the past continuous interference of DG MARE in the GFCM scientific
274 work.
275

276 In the Mediterranean Sea, the CFP and, more recently, the MSFD (Marine Strategy Framework
277 Directory) continue to fall far short of their exploitation objectives [20,21,22]. The last GFCM
278 reports on the Status of Mediterranean and Black Sea Fisheries [23] states that 75% of the
279 assessed stocks is in a state of overexploitation and, that although the trend has been reversed,
280 the level of exploitation is in general unsustainable. As a matter of fact, the current lack of
281 coordination between GFCM-SAC and STECF and the absence of a clear definition of the roles of
282 stakeholders in technical meetings has hindered the assessment of Mediterranean stocks and
283 fueled the difficulties related to the already complex process of aligning management in the
284 Mediterranean with the FAO-UN and EU-CFP sustainability targets. Thus, it is imperative that this
285 impasse is urgently resolved and that the free role of scientists in Mediterranean fisheries science
286 is restored. The current approach of DG MARE to GFCM is an exception when compared to how
287 EU approach other international agreements (e.g., NAFO, ICCAT and IOTC) and ideally EU should
288 contribute to and adopt GFCM scientific advice, without duplication from STECF. Thus, instead of
289 hindering the process, the existence of two advice bodies, GFCM-SAC and STECF, should be a great
290 strength to face the current challenges of fisheries management in the Mediterranean Sea by
291 increasing the number of stocks that could be assessed and promoting synergies towards more

292 methodological expertise and capacity building that could assure the sustainable exploitation of
293 Mediterranean marine resources.
294

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